



Brooklyn Navy Yard
Development Corporation
BrooklynNavyYard.org

Building 77
141 Flushing Ave, Suite 801
Brooklyn, NY 11205

INVITATION FOR BIDS

RESTORATION OF SUBSTATION AT BUILDING 386 PW4275

Contact Information:

Haanwa Chau
Senior Project Manager
hchau@bnydc.org
929.337.1214

Overview of Sections:

- A. Project Information
- B. Conditions Precedent for BNYDC to Consider a Bid Including Pertinent Dates
- C. Contract Particulars
- D. Minority and Women Owned Business Enterprise Participation
- E. Special Requirements
- F. Bid Submission Documents

Overview of Exhibits:

- Exhibit A – Bid Form
- Exhibit B – Form of Bid Bond
- Exhibit C – Experience Questionnaire
- Exhibit D – Declaration of Understanding
- Exhibit E – Confirmation of PASSPort Compliance
- Exhibit F – Doing Business Data Form
- Exhibit G – M/WBE Information Form
- Exhibit H – Form of Contract
- Exhibit I – Environmental Certification Form
- Exhibit J – Excavation Work Plan
 - Health and Safety Plan
 - Community Air Monitoring
- Exhibit K – Site Management Plan
- Exhibit L – FEMA Rider
- Exhibit M – Project Drawings and Specifications
- Exhibit N – Additional M/WBE Provisions
- Exhibit O – M/WBE Utilization Plan



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A. PROJECT INFORMATION

The Brooklyn Navy Yard Development Corporation (“BNYDC”) is issuing this Invitation for Bids (“IFB”) to seek bids (“Bids” and each, a “Bid”) from entities (“Bidders” and each, a “Bidder”) interested in performing the Restoration of Substation G at Building 386 (the “Project”).

1. PROJECT SITE(S):

Building 386 (40°42'03.8"N 73°58'10.0"W)
Brooklyn Navy Yard
63 Flushing Ave, Brooklyn, NY 11205

2. DESCRIPTION OF PROJECT:

Building 386, also referred to as Substation ‘G’, is located within the Brooklyn Navy Yard property. The Substation ‘G’ switchgear (medium and low voltage) located on the ground floor was inundated by 52” of brackish water during Hurricane Sandy, resulting in significant damage to the equipment. Under this project, the Substation ‘G’ switchgear will be replaced in its entirety, constructed, and installed on a reconstructed 2nd floor. Refer to the following for the general scope of work:

a. Electrical:

The existing Substation ‘G’ is fed by two (2) 13.8kV feeders from Substation ‘C’ (Building 542) that are stepped down to 2.4kV by two (2) exterior 4500kVA Oil-Filled Transformers at grade level. The 2.4kV secondary transformer feeders terminate to a Main-Tie-Main configured switchgear lineup. From the medium voltage switchgear, two (2) Main-Tie-Main configured 480V switchgear lineups are energized via four (4) 2000KVA Oil-Filled Transformers, all at grade level. The new Substation ‘G’ shall replace the aforementioned equipment with two (2) 4.16kV rated dry-type exterior 4500kVA transformers installed on an elevated platform above the existing transformers. The subsequent 4.16kV and 480V switchgear lineups shall mirror the Main-Tie-Main configurations of the existing switchgear and be constructed and installed on a reconstructed 2nd floor. The project will include provisions and installation necessary for extending and terminating all existing feeders (13.8kV, 480V, and 208V) and conduit as required to terminate to the new electrical equipment. New electrical concrete encased conduit ductbanks shall be installed and terminated to new electrical manholes, and new general power, lighting and receptacles shall be provided. The project will also include the demolition and disposal of the existing medium voltage switchgear, oil-filled transformers, ground floor and second floor 120/208V loads, including but not limited to general power, receptacles, and lighting.

b. Structural:

The existing second floor foundation slab shall be removed in its entirety and replaced with a new reinforced slab to accommodate the new substation. Steel supports shall be provided to accommodate equipment loads. New foundation (i.e. piles, wall and grade beams, etc.), reinforcements and structural steel support



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structure shall be provided for a stationary crane. Piles, framing, etc. shall be provided to support the installation of new electrical concrete encased conduit ductbanks and electrical manholes.

c. Architecture:

Existing second floor interior walls (office space) and all associated fixtures shall be removed and disposed of in its entirety. A new equipment room on the 2nd floor will be built. This will include new walls, doors, floor, and ceiling with proper fire-rating and sound attenuation.

d. Mechanical:

Remove and return to owner all existing 2nd floor HVAC equipment. Provide a new multi-ductless split heat pump system to provide heating and cooling to the second floor. Provide new electric unit heaters on first floor.

e. Civil:

Restore disturbed asphalt and concrete resulting from the installation of the electrical concrete encased conduit ductbanks, electrical manholes, and structural stationary crane.

f. Hazardous Remediation:

Removal and disposal of all Oil-Filled Transformers (PCB), all asbestos insulated piping, asbestos cable wraps, batteries, and any disturbed soil, as outlined in the contract drawings and the Site Management Plan.

3. PROJECT SPECIFICATION DOCUMENTS AVAILABLE:

Electronically from the link <https://brooklynnavyyard.org/about/contract-opportunities>

4. M/WBE PARTICIPATION GOAL: 8%

B. PERTINENT DATES AND CONDITIONS PRECEDENT FOR BNYDC TO CONSIDER A BID

1. MANDATORY PRE-BID MEETING. A **mandatory** pre-bid submission conference will be held at 9:00 am on October 9, 2024 at BNYDC's offices, 141 Flushing Avenue, Building 77, 8th Floor, Suite 801, Brooklyn, NY 11205. All Bidders who plan to attend should contact Haanwa Chau via email (hchau@bnydc.org) to provide names of attendees and email addresses so that attendees can receive a visitor QR code for entry into the Brooklyn Navy Yard (the "Yard"). The meeting will be immediately followed by a site walkthrough. All attendees must bring and wear their own hardhat.
2. INQUIRIES. Any explanation desired by Bidders regarding the meaning or interpretation of this IFB must be emailed and received by BNYDC no later than 9:00 am on October 30, 2024. BNYDC will evaluate the need to respond to inquiries received. No verbal responses will be provided, and any information given to a prospective Bidder will be furnished to all prospective Bidders as an addendum to this IFB (an "Addendum"). Except as provided



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below, all questions must be directed only to Haanwa Chau, Brooklyn Navy Yard Development Corporation, at hchau@bnydc.org.

3. **BID SUBMISSION DEADLINE.** Written sealed Bids must be received at BNYDC's office on or no later than 12:00pm (noon) on November 20, 2024 (the "Bid Submission Deadline"). If Bidder is submitting a request for a full or partial waiver of the M/WBE Participation Goal set forth in Section D hereof, they shall submit such waiver request no later than 12:00pm (noon) November 13, 2024, seven (7) calendar days prior to the Bid Submission Deadline.
4. **BID SECURITY.** Bidder must submit with the Bid either a bid deposit by certified check or a bid bond in the form attached hereto as Exhibit B in an amount of ten percent (10%) of the Bid. Note that Bid Security is not required for any Bid submitted for an amount under Two Hundred Fifty-Thousand Dollars (\$250,000).
5. **PASSPORT COMPLIANCE.** Bidders are required to be registered and up-to-date in PASSPort prior to submitting a Bid to this IFB. Each Bidder must include its PASSPort identification number on the Confirmation of PASSPort Compliance form attached hereto as Exhibit E.
6. **PROJECT SCHEDULE.** Below are the following pertinent dates:
 - a. Anticipated selection of Bid by and notification from BNYDC to winning Bidder on December 20, 2024;
 - b. Upon selection, the selected Bidder must execute a Contract substantially in the form attached hereto as Exhibit H. Please note that, if any Bidder desires any change(s) to the Contract form attached as Exhibit H, it must include any such proposed change(s) as part of its Bid. BNYDC does not agree to necessarily accept any such proposed Contract changes, but BNYDC will not consider any Contract changes that are not provided as part of a Bid. The contents of the selected Bid, together with this IFB and any formal questions and answers provided during the bid process may be incorporated into any final Contract at BNYDC's discretion;
 - c. Commence work on Project immediately following Notice to Proceed to be issued by BNYDC for this Project (the "NTP").
 - d. Substantial completion of the Project (as defined in the Contract attached as Exhibit H hereto); no later than Section C.1 Time Of Completion (the "Substantial Completion Date").

C. CONTRACT PARTICULARS

1. **TIME OF COMPLETION.** 1095 consecutive calendar days from the issuance of the NTP (3-years).
2. **LIQUIDATED DAMAGES.** \$1000 for each calendar day beyond Substantial Completion Date. Failure to comply with the M/WBE requirements described in this IFB may also result in liquidated damages, as described further in Exhibit N.
3. **RETAINAGE.** As provided in the Contract attached hereto as Exhibit H.
4. **CONTRACT LENGTH.** The anticipated Contract length is 3.5 years.



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D. MINORITY AND WOMEN-OWNED BUSINESS ENTERPRISE PARTICIPATION

The specific requirements of minority-owned business enterprises (“MBEs”) and women-owned business enterprises (“WBEs”) participation for this Contract are detailed below. Additional provisions regarding this IFB’s requirements relating to M/WBEs can be found in Exhibit N (Additional M/WBE Provisions) attached hereto.

Bidders must comply with all applicable MBE and WBE requirements for this Contract.

1. M/WBE PROGRAM. Section 6-129 of the Administrative Code of the City of New York (“Section 6-129”) establishes the program for participation in City procurement (“M/WBE Program”) by “MBEs and WBEs, certified in accordance with Section 1304 of the New York City Charter. As stated in Section 6-129, the intent of the program is to address the impact of discrimination on the City’s procurement process, and to promote the public interest in avoiding fraud and favoritism in the procurement process, increasing competition for City business, and lowering contract costs. BNYDC endorses these goals and has adopted an M/WBE Program to further participation by MBEs and WBEs for its projects. All Bidders shall comply with all requirements of BNYDC’s M/WBE Program applicable to this IFB.
2. M/WBE PARTICIPATION GOAL:
 - a. The percentage goal for M/WBE participation (the “Participation Goal”) for the Contract is eight percent (8%) of the total dollar value of the Contract. The Participation Goal represents a percentage of the total dollar value of the Contract that may be achieved by awarding subcontracts to firms certified with DSBS or DMWBD (each as defined below) as MBEs or WBEs, and/or by crediting the participation of prime contractors and/or qualified joint ventures as provided in Section D.2.d and Section D.2.e below, unless the goals have been waived or modified by BNYDC in accordance with Exhibit N, Section A.
 - b. M/WBE firms must be certified by either (i) the NYC Department of Small Business Services (“DSBS”), or (ii) Empire State Development’s Division of Minority and Women’s Business Development (“DMWBD”) to credit such firms’ participation toward attainment of the Participation Goal. Such certification must occur prior to the firms’ commencement of work. A list of M/WBE firms may be obtained (i) from the DSBS website at www.nyc.gov/buycertified, by emailing DSBS at buyer@sbs.nyc.gov, by calling (212) 513-6356, or by visiting or writing DSBS at 110 William Street, New York, New York, 10038, 7th Floor, and (ii) from the ESD website at www.ny.newnycontracts.com. Eligible firms that have not yet been certified may contact DSBS or DMWBD for additional information on how to get certified. No credit shall be given for participation by a graduate M/WBE, as defined in Section 6-129(c)(20).



- c. The Participation Goal is a material term of the Contract and the selected Bidder shall be subject to the BNYDC approved Participation Goal, unless the goals have been waived or modified by BNYDC in accordance with Exhibit N, Section A.
 - d. An M/WBE Bidder shall be permitted to count its own participation toward fulfillment of the Participation Goal. The value of an M/WBE Bidder's participation shall be determined by subtracting from the total value of the Contract any amounts that the Bidder will pay to direct Subcontractors. A Bidder that is certified as both an MBE and a WBE may count its own participation either toward the goal for MBEs or the goal for WBEs, but not both. If a Bidder is not an M/WBE, it must meet the Participation Goal through the awarding of subcontracts to firms certified with DSBS or DMWBD as MBEs or WBEs.
 - e. A Bidder that is a Qualified Joint Venture (as defined in Section 6-129, and as discussed further in Section 5) shall be permitted to count a percentage of its own M/WBE participation toward fulfillment of the Participation Goal. The value of Bidder's participation shall be determined by subtracting from the total value of the Contract any amounts that Bidder pays to direct Subcontractors, and then multiplying the remainder by the percentage to be applied to total profit to determine the amount to which an MBE or WBE is entitled pursuant to the joint venture agreement, provided that where a participant in a joint venture is certified as both an MBE and a WBE, such amount shall be counted either toward the goal for MBEs or the goal for WBEs, but not both.
3. M/WBE PROPOSAL SUBMISSION FORMS.
 - a. Bidders shall be required to submit with its bid a completed M/WBE Utilization Plan in the form attached as Exhibit O indicating:
 - i. whether the Bidder is an MBE or WBE, or Qualified Joint Venture;
 - ii. the percentage of work it intends to award to direct Subcontractors;
 - iii. in cases where the Bidder intends to award direct subcontracts, a description of the type and dollar value of work designated for participation by MBEs and/or WBEs, and the time frames in which such work is scheduled to begin and end; as well as the name, addresses, and telephone numbers of the M/WBE subcontractors if required by the solicitation; and copies of DSBS or DMWBD certifications for each proposed MBE or WBE subcontractor listed in its M/WBE Utilization;
 - iv. the Bidder's required certification and affirmations, as attached as Exhibit O to this IFB. In the event that this M/WBE Utilization Plan indicates that the bidder does not intend to meet the Participation Goal, the bid shall be deemed non-responsive, unless the goals have been waived or modified by BNYDC in accordance with Exhibit N, Section A.
 - b. **THE BIDDER MUST COMPLETE AN M/WBE UTILIZATION PLAN IN THE FORM ATTACHED HERETO AS EXHIBIT O. AN M/WBE UTILIZATION PLAN SUBMITTED BY THE BIDDER WHICH DOES NOT INCLUDE THE VENDOR CERTIFICATION AND**



REQUIRED AFFIRMATIONS WILL BE DEEMED TO BE NON-RESPONSIVE, UNLESS A FULL WAIVER OF THE PARTICIPATION GOAL IS GRANTED IN ACCORDANCE WITH EXHIBIT N, SECTION A. IN THE EVENT THAT BNYDC DETERMINES THAT THE BIDDER HAS SUBMITTED AN M/WBE UTILIZATION PLAN WHERE THE VENDOR CERTIFICATION AND REQUIRED AFFIRMATIONS ARE COMPLETED BUT OTHER ASPECTS OF THE M/WBE UTILIZATION PLAN ARE NOT COMPLETE, OR CONTAIN A COPY OR COMPUTATION ERROR THAT IS AT ODDS WITH THE VENDOR CERTIFICATION AND AFFIRMATIONS, THE BIDDER WILL BE NOTIFIED BY BNYDC AND WILL BE GIVEN FOUR (4) CALENDAR DAYS FROM RECEIPT OF NOTIFICATION TO CURE THE SPECIFIED DEFICIENCIES AND RETURN A COMPLETED M/WBE UTILIZATION PLAN TO BNYDC. FAILURE TO DO SO WILL RESULT IN A DETERMINATION THAT THE BID IS NON- RESPONSIVE. RECEIPT OF NOTIFICATION IS DEFINED AS THE DATE NOTICE IS E-MAILED (IF THE BIDDER HAS PROVIDED AN E-MAIL ADDRESS), OR NO LATER THAN FIVE (5) CALENDAR DAYS FROM THE DATE OF MAILING OR UPON DELIVERY, IF DELIVERED.

- c. The successful Bidder (each Bidder who is awarded a Contract, a “Contractor”) shall, within 30 days of issuance by BNYDC of a NTP, submit a list of proposed persons or entities to which it intends to award subcontracts within the subsequent 12 months. In the case of multi-year contracts, such list shall also be submitted every year thereafter. BNYDC may also require the Contractor to report periodically about the contracts awarded by its direct Subcontractors to indirect subcontractors (as defined in Section 6- 129(c)(22)). In the event that the Contractor’s selection of a Subcontractor is disapproved, the Contractor shall have a reasonable time to propose alternate subcontractors.

4. STATEMENTS SUBMITTED WITH REQUESTS FOR PAYMENT.

- a. The Contractor shall, with each voucher for payment, and/or periodically as BNYDC may require, submit statements, certified under penalty of perjury, which shall include, but not be limited, to:
 - i. the total amount the Contractor paid to its direct subcontractors, and, where applicable pursuant to Section 6-129(j), the total amount direct subcontractors paid to indirect subcontractors;
 - ii. the names, addresses and contact numbers of each MBE or WBE hired as a subcontractor by the Contractor, and, where applicable, hired by any of the Contractor’s direct subcontractors; and
 - iii. the dates and amounts paid to each MBE or WBE.
- b. The Contractor shall also submit, along with its voucher for final payment:
 - i. the total amount it paid to subcontractors, and, where applicable pursuant to Section 6- 129(j), the total amount its direct subcontractors paid directly to their indirect subcontractors; and



- ii. a final list, certified under penalty of perjury, which shall include the name, address and contact information of each subcontractor that is an MBE or WBE, the work performed by, and the dates and amounts paid to each.
 - c. If payments made to, or work performed by, MBEs or WBEs are less than the amount specified in the Contractor's M/WBE Utilization Form, BNYDC shall take appropriate action, in accordance with the enforcement provisions described in the Contract and in Exhibit N, Section G, unless the goals have been waived or modified by BNYDC in accordance with Exhibit N, Section A.
- 5. **MODIFICATIONS BASED ON CHANGE ORDERS.** Where an M/WBE Utilization Plan has been submitted, and the Bidder requests a change order the value of which exceeds the greater of 10 percent of the Contract, as applicable, or \$500,000, BNYDC shall review the scope of work for the Contract or Task Order, as applicable, and the scale and types of work involved in the change order, and determine whether the Participation Goals should be modified.
- 6. **OTHER M/WBE REQUIREMENTS.** The Contract and Exhibit N contain additional provisions related to the M/WBE requirements applicable to this IFB regarding, without limitation, waivers, modifications, substitutions, indefinite quantity contracts, progress reviews, evaluations and assessments, and enforcement. **PLEASE BE SURE THAT YOU REVIEW AND UNDERSTAND ALL OF THE REQUIREMENTS APPLICABLE TO THIS IFB AND THE CONTRACT PRIOR TO SUBMITTING YOUR PROPOSAL.**

E. SPECIAL REQUIREMENTS

- 1. **MISCELLANEOUS CONDITIONS**
 - a. **NON-BINDING ACCEPTANCE OF QUALIFICATIONS.** This IFB does not commit BNYDC to award a contract for any work or services described herein.
 - b. **MODIFICATIONS.** Bidders may be asked to make such revisions, additions or deletions to their Bids as may be required by BNYDC.
 - c. **RESERVED RIGHTS.** All Bid material submitted becomes the property of BNYDC and BNYDC reserves the right at its sole discretion to:
 - i. Reject any and all Bids received in response to this IFB at any time prior to signing of a contract with respect to the Project;
 - ii. Award a contract to other than the lowest Bidder;
 - iii. Waive, modify or correct any irregularities in Bids received, after notification to the Bidder;
 - iv. Change the structure of the proposed Bid, if such is in the interest of BNYDC;
 - v. Negotiate the final scope, staff participation, and Bid before entering into contract with successful Bidder;



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- vi. Revise the Bid as BNYDC may require subsequent to receipt of a competitively bid proposal for the Project;
- vii. Extend the time for submission of all Bids after notification to all prospective Bidders;
- viii. Terminate negotiations with a selected Bidder and select the next most responsive Bidder, or take such other action as deemed appropriate if negotiations fail to result in a signed contract within a reasonable amount of time from the commencement of negotiations;
- ix. Terminate or modify the IFB process at any time and reissue the IFB;
- x. Approve or reject any sub-contractor proposed by the Bidder; and
- xi. Request a change of any sub-contractor at any time in the contract process.

2. CONTRACT REQUIREMENTS.

- a. Any Bidder awarded a contract as a result of this IFB process will be required to sign a contract substantially in the form as attached hereto as Exhibit H (the "Contract"). If a Bidder desires any material or substantive change(s) to the Contract, it must include any such proposed change(s) in its response to this IFB. The contents of the selected Bid, together with this IFB and any formal questions and answers provided during the Bid processes, may be incorporated into any final Contract at BNYDC's discretion. The anticipated Contract length is 3.5 years.
- b. Any information which may have been released verbally or in writing prior to the issuance of the IFB shall be deemed preliminary in nature and bind neither BNYDC nor the Bidder.
- c. Any Bidder awarded a contract as a result of this IFB will be required to obtain clearance through the City's Procurement and Sourcing Solutions Portal ("PASSPort"). PASSPort moves the VENDEX process online, eliminating paper submissions. Since PASSPort clearance is a pre-requisite to BNYDC's award of a contract, Bidders are required to be registered and up-to-date in PASSPort prior to submitting their response to this IFB and to include their PASSPort identification number with submission of their Bid. Non-compliance with these submission requirements shall result in the disqualification of the Bid and/or the Bidder and/or the cancellation of any contract after its award.
- d. Notice to Bidders: Pursuant to Local Law 34 of 2007, amending the City's Campaign Finance Law, the City is required to establish a computerized database containing the names of any "person" that has "business dealings with the city" as such terms are defined in the Local Law. In order for the City to obtain necessary information to establish the required database, vendors responding to this solicitation are required to complete the Doing Business Data Form attached as Exhibit F hereto and return it with the Bid. (If the responding vendor is a proposed joint venture, the entities that comprise the proposed joint venture must each complete a Data Form.) If the City determines that a vendor has failed to submit a Data Form or has submitted a Data



Form that is not complete, the vendor will be notified by the agency and will be given four (4) calendar days from receipt of notification to cure the specified deficiencies and return a complete Data Form to the agency. Failure to do so will result in a determination that the Bid is non-responsive. Receipt of notification is defined as the day notice is e-mailed or faxed (if the vendor has provided an e-mail address or fax number), or no later than five (5) days from the date of mailing or upon delivery, if delivered.

3. SPECIAL REQUIREMENTS

- a. Each Bidder (or the “Prime Contractor”) must specialize in medium voltage electrical work and is responsible for project management of entire project.

F. BID SUBMISSION DOCUMENTS (“BSDs”)

BNYDC requires that all BSDs listed below be completed and submitted as instructed in this IFB. Failure to submit the below forms, or submitting them improperly, may result in BNYDC’s rejection of the Bid.

- Bid Form: Properly executed and sealed in the form attached as Exhibit A.
- Bid Security: If required per the IFB, completed form attached as Exhibit B.
- Experience Questionnaire: Completed form attached as Exhibit C.
- Declaration of Understanding: Completed and executed declaration attached as Exhibit D.
- Confirmation of PASSPort Compliance: Completed confirmation attached as Exhibit E.
- Doing Business Data Form: Completed form attached as Exhibit F.
- M/WBE Information Form: Completed form attached as Exhibit G.
- M/WBE Utilization Plan: Completed form attached as Exhibit O.
- Addenda: Acknowledged receipt of any Addendum to this IFB by attaching a signed copy of the Addendum to Bidder’s Bid.
- Contract Revisions: If a Bidder desires any material or substantive change(s) to the Contract, Bidder must include any such proposed change(s) in its response to this IFB.
- Environmental Certification Form: Completed form attached as Exhibit I; Completed form attached as Exhibit I certifying that they have reviewed the Site Management Plan Exhibit K and Excavation Work Plan Exhibit J and that all work will be completed in accordance with such documents.

BNYDC appreciates your interest in this IFB and looks forward to receiving your Bid.

EXHIBIT A
BID FORM
BROOKLYN NAVY YARD DEVELOPMENT CORPORATION
BID FOR FURNISHING ALL LABOR AND MATERIAL FOR:

PROJECT: RESTORATION OF SUBSTATION AT BUILDING 386

CONTRACT #: _____

Name of Bidder: _____

Bidder is a(n): Individual Partnership Corporation LLC
(Check one, whichever applies)

Business Address: _____

Business Telephone Number: _____

Federal Tax Identification Number: _____

Home Address (If Individual): _____

If Bidder is a Partnership or an LLC, fill in the following blanks:

Name of Partners/Member	Home Address of Partner/Member
1. _____	_____

2. _____	_____

3. _____	_____

If Bidder is a Corporation, fill in the following blanks:

Organized under the laws of the State of: _____

Admitted to do business in New York on: _____



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Name and Home Address of President: _____

Name and Home Address of Secretary: _____

Name and Home Address of Treasurer: _____

Other Interested Parties, Persons, or Companies (State None if None.)

Name: _____

Address: _____

Name: _____

Address: _____

Bidder certifies, under penalty of perjury (New York State Penal Law §210.45), that:

- a) Bidder, if an individual or a partner in a partnership, is of lawful age and the only one interested in this bid; and no other person, firm partnership LLC or corporation other Bidder has any interest in this bid, or in the Contract if awarded; and
- b) The prices in this Bid have been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor; and
- c) Unless otherwise required by law, the prices quoted in this bid have not been disclosed by the bidder and will not be disclosed by the bidder prior to bid opening, directly or indirectly, to any other bidder or to any competitor; and
- d) No attempt has been made or will be made by the Bidder to induce any other person, partnership, LLC or corporation to submit or not to submit a bid for the purpose of restricting competition; and
- e) No councilman or other officer, director or employee or person whose salary is payable in whole or in part from the Treasury of the City of New York or BNYDC is directly or indirectly interested in this bid, or in the supplies, materials, equipment, work or labor to which it relates, or in any of the profits thereof; and



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BrooklynNavyYard.org

Building 77
141 Flushing Ave, Suite 801
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- f) Bidder is not in arrears to the City of New York or BNYDC upon debt or contract or taxes, and is not a defaulter, as surety or otherwise, upon any obligation of the City of New York or BNYDC and has not been declared not responsible, or disqualified, by BNYDC or any agency of the City of New York or State of New York, nor is there any proceeding pending relating to the responsibility of qualification of the bidder to receive public contracts except _____; and
- g) Bidder has paid all applicable City income, excise and other taxes for all years it has conducted business activities in New York City; and
- h) Bidder has complied with since its effective date and will continue to comply with the provisions of §6-108 of the Administrative Code of the City of New York; and
- i) Bidder has complied with since its effective date and will continue to comply with the provisions of §220, §220a and §230 of the New York State Labor Law; and
- j) Bidder has complied with since its effective date and will continue to comply with §6-109 of the Administrative Code of the City of New York; and
- k) Bidder has complied with since its effective date and will continue to comply with § 24-216 of the Administrative Code of the City of New York; and
- l) Bidder agrees to post notices setting forth the requirements of the aforesaid laws (items h, i, j and k above) in prominent and conspicuous places in each and every plant, factory, building and structure where employees engaged in the performance of the Contract can readily view it and will continue to keep such notices posted until the supplies, materials and equipment, or work labor and services required to be furnished or rendered by the Bidder have been finally accepted by BNYDC; and
- m) Bidder has complied with since its effective date and will continue to comply with Executive Order No. 50, dated, April 25, 1980, on Equal Employment Compliance of the Contract. The required Employment Report must be submitted as part of the bid.
- n) Bidder by submitting this bid certifies that it now has and will continue to have the financial capability to fully perform the Project required for the Contract. The award of the Contract will be made in reliance upon such certification. Therefore, upon request by BNYDC, Bidder will submit proof of financial capability, as BNYDC requires.

Bidder understands that any breach or violation of the foregoing may subject Bidder to damages, liquidated or otherwise, cancellation of the Contract, if awarded, and suspension of Bidder for a period of three years.



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BID PRICE

A. Price for Material Sold and Delivered \$ _____

B. Price for Labor \$ _____

TOTAL PRICE (Add A + B) \$ _____

Indicate TOTAL PRICE in words:



Brooklyn Navy Yard
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BrooklynNavyYard.org

Building 77
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IN WITNESS WHEREOF, Bidder states that they have visited and examined the site of the Project. Bidder affirms that they have carefully examined the Contract form provided. Bidder agrees that it will execute the Contract unchanged in form and faithfully perform the Project required thereunder for the price set forth above, and have executed this Bid Form on the ____ day of _____ 20__

Bidder's Name: _____

By: _____
(Signature of Individual, Partner, Member or Corporate Officer)

Title: _____

Address: _____

_____ (Corporate or LLC Seal)

Attest: Secretary of Corporate or LLC Bidder

ACKNOWLEDGMENT, IF AN INDIVIDUAL

STATE OF NEW YORK)
ss.:
COUNTY OF _____)

On this ____ day of _____, 20__, before me personally came _____ to me known, who, being by me duly sworn, did depose and say that he/ she resides at _____ and that he/she is the Individual described in and who executed the foregoing instrument and that the several matters therein stated are in all respects true.

Notary Public

ACKNOWLEDGMENT, IF A PARTNERSHIP

STATE OF NEW YORK)
ss.:
COUNTY OF _____)



Brooklyn Navy Yard
Development Corporation
BrooklynNavyYard.org

Building 77
141 Flushing Ave, Suite 801
Brooklyn, NY 11205

On this ____ day of _____, 20____, before me personally came _____ to me known, who, being by me duly sworn, did depose and say that he/ she resides at _____ and that he/she is a member of, the firm described in and which executed the foregoing instrument and that the several matters therein stated are in all respects true.

Notary Public

ACKNOWLEDGMENT, IF A LIMITED LIABILITY COMPANY

STATE OF NEW YORK)
: ss.:
COUNTY OF _____)

On the ____ day of _____ in the year 20____, before me personally came _____, to me known, who, being by me duly sworn, did depose and say that that he/she is a member of _____ the limited liability company described in and which executed the foregoing instrument; and that he/she signed his/her name thereto by authority of the members of said limited liability company and that the several matters therein stated are in all respects true.

Notary Public

ACKNOWLEDGMENT, IF A CORPORATION

STATE OF NEW YORK)
: ss.:
COUNTY OF _____)

On the ____ day of _____ in the year 20____, before me personally came _____, to me known, who, being by me duly sworn, did depose and say that that he/she is the _____ of _____ the business described in and which executed the foregoing instrument; and that he/she signed his /her name thereto by authority of the Board of Directors of said corporation and that the several matters therein stated are in all respects true.

Notary Public

PROPOSAL

BROOKLYN NAVY YARD
PROPOSAL
FOR
BROOKLYN NAVY YARD
RESTORATION OF SUBSTATION
AT BUILDING 386

BNYDC Project No:
H2M Contract No. BNYD1905

TO THE BROOKLYN NAVY YARD:

Pursuant to and in compliance with your Notice to Bidders and the Instructions to Bidders relating thereto, the undersigned hereby proposes to furnish all plant, labor, materials, supplies, equipment, and other facilities necessary or proper for or incidental to the above Contract, as required by and in strict accordance with the Plans and Specifications for the amount named in the Proposal hereinafter described.

In making this Proposal the Bidder hereby declares that all provisions of the Addenda which have been issued by the Brooklyn Navy Yard have been complied with in preparing their Bids.

Name of Bidder: _____

Bidder: _____
(Individual, Firm or Corporation, as case may be)

Bidder's Business Address: _____

Telephone: _____ Date of Bid: _____

Fax: _____ E-Mail: _____

PROPOSAL

(If Bidder is an Individual, fill in the following blanks:)

Name of Individual: _____

Residence of Individual: _____

(If Bidder is a Firm, fill in the following blanks:)

Name and Residence of Partner: _____

Name and Residence of Partner: _____

Name and Residence of Partner: _____

(If Bidder is a Corporation, fill in the following blanks:)

Organized under the laws of the State of: _____

Name and Residence of President: _____

Name and Residence of Vice-President: _____

Name and Residence of Secretary: _____

Name and Residence of Treasurer: _____

PROPOSAL

THE BIDDER AFFIRMS AND DECLARES:

1. That the above Bidder is of lawful age and the only one interested in this bid; and that no other person, firm or corporation, except those herein named, has any interest in this bid or in the Contract proposed to be entered into.
2. That this bid is made without any understanding, agreement or in connection with any other person, firm or corporation, making a bid for the same Work, and is in all respects fair and without collusion or fraud.
3. That said Bidder is not in arrears to the Brooklyn Navy Yard upon debt or contract, and is not a defaulter, as surety contractor or otherwise.
4. That no employee of the Brooklyn Navy Yard, or person whose salary is payable in whole or in part from the Brooklyn Navy Yard is, shall be, or become interested directly, or indirectly as a contracting party, partner, stockholder, surety or otherwise, in this bid, or in the performance of the Contract, or in the supplies, materials, equipment and work or labor to which it relates, or in any portion of the profits thereof.
5. That he has carefully examined the Site of the Work and that, from his own personal investigations and research, has satisfied himself as to the nature and location of the work, the character, quality and quantity of existing materials, all difficulties likely to be encountered, the kind and extent of labor, equipment, other facilities needed for the performance of the Work, the general and local conditions, and all other items which may, in any way, affect the Work or its performance.
6. The Bidder also declares that he has carefully examined and fully understands all the component parts of this Contract, that the Work can be performed as called for by the Contract, that he will execute the Contract and will completely perform it in strict accordance with its terms for the following prices.
7. That the Bidder, for allowance items, will make payment to the parties designated by the Brooklyn Navy Yard when directed by the Brooklyn Navy Yard in the amount certified by the Engineer for the purposes indicated. It is also understood and agreed that the Final Contract Payment for allowance items will be based upon such actual payments, and not on the approximate amount cited herein.
8. Where the work performed under this Contract involves a trade or occupation licensed in the New York City, the contractor shall be required to have such a license.

PROPOSAL

I. Rejection of Bids.

- A. The Commissioner may recommend a reject of bid if:
1. The Bidder fails to furnish any of the information required by the bid documents; or if
 2. The bidder misstates or conceals any material fact in the bid, or in the sworn written statement; or if
 3. The bid does not strictly conform to law or the requirements of this contract; or if
 4. The bid is conditional; or if
 5. The bid on Unit Price Contracts, in the opinion of the Navy Yard, contains unbalanced bid prices, where the unit price proposed for any item exceeds the estimated cost by more than fifteen percent (15%), or if any lump sum item bid exceeds the estimated cost by more than twenty-five percent (25%); or if
 6. A determination that the bidder is not responsible is made in accordance with law.
- B. Rejection of all bids and waiver of informalities.

The Chief Operations Officer, however, reserves the right to recommend / to reject all bids whenever he deems it in the best interest of the Brooklyn Navy Yard, and also the right to waive any informalities in a bid.

II. Unit Price Contracts, Comparison of Bids.

Bids on Unit Price Contracts will be compared on the basis of a total bid price, arrived at by taking the sum of the Approximate Quantities of such item multiplied by the corresponding Unit Price, and including any Lump Sum Bid on individual items, in accordance with the items set forth in the bid proposal.

Bidders are warned that the Approximate Quantities of the various items of work and material is estimated only, and is given solely to be used as a uniform basis for the comparison of bids. The quantities actually required to complete the contract work may be more or less than estimated.

III. Lump Sum Contracts, Comparison of Bids.

Bids on lump Sum Contracts will be compared on the basis of the Lump Sum Price bid adjusted for alternate prices bid, if any.

IV. Apprenticeship Training Program

For all contracts in excess of \$500,000 attach here verification letter regarding your firm's having an approved State of New York Apprenticeship Training Program.

PROPOSAL

ALLOWANCES: It is expressly understood and agreed that the total Bid presented in this Proposal is the basis for establishing the amount of the Bid Security.

Final Contract Payment for allowance items shall be based upon actual payments, and not on the approximate amounts cited herein.

DETERMINATION OF LOW BID: Determination of low Bid will be made by comparing the total Bid which shall include the lump sum Base Bid price and allowance.

**BNYDC Project no:
H2M Contract No: BNYD1905**

Restoration of Substation at Building 386 - Brooklyn Navy Yard
63 Flushing Avenue - #300, Brooklyn NY

ITEM NO.		QUANTITY	MATERIAL UNIT PRICE	LABOR UNIT PRICE	MATERIAL LUMP SUMP	LABOR LUMP SUMP	SUB TOTAL
GENERAL REQUIREMENTS AND EXISTING CONDITIONS							
1	RIGGING AND TRANSPORTATION OF SUBSTATION EQUIPMENT FROM WAREHOUSE TO PROJECT SITE	LUMP SUMP	N/A	N/A			
2	WAREHOUSE RENTAL	LUMP SUMP	N/A	N/A			
3	CRANES AND HOISTS	LUMP SUMP	N/A	N/A			
4	BUILDING DEMOLITION (SECOND FLOOR SLAB, CONCRETE SLAB OPENINGS, SLAB REMOVAL FOR NEW PILES, ETC.)	LUMP SUMP	N/A	N/A			
5	SITE DEMOLITION AND REMOVAL (RELATED TO NEW ELECTRICAL MANHOLES, DUCT BANK, EXTERIOR PLATFORM, AND CRANE STRUCTURE)	LUMP SUMP	N/A	N/A			
6	ASBESTOS AND LEAD ABATEMENT	LUMP SUMP	N/A	N/A			
7	PCB TRANSFORMER REMOVAL AND REMEDIATION	LUMP SUMP	N/A	N/A			
STRUCTURAL							
8	CASTE-IN-PLACE CONCRETE	LUMP SUMP	N/A	N/A			
9	STEEL FRAMING	LUMP SUMP	N/A	N/A			
10	STEEL PLATFORM	LUMP SUMP	N/A	N/A			
11	LIFT FRAMING	LUMP SUMP	N/A	N/A			
12	METAL DECK AND FABRICATION	LUMP SUMP	N/A	N/A			
13	OTHER-S	LUMP SUMP	N/A	N/A			
ARCHITECTURAL							
14	THERMAL & MOISTURE PROTECTION	LUMP SUMP	N/A	N/A			
15	OPENINGS (DOORS, WINDOWS, FRAMES, AND HARDWARE)	LUMP SUMP	N/A	N/A			
16	PARTITIONS, FLOORING, CEILINGS	LUMP SUMP	N/A	N/A			
17	PAINT AND MISC. FINISHES	LUMP SUMP	N/A	N/A			
18	OTHER-A	LUMP SUMP	N/A	N/A			
MECHANICAL							
19	DEMOLITION OF EXISTING HVAC SYSTEM	LUMP SUMP	N/A	N/A			

ITEM NO.		QUANTITY	MATERIAL UNIT PRICE	LABOR UNIT PRICE	MATERIAL LUMP SUMP	LABOR LUMP SUMP	SUB TOTAL
MECHANICAL (CONT.)							
20	CONSTRUCTION OF NEW HVAC SYSTEM	LUMP SUMP	N/A	N/A			
21	OTHER-M	LUMP SUMP	N/A	N/A			
ELECTRICAL							
22	DEMOLITION OF EXISTING ELECTRICAL SYSTEM	LUMP SUMP	N/A	N/A			
23	POWER EQUIPMENT	LUMP SUMP	N/A	N/A			
24	INSTALLATION OF MEDIUM VOLTAGE SUBSTATION	LUMP SUMP	N/A	N/A			
25	INSTALLATION OF LOW VOLTAGE SUBSTATION	LUMP SUMP	N/A	N/A			
26	CONDUIT	LUMP SUMP	N/A	N/A			
27	MEDIUM VOLTAGE CABLE	LUMP SUMP	N/A	N/A			
28	LOW VOLTAGE CABLE	LUMP SUMP	N/A	N/A			
29	ELECTRICAL SITE WORK	LUMP SUMP	N/A	N/A			
30	LIGHTING	LUMP SUMP	N/A	N/A			
31	GROUNDING SYSTEM	LUMP SUMP	N/A	N/A			
32	OTHER-E	LUMP SUMP	N/A	N/A			
33	FOR ADDITIONAL 3 #12 + #12 GND (SECTION 260519)	200 LINEAR FEET					
34	FOR ADDITIONAL 3 #10 + #10 GND (SECTION 260519)	200 LINEAR FEET					
35	FOR ADDITIONAL 3 #8 + #10 GND (SECTION 260519)	200 LINEAR FEET					
36	FOR ADDITIONAL 3 #6 + #10 GND (SECTION 260519)	200 LINEAR FEET					
37	FOR ADDITIONAL 3 #4 + #8 GND (SECTION 260519)	200 LINEAR FEET					
38	FOR ADDITIONAL 3 #3 + #8 GND (SECTION 260519)	200 LINEAR FEET					
39	FOR ADDITIONAL 3 #1/0 + #8 GND (SECTION 260519)	200 LINEAR FEET					

ITEM NO.		QUANTITY	MATERIAL UNIT PRICE	LABOR UNIT PRICE	MATERIAL LUMP SUMP	LABOR LUMP SUMP	SUB TOTAL
ELECTRICAL (CONT.)							
40	FOR ADDITIONAL 3 #3/0 + #6 GND (SECTION 260519)	200 LINEAR FEET					
41	FOR ADDITIONAL 3 #500MCM + #3 GND (SECTION 260519)	200 LINEAR FEET					
42	FOR ADDITIONAL 3 CONDUCTOR #4/0AWG MINING CABLE (SECTION 260519)	200 LINEAR FEET					
43	FOR ADDITIONAL 3 CONDUCTOR #250MCM MINING CABLE (SECTION 260519)	200 LINEAR FEET					
44	FOR ADDITIONAL 3 CONDUCTOR #350MCM MINING CABLE (SECTION 260519)	200 LINEAR FEET					
45	FOR ADDITIONAL 3 CONDUCTOR #500MCM MINING CABLE (SECTION 260519)	200 LINEAR FEET					
46	FOR ADDITIONAL 3/4" RIGID GALVANIZED CONDUIT (SECTION 260533)	200 LINEAR FEET					
47	FOR ADDITIONAL 1" RIGID GALVANIZED CONDUIT (SECTION 260533)	200 LINEAR FEET					
48	FOR ADDITIONAL 1-1/2" RIGID GALVANIZED CONDUIT (SECTION 260533)	200 LINEAR FEET					
49	FOR ADDITIONAL 2" RIGID GALVANIZED CONDUIT (SECTION 260533)	200 LINEAR FEET					
50	FOR ADDITIONAL 2-1/2" RIGID GALVANIZED CONDUIT (SECTION 260533)	200 LINEAR FEET					
51	FOR ADDITIONAL 3" RIGID GALVANIZED CONDUIT (SECTION 260533)	200 LINEAR FEET					
52	FOR ADDITIONAL 3-1/2" RIGID GALVANIZED CONDUIT (SECTION 260533)	200 LINEAR FEET					
53	FOR ADDITIONAL 4" RIGID GALVANIZED CONDUIT (SECTION 260533)	200 LINEAR FEET					
54	FOR ADDITIONAL 4" SCHEDULE 40 PVC CONDUIT (SECTION 260533)	200 LINEAR FEET					

CIVIL

55	SITE EXCAVATION, FILL, AND RESTORATION	LUMP SUMP	N/A	N/A			
56	OTHER-C	LUMP SUMP	N/A	N/A			

*Please list items included in 'OTHER' for each trade.

Allowance for Community			
		100 Days	
Core Environmental CAMP Day Rate	x	\$	
	850		
Total Core Environmental CAMP Fee	=	\$ 85,000	
Contractor Markup	+	\$	
Total Allowance for CAMP:			\$ -

**Allowance \$ 150,000.00

General Conditions: \$ -

Permitting (DOB and EAB): \$ -

CAMP Allowance \$ -

Payment and Performance Bonding: \$ -

Insurance: \$ -

Overhead & Profit: \$ -

** Allowance: Work for unforeseen existing conditions, including but not limited to unidentified conduits, cables, below grade utilities, temporary feeders, etc.

BUILDING 386 TOTAL BID AMOUNT (BID ITEMS NOS. 1 THRU 54): \$

BUILDING 386 TOTAL BID AMOUNT BID ITEMS NOS. 1 THRU 54)MUST BE WRITTEN IN WORDS:

DOLLARS

CENTS





Brooklyn Navy Yard
Development Corporation
BrooklynNavyYard.org

Building 77
141 Flushing Ave, Suite 801
Brooklyn, NY 11205

WHEREAS, the Condition of the above obligation is such that the Principal has submitted to Obligee the id which requires Principal to enter into a written contract for the performance of the Project.

NOW, THEREFORE,

- A. If the BID is rejected, or
- B. If the BID is accepted and the Principal and Obligee have executed and delivered the required contract in the form set forth in the Information for Bidders, in accordance with the accepted BID (Contract); and
- C. If the Principal furnishes Obligee with the required bond for Principal’s faithful performance the Contract; and
- D. If the Principal furnishes Obligee with the required bond for the payment of all persons performing labor or furnishing materials in connection with the Contract; and
- E. If the Principal shall in all other respects perform the agreements created by Obligee’s acceptance of the Bid
- F. If the Principal shall pay to the Obligee an amount equaling the difference, not to exceed the Penal Sum hereof, between the amount specified in said BID and such larger amount for which the Obligee may in good faith contract with another party to undertake the Project covered by said Bid.

Then this obligation shall be null and void, otherwise to remain in full force and effect.

It is understood and agreed that the liability of the Surety for any and all claims hereunder shall in no event exceed the Penal Sum as shown herein.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety under this Bond shall be in no way impaired or affected by any extension of the time within which the Obligee may accept the Bid; and said Surety does hereby waive notice of any such extension.

(Principal)

{SEAL}

By: _____
Title: _____
Address _____

(Surety)

{SEAL}



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Development Corporation
BrooklynNavyYard.org

Building 77
141 Flushing Ave, Suite 801
Brooklyn, NY 11205

By: _____
(Attorney-In-Fact)

Address _____

IMPORTANT

- A. Surety companies executing this bond must be certified and appear on the United States Treasury Department's most recent Circular 570 as amended.
- B. Surety companies can execute this bond only in the amount certified on the United States Treasury Department's most recent Circular 570 as amended.
Sureties executing this bond must be licensed as a surety by the State of New York.



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EXHIBIT C
EXPERIENCE QUESTIONNAIRE

As used in the questions below the words "YOU" or "YOUR" means, the bidding individual or bidding entity and each and every one of such bidding entity's officers, directors, partners, members or principals (any shareholder owning 10% or more of the company stock is deemed a principal).

Date: _____

Bidder's Name: _____

Bidder's Office Address: _____

Bidder's Telephone Number: _____

Bidder's Federal Taxpayer Identification Number: _____

Bidder is a(n): Individual Partnership Corporation LLC
(Check one, whichever applies)

A. What type of construction work are YOU primarily engaged in? _____

B. You have been engaged in such construction work for a) as a Prime Contractor? ___ years and/or b) as a Subcontractor ___ years

C. Have YOU or any organization YOU have been affiliated with in any capacity ever failed to complete a Contract awarded to YOU? Yes No

If Yes, for whom, where, when and why? _____

D. Have YOU or any organization YOU have been affiliated with in any capacity ever been declared in default by any City, State or Federal Agency or on any Contract?



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Yes No

If Yes where, when, by whom and why? _____

E. Have YOU or any organization YOU have been affiliated with in any capacity ever been investigated by any City, State or Federal Agency? Yes No

If Yes where, when, by whom and why? _____

F. Have YOU or any organization YOU have been affiliated with in any capacity ever when called before a GRAND JURY to testify, refused to sign a WAIVER OF IMMUNITY or answer any relevant questions or have been indicted for any reason whatsoever? Yes No

If Yes where, when and why? _____

G. List the names of all organization YOU have been affiliated with in any capacity that are not listed in paragraphs D. E. or F. above.

H. Have YOU ever appeared before the Board of Responsibility of the City of New York? Yes
No



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If Yes when and why _____

I. In what other businesses do YOU have a financial interest? _____

REFERENCES

List all corporations and individuals for whom YOU have performed significant work for and an official from whom BNYDC can obtain a reference. YOU must include a current address and telephone number for each reference.

List all cities for which YOU have performed significant work for and an official from whom BNYDC can obtain a reference. YOU must include a current address and telephone number for each reference.



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List all counties for whom YOU have performed significant work for and an official from which BNYDC can obtain a reference. YOU must include a current address and telephone number for each reference.

List all States have YOU performed work and an official from whom BNYDC can obtain a reference. YOU must include a current address and telephone number for each reference.

List all Federal construction projects YOU have performed work on and an official from whom BNYDC can obtain a reference. YOU must include a current address and telephone number for each reference.



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Have YOU filed Performance Record reports with the Bureau of Contract Information, Inc., Washington, D.C.? Yes No if Yes list Date(s) _____



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PROJECT EXPERIENCE FORMS AND RESUMES

Individual Construction Experience

For each key individual in your organization please attach a resume providing at a minimum the following information:

Name

Education

Professional designations

Professional affiliations

Awards

Relevant experience including size of previous projects, cost of such project, location of such projects, a description of such projects and the key individuals position for each project

Special Experience Requirements: for each Special Requirement set forth in the Information For Bidders:

- A. If bidder intends to perform the specific areas of work with its own forces, Bidder must provide Resumes for Key personnel and Project Experience Forms that demonstrates Bidders ability to fulfill the Special Requirements.
- B. If bidder intends to subcontract the specific areas of work, the proposed subcontractor(s) must provide Resumes for Key personnel and Project Experience Forms that demonstrates subcontractor(s) ability to fulfill the Special Requirements.

I (We) have read and understood all the questions in the foregoing Experience Questionnaire and that I (We) have supplied true, full and complete information and answers I (We) understand that BNYDC will rely on the information contained herein.

Bidder

Name: _____

By: _____
(Signature of Individual, Partner, Member or Corporate Officer)

Title: _____

Address: _____

Attest: Secretary of Corporate or LLC Bidder (Corporate or LLC Seal)



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ACKNOWLEDGMENT, IF AN INDIVIDUAL

STATE OF NEW YORK)

ss.:

COUNTY OF _____)

On this _____ day of _____, 20____, before me personally came _____
to me known, who, being by me duly sworn, did depose and say that he/ she resides at
_____ and that he/she is the Individual
described in and who executed the foregoing instrument and that the several matters therein stated
are in all respects true.

Notary Public

ACKNOWLEDGMENT, IF A PARTNERSHIP

STATE OF NEW YORK)

ss.:

COUNTY OF _____)

On this _____ day of _____, 20____, before me personally came
_____ to me known, who, being by me duly sworn, did
depose and say that he/ she resides at
_____ and that he/she is a member
of, the firm described in and which executed the foregoing instrument and that the several matters
therein stated are in all respects true.

Notary Public



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Brooklyn, NY 11205

ACKNOWLEDGMENT, IF A LIMITED LIABILITY COMPANY

STATE OF NEW YORK)

: ss.:

COUNTY OF _____)

On the ____ day of _____ in the year 20__, before me personally came _____, to me known, who, being by me duly sworn, did depose and say that that he/she is a member of _____ the limited liability company described in and which executed the foregoing instrument; and that he/she signed his/her name thereto by authority of the members of said limited liability company and that the several matters therein stated are in all respects true.

Notary Public

ACKNOWLEDGMENT, IF A CORPORATION

STATE OF NEW YORK)

: ss.:

COUNTY OF _____)

On the ____ day of _____ in the year 20__, before me personally came _____, to me known, who, being by me duly sworn, did depose and say that that he/she is the _____ of _____ the business described in and which executed the foregoing instrument; and that he/she signed his /her name thereto by authority of the Board of Directors of said corporation and that the several matters therein stated are in all respects true.

Notary Public



Brooklyn Navy Yard
Development Corporation
BrooklynNavyYard.org

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141 Flushing Ave, Suite 801
Brooklyn, NY 11205

PROJECT EXPERIENCE FORM (To be completed for each of three projects)

Name of Project: _____

Location of Project: _____

Owner or Owner's representative familiar with the work performed:

Name: _____

Title: _____

Phone number: _____

Brief description of work completed: _____

Was the work was performed as a prime subcontractor, or joint venture: _____

Dollar amount of Contract or subcontract: \$ _____

Date Started: _____

Original Scheduled Completion Date: _____

Actual Completion Date: _____

If Not Completed By Original Scheduled Date, Give Reasons Therefore:



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PROJECT EXPERIENCE FORM (To be completed for each of three projects)

Name of Project: _____

Location of Project: _____

Owner or Owner's representative familiar with the work performed:

Name: _____

Title: _____

Phone number: _____

Brief description of work completed: _____

Was the work was performed as a prime subcontractor, or joint venture: _____

Dollar amount of Contract or subcontract: \$ _____

Date Started: _____

Original Scheduled Completion Date: _____

Actual Completion Date: _____

If Not Completed By Original Scheduled Date, Give Reasons Therefore:



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Brooklyn, NY 11205

PROJECT EXPERIENCE FORM (To be completed for each of three projects)

Name of Project: _____

Location of Project: _____

Owner or Owner's representative familiar with the work performed:

Name: _____

Title: _____

Phone number: _____

Brief description of work completed: _____

Was the work was performed as a prime subcontractor, or joint venture: _____

Dollar amount of Contract or subcontract: \$ _____

Date Started: _____

Original Scheduled Completion Date: _____

Actual Completion Date: _____

If Not Completed By Original Scheduled Date, Give Reasons Therefore: _____



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 Brooklyn, NY 11205

EXHIBIT D

DECLARATION OF UNDERSTANDING

DECLARATION OF UNDERSTANDING

By signing in the space provided below, the undersigned certifies that the Bidder (i) has read and understands the scope and requirements of this Project, as described in the IFB and all attachments; (ii) has the capacity to execute this Project, (iii) agrees to accept payment in accordance with the requirements of this IFB and the standard Contract, attached hereto as Exhibit H, and (iv) will, if its Bid is accepted, enter into the attached Contract with the Brooklyn Navy Yard Development Corporation.

The undersigned further stipulates that the information in his/her Bid is, to the best of his/her knowledge, true and accurate.

Authorized Signature, Title

Date

Consultant Firm

Business Address

City

State

Zip

Telephone Number

Fax Number

Federal Tax Identification Number

- Corporation
- Partnership
- Individual
- Other (State)

 (Seal, if a Corporation)



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EXHIBIT E

CONFIRMATION OF PASSPORT COMPLIANCE

CONFIRMATION OF PASSPORT COMPLIANCE

The Bidder shall submit this Confirmation of PASSPort Compliance, which replaces VENDEX and shall include its PASSPort identification number. All VENDEX processes are now completed in the PASSPort Portal, this replaces the paper forms. Please register and complete new questionnaires as soon as possible. PASSPort will not be importing any information from VENDEX. The main purpose of PASSPort is to be a completely paperless interactive system.

Please access to the NYC.gov PASSPort website thru the link below:

<https://www.nyc.gov/site/mocs/passport/about-passport.page>

[to attach PASSPort Confirmation Form]

CONFIRMATION OF PASSPORT COMPLIANCE

The Proposer shall submit this Confirmation of PASSPort Compliance

Name of Proposer: _____

Proposer's Address: _____

Proposer's Telephone Number: _____

Proposer's Fax Number: _____

Date of Proposal Submission: _____

Project ID: _____

PASSPort Compliance: To demonstrate compliance with PASSPort requirements, the Proposer shall complete either Section (1) or Section (2) below, whichever applies.

(1) **Submission of Questionnaires:** By signing in the space provided below, the Proposer certifies that as of the date specified below, the Proposer has submitted PASSPort Questionnaires to the PASSPort website thru the link below: <http://www1.nyc.gov/site/passport/index.page>.

Date of Submission: _____

By: _____

(Signature of Partner or corporate officer)

Print Name: _____

(2) **Submission of Certification of No Change:** By signing in the space provided below, the Proposer certifies that they have read and follow the instructions on the PASSPort website.

By: _____

(Signature of Partner or corporate officer)

Print Name: _____



Brooklyn Navy Yard
Development Corporation
BrooklynNavyYard.org

Building 77
141 Flushing Ave, Suite 801
Brooklyn, NY 11205

EXHIBIT F
DOING BUSINESS DATA FORM

[to attach]



Doing Business Data Form

To be completed by the City agency prior to distribution	
Agency: _____	Transaction ID: _____
Check One: <input type="checkbox"/> Proposal <input type="checkbox"/> Award	Transaction Type (check one): <input type="checkbox"/> Concession <input type="checkbox"/> Contract <input type="checkbox"/> Economic Development Agreement <input type="checkbox"/> Franchise <input type="checkbox"/> Grant <input type="checkbox"/> Pension Investment Contract

Any entity receiving, applying for or proposing on an award or agreement must complete a Doing Business Data Form (see Q&A sheet for more information). Please either type responses directly into this fillable form or print answers by hand in black ink, and be sure to fill out the certification box on the last page. **Submission of a complete and accurate form is required for a proposal to be considered responsive or for any entity to receive an award or enter into an agreement.**

This Data Form requires information to be provided on principal officers, owners and senior managers. The name, employer and title of each person identified on the Data Form will be included in a public database of people who do business with the City of New York; no other information reported on this form will be disclosed to the public. **This Data Form is not related to the City's VENDEX requirements.**

Please return the completed Data Form to the City office that supplied it. Please contact the Doing Business Accountability Project at DoingBusiness@cityhall.nyc.gov or 212-788-8104 with any questions regarding this Data Form. Thank you for your cooperation.

Section 1: Entity Information

Entity Name: _____

Entity EIN/TIN: _____

Entity Filing Status (select one): <input type="checkbox"/> Entity has never completed a Doing Business Data Form. <i>Fill out the entire form.</i> <input type="checkbox"/> Change from previous Data Form dated _____. <i>Fill out only those sections that have changed, and indicate the name of the persons who no longer hold positions with the entity.</i> <input type="checkbox"/> No Change from previous Data Form dated _____. <i>Skip to the bottom of the last page.</i>

Entity is a Non-Profit: Yes No

Entity Type: Corporation (any type) Joint Venture LLC Partnership (any type)
 Sole Proprietor Other (specify): _____

Address: _____

City: _____ State: _____ Zip: _____

Phone : _____ Fax : _____

E-mail: _____

Provide your e-mail address and/or fax number in order to receive notices regarding this form by e-mail or fax.

Section 2: Principal Officers

Please fill in the required identification information for each officer listed below. If the entity has no such officer or its equivalent, please check "This position does not exist." If the entity is filing a Change Form and the person listed is replacing someone who was previously disclosed, please check "This person replaced..." and fill in the name of the person being replaced so his/her name can be removed from the *Doing Business Database*, and indicate the date that the change became effective.

Chief Executive Officer (CEO) or equivalent officer This position does not exist

The highest ranking officer or manager, such as the President, Executive Director, Sole Proprietor or Chairperson of the Board.

First Name: _____ MI: _____ Last: _____

Office Title: _____

Employer (if not employed by entity): _____

Birth Date (mm/dd/yy): _____ Home Phone #: _____

Home Address: _____

 This person replaced former CEO: _____ on date: _____**Chief Financial Officer (CFO) or equivalent officer** This position does not exist

The highest ranking financial officer, such as the Treasurer, Comptroller, Financial Director or VP for Finance.

First Name: _____ MI: _____ Last: _____

Office Title: _____

Employer (if not employed by entity): _____

Birth Date (mm/dd/yy): _____ Home Phone #: _____

Home Address: _____

 This person replaced former CFO: _____ on date: _____**Chief Operating Officer (COO) or equivalent officer** This position does not exist

The highest ranking operational officer, such as the Chief Planning Officer, Director of Operations or VP for Operations.

First Name: _____ MI: _____ Last: _____

Office Title: _____

Employer (if not employed by entity): _____

Birth Date (mm/dd/yy): _____ Home Phone #: _____

Home Address: _____

 This person replaced former COO: _____ on date: _____

Section 3: Principal Owners

Please fill in the required identification information for all individuals who, through stock shares, partnership agreements or other means, **own or control 10% or more of the entity**. If no individual owners exist, please check the appropriate box to indicate why and skip to the next page. If the entity is owned by other companies, those companies do **not** need to be listed. If an owner was identified on the previous page, fill in his/her name and write "See above." If the entity is filing a Change Form, list any individuals who are no longer owners at the bottom of this page. If more space is needed, attach additional pages labeled "Additional Owners."

There are no owners listed because (select one):

- The entity is not-for-profit There are no individual owners No individual owner holds 10% or more shares in the entity
 Other (explain): _____

Principal Owners (who own or control 10% or more of the entity):

First Name: _____ MI: _____ Last: _____
 Office Title: _____
 Employer (if not employed by entity): _____
 Birth Date (mm/dd/yy): _____ Home Phone #: _____
 Home Address: _____

First Name: _____ MI: _____ Last: _____
 Office Title: _____
 Employer (if not employed by entity): _____
 Birth Date (mm/dd/yy): _____ Home Phone #: _____
 Home Address: _____

First Name: _____ MI: _____ Last: _____
 Office Title: _____
 Employer (if not employed by entity): _____
 Birth Date (mm/dd/yy): _____ Home Phone #: _____
 Home Address: _____

Remove the following previously-reported Principal Owners:

Name: _____ Removal Date: _____
 Name: _____ Removal Date: _____
 Name: _____ Removal Date: _____

Section 4: Senior Managers

Please fill in the required identification information for all senior managers who oversee any of the entity's relevant transactions with the City (e.g., contract managers if this form is for a contract award/proposal, grant managers if for a grant, etc.). Senior managers include anyone who, either by title or duties, has substantial discretion and high-level oversight regarding the solicitation, letting or administration of any transaction with the City. **At least one senior manager must be listed, or the Data Form will be considered incomplete.** If a senior manager has been identified on a previous page, fill in his/her name and write "See above." If the entity is filing a Change Form, list individuals who are no longer senior managers at the bottom of this section. If more space is needed, attach additional pages labeled "Additional Senior Managers."

Senior Managers:

First Name: _____ MI: _____ Last: _____

Office Title: _____

Employer (if not employed by entity): _____

Birth Date (mm/dd/yy): _____ Home Phone #: _____

Home Address: _____

First Name: _____ MI: _____ Last: _____

Office Title: _____

Employer (if not employed by entity): _____

Birth Date (mm/dd/yy): _____ Home Phone #: _____

Home Address: _____

First Name: _____ MI: _____ Last: _____

Office Title: _____

Employer (if not employed by entity): _____

Birth Date (mm/dd/yy): _____ Home Phone #: _____

Home Address: _____

Remove the following previously-reported Senior Managers:

Name: _____ Removal Date: _____

Name: _____ Removal Date: _____

Certification

I certify that the information submitted on these four pages and _____ additional pages is accurate and complete. I understand that willful or fraudulent submission of a materially false statement may result in the entity being found non-responsible and therefore denied future City awards.

Name: _____

Signature: _____ Date: _____

Entity Name: _____

Title: _____ Work Phone #: _____

Please return this form to the City agency that supplied it to you, not to the Doing Business Accountability Project.

For information or assistance, call the Doing Business Accountability Project at 212-788-8104.





Brooklyn Navy Yard
Development Corporation
BrooklynNavyYard.org

Building 77
141 Flushing Ave, Suite 801
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EXHIBIT G
M/WBE INFORMATION FORM

[to attach]



Brooklyn Navy Yard
Development Corporation
BrooklynNavyYard.org

Building 77
141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

Dear Vendor:

The Brooklyn Navy Yard Development Corporation is compiling statistical data on companies that provide construction, professional services, standard services, and goods to our company so that we can comply with the New York City Local Law (LL 129). Please complete the attached information sheet and return it alongside your vendor information forms.

If you are a minority or woman-owned business enterprise (M/WBE) but are not yet certified by the City of New York we strongly urge you to do so. The city has an aggressive program to help certified M/WBEs and it is in your best interest to get certified. For more information on getting certified, we suggest that you call the New York City Department of Small Business Services' Certification Hotline at (212) 513-6311. Addition information can also be obtained through the City's website at: www.nyc.gov/getcertified.

We sincerely appreciate your cooperation.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Brian Linett', with a long horizontal flourish extending to the right.

Brian Linett

Sr. Vice President & Controller



Brooklyn Navy Yard
Development Corporation
BrooklynNavyYard.org

Building 77
141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

Name:

Company Title:

Company Name:

Company Address:

Federal Tax ID / SSN:

Email:

Telephone:

Business type:

- Individual/Sole Proprietor
 Corporation

- Partnership
 Other

Business category:

- Construction
 Professional Services
 Standard Services
 Other

- Construction Subcontract
 Professional Services Subcontract
 Goods

Business Demographics

A minority- and women- owned business enterprise (M/WBE) is a business owned (51% or greater) by an owner that identifies as Asian-Indian, Asian-Pacific, Black, Hispanic, Native American, and/or female.

Majority owner M/WBE? Yes No

Majority owner female? Yes No

Designated MBE Group (select one - if N/A, please leave blank):

- Asian - Indian
 Asian - Pacific
 Black
 Hispanic
 Native American

City or state certification (select all that apply):

- Minority and Women-owned Business Enterprise (M/WBE)
 Locally Based Enterprise (LBE)
 Emerging Business Enterprise (EBE)
 Service-Disabled Veteran-Owned Small Business (SDVOB)

Certification Number:



Brooklyn Navy Yard
Development Corporation
BrooklynNavyYard.org

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Brooklyn, NY 11205

EXHIBIT H
FORM OF CONTRACT

[to attach]

BNYDC CONSTRUCTION CONTRACT

CONSTRUCTION CONTRACT NUMBER _____ (hereinafter referred to as the "Contract") dated as of _____, between **BROOKLYN NAVY YARD DEVELOPMENT CORPORATION**, having an office at Building 77, 141 Flushing Avenue, Suite 801, Brooklyn, New York 11205 (hereinafter referred to as "BNYDC"); and _____, having its principal place of business at _____ (hereinafter referred to as the "Contractor") for _____ (hereinafter referred to as "Project") at _____ (hereinafter referred to as "Project Site(s)") which Project Site(s) is located within the Brooklyn Navy Yard (the "Premises"). The Work as defined in Section 1.2 hereof shall commence on _____ for a term of _____ consecutive calendar days therefrom unless extended (hereinafter referred to as the "Term"). Substantial Completion of the Work, as defined in Section 8.2 of this Contract, shall be completed by _____ (the "Substantial Completion Deadline") and Final Completion of the Work, as defined in Section 8.4 of this Contract, shall be completed by _____ (the "Final Completion Deadline"). Such Work shall be performed for the total amount of _____ Dollars (\$_____) (hereinafter referred to as the "Contract Price"). A breakdown of the Contract Price is attached hereto as Exhibit "Q".

In consideration of the IFB, the BSD the RFB, Contract Price, and the mutual covenants contained herein and other valuable consideration, the parties agree as follows:

ARTICLE 1

GENERAL PROVISIONS AND DEFINITIONS

Section 1.1 Contract This Contract is composed of the following items:

- A. Articles 1-17 of this Contract and all Exhibits annexed hereto;
- B. All Change Orders as defined in Section 1.2.5 hereof and, all amendments and addenda to this Contract;
- C. The Information For Bidders (hereinafter referred to as the "IFB"), Bid Submission Documents, (hereinafter referred to as the "BSD") and Request For Bids (hereinafter referred to as the "RFB") issued by BNYDC, together with all addenda to the IFB, BSD, or RFB.
- D. All provisions of laws, rules, regulations and Executive Orders of the United States Government, the State of New York, the City of New York, or any agency or subdivision thereof, which are required to be a part of or apply to this Contract, whether or not any specific reference is made to the same in this Contract.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

- E. All required bid, payment and performance bonds.

Section 1.2 Definitions The following words shall, whenever they appear in this Contract, have the meanings set for them in this section, unless a different meaning is clear from the context:

- A. "Architect/Engineer" shall mean the entity or entities retained by BNYDC to perform design services for the Project.
- B. "BSD" shall mean the Bid Submission Documents as promulgated by BNYDC upon which Contractor presented its bid in response to the RFB and upon which the Contract Price is based.
- C. "BNYDC's Contractors" shall mean other Contractors or construction managers engaged by BNYDC to perform work on the Project or at the Project Site(s).
- D. "Change Orders" shall mean changed, deleted and/or additional Work to be performed by the Contractor pursuant to Article 6 hereof.
- E. The "City" shall mean the City of New York.
- F. The "City Contract" shall mean the management contract between the City of New York and the Brooklyn Navy Yard Development Corp.
- G. "Construction Documents" shall mean the drawings identified on **Exhibit "C"** and the specifications annexed as **Exhibit "D"**.
- H. "Contract Price" shall mean the total compensation for the Work as set forth on page 1 hereof.
- I. "DSBS" shall mean the City of New York Department of Small Business Services.
- J. "Extra Work" shall mean Work by Contactor performed at the request of BNYDC or Work performed by Contactor with BNYDC's. knowledge and approval for which there is no extra charge
- K. "Federal" shall mean the Government of the United States of America.
- L. "IFB" shall mean the Information For Bidders contained in the RFB promulgated by BNYDC upon which Contractor based its bid and upon which the Bid Submission Documents are based.
- M. "Liquidated Damages" shall mean the liquidated damages rate set forth in the RFB multiplied by the number of calendar days that Substantial Completion (as defined in Section 8.2) of the Work is delayed from the Substantial Completion Deadline set forth in the Recitals to this Contract.
- N. "Premises" shall mean the Brooklyn Navy Yard.
- O. "President" shall mean the President of BNYDC, or the President's designee.
- P. "Project" shall mean the services to be performed under this Contract, as defined on page 1 of this Agreement.
- Q. "Protest Work" shall mean Work the Contractor believes is Change Order Work for which no Change Order has been issued.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

- R. "Project Site(s)" shall mean the location within the Brooklyn Navy Yard where the Work is to be performed as defined on page 1 hereof.
- S. "RFB" shall mean the Request For Bids which contained the IFB promulgated by BNYDC upon which Contractor presented its bid on the BSD and upon which the Contract and the Contract Price are based.
- T. "Project Engineer" shall mean a BNYDC's representative whose authority is set forth in Article 8.5 hereof.
- U. "State" shall mean the State of New York.
- V. "Subcontractor(s)" shall mean any entity the Contractor enters into a subcontract or material purchase order (hereinafter referred to as "Subcontract(s)") for purpose of performing the Work. All Subcontractor(s) and Subcontract(s) must be approved by BNYDC.
- W. "Tenant", "Subtenant", "Licensee," "Invitee" "Person" or "Visitor" shall mean any person or entity that is on the Premises with or without the permission of BNYDC.
- X. "Work" shall mean all labor, equipment, services, permits, approvals, inspections and material necessary for the complete and satisfactory completion of the Project as set forth in this Contract.

Section 1.3 Funding

- A. Funds for the payment of Contractor under this Contract may be provided by or through the City, pursuant to the City Contract (hereinafter referred to as City Contract Funded). Therefore if the Project is City Contract Funded, Contractor shall take no action which constitutes a breach of the City Contract. Contractor acknowledges that it has carefully reviewed and completely understands the terms and conditions of the City Contract which was available for review during the bidding period. Contractor further understands and agrees that if the City Contract is terminated this Contract may be assigned by BNYDC to the City.
- B. Funds for payment of Contractor under this Contract may also be provided by the United States Federal Emergency Management Agency's Public Assistance funds ("FEMA Funding"). The requirements in connection with FEMA Funding are set forth in Exhibit "O", which is attached hereto and made a part hereof. Failure by the contractor to comply with the requirements set forth in Exhibit "O" shall be a material default under this Contract.

Section 1.4 Applicable Laws, Rules and Regulations The Work shall be performed in strict compliance with all applicable federal, state and local laws, rules, regulations, codes and orders. Failure by the Contractor to comply with any such law, rule, regulation code or order shall be a material default

BNYDC CONSTRUCTION CONTRACT

under this Contract. Without limiting the generality of the foregoing, the Contractor agrees that it shall specifically comply with the following:

- A. Equal Employment The requirements are set forth in **Exhibit "A"**, which is attached hereto and made a part hereof.
- B. Federal Job Training Partnership Act (hereinafter referred to as the "FJTPA") The FJTPA, which specifies that when hiring for the Work, the Contractor shall give consideration to employing City residents who are economically disadvantaged or are eligible under FJTPA, and who have qualifications and skills commensurate with the requirements for the positions available. To the greatest extent feasible, the Contractor shall give opportunities for training and employment to lower income persons in the area of the Premises.
- C. Minimum Wages; Payroll Reports The provisions of Sections 220 and 230 of the New York State Labor Law shall apply to all Work under this Contract. If no prevailing wage is applicable, then Contractor will pay workers the minimum hourly rate required by law, unless a higher amount is required pursuant to any other provision of this Contract. The Contractor shall furnish on demand by BNYDC or DSBS or such other agency or office as the President may direct, a verified copy of its payroll, and also any other information required by BNYDC to satisfy BNYDC that the provisions of this Section are being observed.
- D. MacBride Principles The requirements are set forth in **Exhibit "B"**, which is attached hereto and made a part hereof.
- E. Noise Control The provisions for noise control for the Work at the Project Site(s) and on the Premises are set forth in Section 24-216 of the City's Administrative Code as it may be amended from time to time.
- F. ADA Requirements Title II of the Americans with Disabilities Act, the rules and regulations promulgated thereunder, and any state and local laws establishing construction requirements with respect to access for disabled persons.
- G. Tropical Hardwoods The provisions for the use of Tropical Hardwoods used for the Work at the Project Site(s) and on the Premises are set forth in Section 167-b of the New York State Finance Law, which prohibits the use of tropical hardwoods, except as expressly permitted.
- H. Whistleblower Protection The requirements are set forth in "**Exhibit K**", which is attached hereto and made a part hereof.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

- I. Paid Sick Leave The requirements are set forth in “**Exhibit L**”, which is attached hereto and made a part hereof.
- J. OSHA The Contractor shall ensure that the Work is performed in a location and manner free from recognized hazards and shall comply with Occupational Safety and Health Administration (“OSHA”) standards, rules and regulations. The Contractor shall regularly examine workplace conditions and use safe and well-maintained tools, equipment and Personal Protective Equipment to ensure conformance with applicable OSHA standards.
- K. Site Management Plan The Contractor shall perform all Work in compliance of the terms and provisions of that certain Site Management Plan (“SMP”) referenced in the Environmental Easement (the “Environmental Easement”) between the City, BNYDC and the People of the State of New York dated as of June 26, 2018 and recorded on July 3, 2018, C.R.F.N. 2018000219215. Contractor specifically acknowledges and agrees that any ground disturbance activities at the Project Site (including all digging for construction, utility installations, or otherwise) must be performed in strict accordance with the notice and other provisions the SMP, including but not limited to the Excavation Work Plan attached as **Exhibit “M”** to this Contract and the Health and Safety Plan attached as **Exhibit “N”** to this Contract, which Plans are attached as appendices to the SMP; (ii) Contractor’s failure to strictly comply with the Environmental Easement and the SMP shall be a material default under this Contract and (iii) in addition to all of BNYDC’s remedies under this Contract, Contractor shall be responsible for payment of any fines or other consequences related to Contractor’s failure to strictly comply with the Environmental Easement and the SMP.

Contractor agrees to incorporate, each of the provisions contained in Article 1.4 and each of the exhibits referenced therein into each Subcontract so as to bind each Subcontractor to the provision of Article 1.4.

Section 1.5 Intent of Contract The intent of this contract is to complete the Project; therefore matters not expressly included in this Contract but which are reasonably inferable therefrom as being necessary to produce the intended results shall be deemed included as a part of the Work. The Contract parts are complementary and cumulative and what is called for by one part shall be as binding as if called for by all.

Section 1.6 The Construction Documents The drawings identified in **Exhibit “C”** which is attached hereto and made a part hereof and the Specifications identified in **Exhibit “D”** are complementary. Anything shown in any of the drawings and not mentioned in the specifications, or mentioned in any of the specifications and not shown in the drawings, shall have the same effect as if shown or mentioned in both. In the event of a conflict between the drawings and the specifications, Contractor shall do the more complete installation, unless directed, in BNYDC’s sole discretion, otherwise in writing.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

Section 1.7 Contract Modifications The Contract is to be construed as one coherent overall document. If part of the Contract is Modified for the purpose of varying, modifying, rescinding or adding to the Contract then such modified portions of the Contract must be read together with the unmodified portions of the Contract to which they relate so as to give effect to the provisions of the Contract Documents that remain in full force and effect. Notwithstanding the above, and to the extent BNYDC or Contractor becomes aware of any conflict within any of the Contract, then BNYDC and Contractor shall promptly inform each other of such conflict and BNYDC shall resolve the conflict. BNYDC's decision is final and binding upon Contractor. Contractor shall proceed with the Work in accordance with BNYDC's determination. If Contractor performs Work before the conflict is resolved such Work is to be done at Contractor's sole risk, cost and expense.

ARTICLE 2

THE PROJECT SITE (S) AND CONTRACTOR'S RESPONSIBILITIES

Section 2.1 Project Site(s) The Premises are the former New York Naval Shipyard, which has been in continuous use for over 200 years. As such, there are buried foundations of demolished buildings, railroad and crane tracks set in massive concrete foundations and concrete decks set on various types of piles; therefore, BNYDC makes no representations whatsoever as to any subsurface condition of the Project Site(s). The Contractor assumes all responsibility and liability for all subsurface conditions at the Project Site(s) that could have been discovered by subsurface examination. The Contract Price contemplates whatever subsurface conditions exist. No Change Order will be issued for subsurface conditions at the Project Site(s) materially differing from any assumptions made by Contractor unless the Contractor having notice of the history of the Premises could not have anticipated such subsurface conditions.

If access to the Project Site(s) or Premises shall be denied to the Contractor at any time by BNYDC or any person(s) not associated with BNYDC or by court action, and such access denial reasonably interferes with Contractor's ability to perform the Work, then the Term set forth on page 1 hereof shall be extended for a period equal to any such period of access denial. Notwithstanding the foregoing, the Contractor shall not be entitled to an extension of time for any access denial attributable to the actions of the Contractor. In no event shall any denial of access to the Project Site(s) be a breach of this Contract and no damages or increased costs shall be recoverable on account of such denial of access.

Section 2.2 Contractor's Responsibilities

- A. Adherence to Contract Documents The Contractor shall perform the Work in strict accordance with the Contract.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

B. Supervision The Contractor shall use its best skills to properly administer, coordinate, supervise and superintend the Work. The Contractor shall furnish a competent on-site representative to receive notices, orders and instructions. The Contractor shall at BNYDC's request, report at a meeting between BNYDC and the Contractor on the general progress of the Work at the Project Site(s). The Contractor shall attend in person or have a competent and responsible representative attend such progress meetings.

C. Labor The Contractor shall furnish and maintain an adequate staff and work force of skilled, competent, experienced, reliable and honest workers at the Project Site(s) to carry out the Work in an efficient and timely manner until completion of the Work and shall enforce discipline and order among Contractor's and Subcontractor's employees and shall not employ on the Work any unfit person or anyone not properly skilled or trained in the task to which they are assigned.

D. Labor Disputes The Work may not be interrupted by labor disputes. The Contractor shall use such materials, have deliveries made to the Project Site(s), and employ only such Labor as will perform their services in harmony with all other trades performing Work at the Project Site(s), all other BNYDC's Contractors on the Premises, or otherwise.

If a labor dispute does occur then the Contractor is responsible for taking all necessary actions to settle such labor dispute. If questions of union jurisdiction do arise, then the Contractor shall immediately take all necessary action to settle such jurisdictional disputes and shall use such labor as will settle such dispute at no additional cost to BNYDC. The Contractor shall be responsible for any time lost due to such dispute.

If Contractor cannot settle the Labor disputes expeditiously, BNYDC shall after three (3) days written notice to Contractor have the right to terminate the Contractor pursuant to Article 9.2 of this Contract. BNYDC shall then have the right to enter upon the Project Site(s) and take possession thereof for the purpose of completing the Work.

E. Layout of Work All layout shall be performed by the Contractor, who shall be solely responsible for establishing and maintaining the layout, line and grade tolerances required for its the Work. The Contractor shall verify all established baselines prior to use and shall notify BNYDC of any discrepancies.

F. Cleaning and Rubbish Removal Contractor shall clear all debris and rubbish created by its operations on a daily basis. The debris and rubbish shall be collected and deposited in containers provided by Contractor. If the Contractor fails to clear and collect the debris and rubbish then, BNYDC may do so for the account of the Contractor. Such debris and rubbish removal costs shall be deducted from the Contract Price unless sooner paid by Contractor to BNYDC.

BNYDC CONSTRUCTION CONTRACT

Section 2.3 Safety The Contractor shall be solely responsible for:

- A. Construction means, methods and techniques; and
- B. Employing methods of construction, materials, scaffolding, tools, structures and equipment which meet or exceed federal, state and local safety and health related rules and regulations, laws and codes; and
- C. Complying with the requirements of all insurance carriers providing insurance coverage for the work.

The Contractor shall coordinate with BNYDC and all BNYDC's Contractors on the Project Site(s) to ensure that the Project Site(s) complies with all safety regulations promulgated by any governmental agency having jurisdiction over the Project Site(s) or the Work. The Contractor shall cooperate fully with BNYDC and other persons, to prevent loss and accidents with respect to the Work on or at the Project Site(s).

ARTICLE 3

TIME OF PERFORMANCE

Section 3.1 Commencement and Coordination of Work Contractor shall commence the Work at the Project Site(s) on the date specified on page 1 of this Contract. Contractor is completely responsible for the coordination of the Work. BNYDC Contractors or third-party Contractors may from time to time work at, on or about the Project Site(s). Contractor agrees to coordinate the Work scheduling to accommodate the needs of such BNYDC Contractors or third-party Contractors.

Section 3.2 BNYDC's Contractors

A. BNYDC reserves the right to have BNYDC's Contractors or third-party Contractors perform work on the Project or at the Project Site(s). Such BNYDC's Contractors or third-party Contractors may provide additional work beyond the Work covered by this Contract including, but not limited to, tenant improvements. Contractor shall, without further compensation, coordinate the Work with the work of BNYDC's Contractors or third-party Contractors. Contractor shall provide BNYDC's Contractors or third-party Contractors access to the Project Site(s) as often and for as long as BNYDC's Contractors or third-party Contractors may request. Contractor shall furnish to BNYDC Contractors or third-party Contractors any services that Contractor utilizes or furnishes to its Subcontractors including, but not limited to, use of hoisting facilities and temporary utilities.

B. Contractor shall integrate the schedule of BNYDC's Contractors or third-party Contractors into the Progress Schedule, as defined in Article 3.3.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

C. Contractor shall permit BNYDC, BNYDC Contractors and third-party Contractors to install equipment of furnishings in the Project, provided that such installation shall not materially interfere with Contractor's performance of its obligations hereunder.

D. If Contractor causes damage to the property of BNYDC, BNYDC's Contractors or third-party Contractors or to any other work or property on the Project Site(s) or Premises, then Contractor shall promptly pay for such damage. Such payment for damages shall be deducted from the Contract Price unless sooner paid by Contractor to BNYDC.

E. BNYDC's Contractors and third-party Contractors may be required to do work before, or simultaneously with the Work. Contractor agrees that, when requested by BNYDC's Contractor shall stop or suspend the Work to allow BNYDC's Contractors and third-party Contractors to complete their work. When BNYDC makes a request for Contractor to stop, interrupt or suspend Work to the extent that there are delays in the performance of the Work, the period of time during which the Work shall have ceased shall be recognized as a Contemplated Delay.

Section 3.3 Schedules Ten days after the issuance of the Contract Award Letter, Contractor shall submit to BNYDC in writing, on a form provided by or otherwise acceptable to BNYDC, a schedule of all items of Work to be performed showing the relative dollar value of each item, the date when each item of Work is to be commenced, the duration of each item of Work and the date when each item of Work is to be completed (hereinafter referred to as "Progress Schedule"). As required by section 3.2 b) above, the Progress Schedule shall show the interrelationship of each construction activity of the Contractor under this Contract and all other contracts affecting the Work. BNYDC must approve the Progress Schedule before Work commences. BNYDC will promptly review the submitted Progress Schedule and notify the Contractor to change those items that BNYDC deems incomplete, inaccurate or untimely. Upon receipt of such notification by BNYDC Contractor will incorporate the required changes and submit a revised Progress Schedule. Upon final approval by BNYDC of the Progress Schedule, Contractor shall strictly adhere to the approved Progress Schedule.

It is a condition precedent that an approved Progress Schedule is on file with BNYDC before payment of any kind will be made to the Contractor.

Section 3.4 Time for Completion Time is of the essence in this Contract. All Work must be completed within the number of calendar days set forth on page 1 hereof, from the date specified on page 1 hereof, subject to the provisions of Article 3.7 below.

Section 3.5 Contemplated Delays BNYDC and Contractor acknowledge that they are aware that delays are common to construction projects (hereinafter referred to as "Contemplated Delays").

The Following circumstances shall be deemed Contemplated Delays:

BNYDC CONSTRUCTION CONTRACT

- A. Errors in the Construction Documents, or discrepancies in the Construction Documents, or Changes to the Construction Documents, or incomplete Construction Documents that necessitate the issuance of corrective Change Orders.

- B. Slow processing of shop drawings.

- C. Interference from BNYDC Contractors or third-party Contractors or visitors to the Project Site(s) as contemplated by this Article 3.

- D. Adverse weather conditions

- E. Delays, disruptions, hindrances, interferences, or acceleration caused by:
 - i. Acts, failures to act, errors or omissions of BNYDC, the Architect/Engineer or other BNYDC consultants (hereinafter referred to as "Consultants") in the performance of their respective obligations on the Project, or their failure to give approvals and/or consents within the time periods set forth in the Progress Schedule that result in delays.
 - ii. Economic, industry-wide strikes; fire; acts of God.
 - iii. Acts of the public enemy.
 - iv. Unavailability of, or inability to obtain, labor or materials by reason of the acts of any governmental body which affect the supply or availability of labor or materials.
 - v. Floods.
 - vi. Rebellions, riots, insurrections or sabotage.
 - vii. Suspension, resequencing, stoppage or interruption of the Work ordered by BNYDC under this Agreement.
 - viii. Interruption or failure of utilities, including without limitation, electric, gas, heat, steam and water.

Section 3.6 Assumption of the Risk for Delays

Notwithstanding any other provisions of this Contract, and for the benefit of BNYDC, Architect/Engineer and the Consultants, Contractor agrees to make no claim against BNYDC, the Architect/Engineer, or the Consultants due to any Contemplated Delays or other delays even if Contractor complies with the provisions of Article 3.7, and Contractor is granted an extension of the Term. Contractor agrees to assume the risk of any and all loss and expense for such other delays in the performance of the Work or any other obligation of Contractor under this Contract.

BNYDC CONSTRUCTION CONTRACT

The intent of this Article 3.6 is to avoid protracted costly litigation as to whether delays, should they occur, were anticipated or unanticipated, foreseeable or unforeseeable, reasonable or unreasonable or as to whether or not they were the fault of BNYDC, Architect/Engineer, Consultants or their representatives. Contractor agrees that all delays, regardless of duration the Contractor assumes any and all loss and expense for such delays in the performance of the Work or any other obligation of Contractor under this Contract.

Contractor certifies that it has considered, as an experienced Contractor, the risk of encountering such delays and its assumption of any and all loss and expense for such delays in the performance of the Work in reaching the Contract Price contained in this Contract.

Section 3.7 Extension of Time for Performance. If performance by the Contractor is a Contemplated Delay, Contractor may be allowed a reasonable extension of the Term to complete the Work. Only the President, upon written application by the Contractor, may grant an extension of time.

Section 3.8 Grounds for Extension If the Contractor has otherwise strictly complied with all of the requirements of this Contract and if Contractor applies, in accordance with Section 3.9 hereof, for an extension of time to complete the Work due to a Contemplated Delay, then Contractor shall be entitled to an extension of the Term to complete the Work. The President shall determine how many days of extension time to grant, but in no event more than the number of days missed due to the contemplated delay.

The Contractor shall not receive separate extensions of time for each of several causes of delay operating concurrently. If one of several causes of delay operating concurrently results from any act, fault or omission of the Contractor or of its Subcontractors or material suppliers, and would of itself (irrespective of the concurrent causes) have delayed the Work, no extension of time will be allowed for the period of delay resulting from such act, fault or omission.

Section 3.9 Applications for Extension of Time to Complete Work. Contractor must within five (5) days after commencement of the Contemplated Delay, submit a written application to the President containing the following:

- A. Contract identification
- B. The nature of each alleged cause of delay in completing the Work
- C. The number of days attributable to each such cause
- D. The date that each such alleged cause of delay began

BNYDC CONSTRUCTION CONTRACT

- E. The anticipated end date of each alleged cause of delay
- F. Original bid amount contained in the BSD
- G. Contract start date
- H. Original completion date
- I. All previous time extensions granted
- J. The extension of time currently requested.

As part of the application for Extension of Time, Contractor must include the following statement:
“Contractor understands and agrees that if a time extension is granted it is only for purposes of permitting continuation of Work and that, unless otherwise agreed by BNDYC in its sole discretion, Liquidated Damages will continue to accrue for each day Substantial Completion is delayed past the applicable Substantial Completion Deadline.”

Section 3.10 Analyses and Approval of Time Extensions The President shall analyze Contractor’s application for extension of time to complete Work and issue a written acceptance or rejection of said application. If the President accepts the application to extend the time for the performance of the Contract then the Term shall be extended the number of days the President specifies.

Section 3.11 Waiver of Claims The Contractor waives all claims for damages, including all costs and increased costs for labor and material, incurred on account of any delay, hindrance or cause whatsoever, and the Contractor agrees that its sole right and remedy for any delay, hindrance or cause shall be that the Contractor shall be entitled to such extension of the Term as the President may grant. Contractor further agrees that such extension of the Term is full and adequate consideration for all delays, hindrances, or causes.

Section 3.12 Liquidated Damages If the Contractor fails to complete the Work by the Substantial Completion Deadline set forth in the Recitals to this Contract, Contractor shall immediately become liable to BNYDC for the specified Liquidated Damages. The Liquidated Damages shall be deducted from the Contract Price unless sooner paid by Contractor to BNYDC.
BNYDC and Contractor agreed to the assessment of liquidated damages because each recognizes and acknowledges that the actual damages suffered by BNYDC by reason of any delay in the completion of the Work will be of such a nature that they will be unreasonably difficult to determine.

BNYDC CONSTRUCTION CONTRACT

BNYDC reserves the right, in accordance with Article 9 hereof, to terminate this Contract and have the Work completed by others at the expense of the Contractor and, in addition, to collect Liquidated Damages.

ARTICLE 4

WORK HOURS

The Contractor shall perform Work only between the hours of 7:30 a.m. and 4:30 p.m., Monday through Friday, except as otherwise specified in the RFB. In an emergency or if the Contractor is required to complete the Work in accordance with the Progress Schedule, Work, with the approval of BNYDC, may be performed at other hours. No extra compensation for any overtime charges or additional expenses resulting from such work shall be paid to Contractor.

ARTICLE 5

PAYMENT; METHOD OF PAYMENT; PAYMENT RECORDS

Section 5.1 Payment BNYDC agrees, upon Final Completion of the Work, to pay the Contractor in full satisfaction for the performance of the Work, and the Contractor agrees to accept, the Contract Price.

Section 5.2 Partial Payment From time to time as the Work progresses, and provided that the Contractor is not in default of this Contract, but not more than once a month, the Contractor shall submit to BNYDC the following required documents (hereinafter referred to as "Required Documents"):

- A. Fully executed and notarized Contractor's Requisition for Progress Payment in the form annexed hereto as **Exhibit "F"**; and
- B. Contractor shall submit for all Work for which Contractor is requesting payment a fully executed and notarized partial release and partial lien waiver, in the form annexed hereto as **Exhibit "I"**; and
- C. Contractor shall submit for each Subcontractor that did Work for which Contractor is requesting payment a fully executed and notarized partial release and partial lien waiver, in the form annexed hereto as **Exhibit "I"**.

BNYDC will review the Required Documents and when satisfied that the documents are accurate and complete, promptly pay the Contractor the amount requested, less retainage as follows: until the Work is substantially complete, 5% of the amount requested.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

If BNYDC is not satisfied with the accuracy or completeness of the Required Documents, BNYDC will return the Required Documents to Contractor together with a statement setting forth the items of inaccuracy or incompleteness.

The statement from BNYDC shall be conclusive and binding upon the Contractor as to all the items included therein.

No further progress payments shall be paid to Contractor until Contractor submits and BNYDC accepts the Required Documents.

Section 5.3 Final Requisition On the day that Final Completion of the Work is achieved, Contractor shall submit to BNYDC the following documents (hereinafter referred to as "Final Documents"):

- A. Fully executed and notarized Contractor's Final Requisition for Payment in the form annexed hereto as **Exhibit "F"**; and
- B. Contractor shall submit for all Work for which Contractor is requesting final payment a fully executed and notarized final release and final lien waiver, in the form annexed hereto as **Exhibit "J"**; and
- C. Contractor shall submit for each Subcontractor that did Work on the Project a fully executed and notarized final release and final lien waiver, in the form annexed hereto as **Exhibit "J"**.

BNYDC will review the Final Documents and when satisfied that the Final Documents are accurate and complete, promptly pay the Contractor the final payment less 1% of the final Contract Price as retainage for guaranty or warranty to be held by BNYDC for one (1) year, and return to Contractor excess retainage, if any.

If BNYDC is not satisfied with the accuracy or completeness of the Final Documents, BNYDC will return the Final Documents to Contractor together with a statement setting forth the items of inaccuracy or incompleteness.

The statement from BNYDC shall be conclusive and binding upon the Contractor as to all the items included therein.

Final payment shall not be made to Contractor until Contractor submits and BNYDC accepts the Final Documents.

Section 5.4 Withholding of Payment

Anything contained in this Agreement to the contrary notwithstanding, BNYDC, reserves the right to withhold from any payment due Contractor any amount that BNYDC deems sufficient to reimburse BNYDC for its actual expenditures made for the account of Contractor.

BNYDC CONSTRUCTION CONTRACT

The right to withhold money from Contractor includes without limitation, all amount payable hereunder. If in BNYDC's opinion there is an actual or potential breach of this Contract, or an actual or potential default under this Contract by Contractor and the remaining balance payable to Contractor under this Contract would be insufficient to complete the Work. In connection therewith, BNYDC may nullify, in whole or in part, any previously approved but unpaid Partial Payments.

Section 5.5 Stored Materials BNYDC will allow materials or equipment that are not incorporated in the Work but will be installed in the Project and are delivered (hereinafter referred to as "Material") and suitably stored at the Project Site(s) to be included as an item in the Contractor's Requisition for Progress Payment. If approved in advance by BNYDC, BNYDC will allow eighty percent (80%) of the cost of the Material suitably stored at a location other than at the Project Site(s) to be included as an item in the Contractor's Requisition for Progress Payment so long as Contractor submits paid invoices, bills of sale or such other document satisfactory to BNYDC that establish BNYDC's title to such materials or equipment. Contractor must also protect BNYDC's interest in the Material by providing BNYDC acceptable proof that BNYDC's interest in the material is properly insured. Since off site storage of Material is for the convenience of Contractor transportation to the Project Site(s) of the Material shall not be included as an item in the Contractor's Requisition for Progress Payment.

Section 5.6 Progress Payment Any payment to Contractor pursuant to a Contractor's Requisition for Progress Payment shall only be for completed work in accordance with Section 5.2 hereof or stored materials pursuant to Section 5.5 hereof. In no event shall BNYDC make a Progress Payment for a downpayment or deposit for materials or equipment.

Section 5.7 Miscellaneous Payment Provisions Nothing contained in this Article 5 shall relieve the Contractor of its obligation to give notice of claims pursuant to any other provision of this Contract. The acceptance of the final payment by the Contractor is a specific waiver and release of any claim the Contractor may have against BNYDC on account of or arising out of the Work. The making of the final payment by BNYDC shall not act as an estoppel against BNYDC or prevent BNYDC from enforcing any right under this Contract or any rights that may accrue or have already accrued at law or in equity.

Section 5.7 Joint Payment All payments by BNYDC shall be in the form of one or more separate checks which together total the amount due, made payable, at the option of BNYDC, either: (1) to the Contractor, (2) to the Contractor and one or more of its suppliers or Subcontractors, or (3) directly to its suppliers or Subcontractors. This provision is strictly for the benefit of BNYDC in order that satisfactory morale and relations with Subcontractors or suppliers is maintained and shall not under any circumstances confer any right upon a third party. In the event BNYDC makes a joint payment to the Contractor and one or more of its suppliers or Subcontractors or pays Contractor's suppliers or Subcontractors directly, then the Contractor shall be notified of such payment and such payment shall be reflected in Contractor's next Requisition and applied to the Contract Price.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

Section 5.8 Payment Records Contractor agrees that its records pertaining to this Contract, the Project Site(s), the Project, all payments made hereunder, all purchases, and expenses charged hereunder or otherwise expended (hereinafter referred to as "Records") shall be subject to examination, audit and post audit at any time by BNYDC, the Comptroller of the City, the Director of Administrative Services of the City, DSBS, or such other designated official, and/or agent of the City, the State of New York, or the United States Government (hereinafter referred to as "Audit"). The Contractor shall maintain the Records at its business premises for a period of at least six years from the date of final payment. The Contractor shall maintain all Records and additional documents and records required by BNYDC (hereinafter referred to as "Additional Records"). Contract agrees that the maintenance of the Records and Additional Records are a material part of this Contract. Contractor agrees to promptly prepare and furnish to BNYDC such statements, Records, Additional Records, reports, data or information as requested by BNYDC. The Contractor acknowledges that its Subcontractors are subject to the provisions of this Section and will include such terms in all Subcontracts. Contractor undertakes to provide BNYDC such statements, Records, Additional Records, reports, data or information from Subcontractors as requested by BNYDC

If an Audit discloses any discrepancy, then BNYDC and the Contractor shall immediately address and clear such discrepancies. If determined by said audit that BNYDC has overpaid Contractor then Contractor shall immediately return such overpayment to BNYDC. Said return of funds shall be in addition to any claim for damages BNYDC may have as against Contractor. If determined by said audit that Contractor has been underpaid by BNYDC then upon a receipt and approval of a fully executed and notarized requisition for payment, BNYDC will pay Contractor the requested amount.

ARTICLE 6

CHANGE ORDERS; PROTEST WORK

Section 6.1 Extra Work BNYDC reserves the right to interpret the Construction Documents and/or to order minor changes in the Work, if those changes do not involve any adjustment in the Contract Price. The Contractor will promptly comply with any such interpretation or order.

Section 6.2 Field Orders In order to resolve conflicts in the Construction Documents, to order minor changes to avoid conflicts between different trades, or for Extra Work Architect/Engineer and BNYDC's Project Engineer shall have the authority to issue written field orders (hereinafter referred to as "Field Orders"). A Field Order is not a Change Order, only the President under Section 6.3 below has the authority to issue a Change Order.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

Section 6.3 Change Orders. BNYDC reserves the right to, from time to time during the course of the Work, change, delete or add Work to the Contract, Such deleted or additional work shall hereinafter be referred to as a "Change Order". The President and the Contractor must sign all Change Orders. An oral directive or a writing not signed by the President and the Contractor shall be void ab initio and of no effect. Contractor upon receipt of a valid Change Order shall promptly perform required Work thereunder. The price for the Work required by the Change Order shall be determined as follows:

- A. If Contractor and BNYDC agree upon a lump sum amount that the Contract Price will be amended by such lump sum amount; and/or
- B. If this Contract the RFB, IFB, or the BSD contains unit prices (hereinafter referred to as "Unit Prices"), which are applicable to the type of work involved in the Change Order, then said Unit Prices will be used to set the amount that the Contract Price will be amended.
- C. If BNYDC and the Contractor cannot agree upon a Change Order price prior to the performance of the Change Order, and if Unit Prices are not applicable to the Change Order, then the Contractor shall be paid for such Change Order Work an amount equal to either
 1. With respect to Change Order Work performed by the Contractor the sum of:
 - a. Contractor's actual, documented to BNYDC's satisfaction, incurred costs defined as:
 - i) Base wages paid to laborers, including all insurance, welfare and other fringe benefits, and payments to labor organizations; and
 - ii) Cost of materials purchased, plus transportation costs, less all Contractor's discounts; and
 - iii) The actual cost of additional insurance necessitated by the Change Order Work; and
 - iv) The cost of installation, maintenance, operation and rental (or rental value of Contractor owned plant and equipment, but not tools) necessitated by the Change Order; and
 - v) The cost of necessary installation and dismantling of such plant and equipment (including transportation to and from the Project Site) (hereinafter referred to as "Actual Costs"); plus
 - b. 10% of such Actual Costs as compensation for all other costs, including overhead and small tools (hereinafter referred to as "Additional Costs"); plus
 - c. An additional 10% of such Actual Costs as compensation for profit (hereinafter referred to as "Profit"); or
 2. With respect to Change Order Work performed by a Subcontractor, the sum of:
 - a. The Subcontractor's Actual Costs; and

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

- b. 10% of Actual Costs as compensation for Subcontractor's Additional Costs,
- c. Not more than 5% of Actual Costs for Subcontractor's profit; and
- d. Not more than 5% of Subcontractor's Actual Costs for the Contractor's Additional Costs and profit;
- e. The total of the markups described in (2) (b), (2) (c) and (2) (d) above shall not exceed 20% of the Subcontractor's Actual Costs.

D. If the Change Order deletes Work, then the Contract Price shall be reduced by an amount equal to the sum of (a) the Actual Costs, plus (6) all unearned Profit and Additional Costs.

E. If BNYDC and the Contractor cannot agree on a price for the Change Order Work under paragraphs a), b) or c) above, then the Contractor agrees that Contractor shall nevertheless immediately perform or delete the Change Order Work. The price to be paid or the credit to be taken for said Change Order Work shall be determined by BNYDC based upon the current market value for said work (hereinafter referred to as "Actual Market Value"), but in no event shall such Actual Market Value exceed the Actual Costs of performing said Change Order Work. The determination of Actual Market Value shall be made by the President and shall be binding upon the Contractor.

Section 6.4 Payment for Change Orders Request for payment of a Change Orders may be included with the Contractor's next Partial Requisition. Such request shall constitute Contractor's agreement that the Change Order relieves BNYDC from any liability for Contractor's loss due to delay, disruption, cost, or expense occasioned by reason of such Change Order and further Contractor releases BNYDC from any further liability therefore.

Section 6.5 Protest Work Contractor must, at least 7 days prior to commencing Protest Work, give BNYDC a formal written notice of the Protest Work together with a detailed explanation of why the contested work is not already covered by the Contract and an itemization of the cost to perform such disputed work. Notwithstanding any such claim of Protest Work, the Contractor shall proceed to diligently perform the Work in question, unless BNYDC shall by written notice direct that such work shall not be performed.

Section 6.6 Protest Work Records Contractor shall, while performing Protest Work, furnish BNYDC daily a written report showing:

- A. The name and social security number of each worker performing Protest Work (hereinafter referred to as a "Protest Worker"); and
- B. The number of hours worked by each Protest Worker; and

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

- C. The type of work each Protest Worker performed; and
- D. The cost, nature and quantity of all materials accompanied by paid receipts from the vendor from whom such materials were purchased showing date purchased and cost; and
- E. The cost, nature and quantity of all equipment furnished or used in connection with the Protest Work accompanied by certified records showing daily usage costs, paid receipts from the vendor from whom such equipment was purchased or rented showing date purchased or rented and cost.

Failure to comply with the requirements of this Section 6.6 shall be deemed a waiver of any claim for payment on account of Protest Work.

ARTICLE 7

SUBCONTRACTS

Section 7.1 Subcontracts The Contractor is not an agent of BNYDC, the City or DSBS. All Subcontracts are between Contractor and Subcontractor. BNYDC, the City and DSBS have no responsibility for and assume no liability under any Subcontract.

Contractor shall include in each Subcontract a representation and warranty that Subcontractor presently has no interest, and Subcontractor shall not acquire any interest, which would directly or indirectly conflict, in any manner or degree, with the performance of Work on the Project and that no person with any such conflicting interest shall be employed in the performance of the Subcontract; any such interest on the part of the Subcontractor, its employees, agents or assigns must be fully disclosed to BNYDC. The Contractor shall include and enforce all applicable terms and conditions set forth in this Contract in every Subcontract.

Section 7.2 Investigation Forms for Subcontractors. The Contractor shall cause each Subcontractor to submit to the City, Mayor's Office of Contract Services (hereinafter referred to as MOCS), a Procurement and Sourcing Solutions Portal (hereinafter referred to as "PASSport") profile. The Subcontractor shall not commence Work until BNYDC receives clearance from the MOCS.

Section 7.3 Indemnification of Subcontractor's Lien. To the fullest extent permitted by law, Contractor indemnifies and holds BNYDC, the City, DSBS and the directors, officers, agents and employees of each

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

harmless against any and all Subcontractors' liens which may be filed. If the Contractor fails to promptly discharge all Subcontractors' liens, BNYDC shall make no further payment to the Contractor under this Contract. BNYDC, the City and DSBS shall have the right to discharge any liens which may be filed by any Subcontractor of any tier, and may recover the costs of securing such discharge from the Contractor by withholding such amount from the next payment due or otherwise.

ARTICLE 8

INSPECTION AND COMPLETION OF THE WORK

Section 8.1 Inspection All Work, materials and methods of construction shall at all times be subject to the inspection by BNYDC or its designee, or any City, New York State or Federal agency or department with jurisdiction over the Premises. If any Work, material or method of construction does not meet the approval of BNYDC or its designee, or any City, New York State or Federal agency or department with jurisdiction over the Premises such Work, material or method of construction shall be immediately changed, corrected, replaced and made good, at the Contractor's expense. BNYDC shall be the final judge of the quality and suitability of the Work, materials, and the methods of construction. Acceptance of any Work, material or method of construction shall not relieve the Contractor from any of its obligations under this Contract. BNYDC and its agents shall have no liability or obligation as a result of the inspection and the Contractor shall not be relieved of any Contract obligations by the making of an inspection or any acceptance resulting therefrom.

Section 8.2 Substantial Completion of the Work. When Contractor believes that the Work is complete Contractor shall request in writing that BNYDC inspect the Project. The Project shall be deemed substantially completed (hereinafter referred to as "Substantial Completion") on the date when all of the following shall have occurred:

- A. BNYDC may use and occupy the Project; and
- B. Only minor incomplete or unsatisfactory Work (hereinafter referred to as "Punch Lists"), if any, remains incomplete provided it does not interfere with BNYDC's use and occupancy; and
- C. A Temporary Certificate of Completion or Certificate of Occupancy and/or such other required approval (i.e., a Notice of Completion or a New York City agency sign-off, as may be applicable) shall have been issued by the appropriate local governmental authority for all or a portion of the Project.

BNYDC CONSTRUCTION CONTRACT

Section 8.3 Punch List When BNYDC or its designee prepares a Punch List, Contractor shall promptly complete and/or correct said work on the Punch List. The Contractor shall remain fully responsible to perform all Work whether or not there is a Punch List. BNYDC shall be entitled to withhold from any payment, in addition to any other sums properly withheld hereunder, the sum of two times the value of the Punch List, but in no event less than \$1,000.

Section 8.4 Final Completion of the Work. The Project shall be deemed finally completed (hereinafter referred to as "Final Completion") on the date when the Work shall have been finally completed and BNYDC shall have received:

- A. Evidence that all Work including Punch List items, have been fully and satisfactorily completed in a good and workmanlike manner, in conformance with this Contract; and
- B. The Project has received, in full compliance with all applicable laws, rules, requirements and regulations of all government Authorities having jurisdiction over the Project the required signoffs and Certificates of Completion and/or Occupancy; and
- C. Contractor has delivered all final certificates of approval relating to the Work and the contemplated uses of the Project, including, without limitation, all necessary certificates of the Board of Fire Underwriters or any successor thereof, Inspection and approval by the Bureau of Electrical Control, the City Fire Department, the City Department of Environmental Protection, all warranties and all guarantees for the Work and the Certificate of Completion and/or Occupancy, shall have been delivered to BNYDC; and
- D. All required receipts, releases, releases of liens, affidavits, waivers, as-built drawings and any other documents required under this Contract shall have been delivered to BNYDC.

Section 8.5 Project Engineer BNYDC may employ a Project Engineer as BNYDC's representative at the Project Site(s). The Project Engineer shall, subject to review by BNYDC, have the authority, in the first instance, to inspect, supervise and control the performance of the Work.

NOTE – The Project Engineer, or any other person, does not have the power to issue a Change Order. Only the President, in compliance with section 6.3, has the power to issue a Change Order.

BNYDC CONSTRUCTION CONTRACT

Section 8.6 Occupation or Use Prior to Completion BNYDC shall have the right before the Final Completion, to take over, occupy, operate or otherwise use any part of the Project. Contractor shall not interfere with or object to such take over, occupancy, operation or use any part of the Project. BNYDC shall notify Contractor in writing of such take over, occupancy, operation or use part of the Project specifying the date of such take over, occupancy, operation or use of part of the Project. Contractor's guarantee on the part of the Project taken over, occupied, operated or used by BNYDC shall begin on the date of such take over, occupancy, operation or use by BNYDC. If BNYDC shall take over, occupy, operate or use any part of the Project, BNYDC shall first inspect the parts of the Project to be so taken over, occupied, operated or used by BNYDC. Contractor will then be furnished in writing with a statement of Substantial Completion, and a Punch List for such part so taken over, occupied, operated or used by BNYDC.

ARTICLE 9

SUSPENSION OF WORK; TERMINATION

Section 9.1 Suspension BNYDC may, at any time, with or without cause, suspend the Work or any portion thereof for a period of not more than 90 days by giving Contractor written notice of such suspension (hereinafter referred to as "Suspension Notice"). Contractor shall immediately stop the Work covered by BNYDC's Suspension Notice and cause all Subcontractors to stop the Work covered by BNYDC's Suspension Notice. Contractor and Subcontractors shall resume the Work on the date set by BNYDC. Contractor and Subcontractors shall not be entitled to any additional compensation for costs attributable to any suspension, but the time for completion of the Work shall be extended by the period of suspension. The Contractor shall secure and make safe the Project Site(s) to BNYDC's satisfaction during any suspension.

Section 9.2 Defaults and Terminations for Cause In addition to any other rights that BNYDC may have, BNYDC shall have the right to declare the Contractor in default and terminate, for cause, this Contract, in whole or in part, if any of the following occur:

- A. The Contractor shall become insolvent; or
- B. The Contractor shall fail to perform the Work in the method and manner required by BNYDC; or
- C. The Contractor shall fail to complete the Work within the Term; or

BNYDC CONSTRUCTION CONTRACT

- D. The Contractor shall fail to assign workers, order materials or enter into Subcontracts in a manner deemed sufficient by BNYDC to permit completion of the Work in accordance with the approved work schedule; or
- E. The Contractor's interest in this Contract or its right to receive funds shall be assigned, transferred, conveyed or otherwise disposed of voluntarily or by operation of law without the prior written consent of BNYDC; or
- F. The Contractor shall not comply with or violate any provision of this Contract; or
- G. The Contractor shall fail to comply with any of the applicable laws, rules, regulations or orders that may be applicable to this Contract, or the Contractor shall be defaulted or debarred by the City, the State of New York or the United States Government; or
- H. Any statement or representation of the Contractor in the Contract or in any document submitted by the Contractor with respect to the Work, the Project, or the Contract (or for purposes of securing the Contract) was untrue or incorrect when made.

Section 9.3 Termination for Convenience BNYDC reserves the right to terminate Contract at any time for its own convenience, without fault, and for such reasons as BNYDC deems appropriate (hereinafter referred to as "Convenience Termination"). A Convenience Termination shall take effect immediately upon Contractor receipt of BNYDC's written Convenience Termination notice. Contractor shall be entitled to full payment of sums due hereunder for Work performed prior to such Convenience Termination. Contractor shall not be entitled to profit or overhead on the unperformed portion of the Work.

Section 9.4 Effects of a Default or a Termination Upon termination of this Contract, Contractor and all Subcontractors will immediately cease work and take all necessary steps to remove all hazards so as to make the Project Site(s) safe. After securing the Project Site(s), Contractor shall promptly present BNYDC a statement of costs actually incurred to the date of termination. The Contractor shall not recover as part of its costs any unearned or anticipated overhead or profit for itself or for its Subcontractors as a result of any termination.

Section 9.5 Payment Due when Termination not for Cause BNYDC will promptly review the statement of costs submitted by the Contractor by verifying and auditing all canceled checks, Subcontracts, paid receipts, bills from Subcontractors and any other document deemed necessary. BNYDC will notify the Contractor in writing when BNYDC is satisfied that the statement of costs is accurate (hereinafter referred to as "Approved Statement of Costs"). Contractor may then submit a Final Requisition for the balance of the Approved Statement of Costs, Contractors Final Release and Final Lien Waivers, all Subcontractors

BNYDC CONSTRUCTION CONTRACT

Final Release and Final Lien Waivers. Receipt of payment from BNYDC of the amount of the Final Requisition shall be full and final payment to the Contractor.

Section 9.6 Payment Due when Termination is for Cause In addition to any other rights BNYDC may have in law, in equity, or under this Contract if termination is for cause, BNYDC may, at its sole discretion, have the Work completed by another Contractor of its choice, or elect not to complete the Work.

BNYDC shall deduct from all monies then due Contractor the sum of:

- A. All expenses incurred in completing the Work; or
- B. The value of the Work not completed (as determined by BNYDC, in its sole discretion; and
- C. all incidental expenses incurred as a result of the termination for cause, including all actual legal fees and accounting fees.

If, after making the above computation, there remains a balance due Contractor BNYDC shall pay such amount to the Contractor upon Contractor submitting a Final Requisition for such balance, Contractors Final Release and Final Lien Waivers, all Subcontractors Final Release and Final Lien Waivers. Receipt of payment from BNYDC of the amount of the Final Requisition shall be full and final payment to the Contractor.

If there is a balance due from the Contractor to BNYDC, then the Contractor shall immediately pay that amount to BNYDC.

No monies shall be due or payable to Contractor, if Contract is terminated for cause, until the Project is completed or BNYDC abandons the Project.

BNYDC need not wait until the completion of the Project to seek the enforcement of its rights hereunder.

ARTICLE 10

PROTECTION OF PERSONS AND PROPERTY; INDEMNIFICATION

Section 10.1 Protection of Persons and Property The Contractor is responsible for providing safety and protection for all persons at the Project Site(s). The Contractor is responsible for all property damage, loss, injury, theft or vandalism at the Project Site(s) resulting from the Contractor's acts or omissions or those acts or omissions of any Subcontractors or any act or omission by anyone for whose acts Contractor may be liable.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

Section 10.2 Indemnification To the fullest extent permitted by law, Contractor agrees to indemnify, keep indemnified, and hold harmless BNYDC and the City and their respective affiliates, officers, directors, members, partners, trustees, beneficiaries, agents and employees (hereinafter referred to as "Indemnities") from and against any and all liability, civil money penalties, fines, claims, losses, suits, damages, demands, judgments, actions, causes of action, settlements, expenses including but not limited to attorney's fees and disbursements, costs and charges of every nature and kind, both legal and otherwise, whether direct or indirect, arising out of (i) the acts or omissions of the Contractor, its Subcontractors, agents, employees or material suppliers, and any and all Persons on the Project Site(s) or in connected to the Work or (ii) any negligence, fault or default of the Contractor, its Subcontractors, agents, employees or material suppliers.

Contractor specifically agrees and acknowledges that there shall be no personal liability on the part of any officer, director, employee or agent of the Indemnities in connection with this Contract or otherwise.

This section 10.2 shall survive any termination of this Contract and remain in full force and effect.

Section 10.3 BNYDC, the City and DSBS not liable BNYDC, the City and DSBS shall not be liable for any damage, injury or liability that may be sustained by Contractor, Subcontractor or any other person whatsoever, or to their goods and chattels from any cause whatsoever arising from or out of the Work at the Project Site(s). Contractor hereby releases and discharges BNYDC, the City and DSBS from any and all demands, claims, actions and causes of action arising from the aforesaid.

Contractor shall look solely and exclusively to the funding for this Project for the satisfaction of any claim or cause of action Contractor may have against BNYDC, the City or DSBS in connection with this Contract or the failure of BNYDC to perform any of its obligations hereunder.

Section 10.4 Contractor Not an Agent of BNYDC, the City, or DSBS Contractor, Contractor's employees, Subcontractors or Subcontractor's employees are not agents, servants or employees of the Indemnities by virtue of this Contract or by virtue of any approval, permit, license, grant, right or authorization given by BNYDC, the City, DSBS or any of their officers, directors, employees or agents. Contractor, Contractor's employees, Subcontractors, or Subcontractor's employees shall not in any way directly or indirectly represent that they are agents, servants or employees of the Indemnities. The Contractor is solely responsible for the work, direction, compensation and personal conduct of its officers, employees, agents, Subcontractors, Subcontractor's officers, employees, and agents.

ARTICLE 11

INSURANCE AND BONDS

Section 11.1 Insurance, Performance Bond and Payment Bond Contractor and each Subcontractor shall provide:

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

- A. Proof of Insurance as set forth in **Exhibit "G"** which is attached hereto and made a part hereof; and
- B. A Performance Bond in the exact form set forth in **Exhibit "H"** which is attached hereto and made a part hereof in the Penal Sum set forth in Attachment 1 of the IFB; and
- C. A Payment Bond in the exact form set forth in **Exhibit "H"** which is attached hereto and made a part hereof in the Penal Sum set forth in Attachment 1 of the IFB.

Section 11.2 Bid Security The bid bond or bid deposit as required by the RFB, the IFB and the BSD shall be retained by BNYDC as security for the Contractor entering into this Contract and commencing Work on the Project. A bid bond will be only be returned to the Contractor in compliance with its own terms. A bid deposit will only be returned to Contractor after the BNYDC receives this Contract duly executed by Contractor, the required Performance Bond and the required Payment Bond.

ARTICLE 12

LABOR AND MATERIALS; GUARANTEES

Section 12.1 Materials and Equipment All materials and equipment permanently installed in or on the Project shall be new, except as approved by BNYDC or as specified in the Construction Documents. Notwithstanding the foregoing, BNYDC encourages the use of recycled products where practicable. The Contractor shall notify BNYDC if it intends to use recycled products with respect to any materials to be permanently installed on the Project.

All labor performed on the Project shall be performed by skilled workers in their respective trades and shall be of first class quality in accordance with the standards of the construction industry and the particular trade. The Contractor shall obtain in the name of BNYDC all manufacturers' warranties and guarantees on all equipment and materials required by this Contract and installed in or on the Project and shall deliver such warranties and guarantees to BNYDC.

Section 12.2 Guarantee of Work Unless otherwise specifically set forth in the Construction Documents or elsewhere in this Contract, Contractor fully warrants and guarantees the materials, equipment, and Work against any and all defects whether latent or patent for a period of one year from the date Final Completion is achieved (hereinafter referred to as the "Warranty Period"). During the warranty period Contractor shall promptly repair, replace, rebuild or restore (as BNYDC may direct) all defective Work and materials and shall pay all costs for labor and materials necessary to correct such defective Work. Should Contractor fail to promptly repair, replace, rebuild or restore such defective Work, BNYDC shall repair, replace, rebuild or restore such defective Work and Contractor shall promptly pay to BNYDC all costs incurred by BNYDC in connection therewith. BNYDC's certificate setting forth the costs incurred in repairing, replacing, rebuilding or restoring any damaged or defective Work shall be binding and conclusive as to the amount thereof upon the Contractor.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

Section 12.3 Security for Materials and Guarantees As security for the Contractor's faithful performance of its obligations under this Article 12, BNYDC will deduct from the Final Completion payment an amount equal to one percent (1%) of the Contract Price or such greater amount fixed in the RFB, the IFB and the BSD (hereinafter referred to as "Retainage"). In BNYDC's sole discretion, BNYDC may require Contractor to post in addition to the Retainage security in such amount, as BNYDC deems necessary to guarantee Contractors performance under this Article 12.

If Contractor faithfully performs all its obligations hereunder, BNYDC will as soon as practicable after the expiration of the Warranty Period return to Contractor the Retainage and additional security, if any, without interest.

Notice by BNYDC to repair, replace, rebuild and/or restore any defective or damaged Work shall be timely if given up to 10 days after the expiration of the Warranty Period.

Section 12.4 Rights not Exclusive BNYDC's rights under this Article 12 are in addition to all other rights BNYDC may have under this Contract, at law or in equity.

ARTICLE 13

TITLE TO THE WORK, MATERIALS AND EQUIPMENT

Section 13.1 Tax Exempt Status Pursuant to Section 1115(a)(15) and (16) of the New York State Tax Law, purchases of tangible personal property by the Contractor or its Subcontractors arising out of this Contract are exempt from the sales and use tax imposed by Article 28 of the New York State Tax Law, to the extent that such property is used to alter, maintain or improve, and becomes an integral component part of City-owned or leased real property which is improved under this Contract. This exemption does not apply to tools, machinery, equipment or other property purchased or leased by the Contractor or its Subcontractors, or to supplies, materials or other property which are consumed in the course of construction or for any other reason not incorporated into the real property which is improved under this Contract.

Section 13.2 Exclusion of Tax From Contract Price Contractor represents and warrants that to the extent applicable state and local sales taxes have been excluded from the Contract Price. Contractor and its Subcontractors shall be responsible for and shall pay any and all applicable taxes, including sales and use taxes imposed upon purchased or leased tools, machinery, equipment, and upon all such unincorporated supplies and materials and other property as provided by law. The Contract Price shall be deemed to include full payment and consideration for the sale of all supplies and materials necessary for the performance of the Contract.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

Section 13.3 Evidence of Title At the request of BNYDC, Contractor shall furnish BNYDC such paid bills, bills of sale and/or other instrument properly executed, acknowledged and delivered as BNYDC may require, proving title for all supplies, materials and equipment permanently installed in or on the Project has passed to the City, free of liens or encumbrances. Contractor shall clearly mark or otherwise identify all such materials as the property of the City.

Section 13.4 Title to Materials Title to all materials used on the Project immediately vests in BNYDC upon the earlier of (1) delivery of such materials to the Premises or (2) payment by BNYDC for such materials. Notwithstanding such transfer of title to the materials until such time as such materials are installed in accordance with the provisions of this Contract and up to Final Completion of the Work, Contractor shall:

- A. Protect the materials against loss or damage, and maintain the materials in proper condition and repair; and
- B. Replace or make good any loss, theft, disappearance, or damage to the materials, and furnish additional materials in place of any that may be lost, stolen or rendered unusable all without cost to BNYDC.

Such transfer of title shall in no way affect any of the Contractor's obligations hereunder. BNYDC reserves the right, in its sole discretion, to reject any defective or otherwise unsatisfactory materials. Title to any rejected, defective or otherwise unsatisfactory materials shall be deemed to revert to Contractor.

Section 13.5 Subcontracts to Separate Materials from Labor All Subcontracts shall be in a form similar to this Contract with respect to the separation of the sale of materials from the work and labor, services, consumable supplies and any other items to be provided. The Subcontracts shall provide separate prices for (1) materials and (2) all other services and items. Such separation shall actually be followed in practice, including the separation of payments for materials from the payments for other work and labor and other things to be provided.

Section 13.6 Tax Exempt Certificates Contractor and Subcontractors shall obtain, Contractor Exempt Purchase Certificates (Form ST-120.1) and shall furnish to all persons, firms or corporations from which they purchase materials for the performance of the Work such Contractor Exempt Purchase Certificates.

ARTICLE 14

REPRESENTATIONS AND WARRANTIES

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

Contractor represents and warrants the following:

Section 14.1 Illegal Consideration

Contractor has not been asked to pay, and has neither offered to pay, nor paid, any illegal consideration, whether monetary or otherwise, in connection with the procurement of this Contract.

Section 14.2 Solicitation Contractor has not employed any person to solicit or procure this Contract, and has not made and shall not make, except to full time employees of the Contractor, any payment or any agreement for the payment of any commission, percentage, brokerage, contingent fee or any other compensation in connection with the procurement of this Contract.

Section 14.3 Conflict of Interest Contractor has not acquired nor will it acquire any interest of any nature, direct or indirect (including without limitation, any interest in land in an area related to the Work or any interest in any corporation, partnership, etc. with any such interest), which would conflict in any manner or degree with the performance of the Work and no person having any such conflicting interest shall be employed by the Contractor in the performance of this Contract.

Section 14.4 Investigation Forms All questionnaires and disclosure forms delivered by the Contractor to BNYDC to date are, to the best of the Contractor's knowledge, true and correct in all material respects; no material change has occurred in the circumstances of the Contractor, its principals, or affiliated persons or entities since the respective dates upon which such disclosure forms were executed which would otherwise require disclosure on such forms; and no material disclosed in such disclosure forms contains, to the best of the Contractor's knowledge, any untrue statement of a material fact or omits to state a material fact necessary in order to make any statement contained in such form not misleading.

Section 14.5 Anti-Boycott Provisions Contractor shall comply in all respects with the provisions of §6-114 of the Administrative Code of the City and the rules and regulations issued by the Comptroller of the City thereunder.

Contractor certifies it is not now participating in, nor shall it participate in, during the term of this Contract, an international boycott in violation of the provisions of the Export Administration Act of 1979, as amended, or the regulations promulgated thereunder.

Upon the final determination by the United States Department of Commerce or any other agency of the Government of the United States that Contractor has participated in an international boycott in violation of the provisions of the Export Administration Act of 1979, as amended, or the regulations promulgated thereunder, BNYDC may, at its sole option, render this Contract forfeit and void.

ARTICLE 15

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

WOMEN OWNED AND MINORITY OWNED BUSINESSES PARTICIPATION

Section 15.1 M/WBE Program. Section 6-129 of the Administrative Code of the City of New York (“Section 6-129”) establishes the program for participation in City procurement (“M/WBE Program”) by “MBEs and WBEs, certified in accordance with Section 1304 of the New York City Charter. As stated in Section 6-129, the intent of the program is to address the impact of discrimination on the City’s procurement process, and to promote the public interest in avoiding fraud and favoritism in the procurement process, increasing competition for City business, and lowering contract costs. BNYDC endorses these goals and has adopted an M/WBE Program to further participation by MBEs and WBEs for its projects. The Contractor shall comply with all requirements of BNYDC’s M/WBE Program described in this Contract.

Section 15.2 M/WBE Participation Goal.

- A. The percentage goal for M/WBE participation (the “Participation Goal”) for the Contract is [percentage]% of the total dollar value of the Contract. The Participation Goal represents a percentage of the total dollar value of the Contract that may be achieved by awarding subcontracts to firms certified with DSBS or DMWBD (each as defined below) as MBEs or WBEs, and/or by crediting the participation of prime contractors and/or qualified joint ventures as provided in Section 15.2(D) and Section 15.2(E) below, unless the goals have been waived or modified by BNYDC in accordance with Section 15.7.
- B. M/WBE firms must be certified by either (i) DSBS, or (ii) Empire State Development’s Division of Minority and Women’s Business Development (“DMWBD”) to credit such firms’ participation toward attainment of the Participation Goal. Such certification must occur prior to the firms’ commencement of work. A list of M/WBE firms may be obtained (i) from the DSBS website at www.nyc.gov/buycertified, by emailing DSBS at buyer@sbs.nyc.gov, by calling (212) 513-6356, or by visiting or writing DSBS at 110 William Street, New York, New York, 10038, 7th Floor, and (ii) from the ESD website at www.ny.newnycontracts.com. Eligible firms that have not yet been certified may contact DSBS or DMWBD for additional information on how to get certified. No credit shall be given for participation by a graduate M/WBE, as defined in Section 6-129(c)(20).
- C. The Participation Goal is a material term of this Contract and the Contractor shall be subject to the BNYDC approved Participation Goal, unless the goals have been waived or modified by BNYDC in accordance with Section 15.7.
- D. An M/WBE Contractor shall be permitted to count its own participation toward fulfillment of the Participation Goal. The value of an M/WBE Contractor’s participation shall be determined by subtracting from the total value of the Contract any amounts that the Contractor will pay to direct Subcontractors. A Contractor that is certified as both an MBE and a WBE may count its own participation either toward the goal for MBEs or the goal for WBEs, but not both. If a

BNYDC CONSTRUCTION CONTRACT

Contractor is not an M/WBE, it must meet the Participation Goal through the awarding of subcontracts to firms certified with DSBS or DMWBD as MBEs or WBEs.

- E. A Contractor that is a Qualified Joint Venture (as defined in Section 6-129, and as discussed further in Section 5) shall be permitted to count a percentage of its own M/WBE participation toward fulfillment of the Participation Goal. The value of Contractor's participation shall be determined by subtracting from the total value of the Contract any amounts that Contractor pays to direct Subcontractors, and then multiplying the remainder by the percentage to be applied to total profit to determine the amount to which an MBE or WBE is entitled pursuant to the joint venture agreement, provided that where a participant in a joint venture is certified as both an MBE and a WBE, such amount shall be counted either toward the goal for MBEs or the goal for WBEs, but not both.

Section 15.3 M/WBE Proposal Submission Forms.

- A. The Contractor shall be required to submit with its bid a completed M/WBE Utilization Plan in the form attached as Exhibit "P" indicating:
- i. whether the Contractor is an MBE or WBE, or Qualified Joint Venture;
 - ii. the percentage of work it intends to award to direct Subcontractors;
 - iii. in cases where the Contractor intends to award direct subcontracts, a description of the type and dollar value of work designated for participation by MBEs and/or WBEs, and the time frames in which such work is scheduled to begin and end; as well as the name, addresses, and telephone numbers of the M/WBE subcontractors if required by the solicitation; and copies of DSBS or DMWBD certifications for each proposed MBE or WBE subcontractor listed in its M/WBE Utilization;
 - iv. the Contractor's required certification and affirmations, as attached as Exhibit "P" to this IFB. In the event that this M/WBE Utilization Plan indicates that the Contractor does not intend to meet the Participation Goal, the bid shall be deemed non-responsive, unless the goals have been waived or modified by BNYDC in accordance with Section 15.7.
- B. **THE CONTRACTOR MUST COMPLETE AN M/WBE UTILIZATION PLAN IN THE FORM ATTACHED HERETO AS EXHIBIT "P". AN M/WBE UTILIZATION PLAN SUBMITTED BY THE CONTRACTOR WHICH DOES NOT INCLUDE THE VENDOR CERTIFICATION AND REQUIRED AFFIRMATIONS WILL BE DEEMED TO BE NON-RESPONSIVE, UNLESS A FULL WAIVER OF THE PARTICIPATION GOAL IS GRANTED IN ACCORDANCE WITH SECTION 15.7. IN THE EVENT THAT BNYDC DETERMINES THAT THE CONTRACTOR HAS SUBMITTED AN M/WBE UTILIZATION PLAN WHERE THE VENDOR CERTIFICATION AND REQUIRED AFFIRMATIONS ARE COMPLETED BUT OTHER ASPECTS OF THE M/WBE UTILIZATION PLAN ARE NOT COMPLETE, OR CONTAIN A COPY OR COMPUTATION ERROR THAT IS AT ODDS WITH THE VENDOR CERTIFICATION AND**

BNYDC CONSTRUCTION CONTRACT

AFFIRMATIONS, THE CONTRACTOR WILL BE NOTIFIED BY BNYDC AND WILL BE GIVEN FOUR (4) CALENDAR DAYS FROM RECEIPT OF NOTIFICATION TO CURE THE SPECIFIED DEFICIENCIES AND RETURN A COMPLETED M/WBE UTILIZATION PLAN TO BNYDC. FAILURE TO DO SO WILL RESULT IN A DETERMINATION THAT THE BID IS NON-RESPONSIVE. RECEIPT OF NOTIFICATION IS DEFINED AS THE DATE NOTICE IS E-MAILED OR FAXED (IF THE CONTRACTOR HAS PROVIDED AN E-MAIL ADDRESS OR FAX NUMBER), OR NO LATER THAN FIVE (5) CALENDAR DAYS FROM THE DATE OF MAILING OR UPON DELIVERY, IF DELIVERED.

- C. The Contractor shall, within 30 days of issuance by BNYDC of a NTP (as defined in the IFB), submit a list of proposed persons or entities to which it intends to award subcontracts within the subsequent 12 months. In the case of multi-year contracts, such list shall also be submitted every year thereafter. BNYDC may also require the Contractor to report periodically about the contracts awarded by its direct Subcontractors to indirect subcontractors (as defined in Section 6-129(c)(22)). In the event that the Contractor's selection of a Subcontractor is disapproved, the Contractor shall have a reasonable time to propose alternate subcontractors.

Section 15.4 Statements Submitted with Requests for Payment.

- A. The Contractor shall, with each voucher for payment, and/or periodically as BNYDC may require, submit statements, certified under penalty of perjury, which shall include, but not be limited, to:
- i. the total amount the Contractor paid to its direct subcontractors, and, where applicable pursuant to Section 6-129(j), the total amount direct subcontractors paid to indirect subcontractors;
 - ii. the names, addresses and contact numbers of each MBE or WBE hired as a subcontractor by the Contractor, and, where applicable, hired by any of the Contractor's direct subcontractors; and
 - iii. the dates and amounts paid to each MBE or WBE.
- B. The Contractor shall also submit, along with its voucher for final payment:
- i. the total amount it paid to subcontractors, and, where applicable pursuant to Section 6-129(j), the total amount its direct subcontractors paid directly to their indirect subcontractors; and
 - ii. a final list, certified under penalty of perjury, which shall include the name, address and contact information of each subcontractor that is an MBE or WBE, the work performed by, and the dates and amounts paid to each.
- C. If payments made to, or work performed by, MBEs or WBEs are less than the amount specified in the Contractor's M/WBE Utilization Form, BNYDC shall take appropriate action, in accordance with the enforcement provisions described in the Contract and in Section 15.13, unless the goals have been waived or modified by BNYDC in accordance with Section 15.7.

BNYDC CONSTRUCTION CONTRACT

Section 15.5 Modifications Based on Change Orders. Where an M/WBE Utilization Plan has been submitted, and the Contractor requests a change order the value of which exceeds the greater of 10 percent of the Contract, as applicable, or \$500,000, BNYDC shall review the scope of work for the Contract or Task Order, as applicable, and the scale and types of work involved in the change order, and determine whether the Participation Goal should be modified.

Section 15.6 Other M/WBE Requirements. The IFB contains additional provisions related to the M/WBE requirements applicable to this Contract. Please be sure that you review and understand all of the requirements applicable to the IFB and this Contract prior to submitting your proposal.

Section 15.7 Pre-Award Waiver of the Participation Goal.

- A. The Contractor may seek a pre-award full or partial waiver of the Participation Goal in accordance with Section 6-129, which requests that BNYDC change the Participation Goal on the grounds that the Participation Goal is unreasonable in light of the availability of certified firms to perform the services required, or by demonstrating that it has legitimate business reasons for proposing a lower level of subcontracting in its M/WBE Utilization Plan.
- B. To apply for a full or partial waiver of the Participation Goal, the Contractor must complete Section 3 of Exhibit "P" and submit such request no later than seven (7) calendar days prior to the date and time the bids are due, in writing to the BNYDC by email at hchau@bnydc.org and mwbe@bnydc.org. Full or partial waiver requests that are received later than seven (7) calendar days prior to the date and time the bids are due may be rejected as untimely. If the Contractor has submitted a timely request, Contractor will receive a BNYDC response by no later than two (2) calendar days prior to the due date for bids; provided, however, that if that date would fall on a weekend or holiday, a BNYDC response will be provided by close-of-business on the business day before such weekend or holiday date.
- C. If BNYDC determines that the Participation Goal is unreasonable in light of the availability of certified firms to perform the services required, it shall revise the solicitation and extend the deadline for bids.
- D. BNYDC may grant a full or partial waiver of the Participation Goal to the Contractor provided that Contractor demonstrates—before submission of the bid— that it has legitimate business reasons for proposing the level of subcontracting in its M/WBE Utilization Plan. In making its determination, BNYDC shall consider factors that shall include, but not be limited to, whether the Contractor has the capacity and the bona fide intention to perform the Contract without any subcontracting, or to perform the Contract without awarding the amount of subcontracts represented by the Participation Goal. In making such determination, BNYDC may consider whether the M/WBE Utilization Plan is consistent with past subcontracting practices of the Contractor whether the Contractor has made efforts to form a joint venture with a certified firm,

BNYDC CONSTRUCTION CONTRACT

and whether the Contractor has made good faith efforts to identify other portions of the Contract that it intends to subcontract.

Section 15.8 Modification of M/WBE Utilization Plan.

- A. A Contractor may request a modification of its M/WBE Utilization Plan (a "Modification") after award of this Contract. BNYDC may grant a request for Modification of a Contractor's M/WBE Utilization Plan if it determines that the Contractor has established, with appropriate documentary and other evidence, that it made reasonable, good faith efforts to meet the Participation Goal. In making such determination, BNYDC shall consider evidence of the following efforts, as applicable, along with any other relevant factors:
- i. The Contractor advertised opportunities to participate in the Contract, where appropriate, in general circulation media, trade and professional association publications and small business media, and publications of minority and women's business organizations;
 - ii. The Contractor provided notice of specific opportunities to participate in the Contract, in a timely manner, to minority and women's business organizations;
 - iii. The Contractor sent written notices, by certified mail or facsimile, in a timely manner, to advise MBEs or WBEs that their interest in the Contract was solicited;
 - iv. The Contractor made efforts to identify portions of the work that could be substituted for portions originally designated for participation by MBEs and/or WBEs in the M/WBE Utilization Plan, and for which the Contractor claims an inability to retain MBEs or WBEs;
 - v. The Contractor held meetings with MBEs and/or WBEs prior to the date their bids were due, for the purpose of explaining in detail the scope and requirements of the work for which their bids were solicited;
 - vi. The Contractor made efforts to negotiate with MBEs and/or WBEs as relevant to perform specific subcontracts, or act as suppliers or service providers;
 - vii. Timely written requests for assistance made by the Contractor to BNYDC's M/WBE liaison officer at mwbe@bnydc.org and to DSBS and DMWBD;
 - viii. Description of how recommendations made by DSBS, DMWBD and BNYDC were acted upon and an explanation of why action upon such recommendations did not lead to the desired level of participation of MBEs and/or WBEs.

BNYDC's M/WBE liaison officer shall provide written notice to the Contractor of the determination.

BNYDC CONSTRUCTION CONTRACT

- B. BNYDC may modify the Participation Goal when the scope of the work has been changed by BNYDC in a manner that affects the scale and types of work that the Contractor indicated in its M/WBE Utilization Plan would be awarded to subcontractors.

Section 15.9 Substitutions. Substitutions to the MBEs and/or WBEs that Contractor identified as firms they intended to use in connection with the performance of the Contract may only be made with the approval of BNYDC, which shall only be given when the Contractor has proposed to use a firm that would satisfy the Participation Goal to the same extent as the firm previously identified, unless BNYDC determines that the Contractor has established, with appropriate documentary and other evidence, that it made reasonable, good faith efforts. In making such determination, BNYDC shall require evidence of the efforts listed in Section B(1) above, as applicable, along with any other relevant factors.

Section 15.10 Indefinite Quantity Contracts. If this Contract is for an indefinite quantity of construction or is a requirements type contract and the Contractor has submitted an M/WBE Utilization Plan and has committed to subcontract work to MBEs and/or WBEs in order to meet the Participation Goal, the Contractor will not be deemed in violation of the M/WBE Program requirements for this Contract with regard to any work which was intended to be subcontracted to an MBE and/or WBE to the extent that BNYDC has determined that such work is not needed.

Section 15.11 Progress Review, Evaluation and Assessment. At least once annually during the term of the Contract, BNYDC shall review the Contractor's progress toward attainment of its M/WBE Utilization Plan, including but not limited to, by reviewing the percentage of work the Contractor has actually awarded to MBE and/or WBE subcontractors and the payments the Contractor made to such subcontractors.

BNYDC shall evaluate and assess the Contractor's performance in meeting those goals, and such evaluation and assessment shall become part of the Contractor's overall contract performance evaluation.

Section 15.12 Miscellaneous Provisions.

- A. The Contractor shall take notice that the resulting contract may be audited. Furthermore, such resulting contract may also be examined by the City's Comptroller to assess compliance with its M/WBE Utilization Plan.
- B. DSBS and DMWBD are available to assist contractors and potential contractors in determining the availability of MBEs and/or WBEs to participate as subcontractors, and in identifying opportunities that are appropriate for participation by MBEs and/or WBEs in contracts.
- C. Prospective contractors are encouraged to enter into qualified joint venture agreements with MBEs and/or WBEs as defined by Section 6-129(c)(30).

BNYDC CONSTRUCTION CONTRACT

- D. By submitting a bid the Contractor hereby acknowledges its understanding of the M/WBE Program requirements set forth herein, and if awarded this Contract, the Contractor hereby agrees to comply with the M/WBE Program requirements of this Contract, all of which shall be deemed to be material terms of this Contract. The Contractor hereby agrees to make all reasonable, good faith efforts to solicit and obtain the participation of MBEs and/or WBEs to meet the required Participation Goal.

Section 15.13 Enforcement.

- A. If BNYDC determines that the Contractor has, in relation to this procurement, violated the M/WBE Program requirements of this Contract, BNYDC may disqualify the Contractor from competing for this Contract and BNYDC may revoke the Contractor's prequalification status, if applicable.
- B. Whenever BNYDC believes that the Contractor or a subcontractor is not in compliance with the M/WBE Program or its M/WBE Utilization Plan, BNYDC shall send a written notice to the Contractor describing the alleged noncompliance and offering the Contractor an opportunity to be heard. BNYDC shall then conduct an investigation to determine whether such Contractor or subcontractor is in compliance.
- C. In the event that the Contractor has been found to have violated the M/WBE Program or its M/WBE Utilization Plan, BNYDC may determine that one of the following actions should be taken:
- i. entering into an agreement with the Contractor allowing the Contractor to cure the violation;
 - ii. revoking the Contractor's pre-qualification to bid for future contracts;
 - iii. making a finding that the Contractor is in default of the Contract;
 - iv. terminating the Contract;
 - v. declaring the Contractor to be in breach of Contract;
 - vi. withholding payment or reimbursement;
 - vii. determining not to renew the Contract;
 - viii. assessing actual and consequential damages;
 - ix. assessing liquidated damages or reducing fees, provided that liquidated damages may be based on amounts representing costs of delays in carrying out the purposes of the M/WBE Program, or in meeting the purposes of the Contract, the costs of meeting utilization goals through additional procurements, the administrative costs of investigation and enforcement, or other factors set forth in the Contract;
 - x. exercising rights under the Contract to procure goods, services or construction from another contractor and charge the cost of such contract to the Contractor that has been found to be in noncompliance; or
 - xi. taking any other appropriate remedy.

BNYDC CONSTRUCTION CONTRACT

- D. If the Contractor has been found to have failed to fulfill its Participation Goal contained in its M/WBE Utilization Plan or the Participation Goal as modified by BNYDC pursuant to Section 15.8, BNYDC may assess liquidated damages in the amount of ten percent (10%) of the difference between the dollar amount of work required to be awarded to MBE and/or WBE firms to meet the Participation Goal and the dollar amount the Contractor actually awarded and paid, and/or credited, to MBE and/or WBE firms. In view of the difficulty of accurately ascertaining the loss which BNYDC will suffer by reason of Contractor's failure to meet the Participation Goal, the foregoing amount is hereby fixed and agreed as the liquidated damages that BNYDC will suffer by reason of such failure, and not as a penalty. BNYDC may deduct and retain out of any monies which may become due under this Contract the amount of any such liquidated damages; and in case the amount which may become due under this Contract shall be less than the amount of liquidated damages suffered by BNYDC, the Contractor shall be liable to pay the difference.
- E. Whenever BNYDC has reason to believe that an MBE and/or WBE is not qualified for certification, or is participating in a contract in a manner that does not serve a commercially useful function (as defined in Section 6-129(c)(8)), BNYDC shall notify the Commissioner of DSBS or DMWBD, as applicable, who shall determine whether the certification of such business enterprise should be revoked.
- F. Statements made in any instrument submitted to BNYDC pursuant to the M/WBE Program shall be submitted under penalty of perjury and any false or misleading statement or omission shall be grounds for the application of any applicable criminal and/or civil penalties for perjury. The making of a false or fraudulent statement by an MBE and/or WBE in any instrument submitted pursuant the M/WBE Program shall, in addition, be grounds for revocation of its certification.
- G. The Contractor's record in implementing its M/WBE Utilization Plan shall be a factor in the evaluation of its performance. Whenever BNYDC determines that a Contractor's compliance with an M/WBE Utilization Plan has been unsatisfactory, BNYDC shall, after consultation with the BNYDC M/WBE liaison officer, file an advice of caution form for inclusion in PASSPort as caution data.

ARTICLE 16

INVESTIGATION

Section 16.1 Cooperation with Investigation The parties to this Contract agree to cooperate fully and faithfully with any investigation, audit or inquiry conducted by BNYDC. The parties to this Contract agree to cooperate fully and faithfully with any investigation, audit or inquiry conducted by a State or City governmental agency or authority that is empowered directly or by designation to compel the attendance of witnesses and to examine witnesses under oath, or the Inspector General of a governmental

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

agency that is a party in interest to the transaction, submitted bid, submitted proposal, contract, lease, permit or license that is the subject of the investigation, audit or inquiry. If any person who has been advised that his/her statement, and any information from such statement, will not be used against him/her in any subsequent criminal proceeding refuses to testify before a grand jury or other governmental agency or authority empowered directly or by designation to compel the attendance of witnesses and to take testimony under oath, or the Inspector General of the governmental agency that is a party in interest, and is seeking testimony, concerning the award of or performance under any transaction, agreement, lease, permit, contract, or license entered into with BNYDC, The City, the State, or any political subdivision or public authority thereof, or the Port Authority of New York and New Jersey, or any local development corporation within the City, or any public benefit corporation organized under the Laws of the State of New York, or, if any person refuses to testify for a reason other than the assertion of his/her privilege against self incrimination in any such investigation, then BNYDC and/or the Commissioner whose agency is a party in interest to the transaction, submitted bid, submitted proposal, contract, lease, permit, or license shall convene a hearing, upon not less than five days written notice to the parties involved, to determine if any penalties should attach for the failure of a person to testify.

If any non-governmental party to the hearing requests an adjournment, BNYDC or the Commissioner who convened the hearing may, upon granting the adjournment, suspend any contract, lease, permit or license, pending the final determination, without the City or BNYDC incurring any penalty or damages for delay or otherwise.

Section 16.2 Penalties The penalties that may attach after a final determination by BNYDC or the Commissioner may include but shall not exceed:

- A. The disqualification, for a period not to exceed five years from the date of an adverse determination for any person or any entity of which such person was a member at the time the testimony was sought, from submitting bids for, or transacting business with, or entering into or obtaining any contract, lease, permit or license with or from BNYDC and/or the City; and/or
- B. The cancellation or termination of any and all such existing BNYDC and/or City contracts, leases, permits or licenses that the refusal to testify concerns and that have not been assigned as permitted under this Contract, nor the proceeds of which pledged, to an unaffiliated and unrelated institutional lender for fair value prior to the issuance of the notice scheduling the hearing, without the City or BNYDC incurring any penalty or damages on account of such cancellation or termination; monies lawfully due for goods delivered, work done, rentals or fees

BNYDC CONSTRUCTION CONTRACT

accrued prior to the cancellation or termination shall be paid by the BNYDC or the City.

Section 16.3 Factors in Assessing Penalties BNYDC and/or The Commissioner shall consider and address in reaching his/her determination and in assessing an appropriate penalty the factors in subparagraphs (a) and (b) below. BNYDC and/or The Commissioner may also consider, if relevant and appropriate, the criteria established in subparagraphs (c) and (d) below, in addition to any other information, which may be relevant and appropriate:

- A. The party's good faith endeavors or lack thereof to cooperate fully and faithfully with any governmental investigation or audit, including but not limited to the discipline, discharge or disassociation of any person failing to testify, the production of accurate and complete books and records, and the forthcoming testimony of all other members, agents, assignees or fiduciaries whose testimony is sought.
 - B. The relationship of the person who refused to testify to any entity that is a party to the hearing, including but not limited to, whether the person whose testimony is sought has an ownership interest in the entity and/or the degree of authority and responsibility the person has within the entity.
 - C. The nexus of the testimony sought to the subject entity and its contracts, leases, permits or licenses with BNYDC and the City.
 - D. The effect a penalty may have on an unaffiliated and unrelated party or entity that has a significant interest in an entity subject to penalties as described above, provided that the party or entity has given actual notice to BNYDC and/or the Commissioner upon the acquisition of the interest, or at the hearing called for gives notice and proves that such interest was previously acquired. Under either circumstance the party or entity shall present evidence at the hearing demonstrating the potential adverse impact a penalty will have on such person or entity.
1. The term "license" or "permit" as used in this Article 16 shall be defined as a license, permit, franchise or concession not granted as a matter of right.
 2. The term "person" as used in this Article 16 shall be defined as any natural person doing business alone or associated with another person or entity as a partner, director, officer, principal or employee.

BNYDC CONSTRUCTION CONTRACT

3. The term "entity" as used in this Article 16 shall be defined as any firm, partnership, corporation, association, joint venture, limited liability company or person that receives monies, benefits, licenses, leases or permits from or through the City or otherwise transacts business with the City.

4. The term "member" as used in this Article 16 shall be defined as any person associated with another person or entity as a partner, member of a limited liability company, director, officer, principal or employee.

Section 16.4 Termination In addition to and notwithstanding any other provision of this Contract, the President and/or the Commissioner may in his/her sole discretion terminate this Contract upon not less than three days written notice in the event the Contractor fails to promptly report in writing to BNYDC and the Commissioner of the Department of Investigations of the City any solicitation of money, goods, requests for future employment or other benefit or thing of value, by or on behalf of any employee of the City or other person, firm, corporation or entity for any purpose which may be related to the procurement or obtaining of this Contract by the Contractor, or affecting the performance of this Contract.

ARTICLE 17

MISCELLANEOUS PROVISIONS

Section 17.1 Notices All notices, demands and requests required or permitted to be given under this Contract shall be in writing and shall not be effective unless personally delivered, sent by United States registered or certified mail, postage paid, return receipt optional, or sent by an overnight courier service of recognized reputation, addressed as hereinafter provided. All such notices, demands and requests mailed to BNYDC shall be addressed to BNYDC as follows:

Brooklyn Navy Yard Development Corporation
Building 77
141 Flushing Avenue, Suite 801
Brooklyn, New York 11205
Attention: Counsel

Or at such other address as BNYDC may from time to time designate by written notice to Contractor. All such notices, demands and requests mailed to Contractor shall be addressed to Contractor at Contractor's address as stated on page 1 hereof. Or at such other address as Contractor may from time to time designate by written notice to BNYDC.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

Notices, demands and requests which shall be served in the manner aforesaid shall be deemed given for all purposes hereunder at the time such notice, demand, or request is deposited in any post office or branch post office or official depository regularly maintained by the United States Postal Service.

Section 17.2 Severability If any provision of this Agreement shall contravene or be invalid under the laws of the United States or the State, it is agreed that such provision shall not invalidate the whole Contract but the Contract shall be construed as if not containing the particular provision or provisions held to be invalid.

Section 17.3 Claims and Actions Against BNYDC Contractor shall look solely to the funds available to and appropriated by BNYDC under the City Contract for this particular project for the satisfaction of any claim or cause of action the Contractor may have against BNYDC in connection with this Contract. No director, officer, employee, agent or other person authorized to act on behalf of BNYDC shall have any personal liability in connection with this Contract or any failure of BNYDC to perform its obligations hereunder. The Contractor agrees that it shall have no claim against BNYDC for damages, or in any action or proceeding at law or in equity, unless the Contractor shall give notice of the existence of such claims to BNYDC within sixty (60) days after the cause of action arose, or the damages first became ascertainable, whichever shall occur first. The notice of claim must strictly comply as to form with all of the provisions required by law regarding claims against the City as provided for in §7-201 of the New York City Administrative Code (except for the time to file such claim which shall be sixty (60) days) with service of the same to be made by personal delivery upon an officer or agent of BNYDC.

Serving the notice of claim in strict accordance with this Article shall be a necessary and non-waivable jurisdictional element of any claim by the Contractor. Any action or proceeding by the Contractor against BNYDC must be commenced within sixty (60) days after the service of said notice of claim, but not before thirty (30) days after the service of the notice of claim.

Contractor acknowledges that it will be adequately compensated by money damages alone for any act or omission of BNYDC and, therefore, specifically waives all rights that it may have for equitable relief, including injunctive relief. The filing of a Notice of Appeal by BNYDC in any judicial proceeding shall stay the enforcement of any judgment against BNYDC, pending a resolution and final determination of that appeal, without BNYDC posting any security and without any court order being obtained.

In addition to any other contractual statute of limitations set forth herein, the Contractor agrees that no action against BNYDC shall lie or be maintained if BNYDC is barred by any statute or time limitation whatsoever at the time the Contractor institutes its suit or for twenty (20) days thereafter, from maintaining, prosecuting or instituting any claim against the City, the State of New York, the United States Government, any insurance company which may be liable, or any of them, based upon the same facts alleged by the Contractor, either as a third-party plaintiff or in a plenary action.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

Section 17.4 Governing Law & Venue. This Contract is deemed executed in the City of New York, State of New York and shall be governed by and construed in accordance with the laws of the State of New York. The parties agree that any and all claims asserted by or against BNYDC, the City or DSBS arising under this Contract or related hereto shall be heard and determined either in the courts of the United States ("Federal Courts") located in New York City or in the courts of the State of New York ("New York State Courts") located in the City and County of New York.

Section 17.5 Service of Process If BNYDC, the City or DSBS initiates any action against the Contractor in Federal Court or in New York State Courts, personal service of process may be made on the Contractor either in person, wherever the Contractor may be found, or by registered mail addressed to the Contractor at its address as set forth on page 1 of this Contract, or to such other address as the Contractor may have provided to BNYDC, the City or DSBS, as the case may be.

Section 17.6 Waiver by the Contractor With respect to any action between BNYDC, the City or DSBS and the Contractor in New York State Court, the Contractor expressly waives and relinquishes any rights it might otherwise have (1) to move to dismiss on grounds of forum non conveniens, (2) to remove to Federal Court, and (3) to move for a change of venue to a New York State Court outside New York County. With respect to any action between BNYDC, the City or DSBS and the Contractor in Federal Court located in New York City, the Contractor expressly waives and relinquishes any rights it might otherwise have to move to transfer the action to a Federal Court outside New York City.

Section 17.7 Change of Venue If the Contractor commences any action against the City or DSBS in a court located other than in the City and State of New York, upon request of BNYDC, the City or DSBS, as the case may be, the Contractor shall either consent to a transfer of the action to a court of competent jurisdiction located in the City and State of New York or, if the court where the action is initially brought will not or cannot transfer the action, the Contractor shall consent to dismiss such action without prejudice and may thereafter reinstitute the action in a court of competent jurisdiction in New York City.

Section 17.8 Assignment Contractor can neither assign this Contract, nor the right to receive the funds to be paid under this Contract, without the express written consent of BNYDC. BNYDC can either assign this Contract or the rights hereunder to the City without the consent of the Contractor.

Section 17.9 Contract Interpretations In the event any interpretation of this Contract is required after execution, or if any actual or apparent conflict between any two or more provisions of the Contract is discovered, then the Contract or such conflict shall be interpreted by the President and that interpretation shall be conclusive and binding on the parties hereto. In the event of any dispute between BNYDC and the Contractor as to whether or not the Work is completed, the inspection report of BNYDC or its agent shall be considered binding, final and conclusive.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

Section 17.10 Titles The titles to any article or any subdivision of this Contract are for organizational purposes only.

Section 17.11 Merger This Contract may not be modified orally. This Contract may be supplemented, amended or revised only in writing by the mutual agreement of the BNYDC and Contractor. This Contract supersedes all previous agreements and/or Contracts whether oral or written between the BNYDC and Contractor.

Section 17.12 Non-Waiver Forbearance, neglect or failure by BNYDC to enforce any and all of the provisions of this Contract or to insist upon strict compliance by Contractor shall not be construed as a waiver of any rights or privileges of BNYDC. A waiver by BNYDC of a past act or circumstance shall not constitute or be a course of conduct or waiver of any subsequent act or circumstance.

Section 17.13 Contractor's Performance Evaluation Provisions Contractor's performance of the Work may be evaluated by BNYDC (i) upon the vouchering of 50% of the Contract Price and/or (ii) upon Substantial Completion of the Work. BNYDC will send a copy of the evaluation to the Contractor after such evaluation and the Contractor may respond in writing to such evaluation. The response will be filed with the evaluation. The evaluation may be filed with the City.

By executing this Contract Contractor verifies that Contractor has carefully and completely reviewed and understands the terms and conditions this Contract.

BNYDC CONSTRUCTION CONTRACT

IN WITNESS WHEREOF, the parties have hereunto set their hands and seal the day and year first above written.

(SEAL) BROOKLYN NAVY YARD
DEVELOPMENT CORPORATION

By: _____

Name: _____

Title: _____

(SEAL) (if any) CONTRACTOR

By: _____

Name: _____

Title: _____

ACKNOWLEDGMENT OF BNYDC

STATE OF NEW YORK)

ss:

COUNTY OF KINGS)

On the ____ day of _____ in the year 20__, before me personally came _____, to me known, who, being by me duly sworn, did depose and say that /she is the _____ of BROOKLYN NAVY YARD DEVELOPMENT CORPORATION, the corporation described in and which executed the above instrument; and that s/he signed her/his name thereto by authority of the Board of Directors of said corporation.

Notary Public

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

ACKNOWLEDGMENT, IF A PARTNERSHIP

STATE OF _____)

ss.:

COUNTY OF _____)

On this day of _____, 20__, before me personally came _____, _____ to me known and known to me to be one of the partners of the firm of _____
_____ described in and which executed the foregoing instrument and __he acknowledged to me that __he executed the same as and for the act and deed of said firm.

Notary Public

ACKNOWLEDGMENT, IF AN INDIVIDUAL

STATE OF _____)

ss.:

COUNTY OF _____)

On this day of _____, 20__, before me personally came _____,
_____ to me known to be the individual described in and who executed the foregoing instrument and __he acknowledged to me that __he executed foregoing instrument.

Notary Public

ACKNOWLEDGMENT, IF A CORPORATION

STATE OF _____)

ss:

COUNTY OF _____)

On the ___ day of _____ in the year 20__, before me personally came _____, to me known, who, being by me duly sworn, did depose and say that he is the _____ of _____
the corporation described in and which executed the above instrument; and that he signed his name thereto by authority of the Board of Directors of said corporation.

Notary Public

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

EXHIBIT A

E.O. 50 CONSTRUCTION RIDER

A. EQUAL EMPLOYMENT OPPORTUNITY

This contract is subject to the requirements of Executive Order No. 50 (April 25, 1980) as amended ("E.O. 50") and the Rules and Regulations promulgated thereunder. No contract will be awarded unless and until these requirements have been complied with in their entirety. By signing this contract, the Contractor agrees that:

- (1) It will not engage in any unlawful discrimination against any employee or applicant for employment because of race, creed, color, national origin, sex, age, disability, marital status or sexual orientation with respect to all employment decisions including, but not limited to, recruitment, hiring, upgrading, demotion, downgrading, transfer, training, rates of pay or other forms of compensation, layoff, termination, and all other terms and conditions of employment;
- (2) When it subcontracts it will not engage in any unlawful discrimination in the selection of Subcontractors on the basis of the race, creed, color, national origin, sex, age, disability, marital status or sexual orientation of the owner, manager or any other officer, director, agent or employee of such Subcontractors;
- (3) It will state in all solicitations or advertisements for employees placed by or on behalf of the Contractor that all qualified applicants will receive consideration for employment without regard to race, creed, color, national origin, sex, age, disability, marital status or sexual orientation, or that it is an equal employment opportunity employer;
- (4) It will send to each labor organization or representative of workers with which it has a collective bargaining agreement or other contract or memorandum of understanding, written notification of its equal employment opportunity commitments under E.O. 50 and the rules and regulations promulgated thereunder; and
- (5) It will furnish all information and reports (which are required by E. O. 50, the rules and regulations promulgated thereunder, and orders of the Director of the New York City Department of Small Business Services, Division of Labor Services ("DLS"), including an Employment Report if the Contract Price is \$1,000,000 or more), before the award of the Contract and will permit access to its books, records and accounts by DLS for the purposes of investigation to ascertain compliance with such rules, regulations, and orders.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

The Contractor understands that in the event of its noncompliance with the nondiscrimination clauses of this Contract or with any of such rules, regulations, or orders, such noncompliance shall constitute a material breach of this Contract and noncompliance with E.O. 50 and the rules and regulations promulgated thereunder. After a hearing held pursuant to the rules of DLS, the Director of DLS may direct the imposition upon the Contractor found to be in noncompliance of any or all of the following sanctions:

- (i) Disapproval of the Contractor;
- (ii) Suspension or termination of this Contract;
- (iii) Declaring the Contractor in default; or
- (iv) In lieu of any of the foregoing sanctions, the Director of DLS may impose an employment program.

The Director of DLS may recommend to BNYDC that a hearing be convened for purposes of declaring a Contractor who has repeatedly failed to comply with E. O. 50 and the rules and regulations promulgated thereunder to be non-responsible.

If the Contract Price is \$1,000,000 or more, the Contractor further agrees as follows:

(i) It shall employ trainees for training level jobs and it shall participate in on-the-job training programs, other than apprenticeship programs, that are approved by DLS and, where required by law, the U.S. Department of Labor, Bureau of Apprenticeship Training or the New York State Department of Labor;

(ii) It shall make a good faith effort to achieve the ratio of one "trainee" (which means an economically disadvantaged person who qualifies for and receives training in one of the construction trades pursuant to a program, other than an apprenticeship program, approved by DLS and, where required by law, the New York State Department of Labor and the United States Department of Labor, Bureau of Apprenticeship and Training) to four journey-level employees of each job group on each construction project. The Contractor shall be considered to employ four journey-level employees in a particular job group when he or she employs any number of journey-level employees in that craft whose aggregate work hours equal the number of hours four full time journey-level employees would have worked in a work week as defined by the prevailing practice in the industry for the particular craft, i.e., 40 hours, 37 hours, 35 hours, etc. For example, in a craft where there is a 40 hour work week, the employment of four journey-level employees results in 160 hours of employment (4 x 40). Hence, any number of journey-level employees which results in 160 hours of work is considered for purposes of the training program to equal four journey-level employees, i.e., three journey-level employees who work 53 hours (3 x 53 = 160). The training requirement shall not apply to any trade in which the employment of four or more journey-level employees and the trainee shall be for less than four weeks; provided, that

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

four weeks shall mean four weeks of full time work as defined by the prevailing practice in the industry for the particular craft, i.e., 160 hours (4 weeks x 40 hours), 150 hours (4 weeks x 37 hours), 140 hours (4 weeks x 35 hours), etc.;

(iii) It shall attempt to provide continuous employment for trainees after the completion of this Contract to enable them to complete their course of training;

(iv) It shall, to the extent it is a party to any collective bargaining agreement, refer, recommend and sponsor for union membership any of its trainees who can perform the duties of a qualified journey-level employee or who have successfully completed the training program. Such former trainees shall be paid full journey-level wages and fringe benefits, whether or not union membership is granted after such referral, recommendation or sponsorship, and the Contractor shall make good faith efforts to continue the employment of such persons; and

(v) If the Contractor fails to provide training to the required number of trainees for the required number of weeks, the Contractor's compensation shall be decreased by an amount (the "Credit") equal to the difference between the wages and fringe benefits paid by the Contractor to the trainees and the wages and fringe benefits which would have been paid to the trainees had the number and duration of the positions been as required unless the Contractor can demonstrate that it made a good faith effort to provide training and was unsuccessful. The wages and fringes deducted will be whatever a first term trainee would receive under the prevailing wage schedule in effect at the time the trainees should have been employed. For purposes hereof, a good faith effort includes but is not limited to:

- (a) Documented efforts to secure trainees from approved training programs,
- (b) Documented outreach efforts to community and civil rights groups to identify candidates for training positions and sponsorship of those persons by the Contractor for entrance into an approved training program, and
- (c) Written notification to DLS that the Contractor has been unable to secure trainees pursuant to subsections (a) and (b) above and requesting DLS's assistance in securing trainees; provided, that neither the provisions of any collective bargaining agreement nor the refusal by a union with which the Contractor has a collective bargaining agreement to recognize the validity of the training program shall excuse the Contractor's obligation to provide training pursuant to E.O. 50 and these regulations.

If the Contract Price is \$1,000,000 or more, the Contractor shall include the provisions of the foregoing paragraph in every subcontract in the amount of \$750,000 or more to which it becomes a party unless exempted by E.O. 50 and the rules and regulations promulgated thereunder, so that such provisions will be binding upon each subcontractor. If the Contract Price is less than \$1,000,000, the Contractor shall include the provisions of this rider (other than the provisions of the immediately preceding paragraph) in every subcontract or purchase order

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

in excess of \$50,000 to which it becomes a party unless exempted by E.O. 50 and the rules and regulations promulgated thereunder, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as may be directed by the Director of DLS as a means of enforcing such provisions including sanctions for noncompliance and/or the taking of a Credit.

The Contractor further agrees that it will refrain from entering into any contract or contract modification subject to E.O. 50 and the rules and regulations promulgated thereunder with a subcontractor who is not in compliance with the requirements of E.O. 50 and the rules and regulations promulgated thereunder.

B. CONSTRUCTION EMPLOYMENT REPORT SUBMISSION REQUIREMENTS

Pursuant to Executive Order No. 50 (April 25, 1980) as amended and the implementing rules and regulations, all Contractors with contracts of \$1,000,000 or more, and all subcontractors with contracts of \$1,000,000 or more, must complete and submit an Employment Report (ER) and EEO-1 report. If you submit an ER you must comply with the training requirements set forth above.

If you are a Contractor with a contract of less than \$1,000,000 you must complete the attached certification of less than \$1,000,000 contract.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

DEPARTMENT OF SMALL BUSINESS SERVICES
DIVISION OF LABOR SERVICES
LESS THAN \$1,000,000 CONTRACT CERTIFICATE

CONTRACTOR _____

ADDRESS _____

TELEPHONE # (____) _____

NAME & TITLE OF SIGNATORY _____

CONTRACTING ENTITY *BROOKLYN NAVY YARD DEVELOPMENT CORPORATION*

CONTRACT AMOUNT _____

PROJECT NUMBER _____

DESCRIPTION AND ADDRESS OF PROPOSED CONTRACT

I, (fill in name of person signing) _____ hereby affirm that I am authorized by the above named Contractor to certify that said Contractor's proposed contract with the above named entity or City agency is less than \$1,000,000.

DATE SIGNATURE

WILLFUL OR FRAUDULENT FALSIFICATION OF ANY DATA OR INFORMATION SUBMITTED HERewith MAY RESULT IN THE TERMINATION OF ANY CONTRACT BETWEEN THE CITY AND THE BIDDER OR CONTRACTOR AND BAR THE BIDDER OR CONTRACTOR FROM PARTICIPATION IN ANY CITY CONTRACT FOR A PERIOD OF UP TO THREE YEARS. FURTHER, SUCH FALSIFICATION MAY RESULT IN CRIMINAL PROSECUTION.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

EXHIBIT B

MACBRIDE PRINCIPLES RIDER

For purposes of this rider, the "Contractor" means the Contractor, as defined in the Contract to which this rider is attached, and the "contracting entity" means Brooklyn Navy Yard Development Corporation.

ARTICLE I. MACBRIDE PRINCIPLES

PART A

The Contractor stipulates that such Contractor and any individual or legal entity in which the Contractor holds a ten percent or greater ownership interest and any individual or legal entity that holds a ten percent or greater ownership interest in the Contractor either (a) have no business operations in Northern Ireland, or (b) shall take lawful steps in good faith to conduct any business operations they have in Northern Ireland in accordance with the MacBride Principles, and shall permit independent monitoring of their compliance with such principles.

PART B

For purposes hereof, "MacBride Principles" shall mean those principles relating to nondiscrimination in employment and freedom of work place opportunity which require employers doing business in Northern Ireland to:

- (1) Increase the representation of individuals from underrepresented religious groups in the work force, including managerial, supervisory, administrative, clerical and technical jobs;
- (2) Take steps to promote adequate security for the protection of employees from underrepresented religious groups both at the workplace and while traveling to and from work;
- (3) Ban provocative religious or political emblems from the workplace;
- (4) Publicly advertise all job openings and make special recruitment efforts to attract applicants from underrepresented religious groups;
- (5) Establish layoff, recall and termination procedures which do not in practice favor a particular religious group;
- (6) Abolish all job reservations, apprenticeship restrictions and different employment criteria which discriminate on the basis of religion;
- (7) Develop training programs that will prepare substantial numbers of current employees from underrepresented religious groups for skilled jobs, including the expansion of existing programs and the creation of new programs to train, upgrade and improve the skills of workers from underrepresented religious groups;

BNYDC CONSTRUCTION CONTRACT

- (8) Establish procedures to assess, identify and actively recruit employees from underrepresented religious groups with potential for further advancement; and
- (9) Appoint a senior management staff member to oversee affirmative action efforts and develop a timetable to ensure their full implementation.

ARTICLE II. ENFORCEMENT OF ARTICLE I

The Contractor agrees that the covenants and representations in Article I above are material conditions to this contract. In the event the contracting entity receives information that the Contractor who made the stipulation required by this rider is in violation thereof, the contracting entity shall review such information and give the Contractor an opportunity to respond. If the contracting entity finds that a violation has occurred, the contracting entity shall have the right to declare the Contractor in default and/or terminate this contract for cause and procure the supplies, services or work from another source in any manner the contracting entity deems proper. In the event of such termination, the Contractor shall pay to the contracting entity, or the contracting entity in its sole discretion may withhold from any amounts otherwise payable to the Contractor, the difference between the contract price for the uncompleted portion of this contract and the cost to the contracting entity of completing performance of this contract either itself or by engaging another Contractor or Contractors. In the case of a requirements contract, the Contractor shall be liable for such difference in price for the entire amount of supplies required by the contracting entity for the uncompleted term of its contract. In the case of a construction contract, the contracting entity shall also have the right to hold the Contractor in partial or total default in accordance with the default provisions of this contract, and/or may seek debarment or suspension of the Contractor. The rights and remedies of the contracting entity hereunder shall be in addition to, and not in lieu of, any rights and remedies the contracting entity has pursuant to this contract or by operation of law.

BNYDC CONSTRUCTION CONTRACT

EXHIBIT C

LIST OF CONTRACT DRAWINGS

[TO BE INSERTED]

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

EXHIBIT D

SPECIFICATIONS

[TO BE INSERTED]

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

EXHIBIT E

INTENTIONALLY OMITTED

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

EXHIBIT F

CONTRACTORS REQUISITION FOR PROGRESS PAYMENTS

ESTIMATE FOR PARTIAL PAYMENT NO. _____

a. Value of Work Completed To Date \$ _____

b. Retainage \$ _____

c. Net Amount Earned (a - b) \$ _____

d. Amount Due for Stored Material \$ _____

e. Total Amount Due This Estimate (c + d) \$ _____

f. Total Previously Approved \$ _____

g. Net Amount Due This Payment (e - f) \$ _____

h. Less Amount Withheld by BNYDC* \$ _____

*Reason:

i. Payment Due This Estimate (g - h) \$ _____

j. Total of All Requisitions Approved to Date
by BNYDC (f + i) \$ _____

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

CONTRACTOR'S CERTIFICATE

I/We certify that:

- a. All items, units, quantities and prices for work and material shown on this estimate are true and correct; and
- b. All work has been performed and material supplied in full compliance with the terms and conditions of the Contract to which this Certificate applies; and
- c. All contract provisions relating to prevailing wages and benefits have been complied with and payroll documentation is attached; and
- d. All outstanding claims for labor, materials and equipment for the performance of said contract have been paid in full in accordance with the requirements of the Contract; and
- e. The above Payment Due This Estimate is a true and correct as of the last day of the period covered by this **CONTRACTORS REQUISITION FOR PROGRESS PAYMENTS.**
- f. All subcontractors have been paid in full.

Signature: _____ Date: _____

Title: _____

BNYDC'S CERTIFICATE

We have verified this **CONTRACTORS REQUISITION FOR PROGRESS PAYMENTS**

Contract Time: _____ Cal. Days

Consumed Contract Time: _____ Cal. Days

% of Contract Completed: _____%

Signature: _____ Date: _____

Title

BNYDC APPROVAL

Payment Approval Amount: \$ _____

Signature: _____

Title

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

EXHIBIT G

The following is minimum acceptable insurance coverage requirements for Contracting Services:

I. Insurance Requirements

- A. Commercial General Liability Policy issued on an Occurrence form with a combined single limit for Bodily Injury, Personal Injury and Property Damage of at least \$1,000,000 per occurrence and \$2,000,000 in the aggregate. Coverage shall include endorsements for: Products/Completed Operations; Underground Hazards where applicable; Contractual Liability for tort liability assumed under contract, Personal Injury; Waiver of Subrogation; Policy Aggregate shall apply on per project basis; Mobile Equipment if such equipment not subject to any motor vehicle statutory law.

Additional Insured endorsement as per Insurance Services Organization (a/k/a ISO) form CG 20 10 07 04 Additional Insured Scheduled Organization and form CG 20 37 07 04 Additional Insured – Completed Operations. Such endorsement shall include BNYDC and any other designated party as Additional Insured, as required by written contract to which this Exhibit is attached and part of.

There shall be no coverage restrictions or coverage exclusions on the General Liability Policy pertaining to, but not limited to: gravity related injuries, unsafe workplace, injuries sustained by employee of Contractor or sub-contractor, Third Party over type actions, construction operations, and construction activity.

The insurance procured by the Contractor shall be primary and non-contributory to any other insurance that may be in effect.

- B. Statutory Workers Compensation Policy and Employer's Liability Policy of minimum \$1,000,000 for work operations in State where project work is performed, including any applicable other states coverage endorsement.
- C. Automobile Liability Insurance Policy for Bodily Injury and Property Damage in the amount of \$1,000,000 per occurrence covering all owned, non-owned, hired, borrowed vehicles subject to statutory motor vehicle law.
- D. Contractors Pollution Liability policy of at least \$1,000,000 for damages arising out of bodily injury, property damages, environmental damages caused by a pollution incident from Contractors work, completed operations, or transportation whether work performed by or on behalf of Contractor.
- E. Umbrella/Excess Liability Policy of at least \$5,000,000 per occurrence. Umbrella Liability policy is to be provided on at least a follow form basis of the underlying General Liability Insurance policy, Automobile Insurance Policy, and Workers' Compensation Insurance policy. The insurance procured by the Contractor shall be primary and non-contributory to any other insurance that may be in effect.
- F. Professional Liability (Errors and Omissions) of at least \$1,000,000 each claim for wrongful acts while performing and/or providing professional services. Coverage shall continue for at least three (3) years beyond the final performance of services.
- G. The following are to be included as additional insured(s) for coverage required in sections A,C,D and E. Each additional insured listed below shall be issued a separate Certificate of Insurance.

Certificate Holder

Brooklyn Navy Yard Development Corporation
Building 77
141 Flushing Avenue, Suite 801
Brooklyn, New York 11205

And as Additional Insureds
Brooklyn Navy Yard Development Corporation
City of New York

Certificate Holder

City of New York
c/o City of New York Department of Small Business Services
One Liberty Plaza, 165 Broadway
New York, NY 10006

And as Additional Insureds
City of New York
Brooklyn Navy Yard Development Corporation

- H. A Certificate of insurance using the ACCORD 25 form is to be provided to the Additional Insured and the Certificate must specifically include a copy of the stipulated additional insured endorsement as required in Section A. Certificate Holder must be notified of any cancellation, non-renewal or material modification of existing policy. Notice is to be received 30 days prior to any

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

change in status. In addition to ACCORD 25 form, a completed New York Construction Certificate of Liability Insurance Addendum (ACCORD 855 form) shall be provided.

- II. If the Contractor utilizes the services of subcontractor for work performed, the same provisions of this Insurance Requirement Exhibit shall be required of those parties. It is the sole responsibility of the Contractor to maintain compliance of such.
 - III. Insurance coverage shall be maintained with responsible insurance companies licensed and admitted to do business in the State of New York and such companies shall have an A.M.Best Rating of A- VII. If a Non-Admitted Insurance Company is used, an AM Best rating of A- shall apply.
 - IV. Any self-insured insurance retentions and, or any deductibles utilized on any of the above required insurance coverage is the sole responsibility of the Contractor, and Contractor agrees to satisfy those retention and or deductible obligations directly with their insurance company.
 - V. The policies required hereunder shall contain the following provisions:
 - “A. Notices from the insurer (the “Insurer”) to BNYDC (“BNYDC”) and the City of New York (the “City”), in connection with this policy, shall be addressed to the General Counsel, BNYDC, at Building 77, 141 Flushing Avenue, Suite 801, Brooklyn, New York 11205 (with a copy to BNYDC’s Deputy General Counsel at the same address);
 - B. The Insurer shall accept notice of accident from BNYDC or the City, within 120 days after receipt by an official of such Additional Insured (as identified above) of notice of such accident as valid and timely notice under this policy;
 - C. The Insurer shall accept notice of claim from the City within 120 days after such claim has been filed with the Comptroller of the City and notice of claim from BNYDC, within 120 days after receipt by such party as valid and timely notice under this policy;
- The Insurer understands and agrees that notice of accident or claim to such Insurer by any one of the following entities shall be deemed notice by all under the policy:
Contractor; or
BNYDC; or
The City; or
Any other Additional Insured.
- E. This policy shall not be canceled, terminated or modified by the Insurer or Contractor unless 30 days prior written notice is sent by registered mail to BNYDC or the City, nor shall this policy be canceled, terminated or modified by the Contractor without prior written consent of BNYDC;
 - F. The presence of engineers, inspectors or other employees or agents of Contractor, BNYDC or the City at the site of the Services performed by Contractor shall not invalidate this policy of insurance;
 - G. Violation of any of the terms of any other policy issued by the Insurer to Contractor or a subcontractor of Contractor shall not invalidate this policy; and
 - H. Insurance, if any, carried by BNYDC, the City or the Additional Insureds will not be called upon to contribute to a loss that would otherwise be paid by the Insurer.”

BNYDC CONSTRUCTION CONTRACT

EXHIBIT H

PERFORMANCE AND PAYMENT BONDS

Form of Performance Bond

KNOW ALL MEN BY THESE PRESENTS, that _____ (hereinafter called the "Principal") and _____ a corporation organized and existing under the laws of the State of _____ (hereinafter called the "Surety"), as Surety, are held and firmly bound unto the Brooklyn Navy Yard Development Corporation the City of New York and The City of New York Department of Small Business Services (hereinafter collectively called the "Obligee") in the sum of _____ Dollars (\$ _____) for the payment of which sum well and truly to be made, the said Principal and Surety bind themselves, and their respective heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal and Obligee, have entered into Construction Contract Number _____ dated _____ (hereinafter referred to as "Construction Contract").

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the above bounden Principal shall:

- A. Well and truly perform all the undertakings, covenants, terms, conditions, and agreements of said Construction Contract within the time provided therein and any extensions thereof that may be granted by the Obligee, and during the life of any guaranty required under said Contract; and
- B. Shall also well and truly perform all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said Contract that may hereafter be made; and
- C. Shall as required by the Construction Contract indemnify and save harmless Obligee from any and all loss, damage, fines, penalties and /or expense including costs and attorney's fees, which the said Obligee may sustain;

Then this obligation shall be null and void; otherwise it shall remain in full force and effect.

Surety agrees that no change, extension of time, alteration, addition, omission, or other modification of the terms of either the said Construction Contract or in the said Work to be performed thereunder, or in the specifications thereunder, or in the plans thereunder, shall in anyway affect Surety's obligation on this Bond, and Surety does hereby waive notice of any such changes, extensions of time, alterations, additions, omissions, and other modifications.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

The Surety, for value received, agrees, if requested to do so by the Obligee, to perform fully and complete the obligations of the Principal mentioned and described in said Construction Contract and any and all modifications thereof pursuant to and in accordance with the undertakings, covenants, terms, conditions and agreements thereof, if the Principal fails, neglects and/or refuses to so perform fully and completely said obligations, and further agrees to commence the performance and completion of said obligations within twenty (20) days after notice from the Obligee of such failure, neglect and/or refusal of the Principal and to perform and complete the same within the time required under said Contract and any and all modifications thereof as extended by the period of time elapsing between the date of such failure, neglect and/or refusal of the Principal and the date of the giving of such notice by the Obligee to the Surety.

Anything contained herein to the contrary notwithstanding, the Surety hereby agrees that a payment or payments made by the Obligee to the Principal which may be at variance with the terms of said contract or any other act of the Obligee which is at variance with, or in violation of, the terms of said contract, shall not serve to release the Surety from its obligations hereunder, in whole or in part, it being the intent of this bond that the Surety's obligations to complete shall be absolute and that any disputes relating to the performance of said contract shall be disposed of at a later date and without interference in, or with the performance of, said Construction Contract.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their several seals this ___ day of _____20__ the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

PRINCIPAL _____(Seal)
(Name)

Attest: _____
Secretary (Business Address)

By: _____
(Signature)

Name:

Title:

SURETY _____(Seal)
(Name)

Attest: _____

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

Secretary
(Business Address)

(Business Address)

By: _____

(Signature)

Name:

Title:

ACKNOWLEDGMENT OF SURETY

STATE OF _____)

ss.:

COUNTY OF _____)

On this _____ day of _____ in the year 20_ before me personally came _____ to me known, who being by me duly sworn, did depose and say that he is the _____ of _____, the corporation described in and which executed the above instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such seal; that it was so affixed by order of the Board of Directors of said corporation and that he signed his name thereto by like order.

Notary Public (SEAL)

ACKNOWLEDGMENT OF PRINCIPAL, IF AN INDIVIDUAL

STATE OF _____)

ss.:

COUNTY OF _____)

On this _____ day of _____ in the year 20_ before me personally came _____ to me known and to be the person described in and who executed the foregoing instrument and he duly acknowledged that he executed the same.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

Notary Public (SEAL)

ACKNOWLEDGMENT OF PRINCIPAL, IF A PARTNERSHIP

STATE OF _____)

ss.:

COUNTY OF _____)

On this ____ day of _____ in the year 20_ before me personally came _____ to me known and known to me to be a partner of the firm of _____ described in and who executed the foregoing instrument, and he duly acknowledged to me that he executed the same for an in behalf of said firm.

Notary Public (SEAL)

ACKNOWLEDGMENT OF PRINCIPAL IF A CORPORATION

STATE OF _____)

ss.:

COUNTY OF _____)

On this ____ day of _____ in the year 20_ before me personally came _____ to me known, who being by me duly sworn, did depose and say that _he is the _____ of _____, the corporation described in and which executed the above instrument; that _he knows the seal of said corporation; that the seal affixed to said instrument is such seal; that it was so affixed by order of the Board of Directors of said corporation and that _he signed his name thereto by like order.

Notary Public (SEAL)

ACKNOWLEDGMENT OF PRINCIPAL IF A LIMITED LIABILITY COMPANY

STATE OF _____)

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

ss.:

COUNTY OF _____)

On this _____ day of _____ in the year 20_ before me personally came _____ to me known, who being by me duly sworn, did depose and say that _he is a member of _____, the limited liability company described in and which executed the above instrument; that __he knows the seal of said limited liability company; that the seal affixed to said instrument is such seal; that it was so affixed by order of the Members of said limited liability company and that __he signed his name thereto by like order.

Notary Public (SEAL)

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

Form of Payment Bond

KNOW ALL MEN BY THESE PRESENTS, that _____ (hereinafter called the "Principal") and _____ a corporation organized and existing under the laws of the State of _____ (hereinafter called the "Surety"), as Surety, are held and firmly bound unto the Brooklyn Navy Yard Development Corporation the City of New York and The City of New York Department of Small Business Services (hereinafter collectively called the "Obligee") in the sum of _____ Dollars (\$ _____) for the payment of which sum well and truly to be made, the said Principal and Surety bind themselves, and their respective heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal and Obligee, have entered into Construction Contract Number _____ dated _____ (hereinafter referred to as "Construction Contract").

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the above bounden Principal shall promptly pay all persons having just claims for:

- A. Labor, materials, services, insurance, supplies, machinery, equipment, rentals, fuels, oils, implements, tools and/or appliances and all other items of whatever nature, furnished for, used or consumed in the prosecution of the Work called for by said Construction Contract and any and all modifications thereof, whether lienable or non-lienable and whether or not permanently incorporated in said work; and
- B. Pension, welfare, vacation and/or other supplemental employee benefit contributions payable under collective bargaining agreements with respect to persons employed upon said Work; and
- C. All federal, state and local taxes and/or contributions required by law to be withheld and/or paid with respect to the employment of persons upon said work;

then this obligation shall be null and void; otherwise it shall remain in full force and effect.

Surety agrees that no change, extension of time, alteration, addition, omission, or other modification of the terms of either the said Construction Contract or in the said Work to be performed thereunder, or in the specifications thereunder, or in the plans thereunder, shall in anyway affect Surety's obligation on this Bond, and Surety does hereby waive notice of any such changes, extensions of time, alterations, additions, omissions, and other modifications.

Principal and Surety agree that this Bond inures to the benefit of all persons supplying labor and material in the prosecution of the Work provided for in said Construction Contract, as well as to the Obligee, and that such persons may maintain independent actions upon this Bond in their own names.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their several seals this ____ day of _____ 20_ the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

PRINCIPAL

_____(Seal)
(Name)

Attest: _____
Secretary (Business Address)

By: _____
(Signature)

Name:

Title:

SURETY

_____(Seal)
(Name)

Attest: _____
Secretary (Business Address)
(Business Address)

By: _____
(Signature)

Name:

Title:

ACKNOWLEDGMENT OF SURETY

STATE OF _____)

ss.:

COUNTY OF _____)

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

On this _____ day of _____ in the year 20__ before me personally came _____ to me known, who being by me duly sworn, did depose and say that he is the _____ of _____, the corporation described in and which executed the above instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such seal; that it was so affixed by order of the Board of Directors of said corporation and that he signed his name thereto by like order.

Notary Public (SEAL)

ACKNOWLEDGMENT OF PRINCIPAL, IF AN INDIVIDUAL

STATE OF _____)

ss.:

COUNTY OF _____)

On this _____ day of _____ in the year 20__ before me personally came _____ to me known and to be the person described in and who executed the foregoing instrument and he duly acknowledged that he executed the same.

Notary Public (SEAL)

ACKNOWLEDGMENT OF PRINCIPAL, IF A PARTNERSHIP

STATE OF _____)

ss.:

COUNTY OF _____)

On this _____ day of _____ in the year 20__ before me personally came _____ to me known and known to me to be a partner of the firm of _____ described in and who executed the foregoing instrument, and he duly acknowledged to me that he executed the same for an in behalf of said firm.

Notary Public (SEAL)

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

ACKNOWLEDGMENT OF PRINCIPAL IF A CORPORATION

STATE OF _____)

ss.:

COUNTY OF _____)

On this _____ day of _____ in the year 20__ before me personally came _____ to me known, who being by me duly sworn, did depose and say that _he is the _____ of _____ the corporation described in and which executed the above instrument; that _he knows the seal of said corporation; that the seal affixed to said instrument is such seal; that it was so affixed by order of the Board of Directors of said corporation and that _he signed his name thereto by like order.

Notary Public (SEAL)

ACKNOWLEDGMENT OF PRINCIPAL IF A LIMITED LIABILITY COMPANY

STATE OF _____)

ss.:

COUNTY OF _____)

On this _____ day of _____ in the year 20__ before me personally came _____ to me known, who being by me duly sworn, did depose and say that _he is a member of _____ the limited liability company described in and which executed the above instrument; that _he knows the seal of said limited liability company; that the seal affixed to said instrument is such seal; that it was so affixed by order of the Members of said limited liability company and that _he signed his name thereto by like order.

Notary Public (SEAL)

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

EXHIBIT I

PARTIAL RELEASE AND PARTIAL LIEN WAIVER

OWNER: BROOKLYN NAVY YARD DEVELOPMENT CORPORATION and THE CITY OF NEW YORK

PROJECT: _____

CONTRACTOR: _____

CONTRACTOR, in consideration of the current payment of \$_____, a portion of the current total contract value of \$_____, the current payment bringing the total of all payments to date to \$_____, in addition to which retainage of ___% is withheld as Maintenance and Guarantee per the contract terms, the execution of this Partial Release and Partial Lien Waiver, receipt of which is hereby acknowledged, represents that it has been paid to the date hereof in full for all labor, services, equipment, or material furnished to **OWNER** on the **PROJECT** including extra work claims and does hereby forever release **OWNER** from any and all claims that **CONTRACTOR** may have against **OWNER** arising to the date hereof from the **PROJECT**.

OWNER'S NOTICE: THIS DOCUMENT WAIVES CONTRACTOR'S RIGHTS UNCONDITIONALLY AND STATES THAT CONTRACTOR HAS BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST CONTACTOR IF CONTRACTOR SIGNS IT, EVEN IF CONTRACTOR HAS NOT BEEN PAID. IF CONTRACTOR HAS NOT BEEN PAID, USE A CONDITIONAL RELEASE FORM.

CONTRACTOR: Acknowledges that it is not permitted to file any mechanic's lien against land and improvements owned by **OWNER** and Warrants that it will not file a mechanic's lien or other lien against land and improvements owned by **OWNER** and has not and will not assign any claims for payment or right to perfect a lien against such land and improvements.

CONTRACTOR: Warrants and represents that (1) All workmen employed by it or its subcontractor upon this **PROJECT** have been paid applicable prevailing wages and in full to the date hereof; 2) All material men from which the undersigned or its subcontractors have purchased materials used in the **PROJECT** have been paid in full for materials delivered on or prior to the date hereof; (3) All union fringe benefits, dues or other obligations have been paid in full on or prior to the date hereof; (4) None of such workman and material men has any claim or demand or right of lien against the land and improvements owned by **OWNER**; and (5) Represents that the signatory hereto is an authorized officer of **CONTRACTOR** with full power to execute this Final Release and Final Lien Waiver.

In addition to the rights and obligations provided by the Contract for the **PROJECT** (which is incorporated herein by reference and made a part hereof), to the fullest extent permitted by law, the undersigned further agrees to

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

defend, indemnify and hold **OWNER**, its successors and assigns, harmless from all claims, actions, and liens filed by the undersigned's subcontractors, suppliers, material men, and laborers, and those interposed by labor organizations for union fringe benefits and/or other union dues or responsibilities, who performed labor or furnished materials in connection with the work performed to the date hereof at the **PROJECT**.

CONTRACTOR agrees that the **OWNER**, any lender and any title insurer may rely upon this waiver.

In witness whereof, we have here to set our hand and seal this __ day of _____ 20__.

CONTRACTOR

BY: _____

Title: _____

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

STATE OF NEW YORK)

ss:

COUNTY OF _____)

On the _____ day of _____ 20__ before me personally came _____, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he executed the same.

NOTARY PUBLIC

STATE OF NEW YORK)

ss:

COUNTY OF _____)

On the ___ day of _____, 20__ before me personally came _____, to me known, who, being by me duly sworn, did depose and say that he resides at _____; that he is the _____ of _____ the business described in and which executed the above instrument; and that he signed his name thereto by authority of the Board of Directors of said corporation.

NOTARY PUBLIC

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

EXHIBIT J

FINAL RELEASE AND FINAL LIEN WAIVER

OWNER: BROOKLYN NAVY YARD DEVELOPMENT CORPORATION and THE CITY OF NEW YORK

PROJECT: _____

CONTRACTOR: _____

CONTRACTOR in consideration of the current payment of \$_____, being the final payment for a total contract value of \$_____, receipt of which is hereby acknowledged, represents that it has been paid in full for all labor, services, equipment, or material furnished to **OWNER** on the **PROJECT** including extra work claims and does hereby forever release **OWNER** from any and all claims that **CONTRACTOR** may have against **OWNER** arising from the **PROJECT**.

OWNER'S NOTICE: THIS DOCUMENT WAIVES CONTRACTOR'S RIGHTS UNCONDITIONALLY AND STATES THAT CONTRACTOR HAS BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST CONTRACTOR IF CONTRACTOR SIGNS IT, EVEN IF CONTRACTOR HAS NOT BEEN PAID. IF CONTRACTOR HAS NOT BEEN PAID, USE A CONDITIONAL RELEASE FORM.

CONTRACTOR: Acknowledges that it is not permitted to file any mechanic's lien against land and improvements owned by **OWNER** and Warrants that it will not file a mechanic's lien or other lien against land and improvements owned by **OWNER** and has not and will not assign any claims for payment or right to perfect a lien against such land and improvements.

CONTRACTOR: Warrants and represents that (1) All workmen employed by it or its subcontractor upon this **PROJECT** have been paid applicable prevailing wages and in full to the date hereof; 2) All material men from which the undersigned or its subcontractors have purchased materials used in the **PROJECT** have been paid in full for materials delivered on or prior to the date hereof; (3) All union fringe benefits, dues or other obligations have been paid in full on or prior to the date hereof; (4) None of such workman and material men has any claim or demand or right of lien against the land and improvements owned by **OWNER**; and (5) Represents that the signatory hereto is an authorized officer of **CONTRACTOR** with full power to execute this Final Release and Final Lien Waiver.

In addition to the rights and obligations provided by the Contract for the **PROJECT** (which is incorporated herein by reference and made a part hereof), to the fullest extent permitted by law, the undersigned further agrees to defend, indemnify and hold **OWNER**, its successors and assigns, harmless from all claims, actions, and liens filed by the undersigned's subcontractors, suppliers, material men, and laborers, and those interposed by labor organizations for union fringe benefits and/or other union dues or responsibilities, who performed labor or furnished materials in connection with the work performed at the **PROJECT**.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

CONTRACTOR agrees that the OWNER, any lender and any title insurer may rely upon this waiver.

In witness whereof, we have here to set our hand and seal this __ day of _____ 20__.

CONTRACTOR

BY: _____

Title: _____

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

STATE OF NEW YORK)

ss:

COUNTY OF _____)

On the _____ day of _____ 20__ before me personally came _____, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he executed the same.

NOTARY PUBLIC

STATE OF NEW YORK)

ss:

COUNTY OF _____)

On the ____ day of _____, 20__ before me personally came _____, to me known, who, being by me duly sworn, did depose and say that he resides at _____; that he is the _____ of _____ the business described in and which executed the above instrument; and that he signed his name thereto by authority of the Board of Directors of said corporation.

NOTARY PUBLIC

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

EXHIBIT K

WHISTLEBLOWER PROTECTION EXPANSION ACT

1. In accordance with Local Law Nos. 30-2012 and 33-2012, codified at sections 6-132 and 12-113 of the New York City Administrative Code, respectively,

- (a) Contractor shall not take an adverse personnel action with respect to an officer or employee in retaliation for such officer or employee making a report of information concerning conduct which such officer or employee knows or reasonably believes to involve corruption, criminal activity, conflict of interest, gross mismanagement or abuse of authority by any officer or employee relating to this Contract to (i) the Commissioner of the Department of Investigation, (ii) a member of the New York City Council, the Public Advocate, or the Comptroller, or (iii) the City Chief Procurement Officer, ACCO, Agency head, or Commissioner.
- (b) If any of Contractor's officers or employees believes that he or she has been the subject of an adverse personnel action in violation of subparagraph (a) of paragraph 1 of this rider, he or she shall be entitled to bring a cause of action against Contractor to recover all relief necessary to make him or her whole. Such relief may include but is not limited to: (i) an injunction to restrain continued retaliation, (ii) reinstatement to the position such employee would have had but for the retaliation or to an equivalent position, (iii) reinstatement of full fringe benefits and seniority rights, (iv) payment of two times back pay, plus interest, and (v) compensation for any special damages sustained as a result of the retaliation, including litigation costs and reasonable attorney's fees.
- (c) Contractor shall post a notice provided by the City in a prominent and accessible place on any site where work pursuant to the Contract is performed that contains information about:
 - (i) how its employees can report to the New York City Department of Investigation allegations of fraud, false claims, criminality or corruption arising out of or in connection with the Contract; and
 - (ii) the rights and remedies afforded to its employees under New York City Administrative Code sections 7-805 (the New York City False Claims Act) and 12-113 (the Whistleblower Protection Expansion Act) for lawful acts taken in connection with the reporting of allegations of fraud, false claims, criminality or corruption in connection with the Contract.
- (d) For the purposes of this rider, "adverse personnel action" includes dismissal, demotion, suspension, disciplinary action, negative performance evaluation, any action resulting in loss of staff, office space, equipment or other benefit, failure to appoint, failure to promote, or any transfer or assignment or failure to transfer or assign against the wishes of the affected officer or employee.
- (e) This rider is applicable to all of Contractor's subcontractors having subcontracts with a value in excess of \$100,000; accordingly, Contractor shall include this rider in all subcontracts with a value a value in excess of \$100,000.

2. Paragraph 1 is not applicable to this Contract if it is valued at \$100,000 or less. Subparagraphs (a), (b), (d), and (e) of paragraph 1 are not applicable to this Contract if it was solicited pursuant to a finding of an emergency. Subparagraph (c) of paragraph 1 is neither applicable to this Contract if it was solicited prior to October 18, 2012 nor if it is a renewal of a contract executed prior to October 18, 2012.

BNYDC CONSTRUCTION CONTRACT

REPORT

CORRUPTION, FRAUD, UNETHICAL CONDUCT

RELATING TO A NYC-FUNDED CONTRACT

OR PROJECT

CALL THE NYC DEPARTMENT OF INVESTIGATION

212-825-5959



DOI CAN ALSO BE REACHED BY MAIL OR IN PERSON AT:

New York City Department of Investigation (DOI)
80 Maiden Lane, 17th floor
New York, New York 10038
Attention: COMPLAINT BUREAU

OR FILE A COMPLAINT ON-LINE AT:

www.nyc.gov/doi

All communications are confidential

THE LAW PROTECTS EMPLOYEES OF CITY CONTRACTORS WHO REPORT CORRUPTION

- Any employee of a City contractor, or subcontractor of the City, or a City contractor with a contract valued at more than \$100,000 is protected under the law from retaliation by his or her employer if the employee reports wrongdoing related to the contract to the DOI.
- **To be protected by this law, an employee must report to DOI – or to certain other specified government officials** – information about fraud, false claims, corruption, criminality, conflict of interest, gross mismanagement, or abuse of authority relating to a City contract valued at more than \$100,000.
- Any employee who makes such a report and who believes he or she has been dismissed, demoted, suspended, or otherwise subject to an adverse personnel action because of that report is entitled to bring a lawsuit against the contractor and recover damages



← Scan the QR Code at Left to File a Complaint

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

EXHIBIT L

PAID SICK LEAVE LAW

Introduction and General Provisions

The Earned Sick Time Act, also known as the Paid Sick Leave Law (“PSLL”), requires covered employees who annually perform more than 80 hours of work in New York City to be provided with paid sick time.¹ Contractors of the City of New York or of other governmental entities may be required to provide sick time pursuant to the PSLL.

¹ Pursuant to the PSLL, if fewer than five employees work for the same employer, as determined pursuant to New York City Administrative Code §20-912(g), such employer has the option of providing such employees uncompensated sick time.

The PSLL became effective on April 1, 2014, and is codified at Title 20, Chapter 8, of the New York City Administrative Code. It is administered by the City’s Department of Consumer Affairs (“DCA”); DCA’s rules promulgated under the PSLL are codified at Chapter 7 of Title 6 of the Rules of the City of New York (“Rules”).

Contractor agrees to comply in all respects with the PSLL and the Rules, and as amended, if applicable, in the performance of this agreement. Contractor further acknowledges that such compliance is a material term of this agreement and that failure to comply with the PSLL in performance of this agreement may result in its termination.

Contractor must notify the Agency Chief Contracting Officer of the City agency or other entity with whom it is contracting in writing within ten (10) days of receipt of a complaint (whether oral or written) regarding the PSLL involving the performance of this agreement. Additionally, Contractor must cooperate with DCA’s education efforts and must comply with DCA’s subpoenas and other document demands as set forth in the PSLL and Rules.

The PSLL is summarized below for the convenience of Contractor. Contractor is advised to review the PSLL and Rules in their entirety. On the website www.nyc.gov/PaidSickLeave there are links to the PSLL and the associated Rules as well as additional resources for employers, such as Frequently Asked Questions, timekeeping tools and model forms, and an event calendar of upcoming presentations and webinars at which Contractor can get more information about how to comply with the PSLL. Contractor acknowledges that it is responsible for compliance with the PSLL notwithstanding any inconsistent language contained herein.

Pursuant to the PSLL and the Rules:

Applicability, Accrual, and Use

An employee who works within the City of New York for more than eighty hours in any consecutive 12-month period designated by the employer as its “calendar year” pursuant to the PSLL (“Year”) must be provided sick time. Employers must provide a minimum of one hour of sick time for every 30 hours worked by an employee and compensation for such sick time must be provided at the greater of the employee’s regular hourly rate or the minimum wage. Employers are not required to provide more than forty hours of sick time to an employee in any Year.

An employee has the right to determine how much sick time he or she will use, provided that employers may set a reasonable minimum increment for the use of sick time not to exceed four hours per day. In addition, an employee may carry over up to forty hours of unused sick time to the following Year, provided that no employer is required to allow the use of more than forty hours of sick time in a Year or carry over unused paid sick time if the employee is paid for such unused sick time and the employer provides the employee with at least the legally required amount of paid sick time for such employee for the immediately subsequent Year on the first day of such Year.

An employee entitled to sick time pursuant to the PSLL may use sick time for any of the following:

- such employee’s mental illness, physical illness, injury, or health condition or the care of such illness, injury, or condition or such employee’s need for medical diagnosis or preventive medical care;
- such employee’s care of a family member (an employee’s child, spouse, domestic partner, parent, sibling, grandchild or grandparent, or the child or parent of an employee’s spouse or domestic partner) who has a mental

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

illness, physical illness, injury or health condition or who has a need for medical diagnosis or preventive medical care;

- closure of such employee's place of business by order of a public official due to a public health emergency; or
- such employee's need to care for a child whose school or childcare provider has been closed due to a public health emergency.

An employer must not require an employee, as a condition of taking sick time, to search for a replacement. However, an employer may require an employee to provide: reasonable notice of the need to use sick time; reasonable documentation that the use of sick time was needed for a reason above if for an absence of more than three consecutive work days; and/or written confirmation that an employee used sick time pursuant to the PSL. However, an employer may not require documentation specifying the nature of a medical condition or otherwise require disclosure of the details of a medical condition as a condition of providing sick time and health information obtained solely due to an employee's use of sick time pursuant to the PSL must be treated by the employer as confidential.

If an employer chooses to impose any permissible discretionary requirement as a condition of using sick time, it must provide to all employees a written policy containing those requirements, using a delivery method that reasonably ensures that employees receive the policy. If such employer has not provided its written policy, it may not deny sick time to an employee because of non-compliance with such a policy.

Sick time to which an employee is entitled must be paid no later than the payday for the next regular payroll period beginning after the sick time was used.

Exemptions and Exceptions

Notwithstanding the above, the PSL does not apply to any of the following:

- an independent contractor who does not meet the definition of employee under section 190(2) of the New York State Labor Law;
- an employee covered by a valid collective bargaining agreement in effect on April 1, 2014 until the termination of such agreement;
- an employee in the construction or grocery industry covered by a valid collective bargaining agreement if the provisions of the PSL are expressly waived in such collective bargaining agreement;
- an employee covered by another valid collective bargaining agreement if such provisions are expressly waived in such agreement and such agreement provides a benefit comparable to that provided by the PSL for such employee;
- an audiologist, occupational therapist, physical therapist, or speech language pathologist who is licensed by the New York State Department of Education and who calls in for work assignments at will, determines his or her own schedule, has the ability to reject or accept any assignment referred to him or her, and is paid an average hourly wage that is at least four times the federal minimum wage;
- an employee in a work study program under Section 2753 of Chapter 42 of the United States Code;
- an employee whose work is compensated by a qualified scholarship program as that term is defined in the Internal Revenue Code, Section 117 of Chapter 20 of the United States Code; or
- a participant in a Work Experience Program (WEP) under section 336-c of the New York State Social Services Law.

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

Retaliation Prohibited

An employer may not threaten or engage in retaliation against an employee for exercising or attempting in good faith to exercise any right provided by the PSSL. In addition, an employer may not interfere with any investigation, proceeding, or hearing pursuant to the PSSL.

Notice of Rights

An employer must provide its employees with written notice of their rights pursuant to the PSSL. Such notice must be in English and the primary language spoken by an employee, provided that DCA has made available a translation into such language. Downloadable notices are available on DCA's website at <http://www.nyc.gov/html/dca/html/law/PaidSickLeave.shtml>.

Any person or entity that willfully violates these notice requirements is subject to a civil penalty in an amount not to exceed fifty dollars for each employee who was not given appropriate notice.

Records

An employer must retain records documenting its compliance with the PSSL for a period of at least three years, and must allow DCA to access such records in furtherance of an investigation related to an alleged violation of the PSSL.

Enforcement and Penalties

Upon receiving a complaint alleging a violation of the PSSL, DCA has the right to investigate such complaint and attempt to resolve it through mediation. Within 30 days of written notification of a complaint by DCA, or sooner in certain circumstances, the employer must provide DCA with a written response and such other information as DCA may request. If DCA believes that a violation of the PSSL has occurred, it has the right to issue a notice of violation to the employer.

DCA has the power to grant an employee or former employee all appropriate relief as set forth in New York City Administrative Code 20-924(d). Such relief may include, among other remedies, treble damages for the wages that should have been paid, damages for unlawful retaliation, and damages and reinstatement for unlawful discharge. In addition, DCA may impose on an employer found to have violated the PSSL civil penalties not to exceed \$500 for a first violation, \$750 for a second violation within two years of the first violation, and \$1,000 for each succeeding violation within two years of the previous violation.

More Generous Policies and Other Legal Requirements

Nothing in the PSSL is intended to discourage, prohibit, diminish, or impair the adoption or retention of a more generous sick time policy, or the obligation of an employer to comply with any contract, collective bargaining agreement, employment benefit plan or other agreement providing more generous sick time. The PSSL provides minimum requirements pertaining to sick time and does not preempt, limit or otherwise affect the applicability of any other law, regulation, rule, requirement, policy or standard that provides for greater accrual or use by employees of sick leave or time, whether paid or unpaid, or that extends other protections to employees. The PSSL may not be construed as creating or imposing any requirement in conflict with any federal or state law, rule or regulation.

BNYDC CONSTRUCTION CONTRACT

EXHIBIT M

EXCAVATION WORK PLAN

NEW YORK STATE REQUEST TO IMPORT/REUSE SOIL

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

EXHIBIT N

HEALTH AND SAFETY PLAN

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

EXHIBIT O

FEMA RIDERS

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

EXHIBIT P

M/WBE UTILIZATION PLAN

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____

BNYDC CONSTRUCTION CONTRACT

EXHIBIT Q

COST BREAKDOWN

CONSTRUCTION CONTRACT NUMBER _____
CONTRACTOR _____



Brooklyn Navy Yard
Development Corporation
BrooklynNavyYard.org

Building 77
141 Flushing Ave, Suite 801
Brooklyn, NY 11205

EXHIBIT I
ENVIRONMENTAL CERTIFICATION FORM

[to attach]

CONTRACTOR EXCAVATION WORK PLAN CERTIFICATION BNYDC VCP Site V00120

Project Name:	
Project Location:	
Contractor Name:	
Contractor Point of Contact:	
Contractor POC Phone & Email:	

I, _____, certify that I have reviewed the following NYSDEC approved Site
(Print name)

Management Plan (SMP) documents for the Brooklyn Navy Yard (BNY) and will complete all Site work in accordance with the requirements set forth in these plans [*Check to confirm and certify that documents have been received and reviewed*]:

- Site Management Plan (SMP)
- Excavation Work Plan (EWP)
- Health And Safety Plan (HASP)
- Community Air Monitoring Plan (CAMP)

Additionally, as the contractor’s responsible party, I certify that: [*Check all that apply**]

- A. All employees who will engage in Site work at the BNY have obtained an OSHA HAZWOPER 40-hour Certification.
- B. A Request to Import/Reuse Fill or Soil form, will be prepared by the contractor and will be submitted to the BNY and CORE Environmental Consultants, Inc. (CORE).

AND

- All imported material(s) will meet the backfill and cover soil quality standards established in 6 NYCRR 375-6.7(d).

OR

- C. No backfill will be imported to the site.
- D. CORE and BNY will be notified of scheduled work dates to ensure CORE is on Site to provide a Qualified Environmental Professional (QEP) to perform CAMP.
- E. The reconstruction of the Site-wide cover will include a concrete or paving system at a minimum of 6” in thickness for paved areas, or for landscaped areas a minimum cover of 12” of clean fill, unless otherwise approved by CORE in writing. **

Sign

Date

* Note: All boxes must be checked, except for items B and C, where either only B or C is to be checked but not both.

** If contract documents (drawings, specifications, etc.) deviate from this requirement, Contractor shall notify BNY, CORE, and the design consultant for clarification and approval in writing prior to the implementation of the work.





Brooklyn Navy Yard
Development Corporation
BrooklynNavyYard.org

Building 77
141 Flushing Ave, Suite 801
Brooklyn, NY 11205

EXHIBIT J

EXCAVATION WORK PLAN (EWP)

HEALTH AND SAFETY PLAN (HASP)

COMMUNITY AIR MONITORING PLAN (CAMP)

EWP, HASP and CAMP are excerpted from the Site Management Plan (SMP) Exhibit K.
Bidders must comply with all requirements.

[to attach]

APPENDIX E

Excavation Work Plan

This Excavation Work Plan (EWP) contains procedures for potential future soil disturbances at the Site, including renovation, below-grade utility line repair, and new construction.

E.1 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to breach the Site-wide protective cover as defined in Section 2.6 of the Site Management Plan (SMP), the Site owner or their representative will notify the NYSDEC. Currently, this notification will be made to:

Jonathan Greco
NYSDEC Project Manager
625 Broadway
Albany, New York 12233
(518) 402-9694
Jonathan.Greco@dec.ny.gov

This notification will include:

- A detailed description of the work to be performed, including the location and aerial extent of excavation, plans/drawings for Site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of impacted soil to be excavated, and any work that may impact an engineering control (EC);
- A summary of environmental conditions anticipated to be encountered in the work areas including the nature and concentration levels of constituents of concern, potential presence of grossly impacted media, and plans for any pre-construction sampling;
- A schedule detailing the start and completion of all intrusive work;
- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP and Title 29 of the Code of Federal Regulations Part 1910.120 (29 CFR 1910.120);
- A copy of the contractor's Health and Safety Plan (HASP), in electronic format, if it differs from the HASP provided in Appendix F of the Site Management Plan (SMP);
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

Tenant Notification Requirements

Tenants who wish to disturb the existing Site-wide cover (as defined in Section 2.6 of the SMP) must notify BNYDC in advance of such activities at least 90 days in advance. A project-specific Work Plan will be provided to BNYDC by the tenant describing soil disturbance activities and will

include figures identifying the area(s) to be disturbed. The Change of Use request must include the NYSDEC 60-Day Advance Notification of Site Change of Use, Transfer or Certificate of Completion, and/or Ownership form found at http://www.dec.ny.gov/docs/remediation_hudson_pdf/changeofuse.pdf or in Appendix H of the SMP. BNYDC will review the Change of Use request and submit to NYSDEC.

E.2 SITE SECURITY

Site Security will be utilized to prevent access to the Site and vandalism or destruction of construction equipment, and to minimize health and safety concerns for surrounding properties. Currently the majority of the Site is covered by buildings, concrete, asphalt pavement, and/or millings, with some vegetated areas/landscaping.

In the event of any excavations or building demolitions, the area of excavation will be surrounded with an 8-foot security fence with a minimum of one gate that can be locked at the end of each working day. The fence will encompass the excavation, equipment, and soil storage areas, if any.

E.3 SOIL SCREENING METHODS

Visual, olfactory and instrument-based (e.g. photoionization detector) soil screening will be performed by a qualified environmental professional (QEP) during all excavations into known or potentially impacted material (remaining contamination). Soil screening will be performed when invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the No Further Action (NFA) letter.

Soils not exhibiting obvious signs of impacts may be reused on Site as backfill beneath a remedy-compliant cover comprised of at least 12 inches of soil meeting the lower of the NYSDEC Title 6 of the New York Codes, Rules and Regulations Part 375 (6 NYCRR 375) Commercial Use and Protection of Groundwater Soil Cleanup Objectives (SCOs), a building, or concrete, asphalt, or millings at least 6 inches in thickness. Soils exhibiting visual or olfactory evidence of impacts will be segregated for characterization and potential off-Site disposal.

Further discussion of off-Site disposal of materials and on-Site reuse is provided in Sections E.7 and E.8 of this Appendix.

E.4 SOIL STAGING METHODS

Any soils disturbed during excavation will be stockpiled in an on-Site staging area. Soil will be segregated into stockpiles based on screening performed as discussed in Section E.3 of this Appendix. Soil stockpiles will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters, and other discharge points.

Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced. Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook maintained at the Site and will be made available for inspection by NYSDEC upon request.

E.5 MATERIALS EXCAVATION AND LOAD-OUT

A QEP or person under their supervision will oversee all invasive work and excavation and load-out of all material not suitable for reuse. The owner or lessee of the property and its contractors are responsible for safe execution of all invasive and other work performed under this EWP.

The presence of utilities and easements on the Site will be investigated by a QEP. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the Site.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate federal, state, local, and NYSDOT requirements (and all other applicable transportation requirements).

A truck wash will be operated on-Site, as appropriate. The QEP will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the Site until the activities performed under this section are complete. Truck wash waters will be collected and disposed of off-Site in an appropriate manner.

Locations where vehicles enter or exit the Site shall be inspected daily for evidence of off-Site soil tracking. The QEP will be responsible for ensuring that all egress points for truck and equipment transport from the Site are clean of dirt and other materials derived from the Site during intrusive excavation activities. Adjacent streets will be cleaned as needed in order to maintain a clean condition with respect to Site-derived materials.

E.6 MATERIALS TRANSPORT OFF-SITE

All materials transport will be performed by licensed haulers in accordance with appropriate federal, state, and local regulations, including 6 NYCRR 364. Haulers will be appropriately licensed and trucks properly placarded.

Material will be transported by trucks equipped with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

Truck transport routes will be developed for each project performed at the Site. This will allow the most efficient truck route with the least disturbance to remaining occupants of the Brooklyn Navy

Yard Industrial Park (BNYIP). All trucks loaded with Site materials will exit the vicinity of the Site using only these approved truck routes. The most appropriate route for each project will take into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of New York City-mapped truck routes; (c) prohibiting off-Site queuing of trucks entering the Site; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project Site. Off-Site queuing will be prohibited.

E.7 MATERIALS DISPOSAL OFF-SITE

All material removed from the Site will be treated as contaminated and regulated material and will be transported and disposed of in accordance with all federal, state (including 6 NYCRR 360), and local regulations. If disposal of material from this Site is proposed for unregulated off-Site disposal (i.e. clean soil removed for development purposes), a formal request, with an associated plan, will be made to NYSDEC. Unregulated off-Site management of materials from this Site will not occur without formal NYSDEC approval.

Off-Site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown of disposal facility by class, if appropriate - i.e., hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, construction/demolition (C/D) recycling facility, etc. Actual disposal quantities and associated documentation will be reported to NYSDEC in the Periodic Review Report (PRR). This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading, and facility receipts.

Non-hazardous historic fill and impacted soils taken off-Site will be handled, at minimum, as a Municipal Solid Waste per 6 NYCRR 360-1.2. Material that does not meet Part 375 Unrestricted Use SCOs is prohibited from being taken to a New York State recycling facility (6 NYCRR 360-16 Registration Facility).

E.8 MATERIALS REUSE ON-SITE

Excavated soils will be considered appropriate for reuse as on-Site backfill if the soil does not exhibit obvious signs of impacts. Soils not exhibiting obvious signs of impacts may be reused on Site as backfill beneath a remedy-compliant cover comprised of at least 12 inches of soil meeting the lower of NYSDEC Commercial Use and Protection of Groundwater SCOs as set forth in 6 NYCRR 375-6.8(b), a building, or concrete, asphalt, or millings at least 6 inches in thickness. Soils exhibiting obvious signs of impacts must be sampled prior to reuse below the Site-wide cover and must meet the lower of the Commercial Use and Protection of Groundwater SCOs and the Standards, Criteria, and Guidance (SCGs) set forth in Table 5.4(e)4 of *DER Technical Guidance for*

Site Investigation and Remediation (DER-10), included at the end of this Section. Soil will be stockpiled in accordance with Sections E.3 and E.4 of this EWP.

The QEP will ensure that procedures defined for materials reuse in the SMP are followed and that unacceptable material does not remain on-Site. Impacted on-Site material, including historic fill and impacted soil, that is acceptable for reuse on-Site will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

Any demolition material proposed for reuse on-Site will be sampled for asbestos and the results will be reported to NYSDEC for acceptance. Concrete crushing or processing on-Site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing generated during Site redevelopment and/or remedial work will not be reused on Site.

Table 5.4(e)4 Reuse of Soil		
Soil on the Site Meets:	Reuse on the Site:	Off-site Export & Reuse:
Unrestricted Soil SCGs	Without restrictions	Without restrictions
Meets the Applicable Use-based and Groundwater Protection SCG and where Appropriate Protection of Ecological Resources Soil SCGs for a Site w/ an Institutional Control (IC) & SMP.	In the soil cover/cap or as backfill within the area of the site subject to the IC.	Not Allowed, unless going to a site with IC subject to a 6 NYCRR 360 Beneficial Use Determination (BUD).
Meets Site-Specific Background Soil Levels.	Without restrictions. (Does not apply to sites in the BCP.)	Not Allowed, unless going to a site with IC subject to a 6 NYCRR 360 BUD.
Site-specific cleanup goals for subsurface soil	Placement below the soil cover/cap within the area of the site subject to the IC.	Not Allowed, unless going to a site with IC subject to a 6 NYCRR 360 BUD.

E.9 FLUIDS MANAGEMENT

All liquids to be removed from the Site including, but not limited to, excavation dewatering, decontamination waters, and groundwater monitoring well purge and development waters, will be handled, transported, and disposed of in accordance with applicable federal, state, and local regulations. Dewatering, purge, and development fluids will not be recharged back to the land surface or subsurface of the Site and will be managed off-Site unless prior approval is obtained from NYSDEC.

Impacted water originating from equipment decontamination, excavation dewatering, and monitoring well purging, will be pumped into storage tanks for off-Site disposal. A licensed liquid

waste hauler will remove, transport, and dispose of the liquid in compliance with all applicable regulations.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river), if any, will be performed under a State Pollutant Discharge Elimination System (SPDES) permit.

E.10 SITE-WIDE COVER RESTORATION

After the completion of soil removal and any other invasive activities the Site-wide cover will be restored in a manner that complies with the Decision Document. The existing Site-wide cover is comprised of buildings, concrete and asphalt pavement, and millings. A demarcation layer will be placed to provide a visual reference to the top of the zone of remaining contamination, the zone that requires adherence to special conditions for disturbance of remaining impacted soils defined in the SMP. If the type of cover system changes from that which exists prior to the excavation (e.g., the building slab is replaced by soil cover), this will constitute a modification of the cover element of the remedy and the upper surface of the remaining contamination. A figure showing the modified surface will be included in the subsequent PRR and in an updated SMP.

E.11 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the Site will be approved by the QEP and will be in compliance with provisions in the SMP prior to receipt at the Site. A Request to Import/Reuse Fill or Soil form, which can be found at <http://www.dec.ny.gov/regulations/67386.html>, will be prepared and submitted to the NYSDEC Project Manager, allowing a minimum of five business days for review.

Material from industrial sites, spill sites or other environmental remediation sites, or potentially impacted sites will not be imported to the Site.

All imported soils will meet the backfill and cover soil quality standards established in 6 NYCRR 375-6.7(d). Approval will also be based on an evaluation of the land use, protection of groundwater, and protection of ecological resources criteria. Soils that meet 'exempt' fill requirements under 6 NYCRR 360, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC. Solid waste will not be imported onto the Site.

Imported materials will be tested at a rate consistent with Table 5.4(e)10 of DER-10, included at the end of this Section. Samples will be analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), TCL semi-volatile organic compounds (SVOCs), TCL pesticides, TCL Aroclors, and Target Analyte List (TAL) metals. Sample collection will be performed in accordance with the Quality Assurance Project Plan (QAPP), included as Appendix G of the SMP.

Trucks entering the Site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

Table 5.4(e)10			
Recommended Number of Soil Samples for Soil Imported To or Exported From a Site			
Contaminant	VOCs	SVOCs, Inorganics & PCBs/Pesticides	
Soil Quantity (cubic yards)	Discrete Samples	Composite	Discrete Samples/Composite
0-50	1	1	3-5 discrete samples from different locations in the fill being provided will comprise a composite sample for analysis
50-100	2	1	
100-200	3	1	
200-300	4	1	
300-400	4	2	
400-500	5	2	
500-800	6	2	
800-1000	7	2	
> 1000	Add an additional 2 VOC and 1 composite for each additional 1000 Cubic yards or consult with DER		

E.12 STORMWATER POLLUTION PREVENTION

Smaller soil disturbances, such as those required for utility maintenance, conducted after issuance of the NFA letter, will likely not require coverage under the SPDES permit system or the preparation of a Stormwater Pollution Prevention Plan (SWPPP) due to the small size of the excavation.

For larger disturbances, such as in the event of a building demolition, a SWPPP and Notice of Intent (NOI) will be required as well as applicable inspections to maintain compliance with the SPDES permit system. Silt fencing or hay bales will be installed around the entire perimeter of the construction area. Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook maintained at the Site and will be made available for inspection by NYSDEC upon request. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barriers and hay bale checks functional.

All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

E.13 CONTINGENCY PLAN

If underground storage tanks (USTs) or other previously unidentified sources for impacts to subsurface media are found during post-remedial subsurface excavations or development-related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Analyses will be performed for TCL VOCs, TCL SVOCs, TCL pesticides, TCL Aroclors, and TAL metals unless the Site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytical parameters will be proposed to NYSDEC for approval prior to sampling.

The NYSDEC Project Manager will be promptly notified in the event that unknown or unexpected impacted media is identified by screening during invasive Site work. Reportable quantities of petroleum product will also be reported to the NYSDEC Spills Hotline. These findings will be also included in the PRR in compliance with the SMP.

E.14 COMMUNITY AIR MONITORING

A Site-specific Community Air Monitoring Plan (CAMP) is contained in the HASP, included as Appendix F to the SMP. CAMP procedures will be implemented for all excavations on Site, regardless of size.

E.15 ODOR CONTROL PLAN

This odor control plan is capable of controlling emissions of nuisance odors on- and off-Site. Specific odor control methods will be determined for each project to adequately address potential odors specific to that project. If nuisance odors are identified at the Site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and the New York State Department of Health (NYSDOH) will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the remedial party's Remediation Engineer, and any measures that are implemented will be discussed in the PRR.

All necessary means will be employed to prevent on- and off-Site nuisances. At a minimum, these measures will include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-site disposal; (e) use of chemical odorants in spray or misting systems; and (f) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-Site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

E.16 DUST CONTROL PLAN

A dust suppression plan that addresses dust management during invasive on-site work will include, at a minimum, the items listed below:

- Dust suppression will be achieved through the use of a dedicated on-Site water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, un-vegetated soils vulnerable to dust production.
- Gravel will be used on roadways to provide a clean and dust-free road surface.
- On-Site roads will be limited in total area to minimize the area required for water truck sprinkling.

E.17 OTHER NUISANCES

A plan for rodent control will be developed and utilized by the contractor for all large excavation work that may be performed.

A plan will be developed and utilized by the contractor for all remedial work to ensure compliance with local noise control ordinances.

APPENDIX F

Health and Safety Plan

HEALTH AND SAFETY PLAN
Brooklyn Navy Yard Industrial Park
63 Flushing Avenue
Brooklyn, New York 11205
Site No. V00120

Prepared for:

BROOKLYN |
NAVY | YARD |

Brooklyn Navy Yard Development Corporation
63 Flushing Avenue, Unit 300
Brooklyn, New York 11205

Prepared by:



CORE Environmental Consultants, Inc.
22-48 119th Street
College Point, New York 11356

March 23, 2018

TABLE OF CONTENTS

1.0	INTRODUCTION.....	1
1.1	PROJECT DESCRIPTION	1
1.2	SITE DESCRIPTION	2
2.0	KEY PERSONNEL.....	3
3.0	MEDICAL SURVEILLANCE REQUIREMENTS.....	4
4.0	SITE HAZARD/RISK ANALYSIS.....	5
4.1	HAZARD ANALYSIS	5
4.2	HANDLING DRUMS AND CONTAINERS.....	5
4.3	ELECTRICAL HAZARDS.....	5
4.3.1	Utilities.....	5
4.3.2	Underground Utilities	5
4.3.3	Overhead Utilities	6
4.4	PHYSICAL HAZARDS	6
4.4.1	Heat Stress.....	7
4.4.2	Cold Stress	8
4.4.3	Noise	9
4.4.4	Hand and Power Tools	9
4.4.5	Slips, Trips, and Falls.....	9
4.4.6	Manual Lifting	9
4.4.7	Overhead Dangers	9
4.4.8	Cuts and Lacerations.....	10
4.4.9	Traffic Hazards	10
4.5	CHEMICAL HAZARDS.....	10
4.6	BIOLOGICAL HAZARDS	10
5.0	SITE CONTROL.....	11
5.1	SUPPORT ZONE	11
5.2	CONTAMINATION REDUCTION ZONE/EXCLUSION ZONE.....	11
5.3	SITE VISITATION	11
6.0	PERSONAL PROTECTIVE EQUIPMENT.....	12
7.0	COMMUNITY AIR MONITORING PLAN.....	13
7.1	METEOROLOGICAL MONITORING	13
7.2	TOTAL VOLATILES	13
7.3	PARTICULATE MONITORING.....	14
7.4	AIR MONITORING EQUIPMENT CALIBRATION	14
7.5	WORK STOPPAGE RESPONSES	14
8.0	DECONTAMINATION PROCEDURES	16
8.1	DECONTAMINATION OF PERSONNEL.....	16
8.2	DECONTAMINATION OF EQUIPMENT	16
9.0	EMERGENCY PROCEDURES	17
9.1	COMMUNICATIONS.....	17
9.2	FIRE/EXPLOSION	17
9.3	FIRST AID	17
9.4	EMERGENCY ASSISTANCE.....	20
10.0	SAFETY CONCERNS AND CONTINGENCY MEASURES	21
10.1	BUDDY SYSTEM	21
10.2	EXCAVATION.....	21
10.3	DECONTAMINATION WATER.....	21

**TABLE OF CONTENTS
(continued)**

TABLES

Table 1	Hazard Characteristics of Suspected Contaminants
Table 2	Components of Personal Protection Levels
Table 3	Anticipated Levels of Personal Protection for Each Activity
Table 4	Action Levels during Intrusive Activities

ATTACHMENTS

Attachment A	Health and Safety Field Meeting Form
Attachment B	NYSDOH Generic Community Air Monitoring Plan
Attachment C	CAMP Monitoring Forms
Attachment D	Hospital Route Map/Directions

1.0 INTRODUCTION

The Brooklyn Navy Yard Development Corporation (BNYD) retained CORE Environmental Consultants, Inc. (CORE) to provide environmental consulting services related to the Brooklyn Navy Yard Industrial Park (BNYIP) Site located at 63 Flushing Avenue, Brooklyn, New York. This Site-specific Health and Safety Plan (HASP) establishes health and safety requirements, responsibilities, and procedures to protect workers during implementation of the final remedy at the Site.

1.1 PROJECT DESCRIPTION

The purpose of this HASP is to set forth appropriate health and safety procedures to be followed by CORE personnel and contractors during on-Site remedial activities, including intrusive activities, and soil, groundwater, and sub-slab vapor sampling, if required.

This document will serve not only to explain the chemical and physical hazards associated with working on Site, but will also outline approved measures for dealing with such hazards. The project Health and Safety Officer (HSO) will be responsible for the development and implementation of project Health and Safety protocols. In addition, the contractor(s) will be required to designate a Site HSO for their personnel and to follow, at a minimum, the requirements of this HASP. All personnel who will be involved with earthwork (excavation, trenching, sampling, or any activity that results in a cover breach) on Site must have completed the appropriate Hazardous Waste Operations (HAZWOPER) Site Worker Training - i.e., 24 hour or 40 hour, as required by the Occupational Safety and Health Administration (OSHA) in Title 29 of the Code of Federal Regulations (29 CFR), Part 1910.120(e)(2), 1910.120(e)(3), and 1910.120(e)(8), as applicable, and the required medical surveillance as required by 29 CFR Part 1910.120(f).

The remedy will include:

Site Walk-throughs

Perform thorough Site-wide walk-throughs to evaluate the presence and condition of the Site-wide cover.

Remedial work may also include:

Soil Boring Program

Soil boring programs will involve evaluation of the nature and extent of impacts to soil through the advancement of borings at various locations on Site.

Excavation

Excavation may be performed during Site redevelopment or Site-wide cover repair. In addition, remediation of polychlorinated biphenyl (PCB)-impacted soil will require excavation.

Sample Analysis

Soil samples collected to classify impacts in PCB-impacted areas will be analyzed for, at a minimum, Target Compound List (TCL) Aroclors. Samples may also be analyzed for TCL volatile organic compounds (VOCs), TCL semi-volatile organic compounds (SVOCs), TCL pesticides, and Target Analyte List (TAL) metals, depending on the needs of each specific investigation.

Community Air Monitoring

Community air monitoring will be performed in accordance with New York State Department of Health (NYSDOH) guidance to guarantee the safety of both workers and Site occupants during any subsurface intrusive activities such as soil boring installation or excavation. The Site-specific community air monitoring requirements are discussed in Section 7.0.

1.2 SITE DESCRIPTION

The Site is located in Brooklyn, Kings County, New York and is identified as Block 2023, Lot 1 by the New York City Department of Finance. The Voluntary Cleanup Agreement (VCA) parcel is an approximately 150-acre portion of the lot that is bound by the East River to the north, Flushing Avenue to the south, Kent Avenue to the east, and Navy Street and the New York City Department of Environmental Protection (NYCDEP) Red Hook Wastewater Treatment Plant (WWTP) to the west. The Site is zoned M3-1 by the New York City Department of City Planning, indicating that it can be used for light and heavy manufacturing purposes. Site occupants are engaged in commercial and light manufacturing activities.

2.0 KEY PERSONNEL

Personnel responsible for implementation of this Health and Safety Plan are:

Name	Company/Title	Address	Contact Information
Ronald Tramosch	CORE Site HSO	22-48 119th Street College Point, NY 11356	Office: (718) 786-4730 Mobile: (917) 804-8717 Email: RPT@coreenv.com
Shani Leibowitz	BNYDC Sr. Vice President	63 Flushing Avenue Brooklyn, NY 11205	Office: (718) 907-5955 Email: SLeibowitz@bnydc.org

SITE HEALTH AND SAFETY OFFICER

The responsibilities of the Site HSO are as follows:

- Implement this HASP on Site;
- Enforce day-to-day health and safety protocols on Site;
- Require that all personnel entering the Site understand the provisions of this HASP;
- Conduct periodic training sessions on use/maintenance of personal protective equipment (PPE) and safety practices;
- Conduct daily health and safety meetings each morning;
- Direct and advise CORE's Site personnel, visitors, and contractor(s) on the specific hazards associated with the Site as well as any changes related to health and safety requirements at the Site;
- Conduct necessary health and safety monitoring;
- Oversee air monitoring program, including monitoring logs;
- Monitor Site conditions and determine if changes in PPE levels are required;
- Execute work stoppages, if required; and
- Report changes in Site conditions and changes in PPE requirements to the Project HSO.

Daily Health and Safety Meeting Forms are included in Attachment A.

3.0 MEDICAL SURVEILLANCE REQUIREMENTS

All personnel who engage in waste Site activities for 30 days or more per year will participate in a Medical Surveillance Program. All project personnel involved in on-Site activities in impacted areas will be required to undergo annual medical examinations. This examination must take place not more than one year prior to and one year after the completion of Site work and must be conducted by a physician who is board-certified in occupational medicine. The physician should be familiar with the job-related duties of each worker examined. The physician must certify whether the individual is fit to conduct work on hazardous waste Sites using personal protection, or whether he or she must work within certain restrictions.

Any person exposed to high levels of hazardous substances will be required to undergo a repeat medical exam at, or before, the conclusion of the project to determine possible health impacts. Any person suffering a lost-time injury or illness must receive medical approval prior to returning to work. When employment is terminated for any reason, the employee must receive an exit medical examination.

All medical records will be held by the employer for the period of employment plus at least 30 years, in accordance with OSHA regulations on confidentiality and any other applicable regulations and will be made available to OSHA upon request. The components of Medical Surveillance include:

- Medical and occupational history;
- Physical examination, with particular attention to the cardiopulmonary system, general physical fitness, skin, blood-forming, hepatic, renal, and nervous systems;
- Blood and urine analyses;
- Pulmonary function testing; and
- Additional tests as appropriate, such as x-ray, stress tests, etc.

4.0 SITE HAZARD/RISK ANALYSIS

Physical hazards include the dangers of tripping and falling on uneven ground, operation of heavy equipment such as drill rigs, vehicular traffic, and utilities either above-ground or buried. The following are physical hazards which may be encountered during remedial activities

4.1 HAZARD ANALYSIS

PPE is the initial level of protection based on the activity hazards and Site conditions which have been identified. Upgrades to respiratory protection may be required based on the action levels discussed in Section 7.0. General on-Site provisions will include: extra nitrile, leather, and/or Kevlar gloves, extra protective coveralls, drinking water and electrolyte fluids, reflective vest, first aid kit, fire extinguisher, hearing protection, and washing facilities.

If Site conditions suggest the existence of a situation more hazardous than anticipated, the Site personnel will evacuate the immediate area. The hazard, level of precautions, and PPE will then be reevaluated.

4.2 HANDLING DRUMS AND CONTAINERS

Regulations for handling drums and containers are specified by OSHA in 29 CFR 1910.120(j). Potential hazards associated with handling drums include vapor generation, fire, explosions, and possible physical injury. Handling of drums/containers during remedial activities may be necessary. If drum/container handling is necessary, it will be performed in accordance with applicable regulations.

4.3 ELECTRICAL HAZARDS

4.3.1 Utilities

The Site may have shallow, buried utilities and also overhead utilities in certain areas. It will be necessary for parties disturbing the existing ground surface and conducting operations with heavy equipment having high clearances to exercise caution in performing project-related work with respect to the presence of utilities. Utility companies with active, buried lines in the Site area will be asked by the contractor performing intrusive activities to mark their facilities. Employees will use these data to choose work locations.

4.3.2 Underground Utilities

No excavating, drilling, boring, or other intrusive activities will be performed until an underground utility survey, conducted by knowledgeable persons or agencies, has been made. This survey will identify underground and in-workplace utilities such as the following:

- Electrical lines and appliances;
- Telephone lines;

- Cable television lines;
- Gas lines;
- Pipelines;
- Steam lines;
- Water lines;
- Sewer lines; and/or
- Pressurized air lines.

The location of utilities will be discussed with CORE personnel and contractors during a Site safety briefing. Utilities identified during survey should be marked or access otherwise restricted to avoid chance of accidental contact.

Even when a utility search has been completed, drilling, boring, and excavation should commence with caution until advanced beyond the depth at which such utilities are usually located. Utilities will be considered “live” or active until reliable sources demonstrate otherwise. Geophysical surveys, including ground penetrating radar (GPR) and electromagnetic (EM) survey, if necessary, will be completed in the area of all indoor boring locations to further refine the presence and locations of potential subsurface utilities.

4.3.3 Overhead Utilities

CORE does not anticipate performing work in the area of overhead utilities; however, if present, clearances will be adequate for the safe movement of vehicles and for the operation of construction equipment.

Overhead or above-ground electric lines should be considered active until a reliable source has documented them to be otherwise. Elevated work platforms, ladders, scaffolding, man-lifts, and drill or vehicle superstructures will be erected a minimum of 20 feet (the actual distance is dependent upon the voltage of the line) from overhead electrical lines until the line is de-energized, grounded, or shielded so arcing cannot occur between the work location or superstructure.

4.4 PHYSICAL HAZARDS

Drilling and excavation programs pose the greatest potential threat to the safety of Site personnel. The following sections describe specific safety measures to be implemented during specific activities.

4.4.1 Heat Stress

Employees may be exposed to the hazards associated with heat stress when ambient temperatures exceed 70 degrees Fahrenheit (°F). Employees should increase water intake while working in conditions of high heat. Enough water should be available so that each employee can consume one quart of water per hour. In addition, they should increase number of rest breaks and/or rotate employees in shorter work shifts. Employees should rest in cool, dry, shaded areas for at least five minutes. Employees should not wait until they feel sick to cool down. Watch for signs and symptoms of heat exhaustion and fatigue. In the event of heat stroke, bring the victim to a cool environment, call for help, and initiate first aid procedures.

The following prevention, recognition, and treatment strategies will be implemented to protect personnel from heat stress. Personnel will be trained to recognize the symptoms of heat stress, and to apply the appropriate treatment.

Prevention

- Provide plenty of liquids. A 50 percent solution of fruit punch (or similar) in water, or plain water to be taken with salted foods such as pretzels will be available in the support zone.
- Buddy system. No individual will attempt to undertake any activity alone.
- Provide cooling devices. A spray hose and a source of water will be provided to reduce body temperature, cool protective clothing, and/or act as a quick-drench shower in case of an exposure incident.
- Adjustment of the work schedule. As is practicable, the most labor intensive tasks should be carried out during the coolest part of the day.

Recognition and Treatment

Any person who observes any of the following forms of heat stress, either in himself or in another worker, will report this information to the Site HSO as soon as possible.

1. Heat Rash (or prickly heat)

Cause: Continuous exposure to hot and humid air, aggravated by chafing clothing.

Symptoms: Eruption of red pimples around sweat ducts accompanied by intense itching and tingling.

Treatment: Remove source of irritation and cool skin with water or wet clothes.

2. Heat Cramps (or heat prostration)

Cause: Profuse perspiration accompanied by inadequate replenishment of body water and electrolytes.

Symptoms: Sudden development of pain and/or muscle spasms in the abdominal region.

Treatment: Remove the worker to the contamination reduction zone. Provide fluids orally. Remove protective clothing. Decrease body temperatures and allow a period of rest in cool location.

3. Heat Exhaustion

Cause: Overexertion in a hot environment and profuse perspiration accompanied by inadequate replenishment of body water and electrolytes.

Symptoms: Muscular weakness, staggering gait, nausea, dizziness, shallow breathing, pale and clammy skin, approximately normal body temperature.

Treatment: Perform the following while simultaneously making arrangements for transport to a medical facility: Remove the worker to the contamination reduction zone. Remove protective clothing. Lie the worker down on his or her back, in a cool place, and raise the feet 6 to 12 inches. Keep warm, but loosen all clothing. If conscious, provide sips of a salt water solution, using one teaspoon of salt in 12 ounces of water. Transport the worker to a medical facility.

4. Heat Stroke

Cause: Same as heat exhaustion.

Symptoms: Dry and hot skin, dry mouth, dizziness, nausea, headache, rapid pulse.

Treatment: Cool worker immediately by immersing or spraying with cool water or sponge bare skin after removing protective clothing. Transport to hospital.

4.4.2 Cold Stress

Exposure to cold weather, wet conditions and extreme wind-chill factors may result in excessive loss of body heat (hypothermia) and/or frost bite. To guard against cold exposure and to prevent cold injuries, appropriate warm clothing should be worn, warm shelter must be readily available, rest periods should be adjusted as needed, and the physical conditions of on Site field personnel should be closely monitored. Personnel and supervisors working on Site will be made aware of the signs and symptoms of frost bite and hypothermia such as shivering, reduced blood pressure, reduced coordination, drowsiness, impaired judgment, fatigue, pupils dilated but reactive to light,

and numbing of the toes and fingers. The potential for wetting of protective clothing should be of concern, since wet clothing (from sweat or splashes) will provide poor insulation against the cold.

4.4.3 Noise

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps, and generators. Employees who will perform suspected or established high noise tasks and operations for short durations (less than 1 hour) will wear hearing protection. If deemed necessary by the HSO, additional hearing protection may be added and the need to monitor sound levels for Site activities will be determined. Other employees who do not need to be in proximity should distance themselves from the equipment generating the noise.

4.4.4 Hand and Power Tools

In order to complete the various tasks for the project, personnel may use hand and power tools. The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire, and electrocution. Work gloves, safety glasses, and hard hats will be worn by the operating personnel when using hand and power tools.

4.4.5 Slips, Trips, and Falls

Working in and around the Site may pose slip, trip, and fall hazards due to slippery and uneven surfaces. Personnel will wear proper foot gear and will employ good work practice and housekeeping procedures to minimize the potential for slips, trips, and falls.

4.4.6 Manual Lifting

Manual lifting of objects and equipment may be required. Failure to follow proper lifting technique can result in back injuries and strains. Employees should use a buddy system and/or power equipment to lift heavy loads whenever possible and should evaluate loads before trying to lift them. Carrying heavy loads with a buddy and proper lifting techniques include: 1) make sure footing is solid; 2) make back straight with no curving or slouching; 3) center body over feet; 4) grasp the object firmly and as close to your body as possible; 5) lift with legs; and 6) turn with your feet, don't twist.

4.4.7 Overhead Dangers

Overhead dangers, including but not limited to falling debris and equipment, can occur while operating drill rigs and excavation equipment. CORE personnel will maintain a minimum distance from large overhead operations and proper communication with heavy equipment operators and their handlers, should work necessitate their presence beyond the minimum safety distance. Proper PPE will be worn during these types of activities including steel-toed/shank boots, safety vests, and hard hats.

4.4.8 Cuts and Lacerations

Field activities that involve drilling and sampling activities usually involve contact with various types of machinery. At least one person on Site must be currently certified in first aid and cardiopulmonary resuscitation (CPR) techniques. Personnel trained and certified in first aid should be prepared to take care of cuts and bruises as well as other minor injuries. CORE will have a first aid kit approved by the American Red Cross available during all field activities.

4.4.9 Traffic Hazards

All traffic, vehicular and pedestrian, shall be maintained and protected at all times consistent with local, state, and federal, and agency regulations regarding such traffic and in accordance with direction of the Owners. Traffic hazards will be limited as the remediation project is to be completed primarily on private land and not in public right of way areas.

4.5 CHEMICAL HAZARDS

Chemicals that may potentially be encountered at the Site include SVOCs, primarily polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and metals. The health/safety characteristics and exposure limits of these compounds are listed in Table 1. The risk of exposure can be by dermal, ingestion, or respiratory routes, depending on the type of compound and intrusive activity being performed.

If during subsurface intrusive activities, the potential for workers to be exposed to particulates and compounds, such as dusts, SVOCs, PCBs, and metals, in soil through inhalation/ingestion/dermal contact routes, workers may need to apply water or an amended water solution to the area to help control the generation of airborne dusts, and particulates. Workers may also use respiratory protection including the use of an air-purifying respirator equipped with approved filter/cartridges. An analysis of the work tasks and potential for chemical exposure should be performed to determine the correct PPE, and/or respirator cartridge(s), if needed. The analysis should include a chemical waste profile to help ensure that PPE specified will be appropriate for the respective chemical hazard(s).

4.6 BIOLOGICAL HAZARDS

There are no anticipated biological hazards associated with the Site.

5.0 SITE CONTROL

In order to keep unauthorized personnel from entering the work areas subsurface intrusive activities without proper protective equipment, and for good control of overall Site safety, two work zones will be established. The two work zones are the support zone and the contamination reduction zone/exclusion zone. Actual zone width will be determined by optimal size of work area and by obstructions, if any. A brief description of the Site work zones follows.

5.1 SUPPORT ZONE

The support zone at the Site will be a mobile unit (automobile) including a cellular telephone for communication. The support zone will be located as near as practicable to the active work areas and decontamination areas.

5.2 CONTAMINATION REDUCTION ZONE/EXCLUSION ZONE

The contamination reduction zone and exclusion zone will be incorporated into one zone at each project-specific location. This zone will be mobile and the location will be dependent upon where active work is being performed. The decontamination of personnel, light equipment, and heavy equipment will be performed prior to leaving the contamination reduction zone.

A temporary storage location will be established at the Site for any stockpiles generated during excavation or construction activities. The location will be situated away from vehicular and pedestrian traffic, and will be secured via fencing or other apparatus.

5.3 SITE VISITATION

It is possible that the Owners or officials from regulating bodies and jurisdiction will visit the Site during operations. It is also possible that an OSHA representative will wish to inspect the Site. All such officials must meet the requirements of occasional Site workers (24 hour OSHA-approved training and Site-specific training) before going into any active contamination reduction zone/exclusion zone. Visitors other than the Owners, NYCDEC, or OSHA representatives will be subject to the additional requirements of having to receive written permission from the Owners to conduct a Site visit. Because of the nature of the work, the work zone will be continually supervised. Signs will be used to prevent the entrance of unauthorized visitors.

All visitors must supply their own PPE and will be directed to appropriate disposal areas for soil or used PPE.

6.0 PERSONAL PROTECTIVE EQUIPMENT

Since personnel working on Site may be exposed to unexpected levels of hazardous airborne chemicals or compounds released during subsurface intrusive activities, or may come in contact with SVOCs, PCBs, and/or metals in soil, various levels of protection will be utilized during field activities. Components of all levels of personal protection that will be available are listed in Table 2. Planned levels of protection for various activities are given in Table 3.

In the event that unexpected levels of organic vapors are encountered, any personnel working at Level D protection will don their respirators at once (upgrade to Level C). The Site HSO will consult with the Project HSO to decide if and when Level D protection may be resumed, or if a higher level of PPE is required. Some modification in safety equipment (e.g., switching from polycoated disposable coveralls to standard disposable coveralls) may be implemented in order to balance concerns for full contaminant protection against concerns for the possibility of heat stress resulting from the need to wear more restrictive PPE. Such modifications may be implemented only if approved in advance by the Site HSO, following consultation with the Project HSO. PPE which fully complies with the requirements of all required levels of protection should be immediately available at all times on the Site.

Level C respiratory protection will be provided using The National Institute for Occupational Safety and Health (NIOSH) -approved half-face respirators, with appropriate NIOSH approved cartridge for removal of organic vapors. All team members will be fit-tested for respirators using irritant smoke. Due to difficulties in achieving a proper seal between face and mask, persons with facial hair will not be allowed to work in areas requiring respiratory protection.

For the fullest protection of on-Site personnel, the supervising field engineer/geologist will conduct organic vapor monitoring at closely spaced intervals during subsurface intrusive activities. Monitoring will be accomplished by real-time monitoring equipment, such as a photoionization detector (PID).

The primary purpose of this monitoring will be to assess the adequacy of respiratory protection and to make it possible to stop work quickly if explosive or hazardous gases are encountered, or if an oxygen-deficient atmosphere is detected. The air monitoring to be carried out during all intrusive activities is summarized below.

Site personnel timesheets with employee and Project Manager signatures will serve to document the amount of time spent on Site by each team member.

7.0 COMMUNITY AIR MONITORING PLAN

Air monitoring will be performed throughout subsurface intrusive activities by trained CORE personnel. Air will be monitored for particulates. Monitoring is restricted to particulates as volatile organic compounds (VOCs) were not identified as constituents of potential concern (COPCs) during previous Site investigations. If VOCs are encountered during excavation activities, monitoring for volatiles utilizing a photoionization detector (PID) should be reevaluated and this Community Air Monitoring Plan (CAMP) updated accordingly. All air monitoring results and meteorological data (e.g., temperature range, wind speed, wind direction, etc.), if applicable, will be recorded on monitoring logs. Air quality monitoring will not be performed during precipitation events.

Community air monitoring will be performed in accordance with NYSDOH guidance to guarantee the safety of both workers and Site occupants. The NYSDOH Generic CAMP is included as Attachment B. Attachment B also includes the New York State Department of Environmental Conservation (NYSDEC) Technical and Administrative Guidance Memorandum (TAGM) #4031 for Fugitive Dust Suppression and Particulate Monitoring at Inactive Hazardous Waste Sites.

The purpose of the CAMP is to protect air quality outside of the project area from any dust or particulates generated during subsurface intrusive activities. This CAMP is applicable during the following activities:

- Drilling activities
- Test pit excavation and/or excavation for Site redevelopment

7.1 METEOROLOGICAL MONITORING

Wind is the primary mechanism for dust and particulate transport outside of the project area. Primary wind direction will be determined prior to the start of each workday, and may be reestablished at any time if a change in wind direction is observed.

7.2 TOTAL VOLATILES

During intrusive activities air monitoring for VOCs will be performed within the work/breathing zone utilizing a PID equipped with a 10.2 eV lamp. When readings up to 1 part per million (ppm) above background in the breathing zone are observed, work activity will continue. Monitoring will be continuous, and recorded at 15-minute intervals.

Levels less than 1 ppm of total volatiles are permissible. If the concentrations of VOCs in ambient air in the work zone area exceed 1 ppm for the 15-minute average, work activity must be temporarily halted. Air monitoring is to remain continuous while work is halted. If vapor levels decrease below 1 ppm, work can resume with continued monitoring. If vapor levels between 1 and 25 ppm are detected, work must be halted, the vapor source identified, abatement actions taken,

and air monitoring continued. If sustained readings from 1 to 25 ppm above background in the breathing zone are observed, work will only be allowed to continue after an upgrade to Level C PPE. Intrusive activities will be shut down if vapor in the work area exceed 25 ppm.

7.3 PARTICULATE MONITORING

For intrusive activities, particulate concentrations will be monitored continuously at the upwind and downwind perimeter boundaries of the work zone. Tri-pod mounted real-time monitoring equipment capable of detecting particulate matter less than 10 micrometers (PM-10) in size will be utilized. Monitoring will be continuous and recorded every minute with 15-minute running averages. Potential fugitive dust migration off Site should also be visually assessed during intrusive activities.

- If the downwind PM-10 level is 100 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) greater than upwind/background concentrations over any 15-minute average period, dust suppression procedures will occur.
- If downwind PM-10 concentrations reach levels of 150 $\mu\text{g}/\text{m}^3$ (or more) greater than upwind/background concentrations, work must be halted while additional dust suppression measures are implemented.

7.4 AIR MONITORING EQUIPMENT CALIBRATION

The particulate monitor will be calibrated to 0 $\mu\text{g}/\text{m}^3$ daily (prior to field activities) and the results will be recorded. Intrusive activities will not begin until all instruments are calibrated and ambient air conditions are recorded. The particulate monitor will be recalibrated throughout the day as necessary.

CAMP monitoring forms are included as Attachment C.

7.5 WORK STOPPAGE RESPONSES

The following responses will be initiated whenever one or more of the action levels necessitating a work stoppage is exceeded:

- The Site HSO will be consulted immediately;
- All personnel will be cleared from the work area until appropriate mitigation techniques have been implemented;
- Monitoring will be continued until the end of the work day; and
- NYSDEC and NYSDOH will be notified as soon as possible.

Any chemical release to air, water, or soil must be reported to the Site HSO at once. Any exposure resulting from protective equipment failure must be immediately reported to the Site HSO and to the Project HSO in writing within 24 hours.

8.0 DECONTAMINATION PROCEDURES

8.1 DECONTAMINATION OF PERSONNEL

Decontamination of personnel will be performed at each contamination reduction zone/exclusion zone. This can be accomplished by washing and rinsing the outer gloves and outer boots over the decontamination trough. Disposable clothing can then be removed and discarded into a 30-gallon trash can with a vinyl liner. If personnel are in Level C protection, the above procedures will be followed and the respirator will be removed, sanitized, and placed in a plastic bag.

8.2 DECONTAMINATION OF EQUIPMENT

Heavy Equipment

Decontamination of heavy equipment (such as excavators) will be accomplished by steam cleaning on a decontamination pad constructed of wood and covered with water retaining polyethylene sheeting with a minimum thickness of 6 mil. Washing of heavy equipment will be completed with attention to minimize any overspray of water, debris and/or soil. All wash water and debris will be collected and containerized in Department of Transportation (DOT)-approved 55-gallon drums for later off-Site disposal. The polyethylene sheeting will be examined frequently for any tears or punctures that may cause a leak. The sheeting will be discarded in a municipal trash dumpster.

Mid-Weight Equipment

Decontamination of mid-weight equipment (such as shovels, augers, etc.) will be accomplished by scrubbing the equipment with a heavy duty bristle brush in a 5-gallon bucket containing water and Alconox® detergent. After washing and scrubbing, the equipment will be rinsed by placing it in a separate bucket of water to remove soap and debris. The wash and rinse water will be containerized in DOT-approved 55-gallon drums for later off-Site disposal.

Light Equipment

Decontamination of light equipment (such as tools, containers, monitoring instruments, radios, clipboards, etc.) will be accomplished by wiping equipment off with clean, damp cloths. The cloths can be discarded in the trash can with disposable clothing.

9.0 EMERGENCY PROCEDURES

The most likely incidents for which emergency measures might be required are:

- A sudden release of hazardous gases/vapors during drilling or excavating;
- An explosion or fire occurring during drilling or excavating; and/or
- A heavy equipment-related accident, or other accident resulting in personal injury.

Emergency procedures established to respond to these incidents are covered under the sections that follow.

9.1 COMMUNICATIONS

A portable telephone will be maintained by the Site HSO during the entire project. The phone will be frequently checked to ensure an appropriate signal is available for the phone to work properly.

9.2 FIRE/EXPLOSION

It will be the responsibility of the contractors to have a fire extinguisher available at the drill rig and/or excavation locations. The operator will have further responsibility of taking fire prevention measures such as the continuous removal from the rig of accumulated oil, grease, or other combustible materials.

In the event of a fire that cannot be controlled with available equipment, or in the event of an explosion, the local fire department will be summoned immediately by the Site HSO, who shall apprise them of the situation upon their arrival. The Owners/occupants will also be notified.

9.3 FIRST AID

First aid for personal injuries will be administered by the Site HSO. All accidents, however insignificant, will be reported to the Site HSO. Personnel designated to administer first aid will have received a minimum of eight hours training in first aid and CPR, and be certified by the American Red Cross. If a Site worker should require further treatment, he/she will be transported to the hospital. The on-Site vehicle will carry a copy of the HASP which includes written directions to the hospital, as well as a map showing the route.

The following sections are intended as a “quick guide” to basic first aid only. Effective CPR and first aid require hands-on training that is best accomplished by attending a class in person.

One common formula for performing first aid:

Do a primary scene and patient survey, followed by checking airway, breathing, and circulation (ABCs).

Survey the scene and approach the victim. Determine whether the scene is safe. Look for dangers, such as downed power lines, traffic, unstable vehicles, or accidents. Determine what may have happened, how many victims are involved, and if any bystanders can help. If several persons appear to be injured, perform triage.

Survey the patient and perform an initial assessment. Get consent from a conscious victim (parent/guardian if the victim is a minor) before providing care. If the victim is unconscious, consent is implied. Use infection control precautions and check for signs and symptoms of any life-threatening conditions and care for them. To perform an initial assessment:

- Check the victim for consciousness and obtain consent if the victim is conscious;
- Check the ABCs (airway, breathing and circulation); and
- Check for severe bleeding.

Provide brief care for the conditions. If the patient lacks air or circulation, they may begin to suffer brain damage after approximately four minutes. After ten minutes, they most likely will have some permanent brain damage. To care for breathing and circulation means first clearing the airway, and briefly attempting to restart their breathing or circulation with rescue breathing or CPR (and use of a portable defibrillator, where available). This step is crucial, because an unconscious person's airway can be blocked by a normal, comfortable-looking head position (e.g., on their back with a pillowed head). Often, simply tilting the head back will open the airway and restart their breathing. Likewise, many people recovering from a blocked airway vomit, and if they are unconscious, they can drown in the vomit. The standard prevention for both these issues is to turn a breathing, unconscious patient on their side, turning their head and spine in the same movement to avoid spinal injury, pillowing their head on one of their arms. Do not move casualties unless it is necessary to remove them from danger, or to make treatment possible (such as onto a hard surface for CPR).

1. Call for emergency services

Calling for emergency medical services must take priority over extended care such as long term rescue breathing or extended CPR, since these techniques are intended to gain time for emergency services to arrive as part of the chain of survival. However, if bystanders are available, both can be pursued at the same time. If you ask others to call an ambulance for you, make sure they report back to you once released by the emergency operator to confirm that the call has been made.

2. Do a secondary patient survey, and provide appropriate emergency first aid

The secondary survey is to gather information about conditions or injuries that may not be life threatening, but may become so if not cared for. Perform a secondary survey only if you are sure that the victim has no life-threatening conditions. A properly trained and certified person performs three stages in the secondary survey:

1. Interview the victim and include bystanders to supplement info from the patient:

- Signs and Symptoms - Visible indications of injury and patient reported sensations (e.g. pain)
- Allergies - especially those relevant to injury (i.e. allergy to latex, penicillin, etc.)
- Medications - what current or recent medications the patient is taking
- Past Medical History - any related history, or medical conditions that could complicate treatment (e.g. heart condition)
- Last meal - last food and/or drink
- Events - confirm how injury most likely occurred

2. Vitals

- LOC - Level of Consciousness description (e.g. - alert, aware, disoriented, confused, unresponsive) or AVPU (Alert, Voice, Pain, Unresponsive)
- Breathing Rate - Number of breaths per minute. Calculate by counting breaths for ten seconds and multiplying by six, or 15 seconds and multiplying by four.
- Pulse Rate - Number of heart beats per minute. Calculate by counting pulse for ten seconds and multiplying by six, or 15 seconds and multiplying by four. Pulse for an unconscious person is taken on the neck (carotid pulse) and on the wrist (radial pulse) for a conscious person.
- Skin Condition - Pale vs. normal, cool/cold vs. hot, clammy/sweaty vs. dry

3. Head-to-toe examination

- Perform a head-to-toe examination
- Look for medical alert bracelets or medallions.
- Compare one side of the patient against the other
- Look for pain or deformity

9.4 EMERGENCY ASSISTANCE

The following table list telephone numbers of police, fire, hospital, and other agencies whose services might be required, or from whom information might be needed. A hospital route map and directions to The Brooklyn Hospital Center, is included in Attachment D.

Name	Contact Numbers
The Brooklyn Hospital Center 121 DeKalb Avenue Brooklyn, New York 11201	Main Number: (718) 250-8000
NYCDEP	311
Fire Department	911
Police Department	911
Poison Information Center	1-800-222-1222
NYSDEC Emergency Hotline	1-800-457-7362
BNYDC	(718) 852-1441

10.0 SAFETY CONCERNS AND CONTINGENCY MEASURES

Normally, it is subsurface intrusive activities that pose the greatest potential threat to the safety of Site personnel. Subsurface intrusive activities at the Site will be conducted under the OSHA Safety and Health Standards (29 CFR Part 1926/191) relative to heavy equipment operation. The following sections describe specific safety measures to be implemented during specific activities.

10.1 BUDDY SYSTEM

The buddy system is an arrangement in which persons are paired, as for mutual safety or assistance. All field work will be completed by at least a two person team.

10.2 EXCAVATION

An active excavation exclusion sub-zone is established by opening the ground surface. A personal air monitor will be used to monitor in real time in this zone. Action levels will be considered to have been reached when a continuous, steady reading has been observed.

If at any time during subsurface intrusive activities, underground storage tanks (USTs), metal, or concrete are penetrated, excavation activities will cease immediately. After obtaining instrument readings, the project geologist/Site HSO will decide whether to continue or discontinue excavation.

10.3 DECONTAMINATION WATER

Investigation-derived waste (IDW) will be containerized in DOT-approved 55-gallon steel drums. All containers will be labeled with the contents and date, and will be stored at an on-Site staging area for later off-Site transport and disposal.

A waste management firm capable of handling both hazardous and nonhazardous wastes, such as National Response Corporation (NRC) of Great River, New York, will be employed to perform waste analysis and profiling, transport, and disposal for all IDW.

**TABLE 1
HAZARD CHARACTERISTICS OF SUSPECTED CONTAMINANTS**

Substance	Incompatibles/Reactive	Exposure Routes/Target Organs	Standards
Polycyclic aromatic hydrocarbons (PAHs)	Strong oxidizers	Inhalation, ingestion, skin and/or eye contact Respiratory system, skin bladder; lung, kidney, and skin cancers	NIOSH REL: TWA 0.1 mg/m ³ OSHA PEL: 0.2 mg/m ³ TWA
Polychlorinated biphenyls (PCBs)	Strong oxidizers	Inhalation, ingestion, skin and/or eye contact Eyes, skin, liver, reproductive system	NIOSH REL: TWA 0.001 mg/m ³ OSHA PEL: 0.05 mg/m ³ TWA (skin)
Arsenic	Strong oxidizers, bromine azide, hydrogen gas	Inhalation, skin absorption, ingestion, skin and/or eye contact Liver, kidneys, skin, lungs, lymphatic system; lung and lymphatic cancers	NIOSH: 15-min 0.002 mg/m ³ OSHA PEL: 0.010 mg/m ³ TWA
Copper	Oxidizers, alkalis, sodium azide, acetylene	Inhalation, ingestion, skin and/or eye contact Eyes, skin, respiratory system, liver, kidneys	NIOSH REL: TWA 1 mg/m ³ OSHA PEL: 1 mg/m ³ TWA

NIOSH = National Institute for Occupational Safety and Health

OSHA = Occupational Safety and Health Administration

REL = NIOSH recommended exposure limits, up to 10 hour work day exposure limit, 40 hours/week.

PEL = OSHA permissible exposure limit, 8 hour exposure limit, 40 hours/week, 29 CFR 1910.1000.

REL, PEL in mg/m³ = (PEL in ppm x molecular weight) / 24.45.

**TABLE 2
COMPONENTS OF PERSONAL PROTECTION LEVELS**

Level D Protection	Level C Protection
<ul style="list-style-type: none"> • Safety glasses with side shields (or goggles) 	<ul style="list-style-type: none"> • Hard Hat
<ul style="list-style-type: none"> • Hard Hat 	<ul style="list-style-type: none"> • Ploy-coated disposable (or standard disposable) overalls
<ul style="list-style-type: none"> • Face Shield (optional) 	<ul style="list-style-type: none"> • Inner gloves of tight-fitting latex or vinyl
<ul style="list-style-type: none"> • Ordinary coveralls 	<ul style="list-style-type: none"> • Outer gloves of neoprene or nitrile
<ul style="list-style-type: none"> • Ordinary work gloves 	<ul style="list-style-type: none"> • Steel-toe, steel-shank work shoes or boots (chemical resistant)
<ul style="list-style-type: none"> • Steel-toe, steel-shank works shoes or boots (chemical resistant) 	<ul style="list-style-type: none"> • Outer boots of neoprene or butyl rubber
<ul style="list-style-type: none"> • Ordinary work gloves 	<ul style="list-style-type: none"> • Disposable outer “booties” (optional work shoes or boots)
	<ul style="list-style-type: none"> • Full-face air-purifying respirator (to be worn)**
	<ul style="list-style-type: none"> • Taping of gloves and boots to disposable coveralls

** Respirator to be fitted with NIOSH/MSHA - approved high-efficiency filter (HEPA) combination respirator cartridges approved for organic vapors, particulates, gases, and fumes. Half-face respirator, face shield, and safety glasses with side shields (or goggles) may be substituted with approval of the Site HSO.

**TABLE 3
ANTICIPATED LEVELS OF PERSONAL PROTECTION FOR PLANNED ACTIVITIES**

Task	PPE Level	Site-Specific Requirements	Respirator
Mobilization/Demobilization			
Reconnaissance	D	Safety glasses, steel toe/shank safety boot, reflective vest, leather work gloves, hearing protection as needed	D - None
Mobilization/Demobilization of Equipment and Supplies	D	Hard hat, safety glasses, steel toe/shank safety boot, reflective vest, leather work gloves, hearing protection as needed	D - None
Establishment of Site Security, Work Zones, and Staging Area	D	Hard hat, safety glasses, steel toe/shank safety boot, reflective vest, leather work gloves, hearing protection as needed	D - None
Groundwater/Soil Sampling			
Soil Borings, Excavation, Digging Test Pits, Backfilling, Grading Observation, Sampling	D	Hard hat, safety glasses, steel toe/shank safety boot with overboot as needed, reflective vest, leather work gloves as needed, nitrile gloves, hearing protection as needed, Tyvek as needed	Level D – None Level C – If action levels exceeded

TABLE 4
ACTION LEVELS DURING INTRUSIVE ACTIVITIES

Particulates ($\mu\text{g}/\text{m}^3$)	Responses
100 $\mu\text{g}/\text{m}^3$ or more above Background (15 minute average)	Implement dust suppression measures Continued monitoring every 15 minutes
150 $\mu\text{g}/\text{m}^3$ Sustained reading	If action level of 150 $\mu\text{g}/\text{m}^3$ is continuously exceeded, work stoppage to implement additional dust suppression measures Continued monitoring every 15 minutes

ATTACHMENTS

ATTACHMENT A

Health and Safety Field Meeting Forms

HEALTH AND SAFETY FIELD MEETING FORM

Date: _____

Time: _____

Project Name: _____

Location: _____

Meeting Conducted by: _____

Topics Discussed:

Physical Hazards: _____

Chemical Hazards: _____

Personal Protection _____

Decontamination: _____

Special Site Considerations: _____

Emergency Information: _____

Hospital Location: _____

Attendees

Name (printed)	Company	Signature

Meeting Conducted by: _____

Signature

ATTACHMENT B

NYSDOH Generic Community Air Monitoring Plan

Appendix 1A

New York State Department of Health Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical-specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed $150 \text{ mcg}/\text{m}^3$ above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than $150 \text{ mcg}/\text{m}^3$ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within $150 \text{ mcg}/\text{m}^3$ of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

Appendix 1B Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.
2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.
3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:
 - (a) Objects to be measured: Dust, mists or aerosols;
 - (b) Measurement Ranges: 0.001 to 400 mg/m³ (1 to 400,000 :ug/m³);
 - (c) Precision (2-sigma) at constant temperature: +/- 10 :g/m³ for one second averaging; and +/- 1.5 g/m³ for sixty second averaging;
 - (d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
 - (e) Resolution: 0.1% of reading or 1g/m³, whichever is larger;
 - (f) Particle Size Range of Maximum Response: 0.1-10;
 - (g) Total Number of Data Points in Memory: 10,000;
 - (h) Logged Data: Each data point with average concentration, time/date and data point number
 - (i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
 - (j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
 - (k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
 - (l) Operating Temperature: -10 to 50° C (14 to 122° F);
 - (m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.
4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.
5. The action level will be established at 150 ug/m³ (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m³, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m³ above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m³ continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM₁₀ at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

- (a) Applying water on haul roads;
- (b) Wetting equipment and excavation faces;
- (c) Spraying water on buckets during excavation and dumping;
- (d) Hauling materials in properly tarped or watertight containers;
- (e) Restricting vehicle speeds to 10 mph;
- (f) Covering excavated areas and material after excavation activity ceases; and
- (g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m³ action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

**TECHNICAL AND ADMINISTRATIVE
GUIDANCE MEMORANDUM #4031**

**FUGITIVE DUST SUPPRESSION AND PARTICULATE MONITORING PROGRAM
AT INACTIVE HAZARDOUS WASTE SITES**

TO: Regional Hazardous Waste Remediation Engrs., Bur. Directors & Section Chiefs

FROM: Michael J. O'Toole, Jr., Director, Division of Hazardous Waste Remediation

SUBJECT: DIVISION TECHNICAL AND ADMINISTRATIVE GUIDANCE MEMORANDUM -- FUGITIVE DUST SUPPRESSION AND PARTICULATE MONITORING PROGRAM AT INACTIVE HAZARDOUS WASTE SITES

DATE: Oct 27, 1989

Michael J. O'Toole, Jr. (signed)

1. Introduction

Fugitive dust suppression, particulate monitoring, and subsequent action levels for such must be used and applied consistently during remedial activities at hazardous waste sites. This guidance provides a basis for developing and implementing a fugitive dust suppression and particulate monitoring program as an element of a hazardous waste site's health and safety program.

2. Background

Fugitive dust is particulate matter--a generic term for a broad class of chemically and physically diverse substances that exist as discrete particles, liquid droplets or solids, over a wide range of sizes--which becomes airborne and contributes to air quality as a nuisance and threat to human health and the environment.

On July 1, 1987, the United States Environmental Protection Agency (USEPA) revised the ambient air quality standard for particulates so as to reflect direct impact on human health by setting the standard for particulate matter less than ten microns in diameter (PM₁₀); this involves fugitive dust whether contaminated or not. Based upon an examination of air quality composition, respiratory tract deposition, and health effects, PM₁₀ is considered conservative for the primary standard--that requisite to protect public health with an adequate margin of safety. The primary standards are 150 ug/m³ over a 24-hour averaging time and 50 ug/m³ over an annual averaging time. Both of these standards are to be averaged arithmetically.

There exists real-time monitoring equipment available to measure PM_{10} and capable of integrating over a period of six seconds to ten hours. Combined with an adequate fugitive dust suppression program, such equipment will aid in preventing the off-site migration of contaminated soil. It will also protect both on-site personnel from exposure to high levels of dust and the public around the site from any exposure to any dust. While specifically intended for the protection of on-site personnel as well as the public, this program is not meant to replace long-term monitoring which may be required given the contaminants inherent to the site and its air quality.

3. **Guidance**

A program for suppressing fugitive dust and monitoring particulate matter at hazardous waste sites can be developed without placing an undue burden on remedial activities while still being protective of health and environment. Since the responsibility for implementing this program ultimately will fall on the party performing the work, these procedures must be incorporated into appropriate work plans. The following fugitive dust suppression and particulate monitoring program will be employed at hazardous waste sites during construction and other activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.
2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Such activities shall also include the excavation, grading, or placement of clean fill, and control measures therefore should be considered.
3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM_{10}) with the following minimum performance standards:

Object to be measured: Dust, Mists, Aerosols

Size range: <0.1 to 10 microns

Sensitivity: 0.001 mg/m^3

Range: $0.001 \text{ to } 10 \text{ mg/m}^3$

Overall Accuracy: $\pm 10\%$ as compared to gravimetric analysis of stearic acid or reference dust

Operating Conditions:

Temperature: 0 to 40°C

Humidity: 10 to 99% Relative Humidity

Power: Battery operated with a minimum capacity of eight hours continuous operation

Automatic alarms are suggested.

Particulate levels will be monitored immediately downwind at the working site and integrated over a period not to exceed 15 minutes. Consequently, instrumentation

shall require necessary averaging hardware to accomplish this task; the P-5 Digital Dust Indicator as manufactured by MDA Scientific, Inc. or similar is appropriate.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the entity operating the equipment to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.
5. The action level will be established at 150 ug/m^3 over the integrated period not to exceed 15 minutes. While conservative, this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m^3 , the upwind background level must be measured immediately using the same portable monitor. If the working site particulate measurement is greater than 100 ug/m^3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see Paragraph 7). Should the action level of 150 ug/m^3 be exceeded, the Division of Air Resources must be notified in writing within five working days; the notification shall include a description of the control measures implemented to prevent further exceedences.
6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM_{10} at or above the action level. Since this situation has the potential to migrate contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.
7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:
 1. Applying water on haul roads.
 2. Wetting equipment and excavation faces.
 3. Spraying water on buckets during excavation and dumping.
 4. Hauling materials in properly tarped or watertight containers.
 5. Restricting vehicle speeds to 10 mph.
 6. Covering excavated areas and material after excavation activity ceases.
 7. Reducing the excavation size and/or number of excavations.

Experience has shown that utilizing the above-mentioned dust suppression techniques, within reason as not to create excess water which would result in

unacceptable wet conditions, the chance of exceeding the 150 ug/m³ action level at hazardous waste site remediations is remote. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. If the dust suppression techniques being utilized at the site do not lower particulates to an acceptable level (that is, below 150 ug/m³ and no visible dust), work must be suspended until appropriate corrective measures are approved to remedy the situation. Also, the evaluation of weather conditions will be necessary for proper fugitive dust control--when extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended.

There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require appropriate toxics monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

ATTACHMENT C
CAMP Monitoring Forms

FIELD INSTRUMENT CALIBRATION



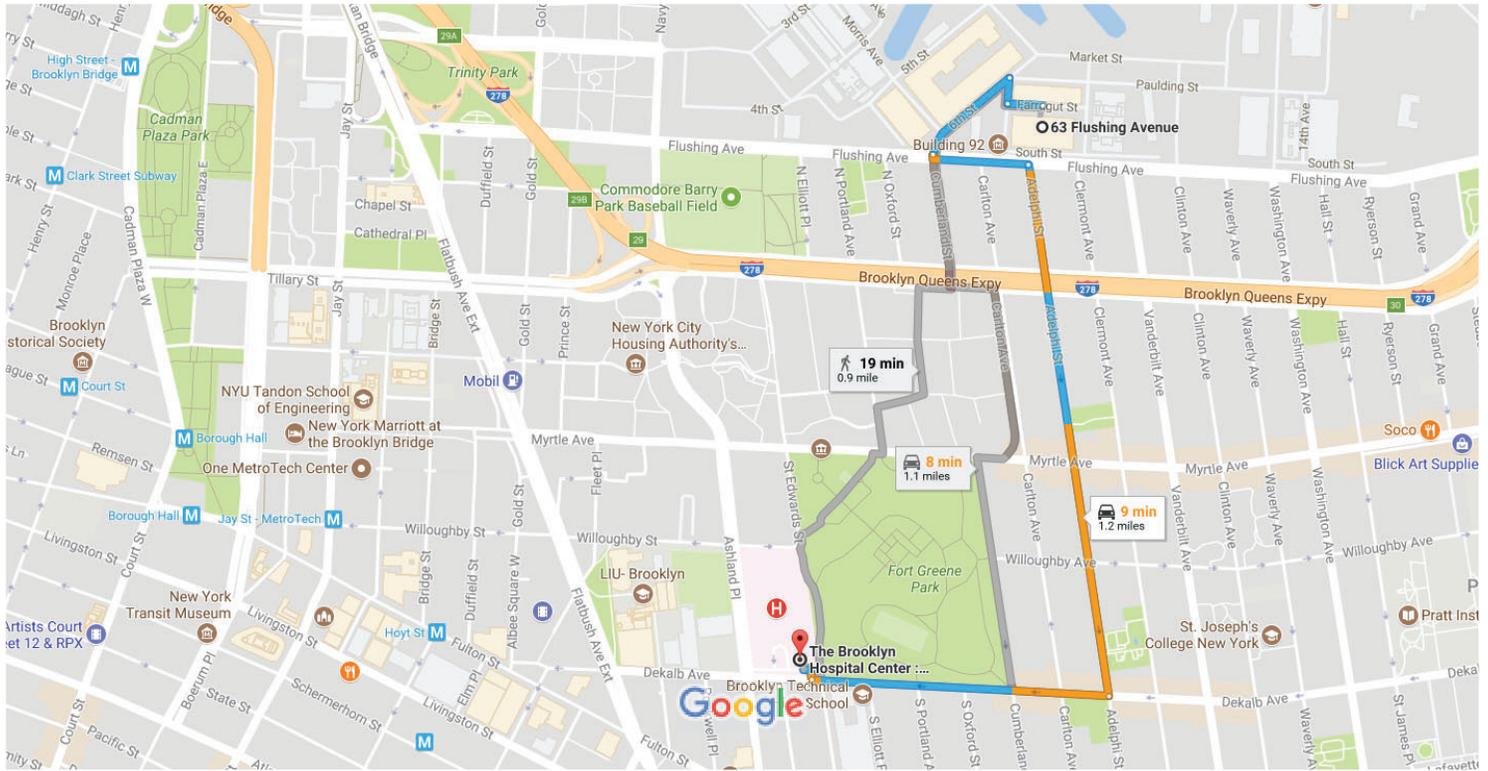
Page 1 of

Project Name:	Date:
Project Address:	
Site Inspector:	

Calibration #1 Instrument Make and Model No: _____ Time: _____ Calibration standard: _____ Instrument reading: _____
Calibration #2 Instrument Make and Model No: _____ Time: _____ Calibration standard: _____ Instrument reading: _____
Calibration #3 Instrument Make and Model No: _____ Time: _____ Calibration standard: _____ Instrument reading: _____
Calibration #4 Instrument Make and Model No: _____ Time: _____ Calibration standard: _____ Instrument reading: _____
Calibration #5 Instrument Make and Model No: _____ Time: _____ Calibration standard: _____ Instrument reading: _____
Calibration #6 Instrument Make and Model No: _____ Time: _____ Calibration standard: _____ Instrument reading: _____

ATTACHMENT D

Hospital Route Map/Directions



Map data ©2017 Google 500 ft

63 Flushing Ave

Brooklyn, NY 11205

- ↑ 1. Head west on Farragut St toward 7th Ave
⚠ Restricted usage road

203 ft
- ↘ 2. Turn right onto 7th Ave
⚠ Restricted usage road

148 ft
- ↙ 3. Turn left onto 6th St
⚠ Restricted usage road

0.1 mi
- ↙ 4. Turn left onto Flushing Ave

0.1 mi
- ↘ 5. Turn right onto Adelphi St

0.6 mi
- ↘ 6. Turn right onto Dekalb Ave

0.3 mi
- ↘ 7. Turn right
i Destination will be on the right

95 ft

ATTACHMENT B

NYSDOH Generic Community Air Monitoring Plan

Appendix 1A

New York State Department of Health Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical-specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed $150 \text{ mcg}/\text{m}^3$ above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than $150 \text{ mcg}/\text{m}^3$ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within $150 \text{ mcg}/\text{m}^3$ of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

Appendix 1B Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.
2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.
3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:
 - (a) Objects to be measured: Dust, mists or aerosols;
 - (b) Measurement Ranges: 0.001 to 400 mg/m³ (1 to 400,000 :ug/m³);
 - (c) Precision (2-sigma) at constant temperature: +/- 10 :g/m³ for one second averaging; and +/- 1.5 g/m³ for sixty second averaging;
 - (d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
 - (e) Resolution: 0.1% of reading or 1g/m³, whichever is larger;
 - (f) Particle Size Range of Maximum Response: 0.1-10;
 - (g) Total Number of Data Points in Memory: 10,000;
 - (h) Logged Data: Each data point with average concentration, time/date and data point number
 - (i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
 - (j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
 - (k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
 - (l) Operating Temperature: -10 to 50° C (14 to 122° F);
 - (m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.
4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.
5. The action level will be established at 150 ug/m³ (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m³, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m³ above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m³ continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM₁₀ at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

- (a) Applying water on haul roads;
- (b) Wetting equipment and excavation faces;
- (c) Spraying water on buckets during excavation and dumping;
- (d) Hauling materials in properly tarped or watertight containers;
- (e) Restricting vehicle speeds to 10 mph;
- (f) Covering excavated areas and material after excavation activity ceases; and
- (g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m³ action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

**TECHNICAL AND ADMINISTRATIVE
GUIDANCE MEMORANDUM #4031**

**FUGITIVE DUST SUPPRESSION AND PARTICULATE MONITORING PROGRAM
AT INACTIVE HAZARDOUS WASTE SITES**

TO: Regional Hazardous Waste Remediation Engrs., Bur. Directors & Section Chiefs

FROM: Michael J. O'Toole, Jr., Director, Division of Hazardous Waste Remediation

SUBJECT: DIVISION TECHNICAL AND ADMINISTRATIVE GUIDANCE MEMORANDUM -- FUGITIVE DUST SUPPRESSION AND PARTICULATE MONITORING PROGRAM AT INACTIVE HAZARDOUS WASTE SITES

DATE: Oct 27, 1989

Michael J. O'Toole, Jr. (signed)

1. Introduction

Fugitive dust suppression, particulate monitoring, and subsequent action levels for such must be used and applied consistently during remedial activities at hazardous waste sites. This guidance provides a basis for developing and implementing a fugitive dust suppression and particulate monitoring program as an element of a hazardous waste site's health and safety program.

2. Background

Fugitive dust is particulate matter--a generic term for a broad class of chemically and physically diverse substances that exist as discrete particles, liquid droplets or solids, over a wide range of sizes--which becomes airborne and contributes to air quality as a nuisance and threat to human health and the environment.

On July 1, 1987, the United States Environmental Protection Agency (USEPA) revised the ambient air quality standard for particulates so as to reflect direct impact on human health by setting the standard for particulate matter less than ten microns in diameter (PM₁₀); this involves fugitive dust whether contaminated or not. Based upon an examination of air quality composition, respiratory tract deposition, and health effects, PM₁₀ is considered conservative for the primary standard--that requisite to protect public health with an adequate margin of safety. The primary standards are 150 ug/m³ over a 24-hour averaging time and 50 ug/m³ over an annual averaging time. Both of these standards are to be averaged arithmetically.

There exists real-time monitoring equipment available to measure PM_{10} and capable of integrating over a period of six seconds to ten hours. Combined with an adequate fugitive dust suppression program, such equipment will aid in preventing the off-site migration of contaminated soil. It will also protect both on-site personnel from exposure to high levels of dust and the public around the site from any exposure to any dust. While specifically intended for the protection of on-site personnel as well as the public, this program is not meant to replace long-term monitoring which may be required given the contaminants inherent to the site and its air quality.

3. **Guidance**

A program for suppressing fugitive dust and monitoring particulate matter at hazardous waste sites can be developed without placing an undue burden on remedial activities while still being protective of health and environment. Since the responsibility for implementing this program ultimately will fall on the party performing the work, these procedures must be incorporated into appropriate work plans. The following fugitive dust suppression and particulate monitoring program will be employed at hazardous waste sites during construction and other activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.
2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Such activities shall also include the excavation, grading, or placement of clean fill, and control measures therefore should be considered.
3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM_{10}) with the following minimum performance standards:

Object to be measured: Dust, Mists, Aerosols

Size range: <0.1 to 10 microns

Sensitivity: 0.001 mg/m^3

Range: $0.001 \text{ to } 10 \text{ mg/m}^3$

Overall Accuracy: $\pm 10\%$ as compared to gravimetric analysis of stearic acid or reference dust

Operating Conditions:

Temperature: 0 to 40°C

Humidity: 10 to 99% Relative Humidity

Power: Battery operated with a minimum capacity of eight hours continuous operation

Automatic alarms are suggested.

Particulate levels will be monitored immediately downwind at the working site and integrated over a period not to exceed 15 minutes. Consequently, instrumentation

shall require necessary averaging hardware to accomplish this task; the P-5 Digital Dust Indicator as manufactured by MDA Scientific, Inc. or similar is appropriate.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the entity operating the equipment to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.
5. The action level will be established at 150 ug/m^3 over the integrated period not to exceed 15 minutes. While conservative, this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m^3 , the upwind background level must be measured immediately using the same portable monitor. If the working site particulate measurement is greater than 100 ug/m^3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see Paragraph 7). Should the action level of 150 ug/m^3 be exceeded, the Division of Air Resources must be notified in writing within five working days; the notification shall include a description of the control measures implemented to prevent further exceedences.
6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM_{10} at or above the action level. Since this situation has the potential to migrate contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.
7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:
 1. Applying water on haul roads.
 2. Wetting equipment and excavation faces.
 3. Spraying water on buckets during excavation and dumping.
 4. Hauling materials in properly tarped or watertight containers.
 5. Restricting vehicle speeds to 10 mph.
 6. Covering excavated areas and material after excavation activity ceases.
 7. Reducing the excavation size and/or number of excavations.

Experience has shown that utilizing the above-mentioned dust suppression techniques, within reason as not to create excess water which would result in

unacceptable wet conditions, the chance of exceeding the 150 ug/m³ action level at hazardous waste site remediations is remote. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. If the dust suppression techniques being utilized at the site do not lower particulates to an acceptable level (that is, below 150 ug/m³ and no visible dust), work must be suspended until appropriate corrective measures are approved to remedy the situation. Also, the evaluation of weather conditions will be necessary for proper fugitive dust control--when extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended.

There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require appropriate toxics monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.



Brooklyn Navy Yard
Development Corporation
BrooklynNavyYard.org

Building 77
141 Flushing Ave, Suite 801
Brooklyn, NY 11205

EXHIBIT K

SITE MANAGEMENT PLAN (SMP)

This project is located within the Voluntary Cleanup Agreement (VCA) area of the Brooklyn Navy Yard (BNY) site. Therefore, the Bidder must comply with all BNY Site Management Plan (SMP) requirements.

A copy of the BNY Site Management Plan (SMP) can be accessed by using the link below:

[BNY SMP Compliance Documents](https://brooklynnavyyard.sharepoint.com/:f:/t/OpsProjects/EnHEp-zqpHZFtfMMJKQ_nC4BgQl1Mb2G9QFPf7vgUq6CQg?e=kZBgSy)

https://brooklynnavyyard.sharepoint.com/:f:/t/OpsProjects/EnHEp-zqpHZFtfMMJKQ_nC4BgQl1Mb2G9QFPf7vgUq6CQg?e=kZBgSy



Brooklyn Navy Yard
Development Corporation
BrooklynNavyYard.org

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141 Flushing Ave, Suite 801
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EXHIBIT L
FEMA RIDER

[To attach]

**UNIFORM FEDERAL CONTRACT PROVISIONS RIDER
FOR FEDERALLY FUNDED PROCUREMENT CONTRACTS**
(Version 01.20.2021)

[Instructions to Agencies: This Uniform Federal Contract Provisions Rider for Federally Funded Procurement Contracts (“Rider”) must be attached to all federally funded procurement contracts (of any dollar amount) that are subject to 2 CFR Part 200 (Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards). This Rider does not apply to subrecipient or subaward agreements. Procurement contracts funded by HUD’s CDBG Program, CDBG-DR Program, or by FEMA must also include the program-specific rider.]

A. *Definitions.* As used in this Rider:

- (1) “Awarding Entity” means the entity awarding the Contract. The Awarding Entity may be the City or a contractor at any tier.
- (2) “City” means the City of New York.
- (3) “Commissioner” means the head of the City agency entering into this Contract.
- (4) “Construction” means the building, rehabilitation, alteration, conversion, extension, demolition, painting or repair of any improvement to real property.
- (5) “Contract” refers to the contract or the agreement between the Awarding Entity and the Contractor.
- (6) “Contractor” means the entity performing the services pursuant to a Contract.
- (7) “Federal Agency” means the U.S. agency or agencies funding this Contract in whole or in part.
- (8) “Government” means the U.S. government.
- (9) “Rider” means this Uniform Federal Contract Provisions Rider.

B. *Termination and Remedies for Breach of Contract.* The following provisions concerning remedies for breach of contract and termination apply to Contracts between the City and the City’s Contractor.

- (1) **Remedies for Breach of Contract.** If the Contractor violates or breaches the Contract, the City may avail itself of any or all of the remedies provided for elsewhere in this Contract. If there are no remedies provided for elsewhere in this Contract, the City may avail itself of any or all of the following remedies.

After declaring the Contractor in default pursuant to the procedures in paragraph (a) of subdivision (2) of this section (B) below, the City may (i) withhold payment for unsatisfactory services, (ii) suspend or terminate the Contract in whole or in part; and/or (iii) have the services under this Contract completed by such means and in such manner, by contract procured with or without competition, or otherwise, as the City may deem advisable in accordance with all applicable Contract provisions and law. After

completion of the services under this Contract, the City shall certify the expense incurred in such completion, which shall include the cost of procuring that contract. Should the expense of such completion, as certified by the City, exceed the total sum which would have been payable under the Contract if it had been completed by the Contractor, any excess shall be promptly paid by the Contractor upon demand by the City. The excess expense of such completion, including any and all related and incidental costs, as so certified by the City may be charged against and deducted out of monies earned by the Contractor.

(2) **Termination.** The City shall have the right to terminate the Contract in whole or in part for cause, for convenience, due to force majeure, or due to reductions in federal funding. If the Contract does not include termination provisions elsewhere, the following termination provisions apply:

a. **Termination for Cause.** The City shall have the right to terminate the Contract, in whole or in part, for cause upon a determination that the Contractor is in default of the Contract. Unless a shorter time is determined by the City to be necessary, the City shall effect termination according to the following procedure:

i. *Notice to Cure.* The City shall give written notice of the conditions of default signed by the Commissioner, setting forth the ground or grounds upon which such default is declared (“Notice to Cure”). The Contractor shall have ten (10) days from receipt of the Notice to Cure or any longer period that is set forth in the Notice to Cure to cure the default. The Commissioner may temporarily suspend services under the Contract pending the outcome of the default proceedings pursuant to this section.

ii. *Opportunity to be Heard.* If the conditions set forth in the Notice to Cure are not cured within the period set forth in the Notice to Cure, the Commissioner may declare the Contractor in default. Before the Commissioner may exercise his or her right to declare the Contractor in default, the Contractor must be given an opportunity to be heard upon not less than five (5) business days’ notice. The Commissioner may, in his or her discretion, provide for such opportunity to be in writing or in person. Such opportunity to be heard shall not occur prior to the end of the cure period but notice of such opportunity to be heard may be given prior to the end of the cure period and may be given contemporaneously with the Notice to Cure.

iii. *Notice of Termination.* After an opportunity to be heard, the Commissioner may terminate the Contract, in whole or in part, upon finding the Contractor in default. The Commissioner shall give the Contractor written notice of such termination (“Notice of Termination”), specifying

the applicable provision(s) under which the Contract is terminated and the effective date of termination. If no date is specified in the Notice of Termination, the termination shall be effective either 10 calendar days from the date the notice is personally delivered or 15 calendar days from the date Notice of Termination is sent by another method. The Notice of Termination shall be personally delivered, sent by certified mail return receipt requested, or sent by fax and deposited in a post office box regularly maintained by the United States Postal Service in a postage pre-paid envelope.

iv. *Grounds for Default.* The City shall have the right to declare the Contractor in default:

1. Upon a breach by the Contractor of a material term or condition of this Contract, including unsatisfactory performance of the services;

2. Upon insolvency or the commencement of any proceeding by or against the Contractor, either voluntarily or involuntarily, under the Bankruptcy Code or relating to the insolvency, receivership, liquidation, or composition of the Contractor for the benefit of creditors;

3. If the Contractor refuses or fails to proceed with the services under the Contract when and as directed by the Commissioner;

4. If the Contractor or any of its officers, directors, partners, five percent (5%) or greater shareholders, principals, or other employee or person substantially involved in its activities are indicted or convicted after execution of the Contract under any state or federal law of any of the following:

a. a criminal offense incident to obtaining or attempting to obtain or performing a public or private contract;

b. fraud, embezzlement, theft, bribery, forgery, falsification, or destruction of records, or receiving stolen property;

c. a criminal violation of any state or federal antitrust law;

d. violation of the Racketeer Influence and Corrupt Organization Act, 18 U.S.C. § 1961 et seq., or the Mail Fraud Act, 18 U.S.C. § 1341 et seq., for acts in connection with the submission of bids or proposals for a public or private contract;

e. conspiracy to commit any act or omission that would constitute grounds for conviction or liability under any statute described in subparagraph (d) above; or

f. an offense indicating a lack of business integrity that seriously and directly affects responsibility as a City vendor.

5. If the Contractor or any of its officers, directors, partners, five percent (5%) or greater shareholders, principals, or other employee or person substantially involved in its activities are subject to a judgment of civil liability under any state or federal antitrust law for acts or omissions in connection with the submission of bids or proposals for a public or private contract; or

6. If the Contractor or any of its officers, directors, partners, five percent (5%) or greater shareholders, principals, or other employee or person substantially involved in its activities makes or causes to be made any false, deceptive, or fraudulent material statement, or fail to make a required material statement in any bid, proposal, or application for City or other government work.

v. *Basis of Settlement.* The City shall not incur or pay any further obligation pursuant to this Contract beyond the termination date set by the City in its Notice of Termination. The City shall pay for satisfactory services provided in accordance with this Contract prior to the termination date. In addition, any obligation necessarily incurred by the Contractor on account of this Contract prior to receipt of notice of termination and falling due after the termination date shall be paid by the City in accordance with the terms of this Contract. In no event shall such obligation be construed as including any lease or other occupancy agreement, oral or written, entered into between the Contractor and its landlord.

b. **Termination for Convenience.** The City shall have the right to terminate the Contract for convenience, by providing written notice (“Notice of Termination”) according to the following procedure. The Notice of Termination shall specify the applicable provision(s) under which the Contract is terminated and the effective date of termination, which shall be not less than 10 calendar days from the date the notice is personally delivered or 15 days from the date the Notice of Termination is sent by another method. The Notice of Termination shall be personally delivered, sent by certified mail return receipt requested, or sent by fax and deposited in a post office box regularly maintained by the United States Postal Service in a postage pre-paid envelope. The basis of

settlement shall be as provided for in subparagraph (v) of paragraph (a) of subdivision (2) of this section (B), above.

c. Termination due to Force Majeure

- i. For purposes of this Contract, a force majeure event is an act or event beyond the control and without any fault or negligence of the Contractor (“Force Majeure Event”). Force Majeure Events may include, but are not limited to, fire, flood, earthquake, storm or other natural disaster, civil commotion, war, terrorism, riot, and labor disputes not brought about by any act or omission of the Contractor.
- ii. In the event the Contractor cannot comply with the terms of the Contract (including any failure by the Contractor to make progress in the performance of the services) because of a Force Majeure Event, then the Contractor may ask the Commissioner to excuse the nonperformance and/or terminate the Contract. If the Commissioner, in his or her reasonable discretion, determines that the Contractor cannot comply with the terms of the Contract because of a Force Majeure Event, then the Commissioner shall excuse the nonperformance and may terminate the Contract. Such a termination shall be deemed to be without cause.
- iii. If the City terminates the Contract due to a Force Majeure Event, the basis of settlement shall be as provided for in subparagraph (v) of paragraph (a) of subdivision (2) of this section (B), above.

d. Termination due to Reductions in Federal Funding

- i. This Contract is funded in whole or in part by funds secured from the Federal government. Should the Federal government reduce or discontinue such funds, the City shall have, in its sole discretion, the right to terminate this Contract in whole or in part, or to reduce the funding and/or level of services of this Contract caused by such action by the Federal government, including, in the case of the reduction option, but not limited to, the reduction or elimination of programs, services or service components; the reduction or elimination of contract-reimbursable staff or staff-hours, and corresponding reductions in the budget of this Contract and in the total amount payable under this Contract. Any reduction in funds pursuant to this paragraph shall be accompanied by an appropriate reduction in the services performed under this Contract.

- ii. In the case of the reduction option referred to in subparagraph (i), above, any such reduction shall be effective as of the date set forth in a written notice thereof to the Contractor, which shall be not less than 30 calendar days from the date of such notice. Prior to sending such notice of reduction, the City shall advise the Contractor that such option is being exercised and afford the Contractor an opportunity to make within seven calendar days any suggestion(s) it may have as to which program(s), service(s), service component(s), staff or staff-hours might be reduced or eliminated, provided, however, that the City shall not be bound to utilize any of the Contractor's suggestions and that the City shall have sole discretion as to how to effectuate the reductions.
- iii. If the City reduces funding pursuant to this paragraph (d), the basis of settlement shall be as provided for in subparagraph (v) of paragraph (a) of subdivision (2) of this section (B), above.

C. Standard Provisions. The Contractor shall comply with, include in its subcontracts, and cause its subcontractors to comply with the following provisions, as applicable:

- (1) *Reporting.* Contractor shall be required to produce and deliver such reports relating to the services performed under the Contract as may be required by the Awarding Entity, City or any other State or Federal governmental agency with jurisdiction.
- (2) *Non-Discrimination.* Contractor shall not violate any Federal, State, or City law prohibiting discrimination concerning employment, the provision of services, and, if applicable, housing, funded by this Contract.
- (3) *Environmental Protection.* If the Contract is in excess of \$150,000, the Contractor shall comply with all applicable standards, orders, or regulations issued under the Clean Air Act (42 U.S.C. § 7401-7671q), Federal Water Pollution Control Act as amended (33 U.S.C. §§ 1251-1387), Section 508 of the Clean Water Act (33 U.S.C. § 1368), Executive Order 11738, and Environmental Protection Agency regulations (provisions of 40 CFR Part 50 and 2 CFR Part 1532 related to the Clean Air Act and Clean Water Act). Violations must be reported to the Federal Agency and the Regional Office of the Environmental Protection Agency (EPA). The Contractor shall include this provision in all subcontracts.
- (4) *Energy Efficiency.* The Contractor shall comply with mandatory standards and policies relating to energy efficiency that are contained in the New York State energy conservation plan issued in compliance with the Energy Policy Conservation Act (Pub. L. 94-163).
- (5) *Debarment.* The Contractor certifies that neither it nor its principals or affiliates are currently in a state of debarment, suspension, exclusion, disqualification, or other ineligible status as a result of prior performance, failure, fraud, or violation of City or New York State laws. The Contractor further certifies that neither it nor its principals or affiliates are debarred, suspended, excluded, disqualified, or otherwise ineligible for participation in Federal assistance programs. The City reserves the right to terminate this

Contract if knowledge of debarment, suspension, exclusion, disqualification or other ineligibility has been withheld by the Contractor.

- (6) *Lobbying*. The Contractor certifies, to the best of its knowledge and belief, that:
- (a) No Federal appropriated funds have been paid or will be paid, by or on behalf of it, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement;
 - (b) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, it will complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," (which is available on the HUD website or here: <https://www.hudexchange.info/resources/documents/HUD-Form-Sflll.pdf>) in accordance with its instructions; and
 - (c) It will require that the language of this Section (C)(6) be included in the award documents for all subcontracts at all tiers.
 - (d) This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. § 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.
- (7) *Solid Waste Disposal Act*. Pursuant to 2 CFR § 200.323, Contractor must comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR Part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds \$ 10,000 or the value of the quantity acquired during the preceding fiscal year exceeded \$ 10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.
- (8) *Prohibition on certain telecommunications and video surveillance services or equipment*.
- (a) The Contractor is prohibited from obligating or expending loan or grant funds to:
 - (1) Procure or obtain;
 - (2) Extend or renew a contract to procure or obtain; or
 - (3) Enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that uses covered

telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Public Law 115–232, section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).

(i) For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).

(ii) Telecommunications or video surveillance services provided by such entities or using such equipment.

(iii) Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

- (b) In implementing the prohibition under Public Law 115–232, section 889, subsection (f), paragraph (1), heads of executive agencies administering loan, grant, or subsidy programs shall prioritize available funding and technical support to assist affected businesses, institutions and organizations as is reasonably necessary for those affected entities to transition from covered communications equipment and services, to procure replacement equipment and services, and to ensure that communications service to users and customers is sustained.
- (c) The Contractor’s attention is directed to Public Law 115–232, section 889 for additional information.
- (d) The Contractor’s attention is directed to § 200.471.

(9) Domestic preferences for procurements.

- (a) As appropriate and to the extent consistent with law, the Contractor should, to the greatest extent practicable under a Federal award, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subawards including all contracts and purchase orders for work or products under this award.
- (b) For purposes of this section:
 - (1) “Produced in the United States” means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.

(2) “Manufactured products” means items and construction materials composed in whole or in part of nonferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

- (10) *Documentation of Costs.* All costs shall be supported by properly executed payrolls, time records, invoices, or vouchers, or other official documentation evidencing in proper detail the nature and propriety of the charges. All checks, payrolls, invoices, contracts, vouchers, orders or other accounting documents, pertaining in whole or in part to the Agreement, shall be clearly identified and regularly accessible.
- (11) *Records Retention.* The Contractor shall retain all books, documents, papers, and records relating to the services performed under the Contract in accordance with 2 C.F.R. §200.334.
- (12) *Records Access.* The Contractor shall grant access to the City, State or any other pass-through entity, the Federal Agency, Inspectors General, and/or the Comptroller General of the United States, or any of their duly authorized representatives, to any books, documents, papers, and/or records of the Contractor that are pertinent to the Contract for the purpose of making audits, examinations, excerpts, and transcripts. The right also includes timely and reasonable access to the Contractor’s personnel for the purpose of interview and discussion related to such documents. The rights of access in this section are not limited to the required retention period but last as long as the records are retained.
- (13) *Small Firms, M/WBE Firms, and Labor Surplus Area Firms.* Contractor shall take the following affirmative steps in the letting of subcontracts, if subcontracts are to be let, in order to ensure that minority firms, women’s business enterprises, and labor surplus area firms are used when possible:
- a. Placing qualified small and minority businesses and women’s business enterprises on solicitation lists;
 - b. Assuring that small and minority businesses, and women’s business enterprises are solicited whenever they are potential sources;
 - c. Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women’s business enterprises;
 - d. Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women’s business enterprises; and
 - e. Using the services and assistance of the Small Business Administration, and the Minority Business Development Agency of the Department of Commerce.

(14) *Intangible Property.*

- a. Pursuant to 2 CFR § 200.315, the Government reserves a royalty-free, non-exclusive, and irrevocable right to obtain, reproduce, publish, or otherwise use, and to authorize others to use, for Government purposes: (a) the copyright in any work developed under the Contract or subcontract; and (b) any rights of copyright to which a Contractor purchases ownership with grant support.
- b. Any reports, documents, data, photographs, deliverables, and/or other materials produced pursuant to the Contract (“Copyrightable Materials”), and any and all drafts and/or other preliminary materials in any format related to such items produced pursuant to the contract, shall upon their creation become the exclusive property of the City. The Copyrightable Materials shall be considered “work-made-for-hire” within the meaning and purview of Section 101 of the United States Copyright Act, 17 U.S.C. § 101, and the City shall be the copyright owner thereof and of all aspects, elements and components thereof in which copyright protection might exist. To the extent that the Copyrightable Materials do not qualify as “work-made-for-hire,” the Contractor hereby irrevocably transfers, assigns and conveys exclusive copyright ownership in and to the Copyrightable Materials to the City, free and clear of any liens, claims, or other encumbrances. The Contractor shall retain no copyright or intellectual property interest in the Copyrightable Materials. The Copyrightable Materials shall be used by the Contractor for no purpose other than in the performance of this Contract without the prior written permission of the City. The City may grant the Contractor a license to use the Copyrightable Materials on such terms as determined by the City and set forth in the license.
- c. The Contractor acknowledges that the City may, in its sole discretion, register copyright in the Copyrightable Materials with the United States Copyright Office or any other government agency authorized to grant copyright registrations. The Contractor shall fully cooperate in this effort, and agrees to provide any and all documentation necessary to accomplish this.
- d. The Contractor represents and warrants that the Copyrightable Materials: (i) are wholly original material not published elsewhere (except for material that is in the public domain); (ii) do not violate any copyright law; (iii) do not constitute defamation or invasion of the right of privacy or publicity; and (iv) are not an infringement, of any kind, of the rights of any third party. To the extent that the Copyrightable Materials incorporate any non-original material, the Contractor has obtained all necessary permissions and clearances, in writing, for the use of such non-original material under this Contract, copies

of which shall be provided to the City upon execution of this Contract.

- e. The Contractor shall promptly and fully report to the City any discovery or invention arising out of or developed in the course of performance of this Contract and the Contractor shall promptly and fully report to the Government to make a determination as to whether patent protection on such invention shall be sought and how the rights in the invention or discovery, including rights under any patent issued thereon, shall be disposed of and administered in order to protect the public interest.
- f. If the Contractor publishes a work dealing with any aspect of performance under this Agreement, or with the results of such performance, the City shall have a royalty-free, non-exclusive irrevocable license to reproduce, publish, or otherwise use such work for City governmental purposes.

D. Special Provisions for Construction Contracts. If this Contract involves Construction work, design for Construction, or Construction services, all such work or services performed by the Contractor and its subcontractors shall be subject to the following requirements in addition to those set forth above in paragraphs (A), (B), and (C):

(1) *Federal Labor Standards.* The Contractor will comply with the following:

- a. The Davis-Bacon Act (40 U.S.C. §§ 3141-3148): If required by the federal program legislation, in Construction contracts involving an excess of \$2000, and subject to any other federal program limitations, all laborers and mechanics must be paid at a rate not less than those determined by the Secretary of Labor to be prevailing for the City, which rates are to be provided by the City. These wage rates are a federally mandated minimum only, and will be superseded by any State or City requirement mandating higher wage rates. The Contractor also agrees to comply with Department of Labor Regulations pursuant to the Davis-Bacon Act found in 29 CFR Parts 1, 3, 5 and 7 which enforce statutory labor standards provisions.
- b. If required by the federal program legislation and subject to any other federal program limitations, Sections 103 and 107 of the Contract Work Hours and Safe Standards Act (40 U.S.C. §§ 3701-3708), which provides that no laborer or mechanic shall be required or permitted to work more than eight hours in a calendar day or in excess of forty hours in any workweek, unless such laborer or mechanic is paid at an overtime rate of 1½ times his/her basic rate of pay for all hours worked in excess of these limits, under any Construction contract costing in excess of \$2000. In the event of a violation of this provision, the Contractor shall not only be liable to any affected employee for

his/her unpaid wages, but shall be additionally liable to the United States for liquidated damages.

c. Copeland Anti-Kickback Act: If required by the federal program legislation and subject to any other federal program limitations: (i) the Contractor shall comply with 18 U.S.C. § 874, 40 U.S.C. § 3145, and the requirements of 29 C.F.R. Part 3 as may be applicable, which are incorporated by reference into this Contract; (ii) The Contractor or subcontractor shall insert in any subcontracts the language contained in (i) of this subsection and also a clause requiring the subcontractors to include the language in subsection (i) in any lower tier subcontracts. The Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor of this subsection; and (iii) A breach of this subsection may be grounds for termination of the Contract, and for debarment as a contractor or subcontractor as provided in 29 C.F.R. § 5.12.

d. If this Contract involves Construction work, design for Construction, or Construction services, a more complete detailed statement of Federal Labor Standards annexed hereto as FEDERAL EXHIBIT 2. If there is a conflict between the provisions of this Article D and FEDERAL EXHIBIT 2, the stricter standard shall be controlling.

(2) *Equal Employment Opportunity*. Executive Order 11246, as amended, and as supplemented in Department of Labor regulations (41 CFR chapter 60) for Construction contracts or subcontracts in excess of \$10,000. The Contractor shall include the notice found at FEDERAL EXHIBIT I in all Construction subcontracts. For the purposes of the Equal Opportunity Construction Contract Specifications and Clause below, the term “Construction Work” means the construction, rehabilitation, alteration, conversion, extension, demolition or repair of buildings, highways, or other changes or improvements to real property, including facilities providing utility services. The term also includes the supervision, inspection, and other onsite functions incidental to the actual construction .

Standard Federal Equal Employment Opportunity Construction Contract Specifications for Contracts and Subcontracts in Excess of \$10,000.

1. As used in these specifications:
 - a. “Covered area” means the geographical area described in the solicitation from which this Contract resulted;
 - b. “Director” means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;
 - c. “Employer identification number” means the Federal Social Security number used on the Employer’s Quarterly Federal Tax Return, U.S. Treasury Department Form 941.
 - d. “Minority” includes:
 - (i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);

(ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);

(iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and

(iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the Contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any Construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this Contract resulted.

3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7 a through p of these specifications. The goals set forth in the solicitation from which this Contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each Construction trade in which it has employees in the covered area. Covered Construction Contractors performing Construction Work in geographical areas where they do not have a Federal or federally assisted Construction contract shall apply the minority and female goals established for the geographical areas where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246 as amended, or the regulations promulgated pursuant thereto.

6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the

availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each Construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organization's responses.

c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.

f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where Construction Work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility

for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foremen, etc., prior to the initiation of Construction Work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and subcontractors with whom the Contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are non-segregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female Construction contractors and suppliers, including circulation of solicitations to minority and female Contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a Contractor association, joint Contractor-union, Contractor-community, or other similar group of which the Contractor is a member and participant, may be asserted

as fulfilling any one or more of its obligations under 7a through p of these specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the Program are reflected in the Contractor's minority and female work force participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).

10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, sexual orientation, gender identity, or national origin.

11. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246 or suspended or is otherwise excluded from or ineligible for participation in federal assistance programs.

12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, Construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, Contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for hiring of local or other areas residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

- (3) **Equal Opportunity Clause** (for contracts for Construction Work) required by 41 CFR § 60-1.4(b).

During the performance of this contract, the Contractor agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following:

Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

(3) The Contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the Contractor's legal duty to furnish information.

(4) The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the Contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(5) The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(6) The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by

the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(7) In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(8) The Contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance:

Provided, however, that in the event a Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

E. Rights to Inventions. [Special Provisions For Contracts Involving Experimental, Developmental, or Research Work.]

(1) If this Contract involves the performance of experimental, developmental, or research work by the Contractor or its subcontractors, and the entity performing such work is a Nonprofit Organization or Small Business Firm as defined below, the following provisions apply in addition to those set forth above in paragraphs (a), (b) and (c), unless the Contract specifically states that this provision is superseded:

a. Definitions. The following definitions apply to this section (D).

- i. "Invention" means any invention or discovery which is or may be patentable or otherwise protectable under Title 35 of the United States Code, or any novel variety of plant which is or may be protected under the Plant Variety Protection Act (7 U.S.C. § 2321 *et seq.*).
- ii. "Subject invention" means any invention of the Contractor conceived or first actually reduced to practice in the performance of work under this Contract, provided that in the case of a variety of plant, the date of determination (as defined in section 41(d) of the Plant Variety Protection Act, 7 U.S.C. 2401(d)) must also occur during the period of Contract performance.
- iii. "Practical Application" means to manufacture in the case of a composition or product, to practice in the case of a

process or method, or to operate in the case of a machine or system; and, in each case, under such conditions as to establish that the invention is being utilized and that its benefits are, to the extent permitted by law or government regulations, available to the public on reasonable terms.

- iv. “Made” when used in relation to any invention means the conception or first actual reduction to practice of such invention.
 - v. “Small Business Firm” means a small business concern as defined at section 2 of Pub. L. 85-536 (15 U.S.C. 632) and implementing regulations of the Administrator of the Small Business Administration. For the purpose of this clause, the size standards for small business concerns involved in government procurement and subcontracting at 13 CFR 121.3-8 and 13 CFR 121.3-12, respectively, will be used.
 - vi. “Nonprofit Organization” means a university or other institution of higher education or an organization of the type described in section 501(c)(3) of the Internal Revenue Code of 1954 (26 U.S.C. 501(c) and exempt from taxation under section 501(a) of the Internal Revenue Code (25 U.S.C. 501(a)) or any nonprofit scientific or educational organization qualified under a state nonprofit organization statute.
 - vii. “Statutory period” means the one-year period before the effective filing date of a claimed invention during which exceptions to prior art exist per 35 U.S.C. 102(b), as amended by the Leahy-Smith America Invents Act, Public Law 112-29.
 - viii. The “contractor” means any person, small business firm or nonprofit organization, or as set forth in section 1, paragraph (b)(4) of Executive Order 12591, as amended, any business firm regardless of size, which is a party to a funding agreement.
- b. *Allocation of Principal Rights.* The Contractor may retain the entire right, title, and interest throughout the world to each subject invention subject to the provisions of this clause and 35 U.S.C. 203. With respect to any subject invention in which the Contractor retains title, the Federal government shall have a nonexclusive, nontransferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States the subject invention throughout the world.

c. *Invention Disclosure ,Election of Title and Filing of Patent Application by Contractor.*

- i. The Contractor will disclose each subject invention to the City and the Federal Agency within two months after the inventor discloses it in writing to Contractor personnel responsible for patent matters. Such disclosure shall be in the form of a written report and shall identify the contract under which the invention was made and the inventor(s). It shall be sufficiently complete in technical detail to convey a clear understanding to the extent known at the time of the disclosure, of the nature, purpose, operation, and the physical, chemical, biological or electrical characteristics of the invention. The disclosure shall also identify any publication, on sale or public use of the invention and whether a manuscript describing the invention has been submitted for publication and, if so, whether it has been accepted for publication at the time of disclosure. In addition, after such disclosure, the Contractor will promptly notify the City and the Federal Agency of the acceptance of any manuscript describing the invention for publication or of any on sale or public use planned by the Contractor.
- ii. The Contractor will elect in writing whether or not to retain title to any such invention by notifying the City and the Federal Agency within two years of disclosure to the City and the Federal Agency. However, in any case where a patent, a printed publication, public use, sale, or other availability to the public has initiated the one year statutory period wherein valid patent protection can still be obtained in the United States, the period for election of title may be shortened by the Federal Agency to a date that is no more than 60 days prior to the end of the statutory period.
- iii. The Contractor will file its initial patent application on a subject invention to which it elects to retain title within one year after election of title or, if earlier, prior to the end of any statutory period wherein valid patent protection can be obtained in the United States after a publication, on sale, or public use. If the Contractor files a provisional application as its initial patent application, it shall file a non-provisional application within 10 months of the filing of the provisional application. The Contractor will file patent applications in additional countries or international patent offices within earlier ten months of the first filed patent application or six months from the date permission is granted by the Commissioner of Patents to file foreign patent

applications where such filing has been prohibited by a Secrecy Order.

- iv. For any subject invention with Federal agency and contractor co-inventors, where the Federal agency employing such co-inventor determines that it would be in the interest of the government, pursuant to 35 U.S.C. 207(a)(3), to file an initial patent application on the subject invention, the Federal agency employing such co-inventor, at its discretion and in consultation with the contractor, may file such application at its own expense, provided that the contractor retains the ability to elect title pursuant to 35 U.S.C. 202(a).
- v. Requests for extension of the time for disclosure, election, and filing under paragraphs (i), (ii), and (iii) of this clause may, at the discretion of the Federal agency, be granted. When a contractor has requested an extension for filing a non-provisional application after filing a provisional application, a one-year extension will be granted unless the Federal agency notifies the contractor within 60 days of receiving the request.

d. Conditions When the Government May Obtain Title

The Contractor will convey to the Federal Agency, upon written request, title to any subject invention --

- i. If the Contractor fails to disclose or elect title to the subject invention within the times specified in (c) of this clause, or elects not to retain title., .
- ii. In those countries in which the Contractor fails to file patent applications within the times specified in paragraph (c) of this clause; provided, however, that if the Contractor has filed a patent application in a country after the times specified in (c) of this clause, but prior to its receipt of the written request of the Federal Agency, the Contractor shall continue to retain title in that country.
- iii. In any country in which the Contractor decides not to continue the prosecution of any non-provisional patent application for, to pay a maintenance annuity or renewal fee on, or to defend in a reexamination or opposition proceeding on, a patent on a subject invention.

e. Minimum Rights to Contractor and Protection of the Contractor Right to File

- i. The Contractor will retain a nonexclusive royalty-free license throughout the world in each subject invention to which the Government obtains title, except if the Contractor fails to disclose the invention within the times specified in (c), above. The Contractor's license extends to its domestic subsidiary and affiliates, if any, within the corporate structure of which the Contractor is a party and includes the right to grant sublicenses of the same scope to the extent the Contractor was legally obligated to do so at the time the Contract was awarded. The license is transferable only with the approval of the Federal Agency except when transferred to the successor of that party of the Contractor's business to which the invention pertains.
- ii. The Contractor's domestic license may be revoked or modified by the funding Federal Agency to the extent necessary to achieve expeditious practical application of the subject invention pursuant to an application for an exclusive license submitted in accordance with applicable provisions at 37 CFR Part 404 and agency licensing regulations (if any). This license will not be revoked in that field of use or the geographical areas in which the Contractor has achieved practical application and continues to make the benefits of the invention reasonably accessible to the public. The license in any foreign country may be revoked or modified at the discretion of the funding Federal Agency to the extent the Contractor, its licensees, or the domestic subsidiaries or affiliates have failed to achieve practical application in that foreign country.
- iii. Before revocation or modification of the license, the funding Federal Agency will furnish the Contractor a written notice of its intention to revoke or modify the license, and the Contractor will be allowed thirty days (or such other time as may be authorized by the funding Federal Agency for good cause shown by the Contractor) after the notice to show cause why the license should not be revoked or modified. The Contractor has the right to appeal, in accordance with applicable regulations in 37 CFR Part 404 and Federal Agency regulations (if any) concerning the licensing of Government-owned inventions, any decision concerning the revocation or modification of the license.

f. Contractor Action to Protect the Government's Interest

- i. The Contractor agrees to execute or to have executed and promptly deliver to the Federal Agency all instruments necessary to (i) establish or confirm the

rights the Government has throughout the world in those subject inventions to which the Contractor elects to retain title, and (ii) convey title to the Federal Agency when requested under paragraph (d) above and to enable the Government to obtain patent protection throughout the world in that subject invention.

- ii. The Contractor agrees to require, by written agreement, its employees, other than clerical and nontechnical employees, to disclose promptly in writing to personnel identified as responsible for the administration of patent matters and in a format suggested by the Contractor each subject invention made under contract in order that the Contractor can comply with the disclosure provisions of paragraph (c), of this clause, to assign to the Contractor the entire right, title and interest in and to each subject invention made under Contract, and to execute all papers necessary to file patent applications on subject inventions and to establish the Government's rights in the subject inventions. This disclosure format should require, as a minimum, the information required by paragraph (c)(1) of this clause. The Contractor shall instruct such employees through employee agreements or other suitable educational programs on the importance of reporting inventions in sufficient time to permit the filing of patent applications prior to U.S. or foreign statutory bars.
- iii. For each subject invention, the contractor will, no less than 60 days prior to the expiration of the statutory deadline, notify the Federal agency of any decision: Not to continue the prosecution of a non-provisional patent application; not to pay a maintenance, annuity or renewal fee; not to defend in a reexamination or opposition proceeding on a patent, in any country; to request, be a party to, or take action in a trial proceeding before the Patent Trial and Appeals Board of the U.S. Patent and Trademark Office, including but not limited to post-grant review, review of a business method patent, inter partes review, and derivation proceeding; or to request, be a party to, or take action in a non-trial submission of art or information at the U.S. Patent and Trademark Office, including but not limited to a pre-issuance submission, a post-issuance submission, and supplemental examination..
- iv. The Contractor agrees to include, within the specification of any United States patent applications and any patent issuing thereon covering a subject invention, the following statement, "This invention was made with government support under (identify the

contract) awarded by (identify the Federal Agency). The government has certain rights in the invention.”

g. Subcontracts

- i. The Contractor will include this clause, suitably modified to identify the parties, in all subcontracts, regardless of tier, for experimental, developmental or research work to be performed by a subcontractor. The subcontractor will retain all rights provided for the Contractor in this clause, and the Contractor will not, as part of the consideration for awarding the subcontract, obtain rights in the subcontractor’s subject inventions.
 - ii. The Contractor will include in all other subcontracts, regardless of tier, for experimental developmental or research work the patent rights clause required by 2 CFR § 200.315(c) and Appendix II to 2 CFR Part 200.
 - iii. In the case of subcontracts, at any tier, when the prime award with the Federal Agency was a contract (but not a grant or cooperative agreement), the Agency, subcontractor, and the Contractor agree that the mutual obligations of the parties created by this clause constitute a contract between the subcontractor and the Federal Agency with respect to the matters covered by the clause; provided, however, that nothing in this paragraph is intended to confer any jurisdiction under the Contract Disputes Act in connection with proceedings under paragraph (j) of this clause.
- h. *Reporting on Utilization of Subject Inventions.* The Contractor agrees to submit on request periodic reports no more frequently than annually on the utilization of a subject invention or on efforts at obtaining such utilization that are being made by the Contractor or its licensees or assignees. Such reports shall include information regarding the status of development, date of first commercial sale or use, gross royalties received by the Contractor, and such other data and information as the Federal Agency may reasonably specify. The Contractor also agrees to provide additional reports as may be requested by the Federal Agency in connection with any march-in proceeding undertaken by the Federal Agency in accordance with paragraph (j) of this clause. As required by 35 U.S.C. § 202(c)(5), the Federal Agency agrees it will not disclose such information to persons outside the Government without permission of the Contractor.
- i. *Preference for United States Industry.* Notwithstanding any other provision of this clause, the Contractor agrees that neither it nor any assignee will grant to any person the exclusive right to use or sell any subject inventions in the United States unless such

person agrees that any products embodying the subject invention or produced through the use of the subject invention will be manufactured substantially in the United States. However, in individual cases, the requirement for such an agreement may be waived by the Federal Agency upon a showing by the Contractor or its assignee that reasonable but unsuccessful efforts have been made to grant licenses on similar terms to potential licensees that would be likely to manufacture substantially in the United States or that under the circumstances domestic manufacture is not commercially feasible.

j. *March-in Rights.* The Contractor agrees that with respect to any subject invention in which it has acquired title, the Federal Agency has the right in accordance with the procedures in 37 CFR § 401.6 and any supplemental regulations of the Federal Agency to require the Contractor, an assignee or exclusive licensee of a subject invention to grant a nonexclusive, partially exclusive, or exclusive license in any field of use to a responsible applicant or applicants, upon terms that are reasonable under the circumstances, and if the Contractor, assignee, or exclusive licensee refuses such a request the Federal Agency has the right to grant such a license itself if the Federal Agency determines that:

i. Such action is necessary because the Contractor or assignee has not taken, or is not expected to take within a reasonable time, effective steps to achieve practical application of the subject invention in such field of use.

ii. Such action is necessary to alleviate health or safety needs which are not reasonably satisfied by the Contractor, assignee or their licensees;

iii. Such action is necessary to meet requirements for public use specified by Federal regulations and such requirements are not reasonably satisfied by the Contractor, assignee or licensees; or

iv. Such action is necessary because the agreement required by paragraph (i) of this clause has not been obtained or waived or because a licensee of the exclusive right to use or sell any subject invention in the United States is in breach of such agreement.

k. *Special Provisions for Contracts with Nonprofit Organizations.* If the Contractor is a nonprofit organization, it agrees that:

i. Rights to a subject invention in the United States may not be assigned without the approval of the Federal Agency, except where such assignment is made to an organization which has as one of its primary functions

the management of inventions, provided that such assignee will be subject to the same provisions as the Contractor;

- ii. The Contractor will share royalties collected on a subject invention with the inventor, including Federal employee co-inventors (when the Federal Agency deems it appropriate) when the subject invention is assigned in accordance with 35 U.S.C. § 202(e) and 37 CFR § 401.10;
 - iii. The balance of any royalties or income earned by the Contractor with respect to subject inventions, after payment of expenses (including payments to inventors) incidental to the administration of subject inventions, will be utilized for the support of scientific research or education; and
 - iv. It will make efforts that are reasonable under the circumstances to attract licensees of subject invention that are Small Business Firms and that it will give a preference to a Small Business Firm when licensing a subject invention if the Contractor determines that the Small Business Firm has a plan or proposal for marketing the invention which, if executed, is equally as likely to bring the invention to practical application as any plans or proposals from applicants that are not Small Business Firms; provided, that the Contractor is also satisfied that the Small Business Firm has the capability and resources to carry out its plan or proposal. The decision whether to give a preference in any specific case will be at the discretion of the Contractor. However, the Contractor agrees that the Federal Agency may review the Contractor's licensing program and decisions regarding Small Business applicants, and the Contractor will negotiate changes to its licensing policies, procedures, or practices with the Federal Agency when the Federal Agency's review discloses that the Contractor could take reasonable steps to implement more effectively the requirements of this paragraph (k)(iv). In accordance with 37 CFR 401.7, the Federal agency or the contractor may request that the Secretary review the contractor's licensing program and decisions regarding small business applicants.
1. *Communication.* The central point of contact at the Federal Agency for communications on matters relating to this clause may be obtained from the City upon request.

NOTICE TO BIDDERS

NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246, as amended) FOR ALL CONSTRUCTION CONTRACTS AND SUB-CONTRACTS IN EXCESS OF \$10,000.

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.

2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all Construction Work in the covered area, are as follows:

Goals and Timetables for Minorities

<u>Trade</u>	<u>Goal (percent)</u>	
Electricians	9.0 to	10.2
Carpenters	27.6 to	32.0
Steamfitters	12.2 to	13.5
Metal Lathers	24.6 to	25.6
Painters	28.6 to	26.0
Operating Engineers	25.6 to	26.0
Plumbers	12.0 to	14.5
Iron Workers (structural)	25.9 to	32.0
Elevator Constructors	5.5 to	6.5
Bricklayers	13.4 to	15.5
Asbestos Workers	22.8 to	28.0
Roofers	6.3 to	7.5
Iron Workers (ornamental)	22.4 to	23.0
Cement Masons	23.0 to	27.0
Glazers	16.0 to	20.0
Plasterers	15.8 to	18.0
Teamsters	22.0 to	22.5
Boilermakers	13.0 to	15.5
All Other	16.4 to	17.5

Goals and Timetables for Women

From April 1, 1980 until the present 6.9

These goals are applicable to all the Contractor's Construction Work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs Construction Work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and nonfederally involved Construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall made a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any Construction subcontract in excess of \$10,000 at any tier for Construction Work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed.

4. As used in this Contract, the "covered area" is the City of New York.

EXHIBIT 2
Federal Labor Standards Provisions (Non-Davis Bacon)¹
Federal Emergency Management Agency
(10/27/2015)

Applicability: The Project or Program to which the construction work covered by this contract pertains is being assisted by the United States of America and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance.

A. Compliance with the Copeland “Anti-Kickback” Act.

1. **Contractor.** The contractor shall comply with 18 U.S.C. § 874, 40 U.S.C. § 3145, and the requirements of 29 C.F.R. pt. 3 as may be applicable, which are incorporated by reference into this contract.
2. **Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clause in paragraph 1 above and such other clauses as the FEMA may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all of these contract clauses.
3. **Breach.** A breach of the contract clauses above may be grounds for termination of the contract, and for debarment as a contractor and subcontractor as provided in 29 C.F.R. § 5.12.

B. Compliance with the Contract Work Hours and Safety Standards Act. The provisions of this Section B are applicable where the amount of the prime contract exceeds \$100,000.

1. **Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
2. **Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in paragraph (1) of this Section B the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In

¹ This version of Exhibit 2 applies to contracts funded by FEMA Grant and Cooperative Agreement Programs, including the Public Assistance Program. Do not use this version of Exhibit 2 in connection with FEMA programs that are subject to the Davis-Bacon Act; such programs are the Emergency Management Preparedness Grant Program, the Homeland Security Grant Program, Nonprofit Security Grant Program, Tribal Homeland Security Grant Program, Port Security Grant Program, and Transit Security Grant Program.

addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this section.

3. **Withholding for unpaid wages and liquidated damages.** The City of New York shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this section.
4. **Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs (1) through (4) of this Section B and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1) through (4) of this section B.

C. **Health and Safety.** The provisions of this paragraph C are applicable where the amount of the prime contract exceeds \$100,000.

1. No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.
2. The Contractor shall comply with all regulations issued by the Secretary of Labor pursuant to Title 29 Part 1926 and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, (Public Law 91-54, 83 Stat 96). 40 USC 3701 et seq.
3. The contractor shall include the provisions of this paragraph in every subcontract so that such provisions will be binding on each subcontractor. The contractor shall take such action with respect to any subcontractor as FEMA or the Secretary of Labor shall direct as a means of enforcing such provisions.

**FEDERAL EMERGENCY MANAGEMENT AGENCY (“FEMA”) RIDER
(1/20/2021)**

**For use with contracts funded by the FEMA Grant and Cooperative Agreement Programs,
including the Public Assistance Program**

(This Rider should not be used with contracts funded by the following FEMA Programs: Emergency Management Preparedness Grant Program, Homeland Security Grant Program, Nonprofit Security Grant Program, Tribal Homeland Security Grant Program, Port Security Grant Program, and Transit Security Grant Program. This Rider should be accompanied by the Uniform Federal Contract Provisions Rider for Federally Funded Procurement Contracts.)

1. Suspension and Debarment. Section C(5) of the Uniform Federal Contract Provisions Rider for Federally Funded Procurement Contracts is supplemented with the following provisions:
 - (a) This contract is a covered transaction for purposes of 2 C.F.R. Parts 180 and 3000. As such, the Contractor is required to verify that none of the Contractor, its principals (defined at 2 C.F.R. § 180.995), or its affiliates (defined at 2 C.F.R. § 180.905) are excluded (defined at 2 C.F.R. § 180.940) or disqualified (defined at 2 C.F.R. § 180.935). By entering into this contract, the Contractor certifies that it is in compliance with 2 C.F.R. Parts 180 and 3000.
 - (b) The Contractor must comply with 2 C.F.R. Part 180, subpart C and 2 C.F.R. Part 3000, subpart C during the term of this contract and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into.
 - (c) The certification in paragraph (a), above, and section C(5) of the Uniform Federal Contract Provisions Rider for Federally Funded Procurement Contracts is a material representation of fact relied upon by the City of New York. If it is later determined that the Contractor did not comply with 2 C.F.R. Part 180, subpart C and 2 C.F.R. Part 3000, subpart C, in addition to remedies available to the City of New York and, if applicable, the State of New York, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment.
2. Davis-Bacon Act. For the purposes of Section D(1)(a) of the Uniform Federal Contract Provisions Rider, compliance with the Davis-Bacon Act (40 U.S.C. §§ 3141-3148) is not required of the Contractor pursuant to FEMA regulations. However, if this Contract is funded by another federal funding source (e.g., the U.S. Department of Housing and Urban Development CDBG or CDBG-DR programs), compliance with the Davis-Bacon Act is required to the extent required by law and as set forth in the contract documents.
3. Rights to Inventions Made Under a Contract or Agreement. Section E of the Uniform Federal Contract Provisions Rider for Federally Funded Procurement Contracts does not apply to the following FEMA Programs: Public Assistance Program, Hazard Mitigation Grant Program, Fire Management Assistance Grant Program, Crisis Counseling Assistance and Training Grant Program, Disaster Case Management Program, and Federal Assistance to Individuals and Households – Other Needs Assistance Grant Program.

4. Copeland “Anti-Kickback” Act. The Contractor shall comply with provisions of the Copeland “Anti-Kickback” Act (18 U.S.C. § 874) as delineated in the Uniform Federal Contract Provisions Rider, FEMA Exhibit 2, Section (A).
5. Contract Work Hours and Safety Standards Act. The Contractor shall comply with the provisions of the Contract Work Hours and Safety Standards Act as delineated in the Uniform Federal Contract Provisions Rider, FEMA Exhibit 2, Section (B).
6. Access to Records.
 - (a) The Contractor agrees to provide the City of New York, the FEMA Administrator, the Comptroller General of the United States, or any of their authorized representatives access to any books, documents, papers, and records of the Contractor which are directly pertinent to this contract for the purposes of making audits, examinations, excerpts, and transcriptions.
 - (b) The Contractor agrees to permit any of the foregoing parties to reproduce said documents by any means or to copy excerpts and transcriptions as reasonably needed.
 - (c) The Contractor agrees to provide the FEMA Administrator or his/her authorized representative access to construction or other work sites pertaining to the work being completed under the contract.
 - (d) In compliance with the Disaster Recovery Act of 2018, the City of New York and the Contractor acknowledge and agree that no language in this contract is intended to prohibit audits or internal reviews by the FEMA Administrator or the Comptroller General of the United States.
7. Logos. The Contractor shall not use DHS seal(s), logos, crests, or reproductions of flags or likenesses of DHS agency officials without specific FEMA pre-approval.
8. Compliance with Law. The Contractor acknowledges that FEMA financial assistance will be used to fund all or a portion of the contract. The Contractor will comply with all applicable federal law, regulations, executive orders, FEMA policies, procedures, and directives.
9. Federal Government not a Party. The Contractor acknowledges and understands that the Federal Government is not a party to this contract and is not subject to any obligations or liabilities to the City, Contractor or any other party pertaining to any matter resulting from the contract.
10. False Claims. The Contractor acknowledges that 31 U.S.C. Chap. 38 applies to the Contractor’s actions pertaining to this contract.



Brooklyn Navy Yard
Development Corporation
BrooklynNavyYard.org

Building 77
141 Flushing Ave, Suite 801
Brooklyn, NY 11205

EXHIBIT M
PROJECT DRAWINGS & SPECIFICATIONS

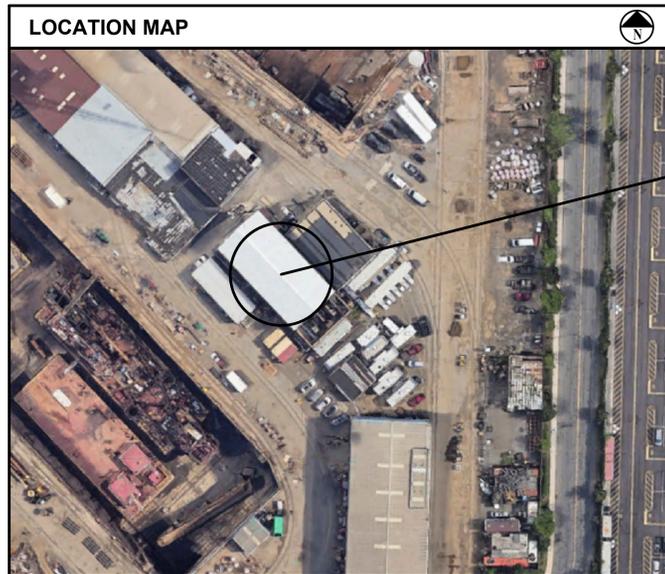
[to attach]

BROOKLYN NAVY YARD

RESTORATION OF SUBSTATION AT BUILDING 386

141 FLUSHING AVENUE, SUITE #801
BROOKLYN, NY 11205
BID SET

BNYD 1905/ 1905A
SEPTEMBER 27, 2024

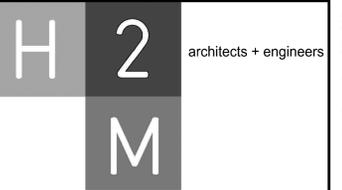


PROJECT LOCATION

DRAWING LIST

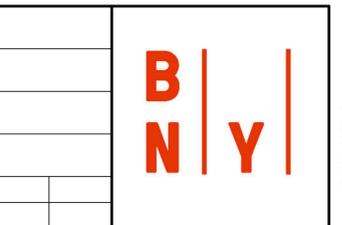
INFORMATIONAL DRAWINGS	
G-000.00	COVER SHEET
G-100.00	GENERAL NOTES
DEMOLITION DRAWINGS	
D-100.00	DEMOLITION FLOOR PLANS
ARCHITECTURAL DRAWINGS	
EN-100.00	ENERGY COM CHECK
A-100.00	FLOOR PLANS
A-200.00	BUILDING ELEVATIONS
A-201.00	BUILDING SECTIONS
A-300.00	DOOR SCHEDULE AND DETAILS
CIVIL DRAWINGS	
C-100.00	SITE RESTORATION PLAN
STRUCTURAL DRAWINGS	
S-001.00	GENERAL NOTES
FO-100.00	FOUNDATION PLAN AND DETAILS
FO-200.00	PILE ELEVATIONS
FO-600.00	FOUNDATION DETAILS
FO-601.00	FOUNDATION DETAILS
S-100.00	ELECTRICAL PLATFORM FRAMING PLAN
S-200.00	STRUCTURAL ELEVATIONS
S-201.00	STRUCTURAL ELEVATIONS
S-500.00	CONCRETE/MASONRY DETAILS
S-600.00	STEEL DETAILS
S-601.00	STEEL DETAILS
S-602.00	STEEL DETAILS
S-603.00	STEEL DETAILS
S-620.00	COLUMN & BRACED FRAME SCHEDULES
MECHANICAL DRAWINGS	
EN-101.00	ENERGY COM CHECK
M-000.00	HVAC LEGENDS, SYMBOLS, ABBREVIATIONS, AND GENERAL NOTES
M-100.00	HVAC DEMO AND NEW WORK PLAN
M-200.00	HVAC SCHEDULES AND DETAILS

ELECTRICAL DRAWINGS	
E-000.00	ELECTRICAL LEGENDS
E-100.00	ELECTRICAL SITE PLAN
E-200.00	ELECTRICAL FIRST FLOOR DEMOLITION PLAN
E-201.00	ELECTRICAL SECOND FLOOR DEMOLITION PLAN
E-300.00	ELECTRICAL FIRST FLOOR POWER PLAN
E-301.00	ELECTRICAL SECOND FLOOR LIGHTING PLAN
E-400.00	ELECTRICAL FIRST FLOOR LIGHTING PLAN
E-401.00	ELECTRICAL SECOND FLOOR LIGHTING PLAN
E-500.00	MEDIUM VOLTAGE SIDE A ELECTRICAL SINGLE LINE DIAGRAM
E-501.00	MEDIUM VOLTAGE SIDE B ELECTRICAL SINGLE LINE DIAGRAM
E-502.00	LOW VOLTAGE SWITCHGEAR A ELECTRICAL SINGLE LINE DIAGRAM
E-503.00	LOW VOLTAGE SWITCHGEAR B ELECTRICAL SINGLE LINE DIAGRAM
E-504.00	TYPICAL MEDIUM VOLTAGE CIRCUIT BREAKER SCHEMATIC DIAGRAM
E-505.00	ELECTRICAL 125VDC SINGLE LINE DIAGRAM
E-600.00	MEDIUM VOLTAGE 4160V SWITCHGEAR ELEVATION AND PLAN VIEW
E-601.00	LOW VOLTAGE SWITCHGEAR ELEVATION AND PLAN VIEW 1 OF 2
E-602.00	LOW VOLTAGE SWITCHGEAR ELEVATION AND PLAN VIEW 2 OF 2
E-603.00	EXTERIOR MEDIUM VOLTAGE SWITCHGEAR ELEVATION AND PLAN VIEW
E-700.00	ELECTRICAL PANEL SCHEDULES
E-800.00	ELECTRICAL DETAILS
E-801.00	DUCTBANK CROSS SECTIONS
E-802.00	DUCTBANK CROSS SECTIONS 2
E-803.00	ELECTRICAL MANHOLE DETAILS
E-804.00	ELECTRICAL FIRST FLOOR GROUNDING PLAN
E-805.00	ELECTRICAL GROUNDING DETAILS
ENVIRONMENTAL DRAWINGS	
H-101.00	ENVIRONMENTAL HAZARDOUS MATERIALS PLAN
H-102.00	ENVIRONMENTAL HAZARDOUS MATERIALS PLAN



538 Broad Hollow Road
4th Floor East
Melville, NY 11747
P:(631)756-8000
F:(631)694-4122

Melville, NY 11747
Albany, NY 12205
White Plains, NY 10601
New City, NY 10956
Parsippany, NJ 07054
Howell, NJ 07731



Brooklyn Navy Yard
Development Corporation

Restoration of Substation G at
Building 386

141 FLUSHING AVENUE, SUITE 801
BROOKLYN, NY 11205

G-000.00

538 Broad Hollow Road, 4th Floor East
Melville, NY 11747
631.756.8000 • www.h2m.com
NY Architecture & Landscape Architecture: No Certificate Required
NY Engineering Certificate of Authorization No. 0018438

CONSULTANTS:

MARK	DATE	DESCRIPTION
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	1-12-2024	Final Bid Documents
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DESIGNED BY: LAM
DRAWN BY: LAM
CHECKED BY: LAM
REVIEWED BY: LAM
PROJECT NO.: BNYD 1905A
DATE: SEPT 2023
SCALE: AS SHOWN

KEVIN M. PAUL, R.A.
NY REGISTERED ARCHITECT Lic. No. 022876
"IN ACCORDANCE WITH ARTICLE 145, SECTION 7209 OF THE NYS EDUCATION LAW,
ALTERNATION OF THE DOCUMENT EXCEPT BY ARCHITECT'S PROFESSIONAL JUDGMENT"

CLIENT
**Brooklyn Navy Yard
Development Corporation**

Restoration of Substation G at
Building 386

141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

CONTRACT
ALL CONTRACTS

STATUS
BID SET

SHEET TITLE
DEMOLITION FLOOR PLANS

DRAWING No. **D-100.00**
SHEET No. **03**
OF **54**

DEMOLITION PLAN LEGEND

	INDICATES EXISTING WALL TO REMAIN		INDICATES EXISTING WALL TO BE REMOVED AND DISPOSED OF
	INDICATES DOOR, FRAME AND HARDWARE TO REMAIN		INDICATES EXISTING DOOR AND DOOR FRAME TO BE REMOVED AND DISPOSED OF
	INDICATES EXISTING STRUCTURE ABOVE - SEE 'S' DRAWINGS FOR ADDITIONAL INFORMATION		INDICATES EXISTING WINDOW AND WINDOW FRAME TO REMAIN
	INDICATES EXISTING LOUVER AND LOUVER FRAME TO REMAIN		

GENERAL DEMOLITION NOTES

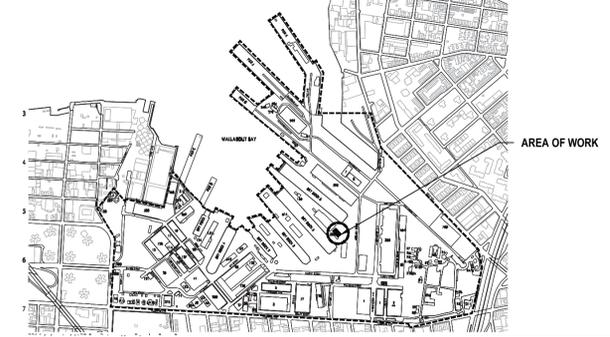
- ALL DEMOLITION WORK AND REMOVALS SHALL BE THE RESPONSIBILITY OF CONTRACTOR UNLESS OTHERWISE NOTED
- ALL DEMOLITION WORK SHALL BE IN COMPLIANCE WITH ALL FEDERAL AND NEW YORK STATE APPLICABLE BUILDING AND LIFE AND SAFETY REGULATIONS.
- THE CONTRACTOR SHALL PROTECT ALL PORTIONS OF THE EXISTING BUILDING WHERE NEW WORK IS TO BE COMPLETED FROM DUST, WEATHER INCLEMENCY AND FREEZING. PROVIDE DUST FREE BARRIER PARTITIONS DURING DEMOLITION TO PREVENT DEBRIS FROM ENTERING NON-WORK AREAS. THE CONTRACTOR WILL BE HELD RESPONSIBLE FOR ANY DAMAGE TO THE EXISTING STRUCTURE OR BUILDING CONTENTS.
- THE CONTRACTOR SHALL ADEQUATELY PROTECT ALL EXISTING FINISHES SCHEDULED TO REMAIN ALONG THE ACCESS ROUTE AND ADJOINING SURFACES OUTSIDE THE CONTRACT AREA OR SCOPE OF WORK FROM DAMAGE DURING THE PROJECT DURATION. THE CONTRACTOR SHALL BE RESPONSIBLE TO RESTORE EXISTING CONDITIONS AND/OR FINISHES DAMAGED DURING CONSTRUCTION INCLUDING PATCHING AND PAINTING AS REQUIRED AND DEEMED NECESSARY BY THE ARCHITECT AT NO ADDITIONAL COST TO THE OWNER.
- THE CONTRACTOR SHALL REMOVE AND DISPOSE OF ALL CONSTRUCTION DEBRIS AND UNWANTED MATERIAL OFF SITE IN ACCORDANCE WITH ALL FEDERAL AND NEW YORK STATE APPLICABLE BUILDING AND LIFE AND SAFETY REGULATIONS.
- THE CONTRACTOR SHALL TAKE CARE NOT TO DAMAGE ADJOINING SURFACES AND FINISHES DURING DEMOLITION. THE CONTRACTOR SHALL PATCH AND REPAIR ALL ADJACENT SURFACES DAMAGED DURING DEMOLITION. THE CONTRACTOR SHALL MATCH ALL ADJACENT FINISHES.
- OVER-DEMOLITION SHALL BE ALLOWED PROVIDED THAT ALL SURFACES SHALL BE REBUILT TO MATCH MATERIALS, STRUCTURAL INTEGRITY AND APPEARANCE OF THOSE WHICH WERE REMOVED AND IN CONFORMANCE WITH CONTRACT DOCUMENTS AND AT NO ADDITIONAL COST TO THE OWNER.
- REMOVE ALL ITEMS THAT WILL BE ABANDONED AS A RESULT OF THE WORK BEING PERFORMED.
- THE CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS, DIMENSIONS AND QUANTITIES OF ALL ITEMS PRIOR TO BID.
- THE CONTRACTOR SHALL TAKE CARE NOT TO DAMAGE PARKING LOT PAVING, CONCRETE SIDEWALKS, LANDSCAPING, GRASS AREAS AND EXTERIOR FINISHES. ANY DAMAGED AREAS SHALL BE RESTORED TO EXISTING CONDITION BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.
- COORDINATE THE WORK OF THE DEMOLITION DRAWING WITH ALL CONSTRUCTION DRAWINGS AND DOCUMENTS.
- THIS DRAWING IS A GENERAL LIST OF DEMOLITION ITEMS AND IS NOT EVERY ITEM REQUIRED FOR DEMOLITION. THE CONTRACTOR SHALL PROVIDE ALL DEMOLITION REQUIRED TO PERFORM ALL WORK INDICATED WITHIN THE PROJECT DRAWINGS AND SPECIFICATIONS AND TO PREPARE ALL AREAS FOR THE CONSTRUCTION WORK.
- REMOVE AND STORE FOR REINSTALLATION ALL EXISTING FIRE EXTINGUISHERS WITHIN WORK AREAS. FIRE EXTINGUISHERS TO BE INSPECTED AND RECHARGED IF NECESSARY; REPLACE NON FUNCTIONAL FIRE EXTINGUISHERS OR FIRE EXTINGUISHER FAILING INSPECTION.
- REMOVE AND STORE FOR REINSTALLATION EXISTING DOOR SIGNAGE. TYPICAL FOR ALL DOORS IN WORK AREA.
- STORE ALL MATERIALS TO BE REUSED SAFELY ON SITE. STORE ALL MATERIALS TO BE SAVED - BUT NOT REUSED - ELSEWHERE IN THE BUILDING AS DIRECTED BY THE OWNER.
- CONTRACTOR SHALL COORDINATE THE EXACT LOCATIONS OF ALL DUMPSTERS, CHUTES AND MATERIALS STORED AT GRADE (IF ANY) WITH THE OWNER.
- COORDINATE THE ACCEPTABLE USE AND ACCESS OF EXISTING AREAS TO REMAIN WITH THE BUILDING THROUGHOUT THE COURSE OF WORK.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE LOCATION OF ALL BELOW SLAB MECHANICAL, ELECTRICAL AND PLUMBING TRADES.
- THE CONTRACTOR SHALL TAKE CARE AS TO ADEQUATELY PROTECT ALL ADJOINING AREAS INCLUDING HVAC OPENINGS FROM DUST AND DEBRIS DURING DEMOLITION AND CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE TO WIPE DOWN AND CLEAN AREA OF WORK UPON COMPLETION OF THE PROJECT.
- ALL PIPING, LIGHTING AND OTHER APPURTENANCES SUSPENDED FROM THE SLAB ARE ALSO TO BE CAPPED, TERMINATED AND REMOVED.

PLUMBING DEMOLITION NOTES

- ALL DEMOLITION WORK SHALL BE IN COMPLIANCE WITH ALL FEDERAL, STATE, AND NEW YORK CITY APPLICABLE BUILDING AND LIFE AND SAFETY REGULATIONS.
- VERIFY IN FIELD EXACT LOCATIONS OF EXISTING HOT WATER, COLD WATER, HOT WATER RETURN, SANITARY, WASTE & VENT PIPING. CONTRACTOR SHALL REMOVE ALL ABOVE SLAB EXISTING PIPING NOT ENCASED WITH ASBESTOS INSULATION. ALL SANITARY PIPING TO BE CUT AND CAPPED BELOW SLAB AND CONTRACTOR TO PATCH EXISTING SLAB TO MATCH EXISTING SLAB HEIGHT.
- THE CONTRACTOR SHALL REMOVE ALL EXISTING PLUMBING EQUIPMENT SUCH AS WATER HEATERS, PUMPS, VALVES, ETC. VERIFY IN FIELD LOCATION.

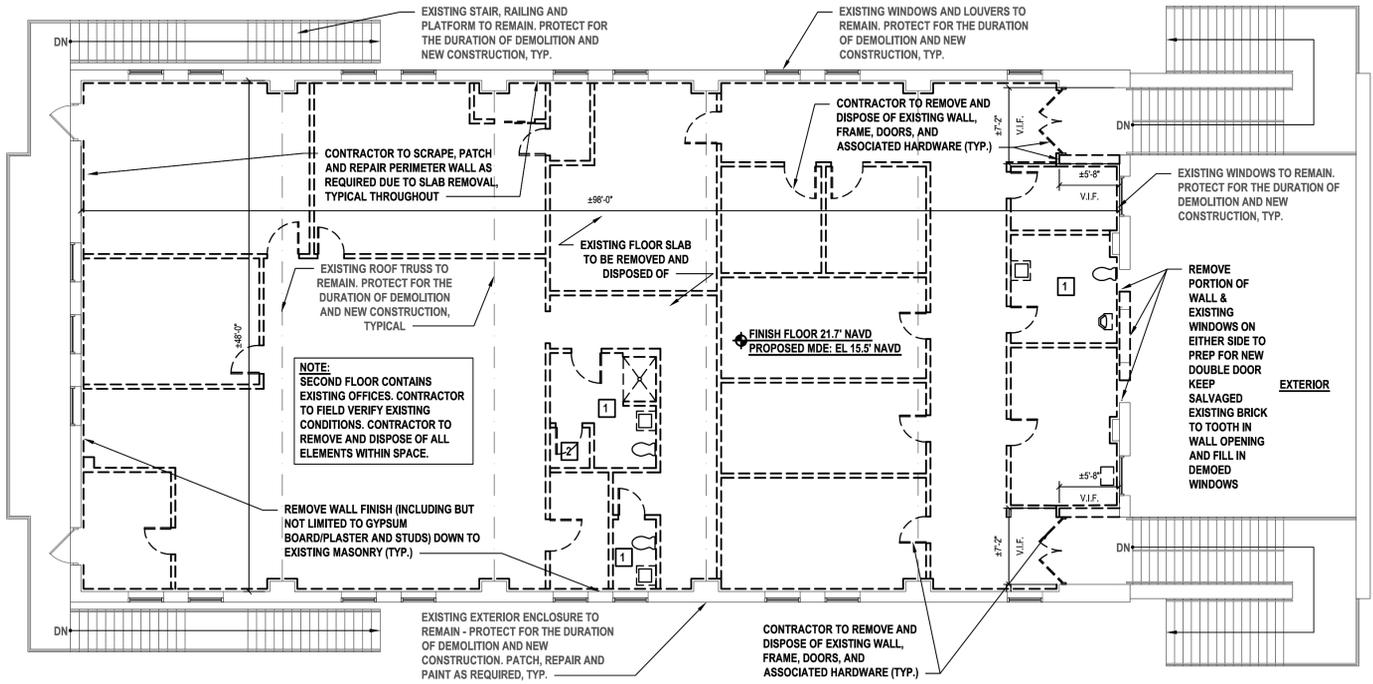
KEYED PLUMBING DEMOLITION NOTES

- COMPLETELY REMOVE AND DISPOSE OF ALL PLUMBING FIXTURES INCLUDING WATER CLOSETS, LAVATORIES, FAUCETS, CLEAN OUT DECK PLATES, STOP VALVES AND ALL DEVICES USED TO SECURE THESE FIXTURES IN PLACE.
 - PRIOR TO THE REMOVALS OF FIXTURES, THE CONTRACTOR SHALL MAKE ALL NECESSARY DISCONNECTS. WORK SHALL INCLUDE SANITARY, HW, CW, HWR AND VENT PIPING.
 - SEAL ALL PIPING PENETRATIONS AND INSTALL FIRE-STOPPING IN ALL RATED WALLS, FLOORS, SOFFITS ETC. OPENING LARGER THAN 1.5x THE DIAMETER OF THE PIPING PASSING THROUGH SHALL BE SEALED WITH NON-SHRINK EPOXY GROUT.
- EXISTING STORAGE WATER HEATER TO BE REMOVED ENTIRELY, INCLUDING PIPING, EXPANSION TANKS, PUMPS, AND VALVES.



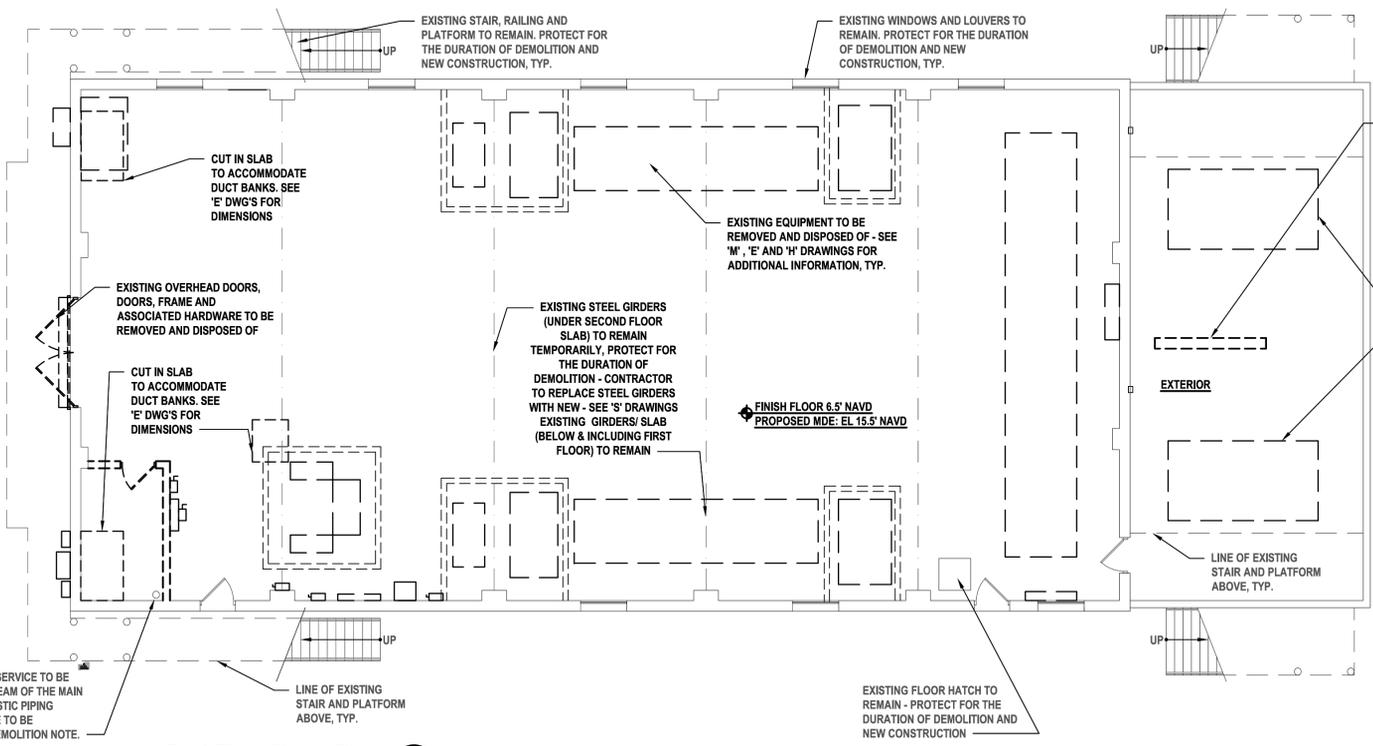
Key Plan
SCALE: N.T.S.

STRUCTURAL: B00849769-I1
MECHANICAL: B00849755-I1



Second Floor Demo Plan
SCALE: 1/8"=1'-0"

NOTE: PROTECT WALL OPENING W/ 20' OF A FLOOR OPENINGS USED FOR THE PASSAGE OF DEBRIS FROM LEVELS ABOVE SHALL BE SOLIDLY BOARDED UP OR OTHERWISE SUBSTANTIALLY COVERED PER NYCBC3306.9.12.2



First Floor Demo Plan
SCALE: 1/8"=1'-0"

BNYD (Brooklyn Navy Yard) - 40708BNYD1905A - 42791 - 1/16/2024 10:52 AM LAM Modified: Jan 12, 2024 - 12:24 PM Printed on Sep 06, 2024 - 2:00pm By: hrcasak

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Melville, NY 11747
631.756.0000 • www.h2m.com
NY Architecture & Landscape Architecture: No Certificate Required
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CONSULTANTS:

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	11-08-2019	30% Submission

DESIGNED BY: LAM
DRAWN BY: LAM
PROJECT NO.: BNYD 1905A
DATE: SEPT 2023
SCALE: AS SHOWN

12/31/2025
EXP. DATE

KEVIN M. PAUL, R.A.
NY REGISTERED ARCHITECT LIC. NO. 022876
"IN ACCORDANCE WITH ARTICLE 145, SECTION 7209 OF THE NYS EDUCATION LAW,
ALTERNATION OF THIS DOCUMENT EXCEPT BY LICENSED PROFESSIONAL PERSONNEL"

CHECKED BY: []
REVIEWED BY: []

CLIENT
**Brooklyn Navy Yard
Development Corporation**

Restoration of Substation G at
Building 386

141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

CONTRACT
ALL CONTRACTS

STATUS
BID SET

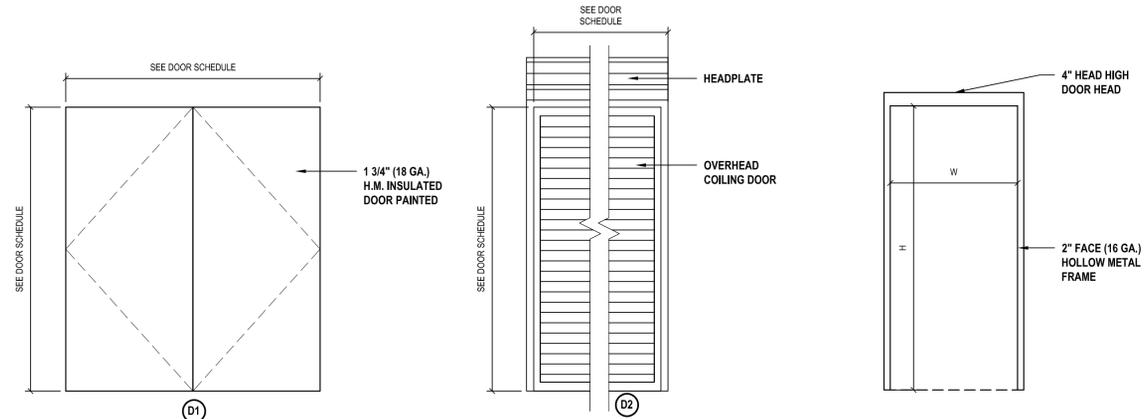
SHEET TITLE
**DOOR SCHEDULE AND
DETAILS**

DRAWING No. **A-300.00**
SHEET No. **08**
OF **54**

DOOR AND FRAME SCHEDULE

MARK	DOOR			EL	MATL	FRAME			Hardware	NOTES	
	WD	HGT	THK			HEAD	JAMB	SILL			
1	6'-0"	6'-6"	1 3/4"	HM	D1	HM	H2	J2	S1	1	--
2	8'-0"	8'-6"	1 3/4"	HM	D1	HM	H1	J1	S2	2	BASED ON 32 BRICK COURSES - VJF
3	10'-4"	11'-0"	2"	IM	D2	---	H3	J3	---	---	PROVIDE HEAD & JAMB WEATHERSTRIPPING

HM - HOLLOW METAL - TO BE PAINTED
IM - INSULATED METAL



1 Door Types
SCALE: 1/2" = 1'-0"

2 Frame Type
SCALE: 1/2" = 1'-0"

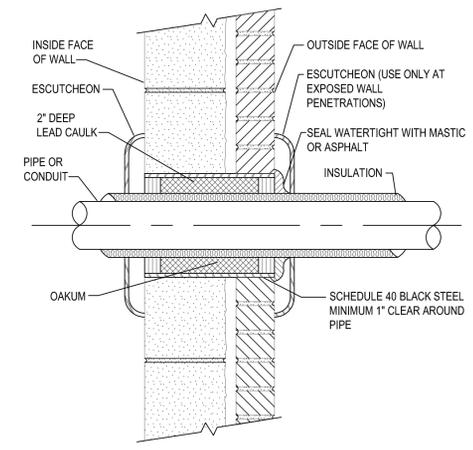
HARDWARE SCHEDULE

HARDWARE SET #1

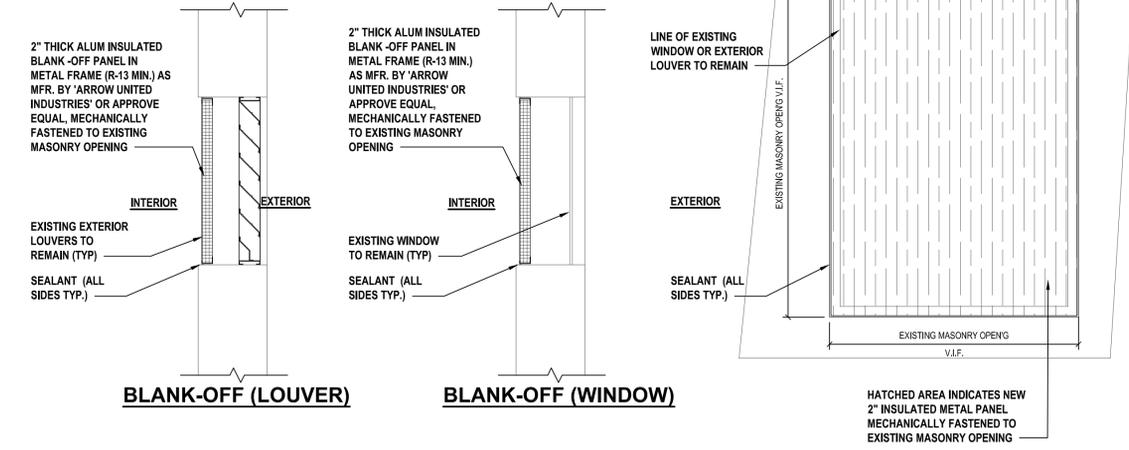
- 4 PR HINGES
- 2 CLOSERS
- 2 PANIC DEVICE
- 1 MORTISE CYLINDER
- 1 COORDINATOR
- 1 ASTRAGAL
- 4 JAMB SEALS
- 1 X4 MORTISE/ RIM CYLINDER
- 2 DOOR BOTTOMS
- 2 WALL STOPS
- 2 KICKPLATES
- 1 SADDLE

HARDWARE SET #2

- 4PR HINGES
- 2 CLOSERS
- 1 MORTISE CYLINDER
- 1 COORDINATOR
- 1 ASTRAGAL
- 4 JAMB SEALS
- 1 X4 MORTISE/ RIM CYLINDER
- 2 DOOR BOTTOMS
- 2 WALL STOPS
- 2 KICKPLATES
- 1 SADDLE

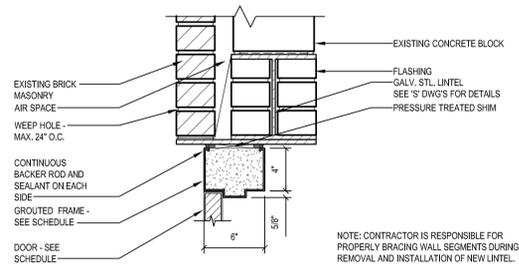


1 Typical Penetration Through Exterior Wall
SCALE: NTS

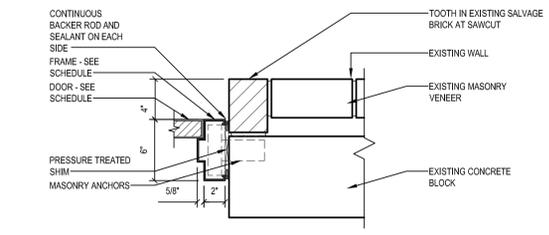


2 WINDOW/ LOUWER BLOCK DETAILS
SCALE: NTS

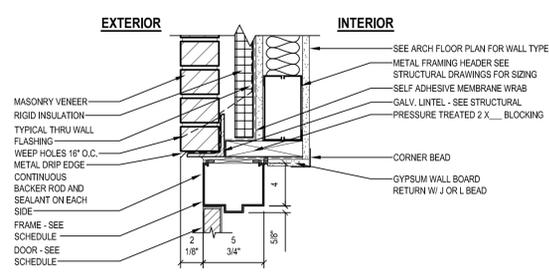
STRUCTURAL: B00849769-11
MECHANICAL: B00849755-11



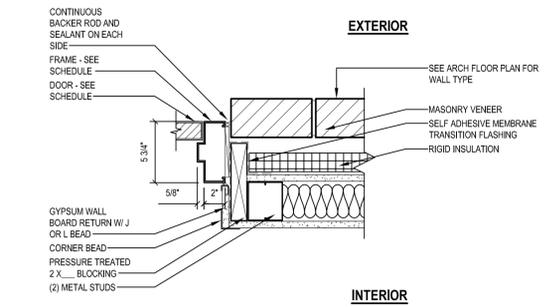
H1 Door Head (Lintel)
Scale: 1/2" = 1'-0" H2M Ref # DH59A-109



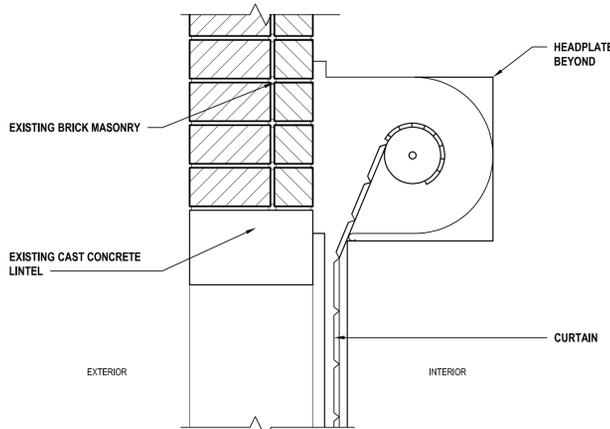
J1 Door Jamb
Scale: 1/2" = 1'-0" H2M Ref # DJ59-109



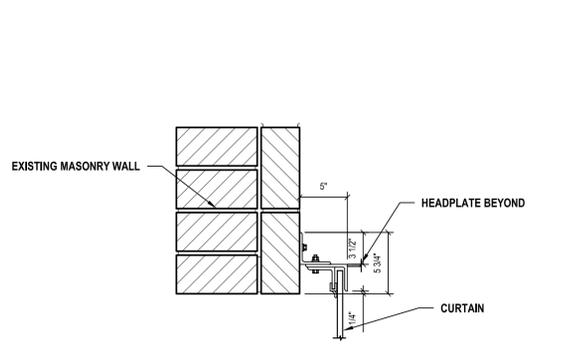
H2 Door Head
Scale: 1/2" = 1'-0" H2M Ref # DH22-027



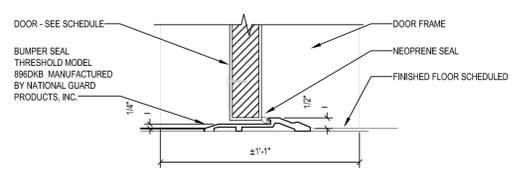
J2 Door Jamb
Scale: 1/2" = 1'-0" H2M Ref # J2



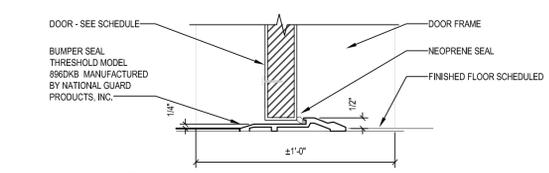
H3 Door Head - Overhead Door
Scale: 1/2" = 1'-0" H2M Ref # DJ59-109



J3 Door Jamb - Overhead Door
Scale: 1/2" = 1'-0" H2M Ref # DJ59-109



S1 Saddle Detail
Scale: 3" = 1'-0" H2M Ref # DS-003



S2 Saddle Detail
Scale: 3" = 1'-0" H2M Ref # DS-003

X:\BIDD\Brooklyn Navy Yard\43700BENTY1905A - 42751 - 1166666602.BIM\CADD\Door-Details\A-300.00.dwg 3/8/2024 10:48:39 AM User: Maudlin, Jan 12, 2024 - 3:21 PM Plotted on: Sep 08, 2024 - 2:09pm By: throckm

CONSULTANTS:

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08/12/2027
EXP. DATE

SEAN P. CALLAHAN, P.E.
NY PROFESSIONAL ENGINEER Lic. No. 06008

DESIGNED BY: SJP	DRAWN BY: SJP	CHECKED BY: SPC	REVIEWED BY:
PROJECT NO: BNYD 1905A	DATE: SEPT 2024	SCALE: AS SHOWN	

Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386



141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

CONTRACT
ALL CONTRACTS

STATUS
FINAL BID DOCUMENTS

SHEET TITLE
SITE RESTORATION PLAN

DRAWING No.
C-100.00

SHEET No.
09
OF
54

DEMOLITION LEGEND

SAWCUT LINE	-----
SITE RESTORATION LEGEND	
CONCRETE DUCT BANK	[Pattern]
ASPHALT RESTORATION	[Pattern]

EXISTING CONDITIONS NOTES:

- EXISTING SURVEY PREPARED BY H2M ARCHITECTS AND ENGINEERS, DATED 8/27/20.
- MARKOUT OF UNDERGROUND UTILITIES COMPLETED BY SINGER UTILITY ENGINEERING, P.C. ON AUGUST, 2020.
- LOCATION OF UNDERGROUND UTILITIES AND STRUCTURES BOTH PUBLIC AND CUSTOMER OWNED, WERE OBTAINED FROM EITHER OLD MAPS, SURVEYS, DRAWINGS/RECORDS SUPPLIED BY OTHERS AND/OR UTILITY MARKOUT. THE OWNER AND ENGINEER DO NOT GUARANTEE OR ACCEPT RESPONSIBILITY FOR ANY DAMAGE TO SUCH FACILITIES DUE TO DISCREPANCIES IN LOCATION AND SIZE SHOWN ON THE PLANS OR THOSE UTILITIES AND STRUCTURES NOT SHOWN.

UTILITY NOTES:

SUBSURFACE UTILITY ENGINEERING (SUE) QUALITY LEVELS OF SERVICE (ACCURACY)
ALL MARKOUT IS QUALITY LEVEL B UNLESS OTHERWISE NOTED.

QL-A = QUALITY LEVEL A (TEST HOLES)
DATA TYPICALLY ACQUIRED AT ONE POINT ON AN UNDERGROUND UTILITY FEATURE EXPOSED BY AIR VACUUM EXCAVATION OR OTHER MEANS. THE HORIZONTAL AND VERTICAL LOCATION OF THIS REFERENCE POINT IS ACQUIRED AND REPORTED TO ACCEPTABLE SURVEY TOLERANCES. THE ACQUIRED DATA FULFILLS SECTION 5.4.5 ON PAGE 6 OF ASCE STANDARD 38-02.

QL-B = QUALITY LEVEL B (UTILITY DESIGNATION)
DEPICTION OF AN UNDERGROUND UTILITY LINE ESTABLISHED BY SENSING THE LOCATION WITH ELECTRONIC INSTRUMENTATION. LINEWORK AND UTILITY SURFACE FEATURES ARE ACQUIRED BY SURVEYING POINTS ALONG ALIGNMENT TO ACCEPTABLE SURVEY TOLERANCES.

QL-C = QUALITY LEVEL C (RECORDS PLOTTING)
UTILITY INFORMATION OBTAINED FROM RECORD INFORMATION AND PLOTTED TO CORRELATE WITH SURFACE UTILITY FEATURES WHICH HAVE BEEN SURVEY LOCATED AND ACCURATELY REDUCED ON TO DESIGN/CONSTRUCTION DOCUMENTS.

QL-D = QUALITY LEVEL D (RECORDS DRAFTING)
DEPICTION OF UNDERGROUND UTILITY LINES BY TRANSPOSITION FROM UTILITY RECORDS OR PLACED FROM VERBAL RECOLLECTIONS WITHOUT BENEFIT OF SURVEYED SURFACE FEATURES. ACCURACY OF INFORMATION IS QUESTIONABLE.

EOL
END OF INFORMATION PERTAINS TO THE LOSS OF SIGNAL THAT HAS BEEN APPLIED TO AN UNDERGROUND UTILITY AND THEN DETECTED TO ELECTRONICALLY LOCATE THE UTILITY. COMMONLY FOUND WHERE UTILITIES CHANGE TO NON-CONDUCTIVE MATERIALS, ARE CUT OR AT END OF UTILITY.

EXISTING CONDITIONS LEGEND

DESCRIPTION	SYMBOL
DRAINAGE MANHOLE	⊙
CATCH BASIN	⊞
INLET	⊞
INLET	⊞
WATER MANHOLE	⊙
WATER VALVE	⊙
ROOF DRAINLEADER	⊙
SANITARY MANHOLE	⊙
ELECTRIC MANHOLE	⊙
ELECTRIC RISER	⊙
TELEPHONE MANHOLE	⊙
CABLE TELEVISION BOX	⊙
MANHOLE	⊙
BOLLARD	⊙
STORM DRAIN	D --- D
WATER MAIN	W --- W
ROOF LEADER	L --- L
UNDERGROUND ELECTRIC	E --- E
UNDERGROUND TELEPHONE	T --- T
FENCE	X --- X
EDGE OF PAVEMENT	---
CONTOUR	--- 100 ---
SPOT ELEVATION	100.0
TOP/BOT CURB GRADE	to 100.50 to 100.00
ASPHALT PAVEMENT	[Pattern]
CONCRETE PAVEMENT	[Pattern]

SITE DEMOLITION NOTES:

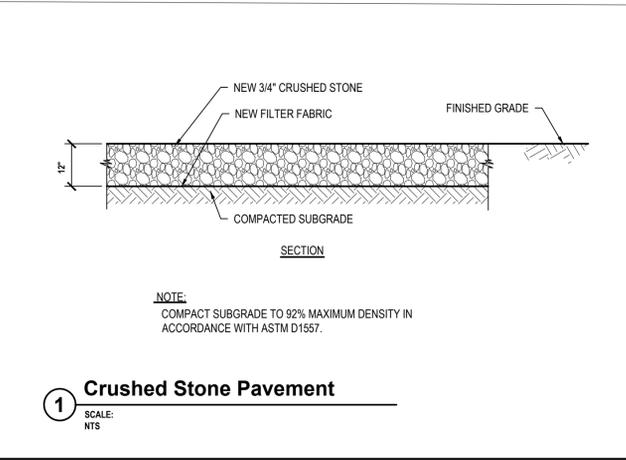
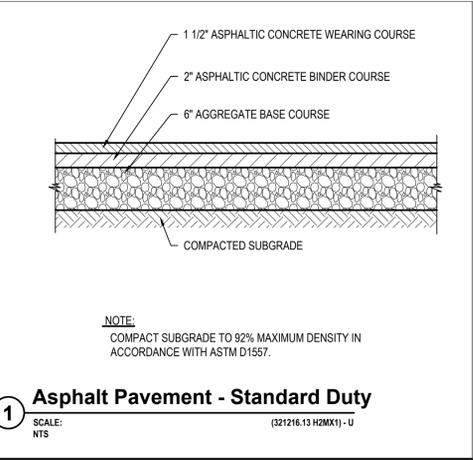
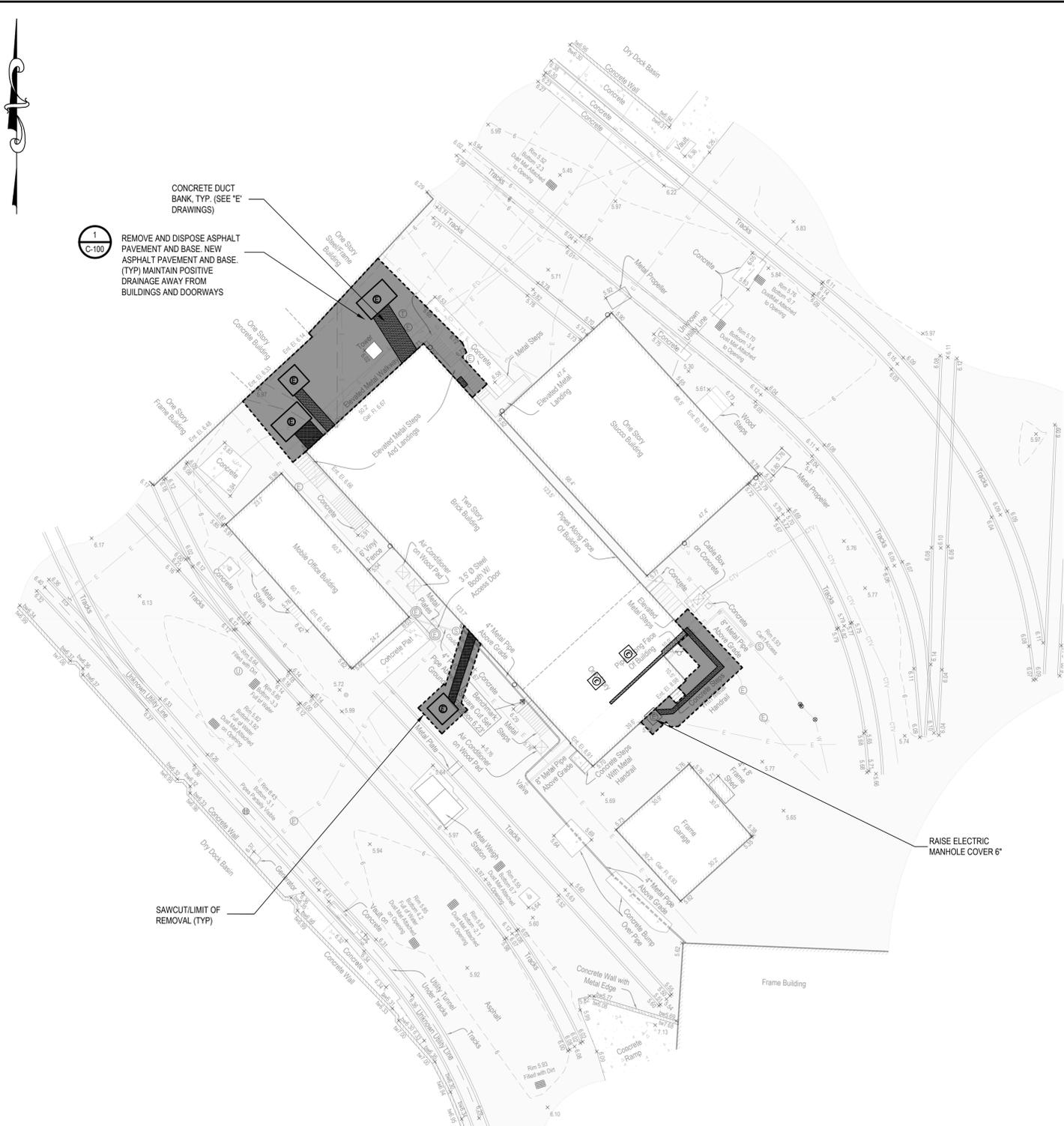
- REPORT ANY DISCREPANCIES BETWEEN ACTUAL FIELD CONDITIONS AND THE PLANS TO THE ENGINEER IN WRITING IMMEDIATELY.
- UNDERGROUND UTILITY INFORMATION SHOWN ON THESE PLANS WAS OBTAINED FOR DESIGN PURPOSES ONLY. PROVIDE FOR CONSTRUCTION MARKOUT AND LOCATE EXISTING UNDERGROUND UTILITIES. NO EXCAVATION CAN COMMENCE UNTIL UTILITY DOCUMENTATION HAS BEEN COMPLETED.
- AFTER MARKOUT AND PRIOR TO DISTURBING THE SITE, UNCOVER ALL SUBSURFACE UTILITIES AND STRUCTURES WITHIN LIMITS OF DISTURBANCE TO CONFIRM THEIR LOCATION AND DEPTH.
- NO COMPENSATION WILL BE MADE FOR ANY INCONVENIENCE CAUSED BY ENCOUNTERING UTILITIES AND STRUCTURES WHICH ARE NOT SHOWN, OR ARE INACCURATELY SHOWN ON THE PLANS.
- REPAIR ANY DAMAGE TO EXISTING UTILITIES RESULTING FROM CONTRACTOR OPERATIONS IMMEDIATELY AT NO COST TO OWNER.
- REPAIR ANY DAMAGE TO EXISTING SITE FEATURES SCHEDULED TO REMAIN RESULTING FROM CONTRACTOR OPERATIONS AT NO COST TO OWNER.
- LOCATE ALL COMPONENTS OF ANY EXISTING IRRIGATION SYSTEMS PRIOR TO CONSTRUCTION AND PROTECT THROUGHOUT THE DURATION OF THE CONTRACT. REPAIR ALL DAMAGED COMPONENTS AT NO ADDITIONAL COST TO THE OWNER.
- SAWCUT CONCRETE PAVEMENT BACK TO NEAREST EXPANSION/CONTROL JOINT.
- PROVIDE TEMPORARY FENCING TO PROTECT WORK AREAS.
- DELINEATE THE LIMITS OF CLEARING AND REVIEW WITH THE OWNER PRIOR TO COMMENCING WORK.
- NOTIFY OWNER AND ENGINEER IMMEDIATELY IN WRITING WHEN UNKNOWN STRUCTURES OR SUSPECTED HAZARDOUS OR CONTAMINATED MATERIALS ARE ENCOUNTERED PRIOR TO REMOVAL OR DISTURBANCE.
- TAKE APPROPRIATE MEASURES TO PROTECT PEDESTRIANS AND VEHICULAR TRAFFIC DURING REMOVAL ACTIVITIES, AND PROVIDE TEMPORARY MEASURES FOR THE PROTECTION AND SAFETY OF THE PUBLIC UNTIL FINAL ACCEPTANCE BY THE OWNER.
- BACKFILL ALL VOIDS RESULTING FROM THE REMOVAL OF EXISTING SITE FEATURES. BACKFILL TO BE SOIL, FREE OF ORGANIC MATERIAL, DEBRIS, TRASH, CLAY AND STONES LARGER THAN 4 INCHES.

SITE PLAN NOTES:

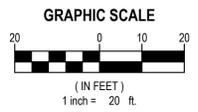
- INSPECT THE SITE PRIOR TO SUBMISSION OF BIDS AND MAKE NO ADDITIONAL CLAIMS REGARDING SITE CONDITIONS THEREAFTER.
- NOTIFY THE OWNER AND H2M (TELEPHONE 631-756-8000) AT LEAST 48 HOURS PRIOR TO THE COMMENCEMENT OF THE WORK. THE SAME NOTICE SHALL BE REQUIRED WHEN RESUMING WORK AFTER ANY STOPPAGE OR DELAY.
- COMPLETE ALL SURVEY AND STAKEOUT AS REQUIRED TO PROPERLY COMPLETE THE WORK.
- PERFORM DAILY CLEANUP OPERATIONS INCLUDING REMOVAL OF DEBRIS AND EXCESS CONSTRUCTION MATERIAL, AND DRIVEWAY/STREET CLEANING TO THE SATISFACTION OF THE OWNER.
- DURING ALL NON-WORKING HOURS, STORE ALL EQUIPMENT AND MATERIALS WITHIN AN AREA DESIGNATED BY THE OWNER AT THE PROJECT SITE.
- ALL CURB DIMENSIONS SHOWN REFER TO THE FACE OF CURB.
- ALL CONSTRUCTION TO CONFORM WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL CODE REQUIREMENTS.
- COORDINATE CONSTRUCTION ACTIVITIES WITH OWNER TO MINIMIZE INTERRUPTION TO THE OWNER'S OPERATIONS.
- RESTORE SURROUNDING AREAS DAMAGED OR DISTURBED DURING CONSTRUCTION. RESTORE TO NEW CONDITIONS AT NO ADDITIONAL COST TO THE OWNER.
- RESTORE ALL DISTURBED GRASS AREAS AND ALL AREAS NOT SPECIFICALLY IDENTIFIED FOR OTHER IMPROVEMENTS WITH 4 INCHES OF TOPSOIL AND SEED.
- REMOVE ALL ASPHALT FROM EXISTING CASTINGS.
- SEAL ALL JOINTS BETWEEN NEW ASPHALT AND EXISTING ASPHALT WITH HOT ASPHALT CEMENT.

GRADING AND DRAINAGE NOTES:

- FOR NEW CONSTRUCTION THAT MEETS EXISTING CONDITIONS, ABUTTING SURFACES SHALL BE FLUSH AND ALIGNED.
- ADJUST ALL EXISTING CASTINGS AND VALVE COVERS TO MEET PROPOSED GRADE.
- CONSTRUCTION DEBRIS AND EXCESS SOIL SHALL BE REMOVED AND LEGALLY DISPOSED OFF SITE.
- UNSATURABLE SOILS ENCOUNTERED DURING CONSTRUCTION SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER AND ENGINEER IMMEDIATELY IN WRITING BEFORE REMOVAL OR DISTURBANCE.



Site Restoration Plan



DESIGN CRITERIA:

ALL DESIGN LOADS ARE IN ACCORDANCE WITH 2022 NYC BC IN CONJUNCTION WITH ASCE 7-16 AND IBC 2021

RISK CATEGORY: II

Table with 2 columns: Load Type and Value. Includes Dead Loads (Second Floor Total Dead Load, Interior Transformer, etc.), Live Loads (Electrical Room, Exterior Staging Platform, etc.), and Snow Loads (Ground Snow Load, Exposure Factor, etc.).

NOTE: THE DESIGN LOAD DATA BELOW PERTAINS TO THE DESIGN OF THE EXTERIOR PLATFORM AND LIFT STRUCTURE. MODIFICATIONS TO THE EXISTING BUILDING DO NOT REQUIRE COMPLIANCE WITH THE LATEST NYC BUILDING CODE. THE EXISTING BUILDING TO COMPLY WITH THE NYC 1968 BUILDING CODE.

3. SNOW LOADS

Table with 2 columns: Snow Load Factor and Value. Includes Ground Snow Load (Pg = 25 PSF), Exposure Factor (Ce = 1.1), Importance Factor (Is = 1.0), Thermal Factor (Ct = 1.1), Flat Roof Snow Load (Pf = 21.2 PSF), Minimum Snow Load (Pm = 20 PSF), Rain on Snow Surcharge (Ps = 0 PSF), Total Design Snow Load w/o Drift (Pt = 21.2 PSF), and Drift Snow Load (Pd = 58.1 PSF).

NOTE: THE DESIGN LOAD DATA BELOW PERTAINS TO THE DESIGN OF THE EXTERIOR PLATFORM AND LIFT STRUCTURE. MODIFICATIONS TO THE EXISTING BUILDING DO NOT REQUIRE COMPLIANCE WITH THE LATEST NYC BUILDING CODE. THE EXISTING BUILDING TO COMPLY WITH THE NYC 1968 BUILDING CODE.

4. WIND LOADS

Table with 2 columns: Wind Load Parameter and Value. Includes Basic Wind Speed (115 MPH), Exposure (C), Internal Pressure Coefficient (Gcp = +/- 0.18), End Zone Width (10 FT), and Net Uplift (7 PSF).

Table with 2 columns: ASD Design Wind Load and Value. Includes MWFRS Wall (End Zone) at 30.45 PSF, MWFRS Wall (Int. Zone) at 20.16 PSF, and MWFRS Roof at -25.38 PSF.

Table with 2 columns: Component & Cladding Design Wind Load and Value. Includes Walls (End Zone) at 24.2 PSF, Walls (Int. Zone) at 24.2 PSF, Roof (End Zone) at 10.0 PSF, and Roof (Int. Zone) at 10.0 PSF.

COMPONENT AND CLADDING VALUES LISTED ARE BASED ON 10 SQUARE FOOT "EFFECTIVE AREA" AS DEFINED BY SEI/ASCE 7-16 STANDARD. MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES. ALL ITEMS SPECIFIED TO BE DESIGNED BY OTHERS SHALL BE DESIGNED TO WITHSTAND COMPONENT AND CLADDING LOADS UNLESS SPECIFICALLY NOTED OTHERWISE IN PLANS. SPECIFICATIONS OR BY RFI RESPONSE. WIND LOADS MAY BE REDUCED BASED ON INCREASED "EFFECTIVE AREA" WHEN CALCULATIONS ARE SUBMITTED AND REVIEWED BY ENGINEER PRIOR TO FINAL DESIGN SUBMISSION. SUBMITTAL SHALL INCLUDE EFFECTIVE AREA ASSUMPTIONS FOR EACH COMPONENT AND WIND LOAD CALCULATIONS USING PARAMETERS SPECIFIED HEREIN.

NOTE: THE DESIGN LOAD DATA BELOW PERTAINS TO THE DESIGN OF THE EXTERIOR PLATFORM AND LIFT STRUCTURE. MODIFICATIONS TO THE EXISTING BUILDING DO NOT REQUIRE COMPLIANCE WITH THE LATEST NYC BUILDING CODE. THE EXISTING BUILDING TO COMPLY WITH THE NYC 1968 BUILDING CODE.

5. SEISMIC LOADS

Table with 2 columns: Seismic Parameter and Value. Includes Site Class (C), Importance Factor (Ie = 1.0), Seismic Design Category (C), Analysis Method (Equivalent Lateral Force Procedure), Steel Systems (R = 3.0, Cd = 3.0), and Total Ultimate Base Shear (13.29 KIPS).

7. GEOTECHNICAL INFORMATION:

GEOTECHNICAL INFORMATION PROVIDED BY GEOTECHNICAL ENGINEERING REPORT BY MFS CONSULTING ENGINEERS, DATED 7 FEBRUARY 2020. REFER TO THIS REPORT FOR ADDITIONAL SOIL AND FOUNDATION DESIGN INFORMATION. SHALLOW FOUNDATIONS ARE NOT PERMITTED FOR NEW CONSTRUCTION. VALUES PROVIDED ARE FOR EVALUATION OF EXISTING STRUCTURE ONLY. SOIL BEARING CAPACITY: 500 PSF (FOR EXISTING FOUNDATIONS ONLY). FROST DEPTH: 4 FT. SUBGRADE MODULUS: 50 PCI.

MAXIMUM SAFE EXCAVATION SLOPE: 1.5H : 1V

6. FLOOD LOADS

FLOOD LOADING BASED ON BUILDING CODE, ASCE 24, ASCE 7, AND FEMA FIRMS AND PFIRMS IN EFFECT AT THIS SITE.

Table with 2 columns: Flood Zone and Elevation. Includes Flood Zone (COASTAL AE), Base Flood Elevation (BFE NAVD): 13 FT, and Design Flood Elevation (DFE NAVD): 16.5 FT.

DESIGN FLOOD ELEVATION IS EQUAL TO BASE FLOOD ELEVATION PLUS 1'-0" FREEBOARD, PLUS 2'-6" PROJECTED SEA LEVEL RISE (DFE = BFE + 1'-0" FB + 2'-6" SLR).

DESIGN CODES/REFERENCE FOR DESIGN AND DELEGATED DESIGN

- 1. AISI OF THE COLD-FORMED STEEL DESIGN MANUAL
2. AWS D1.1:2015 - STRUCTURAL WELDING CODE - STEEL
3. ACI 318 BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE
4. ANSI / AISC 360-16, SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS.
5. STRUCTURAL WELDED WIRE REINFORCEMENT MANUAL OF STANDARD PRACTICE, WIRE REINFORCEMENT INSTITUTE
6. ACI 530 BUILDING CODE REQUIREMENTS FOR MASONRY STRUCTURES
7. SJI RECOMMENDED CODE OF STANDARD PRACTICE FOR STEEL JOISTS AND JOIST GIRDERS
8. NATIONAL DESIGN SPECIFICATIONS (NDS) FOR WOOD CONSTRUCTION
9. STRUCTURAL WELDED WIRE REINFORCEMENT MANUAL OF STANDARD PRACTICE, WIRE REINFORCEMENT INSTITUTE
10. LIVE LOAD REDUCTION ON SUPPORTING ELEMENTS IN ACCORDANCE WITH BC-NYC 2022 SECTION 1607

GENERAL NOTES:

- 1. SPECIFICATIONS ARE PART OF THE CONSTRUCTION DOCUMENTS AND MUST BE USED IN CONJUNCTION WITH THE DRAWINGS.
2. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS BY MEASUREMENTS AT THE JOB SITE AND SHALL TAKE ANY AND ALL OTHER MEASUREMENTS NECESSARY TO VERIFY THE DRAWINGS AND TO PERFORM THE WORK PROPERLY. ANY DISCREPANCY BETWEEN THE DRAWINGS AND THE MEASURED DIMENSIONS OF THE EXISTING SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER. NO WORK SHALL PROCEED UNTIL SUCH DISCREPANCY HAS BEEN RECTIFIED INCLUDING BUT NOT LIMITED TO FABRICATION OF MATERIALS. SUCH DISCREPANCIES BETWEEN THE DRAWINGS AND THE MEASURED DIMENSIONS SHALL NOT BE THE REASONS FOR AN EXTRA COST OR DELAY IN THE EXECUTION OF THE WORK AND THE WORK SHALL BE PERFORMED AT NO EXTRA COST TO THE OWNER.
3. ALL CONTRACTORS ARE REQUIRED TO VISIT THE SITE AND FULLY INFORM THEMSELVES AS TO THE EXISTING CONDITIONS AND LIMITATIONS PRIOR TO SUBMITTING THEIR PROPOSAL/BID. FAILURE TO VISIT THE SITE AND NOT FAMILIARIZING THEMSELVES WITH THE CONDITIONS AND LIMITATIONS WILL IN NO WAY RELIEVE THE SUCCESSFUL BIDDER FROM FURNISHING ANY MATERIALS OR PERFORMING ANY WORK THAT MAY BE REQUIRED TO COMPLETE THE WORK IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS AT NO ADDITIONAL COST TO THE OWNER.
4. THE CONTRACT STRUCTURAL DOCUMENTS REPRESENT THE FINISHED STRUCTURE. THE CONTRACTOR ALONE IS RESPONSIBLE FOR THE MEANS AND METHODS OF CONSTRUCTION AND SAFETY OF STRUCTURE AND WORKERS DURING THE ENTIRE CONSTRUCTION PERIOD, WHICH SHALL INCLUDE BUT NOT BE LIMITED TO DESIGN AND INSTALLATION OF BRACING, SHORING FOR CONSTRUCTION EQUIPMENT, SHORING FOR THE BUILDING, FORMS AND SCAFFOLDING, SHORING OF RETAINING WALLS AND OTHER TEMPORARY SUPPORTS AS REQUIRED. ANY DAMAGE TO THE STRUCTURE IF OCCURRED SHALL BE RECTIFIED TO THE ENTIRE SATISFACTION OF THE OWNER AT NO ADDITIONAL COST TO THE OWNER. THE CONTRACTOR SHALL SCHEDULE THE WORK IN CONSULTATION WITH THE OWNER AND IN SUCH A WAY AS TO MINIMIZE THE CONFLICT OF THE OPERATION OF THE BUILDING. COMPLY WITH APPLICABLE REQUIREMENTS OF OSHA AND OTHER GOVERNING BODIES HAVING JURISDICTION AT THE SITE.
5. IN CASE OF ANY DAMAGE TO THE CONSTRUCTION, THE CONTRACTOR SHALL REPAIR THE SAME TO THE SATISFACTION OF THE OWNER AT NO ADDITIONAL COST TO THE OWNER.
6. THE CONTRACTOR SHALL INFORM THE ENGINEER OF ANY DEMOLITION, ALTERATIONS REQUIRED OR INTERFERENCES NOT SHOWN ON THE DEMOLITION DRAWINGS FOR RESOLUTION. THE CONTRACTOR SHALL ALLOW 7 WORKING DAYS FOR RESOLUTION OF THE CONDITION UNLESS ADDITIONAL TIME IS STATED TO BE REQUIRED BY THE ENGINEER.
7. TYPICAL DETAILS ON DRAWINGS APPLY TO SITUATIONS OCCURRING ON THE PROJECT THAT ARE THE SAME OR SIMILAR TO THOSE SPECIFICALLY DETAILED. SUCH DETAILS APPLY WHETHER OR NOT DETAILS ARE REFERENCED AT EACH LOCATION. NOTIFY ENGINEER OF CONFLICTS REGARDING APPLICABILITY OF TYPICAL DETAILS.
8. DO NOT LOAD THE FINISHED SLAB WITH ERECTION EQUIPMENT. DO NOT STACK CONSTRUCTION MATERIALS ON DECK/SLABS. DO NOT CAUSE IMPACT LOADS TO DECK/SLAB DURING CONSTRUCTION.
9. VERIFY THE LOCATION OF CHASES, INSERTS, OPENINGS, SLEEVES, FINISHES, DEPRESSIONS, PADS, AND WALL OPENINGS.
10. PRINCIPAL OPENINGS THROUGH THE FRAMING AND SLABS ARE SHOWN ON DRAWINGS. COORDINATE WITH THE ARCHITECTURAL, MECHANICAL, AND ELECTRICAL DRAWINGS FOR ALL REQUIRED OPENINGS AND PROVIDE FOR REQUIRED OPENINGS WHETHER SHOWN ON THE STRUCTURAL DRAWINGS OR NOT. VERIFY SIZE AND LOCATION OF OPENINGS WITH MECHANICAL/ELECTRICAL TRADES. DEVIATIONS FROM THE OPENINGS SHOWN ON THE STRUCTURAL DRAWINGS MUST BE APPROVED PRIOR TO CONSTRUCTION/FABRICATION OF THE REQUIRED OPENINGS.
11. LOADINGS FOR MECHANICAL & ELECTRICAL EQUIPMENT ARE BASED ON THE UNITS SHOWN ON THE MECHANICAL & ELECTRICAL DRAWINGS. ANY CHANGES IN TYPE SIZE OR NUMBER OF PIECES OF EQUIPMENT SHALL BE REPORTED TO THE ARCHITECT/ENGINEER FOR VERIFICATION OF THE ADEQUACY OF SUPPORTING MEMBERS PRIOR TO THE PLACEMENT OF SUCH EQUIPMENT.
12. SEE ARCHITECTURAL DRAWINGS FOR ELEVATIONS NOT SHOWN AND FOR EXACT LOCATIONS OF ALL SLAB DEPRESSIONS AND HOUSEKEEPING PADS. THE CONTRACTOR SHALL COMPARE THE STRUCTURAL SECTIONS WITH ARCHITECTURAL SECTIONS AND REPORT ANY DISCREPANCY TO THE ARCHITECT PRIOR TO FABRICATING OR INSTALLING STRUCTURAL MEMBERS.

FOUNDATION NOTES:

- 1. FOUNDATION DESIGN IS BASED UPON THE GEOTECHNICAL ENGINEERING REPORT BY MFS DATED 2/7/2020. COORDINATE STRUCTURAL PLANS AND DETAILS WITH REQUIREMENTS OF GEOTECHNICAL REPORT. THE FOUNDATIONS HAVE BEEN DESIGNED TO BE PILE SUPPORTED PER THE RECOMMENDATIONS OF THE REPORT.
2. REFER TO THE GEOTECHNICAL REPORT AND SPECIFICATIONS FOR GENERAL REQUIREMENTS OF EARTHWORK, OVER EXCAVATION, SUBGRADE PREPARATION, FILL AND COMPACTION, WATERPROOFING AND OTHER PERTINENT REQUIREMENTS AND INFORMATION. IF THERE IS A CONFLICT BETWEEN GEOTECHNICAL REPORT AND STRUCTURAL PLANS OR SPECIFICATIONS THEN THE MORE STRINGENT CRITERIA SHALL APPLY UNLESS OTHERWISE DIRECTED BY AN RFI.
3. PROTECT PIPES AND CONDUITS RUNNING THROUGH WALLS AND SLABS WITH 1/2 INCH EXPANSION JOINT MATERIAL. LOWER CONTINUOUS FOOTINGS AND GRADE BEAMS PERPENDICULAR TO PIPE RUNS TO ALLOW PIPES TO PASS ABOVE THE FOOTINGS. LOWER FOOTINGS AND GRADE BEAMS PARALLEL TO PIPE RUNS TO AVOID SURCHARGE ONTO ADJACENT TRENCH EXCAVATIONS.
4. MAINTAIN SPECIFIED SUBGRADE AND FILL MOISTURE CONTENT UNTIL FOUNDATIONS ARE PLACED.
5. ARRANGE FOR OWNER'S INDEPENDENT TESTING AGENCY TO MONITOR CUT AND FILL OPERATIONS AND PERFORM FIELD DENSITY AND MOISTURE CONTENT TESTS TO VERIFY COMPACTION AND APPROVE FOOTING SUBGRADES PRIOR TO PLACING CONCRETE.
6. DO NOT PLACE FOOTINGS OR SLABS AGAINST SUBGRADE CONTAINING FREE WATER, FROST, OR ICE.
7. MAINTAIN PROPER SITE DRAINAGE DURING CONSTRUCTION TO ENSURE SURFACE RUNOFF AWAY FROM STRUCTURES AND TO PREVENT PONDING OF SURFACE RUNOFF NEAR THE STRUCTURES.

EXCAVATION NOTES:

- 1. PROTECT ABOVE AND BELOW GRADE UTILITIES WHICH ARE TO REMAIN.
2. PROTECT BENCH MARKS, EXISTING STRUCTURES, FENCES, SIDEWALKS, PAVING AND CURBS FROM EXCAVATION EQUIPMENT AND VEHICULAR TRAFFIC.
3. GRADE TOP PERIMETER OF EXCAVATION TO PREVENT SURFACE WATER FROM DRAINING INTO EXCAVATION.
4. HAND TRIM EXCAVATION. REMOVE LOOSE MATTER.
5. REMOVE LUMPED SUB-SOIL, BOULDERS AND ROCK.
6. NOTIFY ENGINEER OF UNEXPECTED SUBSURFACE CONDITIONS AND DISCONTINUE AFFECTED WORK AREA UNTIL NOTIFIED TO RESUME WORK.
7. CORRECT UNAUTHORIZED EXCAVATION AT NO EXTRA COST TO OWNER IN ACCORDANCE WITH BACKFILLING NOTES.
8. STOCKPILE EXCAVATED MATERIAL IN AREA DESIGNATED ON SITE AND REMOVE EXCESS MATERIAL NOT BEING REUSED FROM SITE.
9. PROTECT EXCAVATIONS BY METHODS REQUIRED TO PREVENT CAVE-IN OR LOOSE SOIL FROM FALLING INTO EXCAVATION.
10. CONTRACTOR SHALL VERIFY LOCATION OF EXISTING STRUCTURES AND UTILITIES PRIOR TO EXCAVATION. CONTRACTOR SHALL ENSURE ALL SURROUNDING STRUCTURES ARE PROTECTED FROM THE EFFECTS OF ALL EXCAVATION.

STRUCTURAL STEEL NOTES:

- 1. DETAIL AND ERECT STRUCTURAL STEEL ELEMENTS IN ACCORDANCE WITH THE FOLLOWING:
A. AISC SPECIFICATION FOR THE DESIGN, FABRICATION, AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS.
B. AISC MANUAL OF STEEL CONSTRUCTION.
C. AISC CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES.
D. AWS STRUCTURAL WELDING CODE, D1.1.
2. PROVIDE STRUCTURAL STEEL OF THE FOLLOWING ASTM DESIGNATIONS UNLESS NOTED OTHERWISE:
A. STRUCTURAL STEEL WIDE FLANGE SHAPES: ASTM A 992, Fy = 50 KSI
B. EDGE ANGLES, BENT PLATES, HANGERS AND BRACES: ASTM A 36, Fy = 36 KSI
C. STRUCTURAL PIPE: ASTM A 53, GRADE B, TYPE E OR S, Fy = 46 KSI
D. HOLLOW STRUCTURAL SHAPES: ASTM A 500, GRADE B, Fy = 46 KSI
E. PLATES: ASTM A 36, Fy = 36 KSI
3. CONNECTION MATERIALS:
A. BEAM-COLUMN STIFFENER PLATES AND DOUBLER PLATES TO MATCH THE GRADE STEEL OF STRUCTURAL ELEMENT.
B. HIGH STRENGTH BOLTS: ASTM A 325 OR A 490. SEE NOTE D.
C. HARDENED STEEL WASHERS: ASTM F 436
D. CONNECTION DESIGN SHALL BE CONSISTENT WITH BOLT SIZE AND GRADE THROUGHOUT JOB AT SIMILAR CONNECTIONS. ONLY ONE GRADE OF STEEL BOLT SHALL BE USED FOR ENTIRE CONSTRUCTION FOR EACH BOLT SIZE SPECIFIED AND INSTALLED.
4. WELD MINIMUM SIZE AND STRENGTH:
A. PROVIDE MINIMUM SIZE OF FILLET WELDS AS SPECIFIED IN TABLE J2.4 OF THE AISC MANUAL.
B. PROVIDE MINIMUM EFFECTIVE THROAT THICKNESS OF PARTIAL PENETRATION GROOVE WELDS AS SPECIFIED IN TABLE J2.3 OF THE AISC MANUAL.
C. DEVELOP THE FULL TENSILE STRENGTH OF THE MEMBER ELEMENT JOINED, ON ALL SHOP AND FIELD WELDS, UNLESS NOTED OTHERWISE ON THE DRAWINGS.
D. WHERE CONNECTIONS ARE NOTED ON DRAWINGS AS MOMENT CONNECTIONS, PROVIDE WELDS TO DEVELOP FULL FLEXURAL CAPACITY OF THE LESSER MEMBER.
E. PROVIDE ELECTRODES FOR FIELD OR SHOP WELDING THAT CONFORM TO ASTM A 233 (CLASS 70).
F. ALL WELDS ARE CONTINUOUS FOR THE FULL LENGTH OF THE CONNECTION UNLESS NOTED OTHERWISE ON DRAWINGS.
5. PROVIDE MINIMUM OF TWO BOLTS PER CONNECTION. PROVIDE MINIMUM BOLT DIAMETER OF 3/4 INCH.
6. PROVIDE BOLTS, NUTS AND WASHERS THAT ARE HOT DIP GALVANIZED ACCORDING TO ASTM A 153, CLASS C WHEN USED TO CONNECT STEEL ELEMENTS THAT ARE HOT DIP GALVANIZED AFTER FABRICATION.
7. SUBMIT CALCULATIONS FOR CONNECTION DESIGNS NOT FULLY DETAILED ON DRAWINGS. DESIGN CONNECTIONS UNDER SUPERVISION OF REGISTERED PROFESSIONAL ENGINEER, REGISTERED IN THE STATE WHERE PROJECT IS BEING CONSTRUCTED. EMPLOYED BY THE STEEL FABRICATOR. DESIGN CALCULATIONS TO BE SEALED BY FABRICATOR'S REGISTERED PROFESSIONAL ENGINEER. SHOP DRAWINGS SUBMITTED WITHOUT COMPLETE DESIGN CALCULATIONS WILL NOT BE REVIEWED.
8. PROVIDE SIMPLE SHEAR CONNECTIONS FOR STEEL CONNECTIONS NOT FULLY DETAILED BY UTILIZING HIGH STRENGTH BEARING BOLTS IN SINGLE OR DOUBLE SHEAR. PROVIDE DOUBLE ANGLE BOLTED CONNECTIONS WHERE POSSIBLE. UNLESS LARGER REACTION IS SHOWN ON DRAWINGS, CONNECTION DESIGNER SHALL DESIGN SHEAR CONNECTIONS TO RESIST THE REACTION RESULTING FROM THE MAXIMUM ALLOWABLE UNIFORM LOAD OF THE BEAM FOUND IN THE AISC SPECIFICATION BEING APPLIED ALONG ITS FULL LENGTH.
9. STEEL FABRICATION:
A. FABRICATE AND ASSEMBLE STRUCTURAL MEMBERS/ASSEMBLIES IN SHOP TO GREATEST EXTENT POSSIBLE.
B. SPLICING OF STRUCTURAL STEEL MEMBERS IS PROHIBITED WITHOUT PRIOR APPROVAL BY THE EOR.
C. FABRICATOR SHALL BE RESPONSIBLE FOR ALL ERRORS OF DETAILING ON THE SHOP DRAWINGS, ERRORS IN FABRICATION, AND THE CORRECT FITTING OF STRUCTURAL STEEL MEMBERS.
D. CONFORM TO THE AISC CODE OF STANDARD PRACTICE, FOR ERECTION TOLERANCES. FIELD MODIFICATION TO STRUCTURAL STEEL IS PROHIBITED WITHOUT PRIOR APPROVAL BY THE EOR.
E. CLEAN STEEL OF RUST, LOOSE MILL SCALE AND OTHER FOREIGN MATERIALS WHERE REQUIRED FOR FABRICATION, FITTING UP, OR WELDING.
F. DO NOT CUT STRUCTURAL STEEL MEMBERS FOR THE WORK OF OTHER TRADES WITHOUT PRIOR REVIEW AND APPROVAL OF THE ARCHITECT/ENGINEER.
G. SHOP PRIME ALL MEMBERS NOT SCHEDULED FOR GALVANIZING WITH RED OXIDE PRIMER UNLESS NOTED OTHERWISE. DO NOT PAINT AT LOCATIONS OF FIELD WELDS.
10. FURNISH STEEL SHOP DRAWINGS FOR ARCHITECT'S AND STRUCTURAL ENGINEER'S REVIEW PRIOR TO FABRICATION. INCLUDE WELDING PROCEDURES, TESTING PROGRAMS FOR WELDING AND HIGH STRENGTH BOLTING, COATING MATERIAL AND ERECTION SEQUENCE ON SHOP DRAWINGS. SHOP DRAWINGS SHALL NOT BE REPRODUCTIONS OF CONTRACT DOCUMENTS. SHOP DRAWINGS SHALL BE PREPARED UNDER THE SUPERVISION OF, AND SHALL BE SIGNED AND SEALED BY, A LICENSED PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF NEW YORK.
11. PROVIDE TEMPORARY SHORING OR BRACING DURING CONSTRUCTION PHASE PRIOR TO COMPLETING CONNECTIONS AND INSTALLATION OF FLOOR SLAB. TEMPORARY CONSTRUCTION BRACING OF THE STRUCTURAL STEEL FRAME IS THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL REMAIN IN PLACE UNTIL AFTER THE PERMANENT BRACING SYSTEM HAS BEEN COMPLETED.

BACKFILLING NOTES:

Table with 2 columns: Sieve Size and Percent Passing. Includes Type C Sand: Natural River or Bank Sand, Washed, Free of Silt, Clay, Loam, Friable or Soluble Materials, or Organic Matter, Graded in Accordance with ANSI/ASTM C136 within the following limits.

- 2. VERIFY EXISTING CONDITIONS AND SUBSTRATE.
3. VERIFY FILL MATERIALS TO BE REUSED ARE ACCEPTABLE.
4. COMPACT SUBGRADE TO 95 PERCENT MAXIMUM DRY DENSITY IN ACCORDANCE WITH ANSI/ASTM D1557.
5. CUT OUT SOFT AREAS OF SUBGRADE NOT CAPABLE OF IN-SITU COMPACTIONS. BACKFILL WITH TYPE D FILL AND COMPACT TO DENSITY EQUAL TO OR GREATER THAN REQUIREMENTS FOR SUBSEQUENT BACKFILL MATERIAL.
6. BACKFILL AREAS TO CONTOURS AND ELEVATIONS WITH UNFROZEN MATERIALS.
7. SYSTEMATICALLY BACKFILL TO ALLOW MAXIMUM TIME FOR NATURAL SETTLEMENT. DO NOT BACKFILL OVER POROUS, WET, FROZEN OR SPONGY MATERIALS.
8. PLACE AND COMPACT MATERIALS IN CONTINUOUS LAYERS NOT EXCEEDING 6 INCHES COMPACTED DENSITY.
9. ALL BACKFILL MATERIALS SHALL BE COMPACTED TO 95 PERCENT MAXIMUM DRY DENSITY IN ACCORDANCE WITH ANSI/ASTM D1557. MAINTAIN OPTIMUM MOISTURE CONTENT TO ATTAIN REQUIRED DENSITY.
10. AT COMPLETIONS OF WALL CONSTRUCTIONS, BACKFILL SHALL BE PLACED LEVEL WITH FINAL TOP OF WALL ELEVATION. IF FINAL GRADING, PAVING, LANDSCAPING AND/OR STORM DRAINAGE INSTALLATION ADJACENT TO THE WALL IS NOT PLACED IMMEDIATELY AFTER WALL COMPLETION, TEMPORARY GRADING AND DRAINAGE SHALL BE PROVIDED TO ENSURE WATER RUNOFF IS NOT DIRECTED AT THE WALL OR ALLOWED TO COLLECT OR POND BEHIND THE WALL UNTIL FINAL CONSTRUCTION ADJACENT TO THE WALL IS COMPLETED.

METAL DECK:

- 1. PROVIDE DESIGN, FABRICATION, AND ERECTION OF METAL DECK CONFORMING TO THE STEEL DECK INSTITUTE'S "CODE OF RECOMMENDED STANDARD PRACTICE AND BASIC DESIGN SPECIFICATIONS".
2. FORM ROOF AND FLOOR DECK FROM STEEL SHEETS CONFORMING TO ASTM A 611 GRADE C AND D OR A 653 OR HIGHER SPECIFICATIONS WITH A MINIMUM YIELD STRENGTH OF 33 KSI.
3. ATTACH SHEETS TO STEEL SUPPORT MEMBERS AS INDICATED AND IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS FOR INSTALLATION. WHEN DECK IS SCHEDULED TO BE EXPOSED, DE-SLAG, CLEAN AND TOUCHED UP WELDS WITH A ZINC-RICH PRIMER.
4. LAP ROOF AND FLOOR DECK ENDS MINIMUM OF 2 INCHES. WHEN FASTENING DECK TO SUPPORT MEMBERS PROVIDE WELDING MATERIALS INSTALLATION PROCEDURES TO PREVENT BURNING OF HOLES IN DECK.
5. PROVIDE SIX INCH CLOSURE STRIP WHERE CHANGES IN DECK DIRECTION OCCUR. CLOSURE TO BE SAME GAGE AS DECK.
6. AT ENDS OF DECKS OR WHERE CHANGES OF DECK DIRECTION OCCUR, FASTEN TO SUPPORTS AT EACH FLUTE. PROVIDE ADEQUATE CLOSURES AND FASTENERS/ WELDS TO SIDES AT EIGHTEEN INCHES ON CENTER.
7. WHERE PARTIAL PANELS MAY BE REQUIRED TO COMPLETE DECK INSTALLATION AT PERIMETER OF STRUCTURE, PROVIDE WELDS IN EACH FLUTE TO STRUCTURAL MEMBERS. INSTALL DECK IN THREE CONTINUOUS SPAN LENGTHS.
8. AT PERIMETER OF DECK, SECURE DECK TO STRUCTURAL MEMBERS WITH SAME ATTACHMENT AND SPACING SUPPORT ATTACHMENT AS INDICATED ON PLANS.

CONCRETE NOTES:

- 1. PROVIDE BATCH MIXING, TRANSPORTATION, PLACING AND CURING OF CONCRETE IN ACCORDANCE WITH RECOMMENDATIONS OF ACI 301 AND ACI 318. USE TYPE I PORTLAND CEMENT UNLESS NOTED OTHERWISE. PROVIDE ADMIXTURES AND SPECIAL REQUIREMENTS AS SPECIFIED.
A. ALL CONCRETE SHALL BE NORMAL WEIGHT (145 PCF) CONCRETE Fc = 4,000 PSI AT 28 DAYS.
2. PROVIDE CONCRETE MIXES DESIGNED BY A QUALIFIED TESTING LABORATORY FOR REVIEW AND APPROVAL BY THE STRUCTURAL ENGINEER.
3. PROVIDE CONSTRUCTION AND CONTROL JOINTS AS REQUIRED BY A.C.I. CODE AND AS INDICATED ON DRAWINGS. SUBMIT PLAN TO ENGINEER INDICATING PROPOSED CONTROL AND EXPANSION JOINT LOCATIONS IN CONCRETE SLABS FOR REVIEW AND APPROVAL PRIOR TO INSTALLATION.
4. WIRE BRUSH AND CLEAN CONSTRUCTION JOINTS PRIOR TO POURING NEW CONCRETE.
5. PROVIDE ADEQUATE STRUCTURAL FRAMING AS APPROVED BY STRUCTURAL ENGINEER FOR MECHANICAL OPENINGS THROUGH THE SLABS, WALLS AND FLOOR DECK.

INSPECTION REQUIREMENTS (2022 NYC CODE)

SPECIAL INSPECTIONS (NYC BUILDINGS TR1)

Table with 3 columns: Inspection Item, Code Reference, and Status. Includes Structural Steel - Welding, Structural Steel - Details, Structural Steel - High Strength Bolting, Concrete - Cast in Place, Masonry, Subgrade Inspection, Subsurface Conditions - Fill & In Place Density, Subsurface Investigations (Borings/Test Pits), Excavations - Sheeting, Shoring and Bracing, Deep Foundations, Concrete Design Mix, Concrete Sampling and Testing, Post Installed Anchors, Helical Piles.

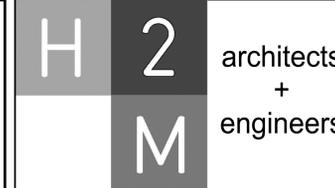
PROGRESS INSPECTIONS (NYC BUILDINGS TR1)

Table with 2 columns: Inspection Item and Code Reference. Includes Preliminary, Footing and Foundation, Lowest Floor Elevation, and Final.

SPECIAL INSPECTION NOTES

SPECIAL INSPECTIONS SHALL MEET THE REQUIREMENTS OF NYC BC CHAPTER 17. SPECIAL INSPECTOR(S) SHALL BE RETAINED BY THE OWNER TO PERFORM THE REQUIRED SPECIAL INSPECTIONS. THE NAMES OF PERSONS OR FIRMS WHO ARE TO PERFORM THE SPECIAL INSPECTIONS SHALL BE FORWARDED TO THE BUILDING OFFICIAL FOR APPROVAL. THE SPECIAL INSPECTOR(S) SHALL COMPLETE AND SUBMIT ALL FORMS REQUIRED BY NEW YORK CITY.

- 1. THE SPECIAL INSPECTOR(S) SHALL:
A. OBSERVE THE WORK ASSIGNED FOR CONFORMANCE TO THE APPROVED DRAWINGS AND SPECIFICATIONS.
B. FURNISH INSPECTION REPORTS TO THE ENGINEER OF RECORD AND BUILDING DEPARTMENT. DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION, THEN, IF NOT CORRECTED TO THE ENGINEER AND THE BUILDING DEPARTMENT.
C. SUBMIT TO THE ENGINEER OF RECORD AND THE BUILDING DEPARTMENT A SIGNED FINAL REPORT STATING THAT THE WORK WAS IN CONFORMANCE WITH THE APPROVED DRAWINGS AND SPECIFICATIONS AND THE APPLICABLE WORKMANSHIP PROVISIONS OF THE NYC BC.



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NY Engineering Certificate of Authorization No. 0018438

Table with 3 columns: Mark, Date, Description. Includes Final Bid Documents, 100% Submission, DOB Objections, etc.

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C. SUBMIT TO THE ENGINEER OF RECORD AND THE BUILDING DEPARTMENT A SIGNED FINAL REPORT STATING THAT THE WORK WAS IN CONFORMANCE WITH THE APPROVED DRAWINGS AND SPECIFICATIONS AND THE APPLICABLE WORKMANSHIP PROVISIONS OF THE NYC BC.

Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386



141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

ALL CONTRACTS

FINAL BID DOCUMENTS

GENERAL NOTES

DRAWING No. S-001.00
SHEET No. 10 OF 54

CONSULTANTS:

MARK	DATE	DESCRIPTION
	09-09-2024	Final Bid Documents
	09-29-2023	100% Submission
2	07-18-2023	DOB Objections
1	05-30-2023	DOB Objections
	01-04-2023	95% Submission
	10-12-2022	90% Submission
	08-10-2020	60% Resubmission
	03-03-2020	60% Submission
	11-08-2019	30% Submission

DESIGNED BY: DJA
DRAWN BY: DJA
CHECKED BY: SDL
REVIEWED BY: SDL

PROJECT NO: BNYD 1905A
DATE: SEPT 2024
SCALE: AS SHOWN

Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386

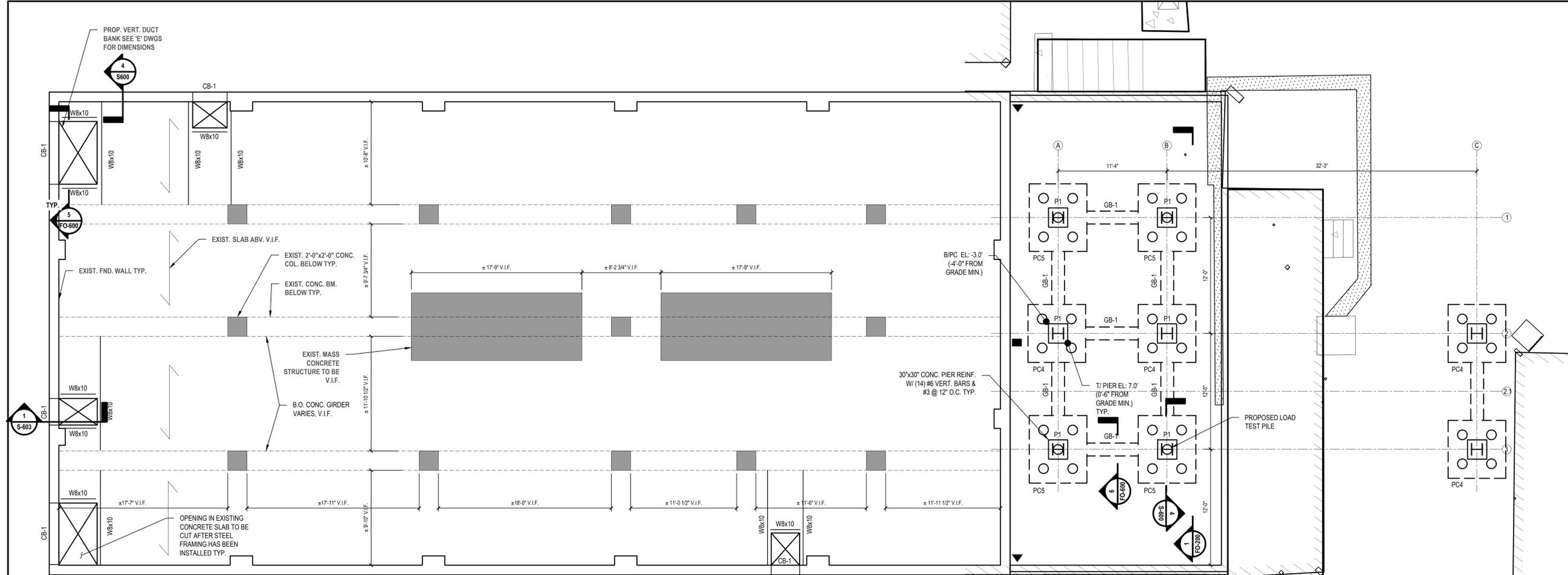


141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

ALL CONTRACTS

FINAL BID DOCUMENTS

FOUNDATION AND FIRST FLOOR FRAMING PLAN



- NOTES:**
- INDICATES HELICAL OR MICRO PILE RATED FOR:
 - 40 TON COMPRESSION (ULTIMATE FOS = 2)
 - 2 TON UPLIFT (ULTIMATE FOS = 3)
 - 5 TON SHEAR (ULTIMATE FOS = 2)
 - NOTE: SEE GEOTECHNICAL REPORT FOR DOWNDRAG FORCES
 - PILES SHALL BE DESIGNED TO THE LOADS AND UNBRACED LENGTHS LISTED IN THE DRAWINGS HEREIN OR OTHERWISE DETERMINED BY THE GEOTECHNICAL ENGINEER AND PILE DESIGNER. CALCULATIONS FOR GEOTECHNICAL AND STRUCTURAL CAPACITY OF THE PILES SHALL BE SUBMITTED TO THE EOR FOR REVIEW AND APPROVAL PRIOR TO CONDUCTING ANY LOAD TESTING ON SITE. THE GEOTECHNICAL COMPANY WHO PREPARED THE GEOTECHNICAL REPORT FOR THIS PROJECT MFS ENGINEERING CAN BE RETAINED TO PERFORM THE FINAL PILE DESIGN AS DESCRIBED ABOVE.
 - PILE CONTRACTOR SHALL CONDUCT LOAD TESTING AS PER THE NYC BC. LOAD TESTING

- SHALL BE DESIGNED AND OBSERVED BY A NYS REGISTERED ENGINEER. REFER TO SECTION 1814.1 FOR TESTING PROCEDURES. THE LOAD TEST SHALL BE PERFORMED FOR ALL LOADS INDICATED ON DWGS.
- ALL EXCAVATED EARTH SHALL BE REPLACED WITH WELL-GRADED SAND AND GRAVEL HAVING NOT MORE THAN 10 % BY DRY WEIGHT PASSING THE NO.200 SIEVE. THE MAXIMUM PARTICLE SIZE SHOULD BE 3 INCHES. THE FILL SHOULD BE FREE OF ORGANICS, CLAY, AND OTHER DELETERIOUS OR COMPRESSIBLE MATERIALS PER MFS REPORT. SEE REPORT FOR PREPARATION REQUIREMENT.
- CONTRACTOR SHALL COORDINATE SIZES AND LOCATIONS OF ALL REQUIRED PIPING AND CONDUIT WALL PENETRATION WITH ALL OTHER WORK.
- CONTROLLED FILL MATERIAL SHOULD BE PLACED IN UNIFORM 12 - INCH - THICK LOOSE LIFTS AND COMPACTED USING A 2-TON WALK-BEHIND VIBRATORY ROLLER TO AT LEAST 95% OF ITS MAXIMUM DRY UNIT WEIGHT AS DETERMINED BY ASTM TEST DESIGNATION D1557. IN RESTRICTED AREAS WHERE ONLY HAND-OPERATED COMPACTORS CAN BE USED, THE MAXIMUM LIFT THICKNESS SHOULD BE LIMITED TO 6 INCHES. THE APPROPRIATE

- WATER CONTENT AT THE TIME OF COMPACTION SHOULD BE PLUS OR MINUS 2 PERCENTAGE POINTS OF OPTIMUM AS DETERMINED BY THE LABORATORY COMPACTION TESTS OF PROPOSED FILL MATERIAL.
- WATERSTOPS SHALL BE INSTALLED AT ALL VERTICAL AND HORIZONTAL CONCRETE JOINTS BELOW GRADE.
- DE-WATERING WILL BE REQUIRED AND PERFORMED BY CONTRACTOR WITH DESIGN BY A NYS REGISTERED ENGINEER. DESIGN TO BE PROVIDED TO THE E.O.R FOR REVIEW. ADDITIONAL PERMITS MAY BE REQUIRED FOR DISCHARGING EFFLUENT.
- CONTRACTOR TO UTILIZE A 3" MUD-SLAB UNDER ALL FOUNDATION AND SLABS.
- THE CONTRACTOR SHALL INSTALL OPTICAL MONITORS AND VIBRATION MONITORS, SEE MONITORS DEVICE SCHEDULE FOR DETAILS.
- INSTALL A MINIMUM 6-INCH THICK LAYER OF COMPACTED 3/4 - INCH CLEAN CRUSHED STONE UNDERNEATH ALL FOUNDATIONS

Electrical Platform Foundation Plan & First Floor Framing Plan
SCALE: 3/16"=1'-0"

- MICRO-PILE INSTALLATION NOTES:**
- ALL PILES SHALL BE INSTALLED AT LOCATIONS SHOWN ON THE CONTRACT DRAWINGS.
 - LAYOUT OF PILE LOCATIONS BY GC (SURVEYED IN PLACE.)
 - SUBSURFACE AND EXPOSED UTILITY IDENTIFICATION AND EXPLORATION AS NECESSARY BY GC
 - THE DIAMETER OF THE CUTTING SIDE OF THE CASING SHALL NOT EXCEED THE OUTER DIAMETER OF THE CASING BY 1/4"
 - "GROUT" TO BE MIXTURE OF SAND AND CEMENT-GROUT TO ATTAIN SPECIFIED STRENGTH.
 - A SET OF SIX 2-INCH BY 2-INCH CUBES OF GROUT SHALL BE TAKEN EACH DAY DURING WHICH MICRO-PILES ARE GROUTED. CUBES SHALL BE THEN TESTED BY AN INDEPENDENT TESTING LABORATORY IN ACCORDANCE WITH THE CONTRACT SPECIFICATIONS.
 - PERMANENT STEEL CASING SHOULD EXTEND 5 FEET MIN. BELOW THE MARCH DEPOSITS.
- MICRO-PILE INSTALLATION PROCEDURE:**
- MOBILIZATION TO SITE.
 - SETUP RIG ON PROPER LOCATION AND PLUMB MAST.
 - DRILL IN PILES USING DUPLEX DRILLING METHODS. FLUSH WITH WATER ONLY. NOTE: WHEN CLEANING THE INSIDE CASING, 2-DIAMETERS OR TWO FOOT SHOULD BE MAINTAINED BEHIND THE TIP OF THE OUTER CASING
 - CASING IS DRILLED-IN TO THE BOTTOM OF THE GROUT [BOND] ZONE AS INDICATED ON DRAWINGS
 - FLUSH HOLE CLEAN OF SPOILS. IF PILE TIP IS BELOW GWT, FLUID LEVEL INSIDE CASING TO BE MAINTAINED AT TOP OF PILE DURING CLEAN OUT. A BUCKET OR AUGER MAY BE USED TO CLEAN HOLE. PLACE 3/4" DIAMETER PVC GROUT TUBE TO WITHIN 2 FEET OF BOTTOM OF CASING, AND GROUT THE PILE FROM THE BOTTOM TO DISPLACE THE DRILLING FLUID. CONTINUE GROUTING UNTIL GOOD GROUT FLOWS OUT THE TOP OF THE PILE
 - INTRODUCE REINFORCING THREADBAR WITH SPACERS AND PUSH TO THE BOTTOM OF THE PILE.
 - START PULLING THE CASING IN 5-FOOT INCREMENTS WHILE PUMPING GROUT AND MAINTAIN 75PSI GROUT PRESSURE BUT NOT EXCEEDING 100PSI. NOTE: GROUTING OF THE BOND ZONE WILL CEASE IF OVER 150% OF ITS THEORETICAL VALUE IS PUMPED IN. ACTUAL VOLUME TO BE SPECIFIED BY CONTRACTOR.
 - WHEN CASING REACHES THE ELEVATION REQUIRED BY THE UNBRACED LENGTH PER THE GEOTECHNICAL REPORT IT SHALL BE PUSHED BACK DOWN TO 5 FEET
 - CUT THREADBAR TO PROPER ELEVATION AS SHOWN ON CONTRACTOR DRAWINGS
 - THE INSTALLATION OF ADDITIONAL PILES IN THE SAME CAP SHALL NOT BE INSTALLED UNTIL THE GROUT HAS CURED FOR AT LEAST 24 HOURS
 - PRIOR TO THE INSTALLATION OF THE NEW MICRO-PILES CONTRACTOR SHALL PERFORM EXISTING CONDITIONS SURVEY TO DOCUMENT EXISTING CRACKS IN FLOORING, FOUNDATION, BRICK FACADE, CMU WALLS, ETC. AND IDENTIFY ANY POTENTIAL IMPACTS
 - MONITORING SERVICES DURING MICRO-PILE INSTALLATION TO OBSERVE MOVEMENT OF EXISTING BUILDING.
 - DO NOT USE AIR TO INSTALL THE MICRO-PILES FOR THIS PROJECT.

- ADDITIONAL PILE NOTES:**
- THE CONTRACTOR SHALL PERFORM, AT HIS EXPENSE, PILE LOAD TEST TO CONFIRM CAPACITY AND PROPER DEPTH OF PILE. REFER TO PLAN NOTE 3
 - PILE SHALL BE INSTALLED TO OBTAIN THE PROPER BEARING CAPACITY REQUIRED PER NYC BUILDING CODE
 - MINIMUM PILE EMBEDMENT SHALL BE 45 FEET. NO PILE SHALL BE MORE THAN 3 INCHES OFF FROM DESIGN LOCATION, NOR PUT OF PLUMB MORE THAN 4% OF ITS LENGTH. TOLERANCES SHALL APPLY TO THE PILES AFTER CUT-OFF.
 - PILE DRILLING SHALL BE SUPERVISED BY A LICENSED PROFESSIONAL ENGINEER HIRED BY THE CONTRACTOR ON BEHALF OF THE OWNER. HE/SHE SHALL PROVIDE SIGNED AND SEALED DESIGN PLAN FOR FILING WITH THE BUILDING DEPARTMENT.
 - A SURVEY SHALL BE MADE OF THE LOCATION OF EACH PILE AS DRILLED, ALONG WITH PILE LOGS AND SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL AND/OR CORRECTIVE ACTION. PILES CUT-OFF ELEVATIONS SHALL ALSO BE MARKED ON EACH PILE.
 - THE CONTRACTOR SHALL RETAIN A NYS REGISTERED PROFESSIONAL ENGINEER TO DESIGN THE PILES PER THE SPECIFICATIONS ON THESE DRAWINGS. A DETAILED DRAWING OF THE PILE AND DESIGN CALCULATIONS SHALL BE PROVIDED TO THE E.O.R. FOR REVIEW.
 - CONCRETE SHALL NOT BE POURED UNTIL APPROVAL IS OBTAINED FROM THE ENGINEER OF RECORD.
 - THE DESIGN OF THE FOUNDATION IS BASED UPON BORINGS AND GEOTECHNICAL REPORT PROVIDED BY YU & ASSOCIATES, INC. THIS INFORMATION IS PART OF THIS CONTRACT, ALSO SEE GEOTECH REPORT DATED DECEMBER 14, 2020. INCLUDED IN SPECIFICATION SECTION 023200.01- APPENDIX A-GEOTECHNICAL INVESTIGATION REPORT.
- 1808.4.1.3. TEST PROCEDURES**
- 2-LOAD TESTS SHALL BE CONDUCTED IN ACCORDANCE WITH ASTM D 1143 STANDARD PROCEDURES AND THE FOLLOWING CONDITIONS:
 - DIAL EXTENSOMETER GAGES SHALL PROVIDE READINGS TO THE NEAREST 0.001 INCH (0.025MM).
 - ELECTRICAL TRANSDUCERS MAY BE USED TO MAKE SETTLEMENT OBSERVATIONS PROVIDED THAT BACKUP MEASUREMENTS ARE MADE UTILIZING DIAL EXTENSOMETERS AS DESCRIBED HEREIN AT SUFFICIENT TIMES TO VALIDATE THE TRANSDUCER READINGS.
 - THE TOTAL TEST LOAD SHALL REMAIN IN PLACE UNTIL THE RATE OF SETTLEMENT DOES NOT EXCEED 0.001 INCHES OVER A TIME PERIOD OF 12 HOURS. THE LOAD SHALL BE REMOVED IN INCREMENTS NOT EXCEEDING 25 PERCENT OF THE TOTAL LOAD AT 1 HOUR INTERVALS OR LONGER. IN ADDITION TO OBSERVATIONS REQUIRED BY ASTM D 1143, SETTLEMENT OBSERVATIONS SHALL BE PERFORMED AT 1/2 MINUTE, 1-MINUTE, 2-MINUTE, AND 4-MINUTE INTERVALS AFTER APPLICATION OF EACH LOAD INCREMENT, AND 24 HOURS AFTER THE ENTIRE LOAD TEST HAS BEEN REMOVED.
 - ANY TEMPORARY SUPPORTING CAPACITY THAT THE SOIL MIGHT PROVIDE TO THE PILE DURING A LOAD TEST, BUT WHICH WOULD BE DISSIPATED WITH TIME, SHALL BE ELIMINATED BY CASING OFF OR BY OTHER SUITABLE MEANS, SUCH AS INCREASING THE TOTAL TEST LOAD TO ACCOUNT FOR SUCH TEMPORARY CAPACITY.

- HELICAL PILE NOTES:**
- ALL PILES SHALL BE HELICAL PILES AND ACCESSORIES AS FURNISHED BY IDEAL FOUNDATION OR APPROVED EQUAL.
 - HELICAL PILE LEAD SECTIONS SHALL BE IDEAL FOUNDATIONS, MODEL 312 WITH A 3-1/2" X 3" ROUND SHAFT AT A MINIMUM. FINAL SIZE TO BE DETERMINED BY PILE CONTRACTOR'S ENGINEER. HELICES SHALL BE DESIGNED BY THE PILE MANUFACTURER AND CONFORM TO THE LOADS LISTED ON THESE PLANS. HELIX PILE EXTENSION MAY BE 5', 7', OR 10' LONG DEPENDING ON VERTICAL CLEARANCE.
 - HELICAL PILES, EXTENSIONS AND ACCESSORIES SHALL BE HOT DIPPED GALVANIZED STEEL IN ACCORDANCE WITH ASTM A153.
 - ALL PILE INSTALLATION OPERATIONS SHALL BE SUPERVISED BY A N.Y.S. LICENSED ENGINEER COMMISSIONED BY THE PILE INSTALLER. THE INSPECTOR SHALL KEEP A COMPLETE RECORD OF THE PILE INSTALLATION OPERATION.
 - HELICAL PILES SHALL BE INSTALLED THROUGH ALL FILL, BOG, SILT ETC. AND TO PENETRATE INTO GOOD GRANULAR BEARING MATERIAL, AND TO THE MINIMUM CAPACITY AS SHOWN ON THE PLAN NOTES.
 - HELICAL PILES SHALL BE INSTALLED AS SHOWN ON THE ENGINEER'S PLAN. ALL CHANGES IN PILE LOCATION MUST BE APPROVED BY THE DESIGN ENGINEER.
 - IF UNDERGROUND OBSTRUCTIONS ARE ENCOUNTERED DURING INSTALLATION, THE CONTRACTOR SHALL HAVE THE OPTION OF REMOVING THE OBSTRUCTION, IF POSSIBLE, OR RELOCATING THE PILE, WITH THE DESIGN ENGINEER'S APPROVAL. THE LATTER OPTION MAY REQUIRE THE RELOCATION OF ADJACENT PILES.
 - THE HELICAL PILE SHALL BE CONNECTED TO THE STRUCTURE USING A PTS APPROVED STEEL BRACKET OR CAP PLATE AS THE CASE MAY BE AS SHOWN ON DESIGN ENGINEER'S PLAN. THESE CONNECTION DEVICES SHALL BE CAPABLE OF SAFELY TRANSFERRING THE STRUCTURAL LOADS TO THE HELICAL PILE.
 - WRITTEN INSTALLATION RECORDS SHALL BE OBTAINED FOR EACH HELICAL PILE. THESE RECORDS SHALL INCLUDE BUT ARE NOT LIMITED TO THE FOLLOWING:
 - PROJECT NAME AND/OR LOCATION.
 - NAME OF CONTRACTORS FOREMAN OR REPRESENTATIVE WHO WITNESSED THE INSTALLATION.
 - DATE AND TIME OF INSTALLATION.
 - LOCATION AND REFERENCE NUMBER OF EACH PILE.
 - DESCRIPTION OF LEAD SECTION AND EXTENSION INSTALLED.
 - OVERALL DEPTH OF INSTALLATIONS REFERENCED FROM THE BOTTOM OF THE GRADE BEAM OR PILE CAP.
 - TORQUE READING FOR THE LAST THREE FEET OF INSTALLATION IF PRACTICAL IN LIEU OF THIS REQUIREMENT, THE TERMINAL TORQUE SHALL BE RECORDED AS A MINIMUM.
 - ANY OTHER RELEVANT INFORMATION RELATING TO THE INSTALLATION.
 - THE INSTALLER'S N.Y.S. LICENSED PROFESSIONAL ENGINEER MUST CERTIFY THE PILE INSTALLATION RECORD.
 - PILE DESIGNER TO DESIGN PILES FOR UNBRACED LENGTH OF 46' MIN. CONSULT GEOTECHNICAL ENGINEER FOR FINAL DESIGN PARAMETER

MONITORING DEVICE SCHEDULE

IDENTIFICATION	SPECIFICATIONS					
MARK	DEVICE	TYPE	SERIAL NUMBER	READINGS FREQ.	ALLOWABLE READINGS LIMIT	IF SPECIFIED LIMIT IS EXCEEDED
▼	VIBRATION MONITOR	MICROMETER (SEE 10.88)	UM791/UM793	24 HOURS & 7 DAYS	1/2 IN/S	ALERT E.O.R. & CEASE CONSTRUCTION ACTIVITIES UNTIL E.O.R CAN COMMENT
■	OPTICAL MONITOR	OPTICAL PRISM	NA	WEEKLY	1/16 IN	ALERT E.O.R. & CEASE CONSTRUCTION ACTIVITIES UNTIL E.O.R CAN COMMENT

CONCRETE BEAM SCHEDULE

TYPE	BEAM DEPTH	BEAM WIDTH	TOP BARS	BOTTOM BARS	STIRRUPS (SIZE & SPACING)	REMARKS
CB-1	1'-0"	1'-0"	3-#7	#3 @ 6" c.	#3 @ 6" c.	SEE TYP. DETAIL 6FO-600

NOTE: INDICATES CONCRETE BEAM OVER NEW DUCT BANK OPENING IN EXISTING FOUNDATION WALL. SEE 'E' DWGS. FOR LOCATIONS AND SIZES.

CONCRETE GRADE BEAM SCHEDULE

TYPE	BEAM DEPTH	BEAM WIDTH	TOP BARS	BOTTOM BARS	STIRRUPS (SIZE & SPACING)	REMARKS
GB-1	2'-0"	1'-4"	3-#8	3-#8	#3 @ 12" c.	SEE TYP. DETAIL 6FO-600

CONCRETE PIER SCHEDULE

TYPE	PIER LENGTH	PIER WIDTH	VERTICAL BARS	STIRRUPS (SIZE & SPACING)	REMARKS
P1	2'-6"	2'-6"	8-#7	#4 @ 12" c.	STIRRUPS #5 @ 3" O.C. FOR FIRST 4 BARS SEE TYP. DETAIL 7FO-600

- LEGEND:**
- B/PC = BOTTOM OF PILE CAP
 - B/GB = BOTTOM OF GRADE BEAM
 - E.J. = EXPANSION JOINT
 - C.J. = CONTROL JOINT
 - PC = PILE CAP
 - GB = GRADE BEAM

BNYD (Brooklyn Navy Yard) - 401068BNYD1905A - 02/2024 - 11.dwg
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 Date: 09/09/2024 10:53am
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 Scale: 1/8"=1'-0"
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 Plot Device: HP DesignJet 3845 ZHP
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CONSULTANTS:

MARK	DATE	DESCRIPTION
	09-09-2024	Final Bid Documents
	09-29-2023	100% Submission
2	07-18-2023	DOB Objections
1	05-30-2023	DOB Objections
	01-04-2023	95% Submission
	10-12-2022	90% Submission
	08-10-2020	60% Resubmission
	03-03-2020	60% Submission
	11-08-2019	30% Submission

DESIGNED BY: DJA
DRAWN BY: DJA
CHECKED BY: SDL
REVIEWED BY: SDL

PROJECT NO: BNYD 1905A
DATE: SEPT 2024
SCALE: AS SHOWN

CLIENT

Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386

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Brooklyn, NY 11205



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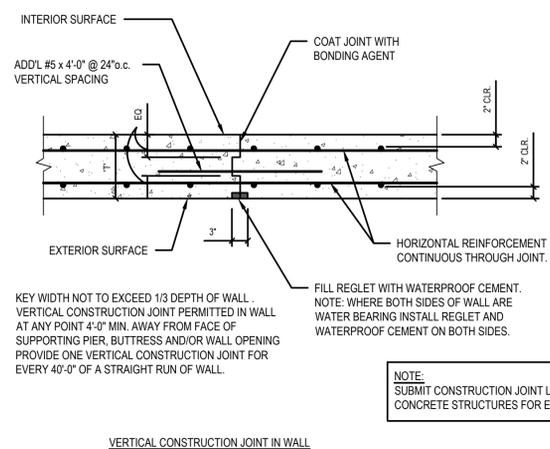
CONTRACT
ALL CONTRACTS

STATUS
FINAL BID DOCUMENTS

SHEET TITLE
FOUNDATION DETAILS

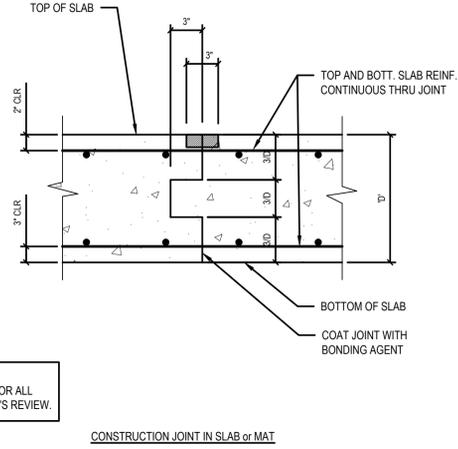
DRAWING No.
FO-600.00

SHEET No.
13
OF
54

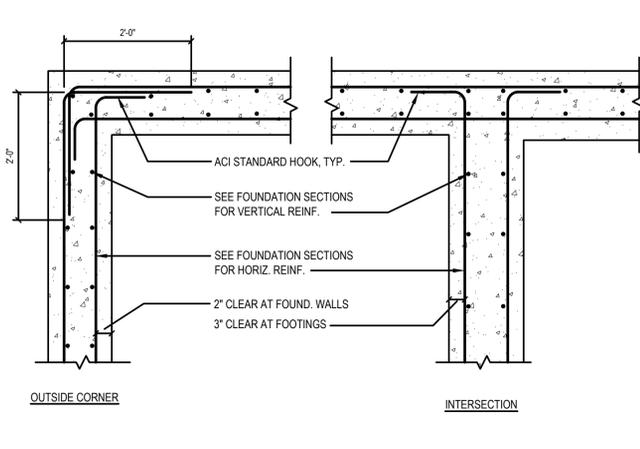


NOTE:
SUBMIT CONSTRUCTION JOINT LAYOUT FOR ALL CONCRETE STRUCTURES FOR ENGINEER'S REVIEW.

VERTICAL CONSTRUCTION JOINT IN WALL

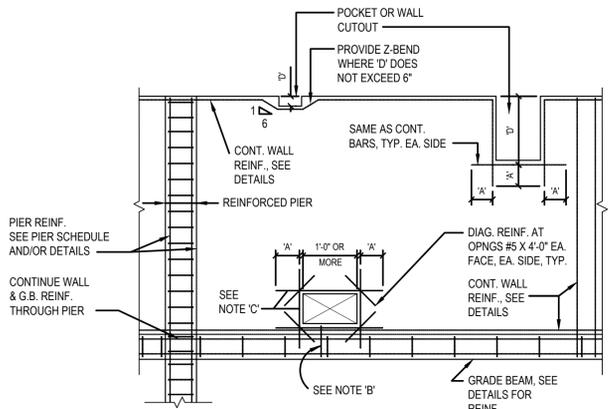


CONSTRUCTION JOINT IN SLAB or MAT



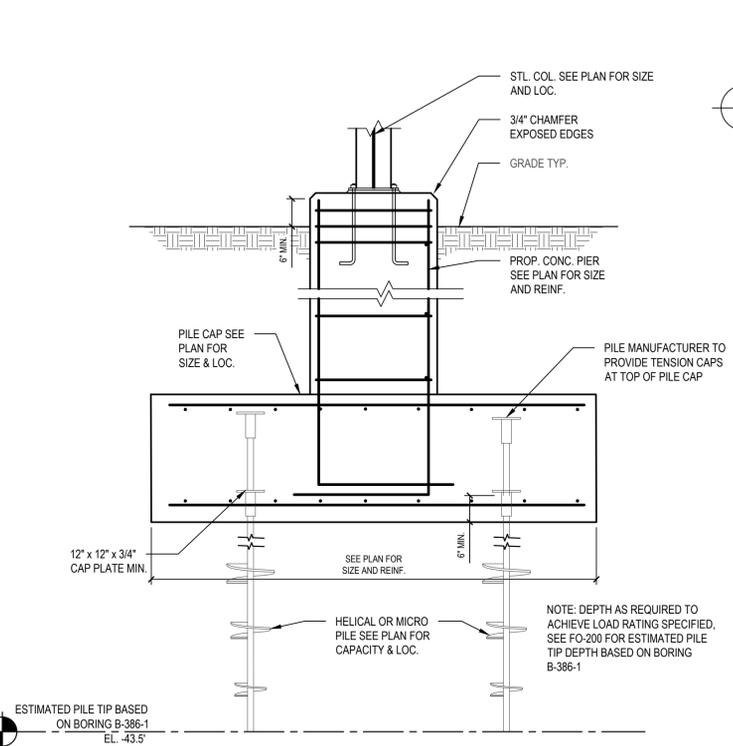
2 Wall and Grade Beam Horizontal Reinforcement Detail

- NOTE 'A': DIMENSION 'A' EQUALS 36 BAR DIA. OR HOOK
- NOTE 'B': WHERE EDGE OF OPNG. IS 2'-0" OR LESS FROM TOP OR BOTTOM OF WALL, PROVIDE #3 TIES @ 12" O.C.
- NOTE 'C': PROVIDE HORIZONTAL AND VERTICAL REINF. AT ALL SIDES OF OPENINGS TO MATCH WALL CONT. HORIZ. AND VERT. REINF.
- NOTE 'D': FOR DEPTH OF BEAM OR COLUMN POCKETS, SEE PLAN OR SCHEDULES

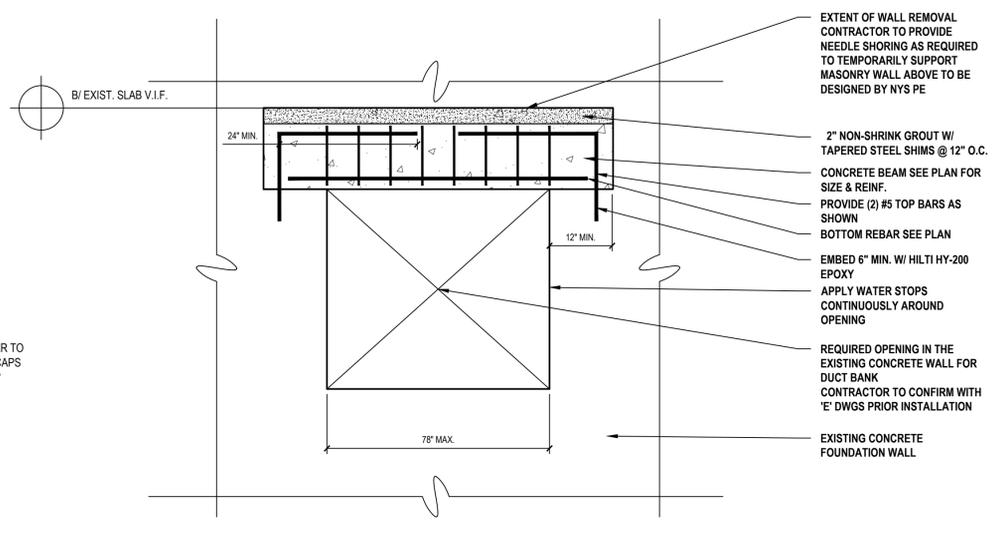


3 Reinforcement Layout at Various Conditions

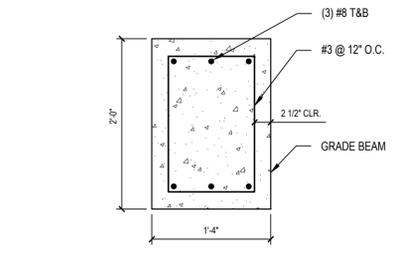
1 Construction Joints



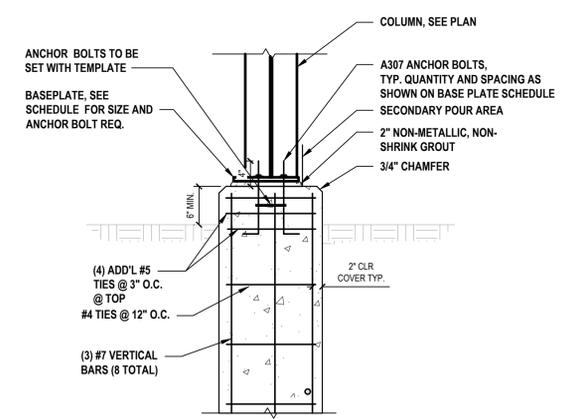
4 Typical Pile Cap Section Detail



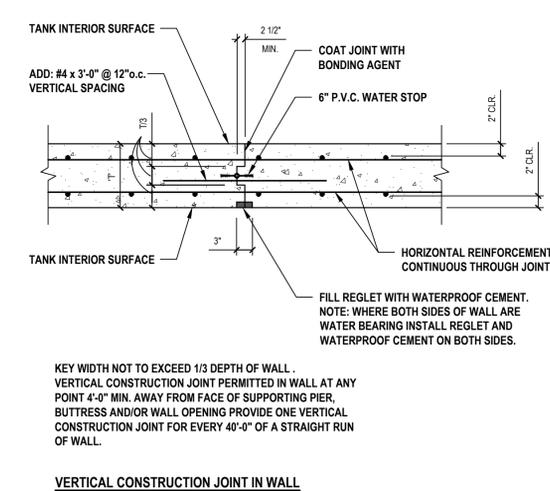
5 Typical Horizontal Duct Bank Penetration Detail



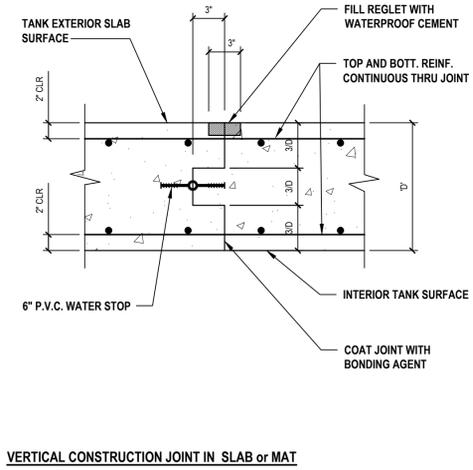
6 Grade Beam Reinforcement



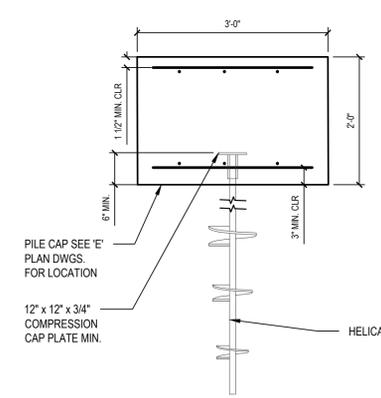
7 Typical Pier Detail



VERTICAL CONSTRUCTION JOINT IN WALL



VERTICAL CONSTRUCTION JOINT IN SLAB or MAT



- NOTE:
1) PLACE (1) PILE CAP AT EACH END OF CONDUIT RUN, TYP.
2) PLACE (1) PILE CAP AT 10'-0" ON CENTER FOR LENGTH OF DUCT BANK RUN.
3) SET HELICAL PILE DEPTH AS REQUIRED TO ACHIEVE LOAD RATING SPECIFIED
4) USE TYPE 'A' FOR DUCT BANKS LESS THAN 36" WIDE. FOR WIDER DUCT BANKS USE TYPE 'B'

9 Typical Duct Bank Support Detail

8 Waterstop Construction Joints

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	09-09-2024	Final Bid Documents
	09-29-2023	100% Submission
2	07-18-2023	DOB Objections
1	05-30-2023	DOB Objections
	01-04-2023	95% Submission
	10-12-2022	90% Submission
	08-10-2020	60% Resubmission
	03-03-2020	60% Submission
	11-08-2019	30% Submission

DESIGNED BY: DJA
DRAWN BY: DJA
CHECKED BY: SDL
REVIEWED BY: SDL

PROJECT NO: BNYD 1905A
DATE: SEPT 2024
SCALE: AS SHOWN

**Brooklyn Navy Yard
Development Corporation**

**Restoration of Substation G at
Building 386**



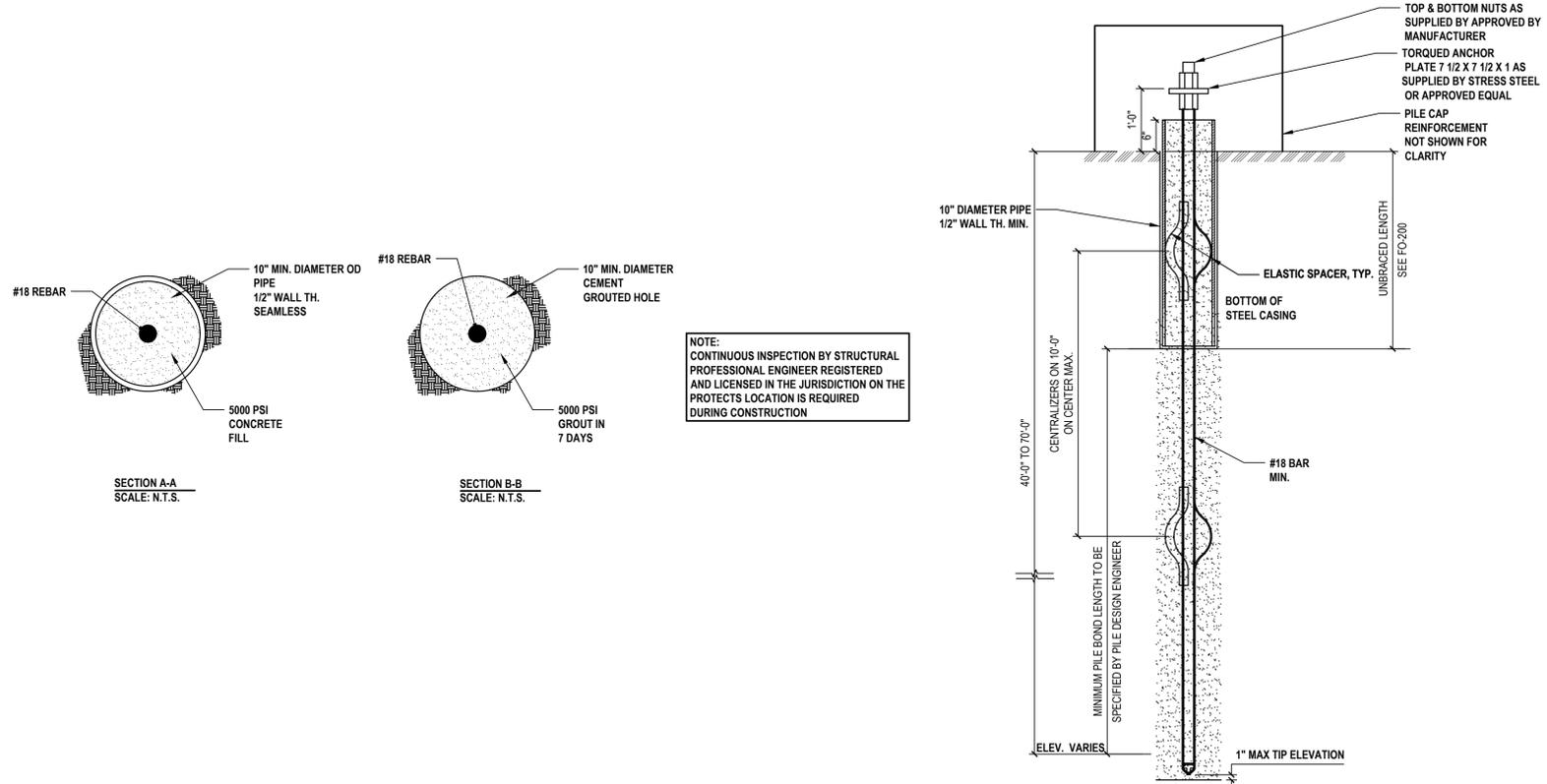
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CONTRACT
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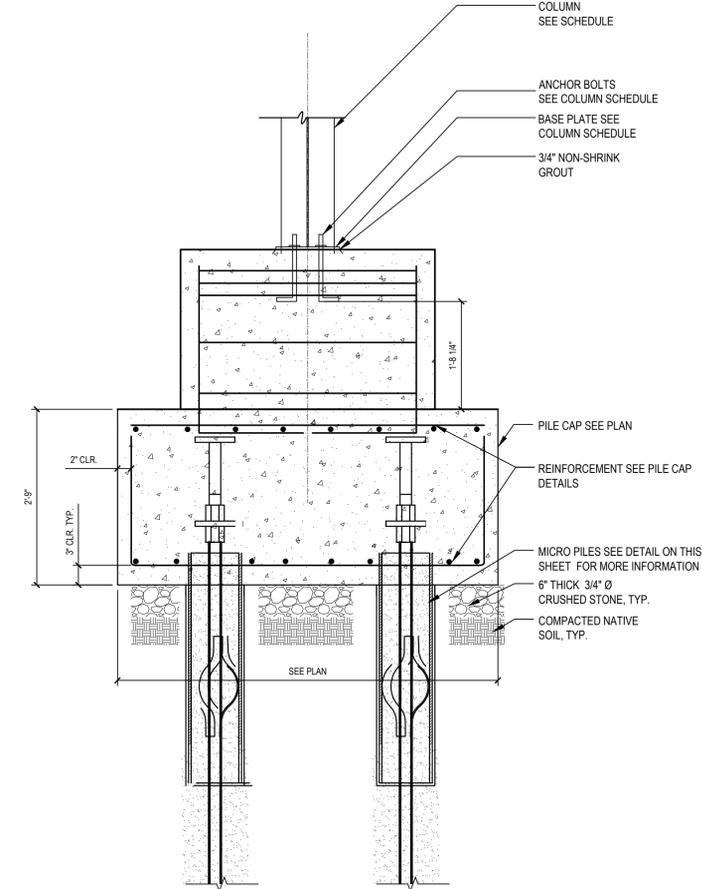
STATUS
FINAL BID DOCUMENTS

SHEET TITLE
FOUNDATION DETAILS

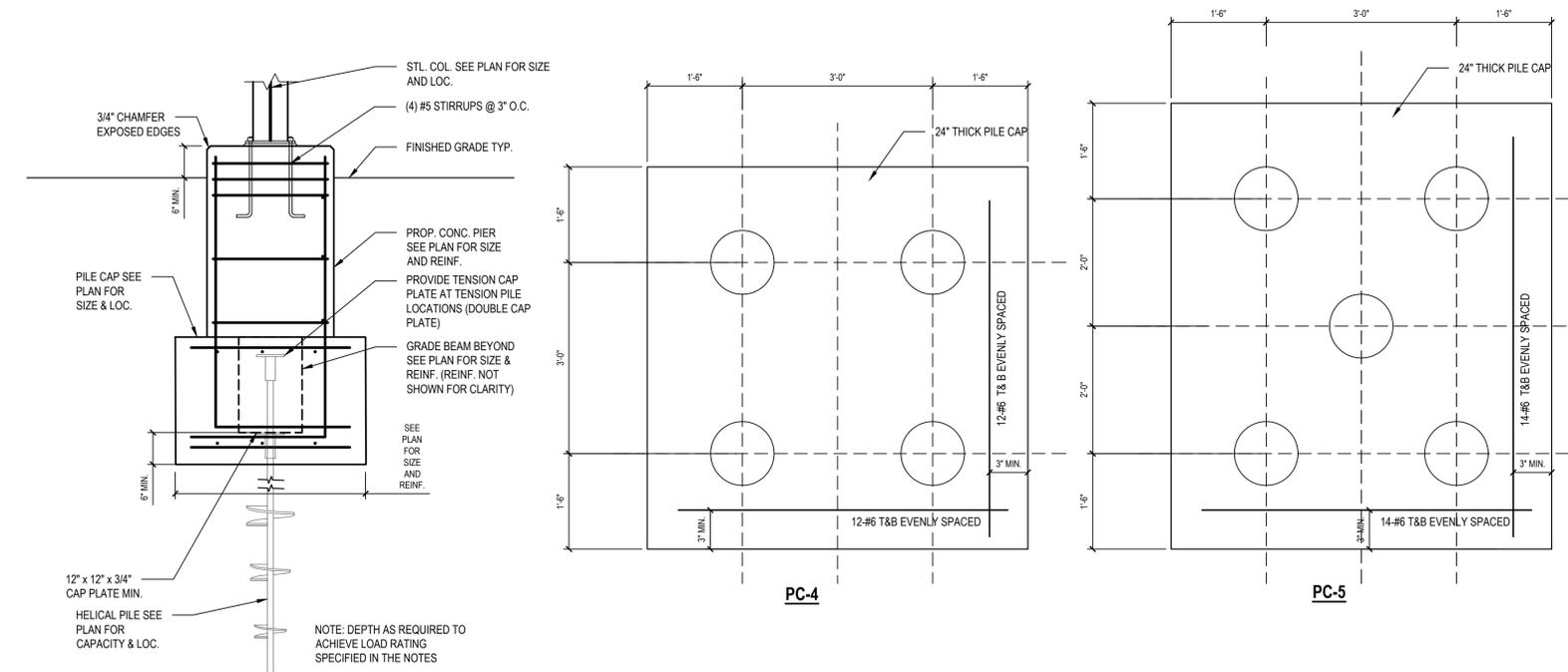
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SHEET No. **14**
OF **54**



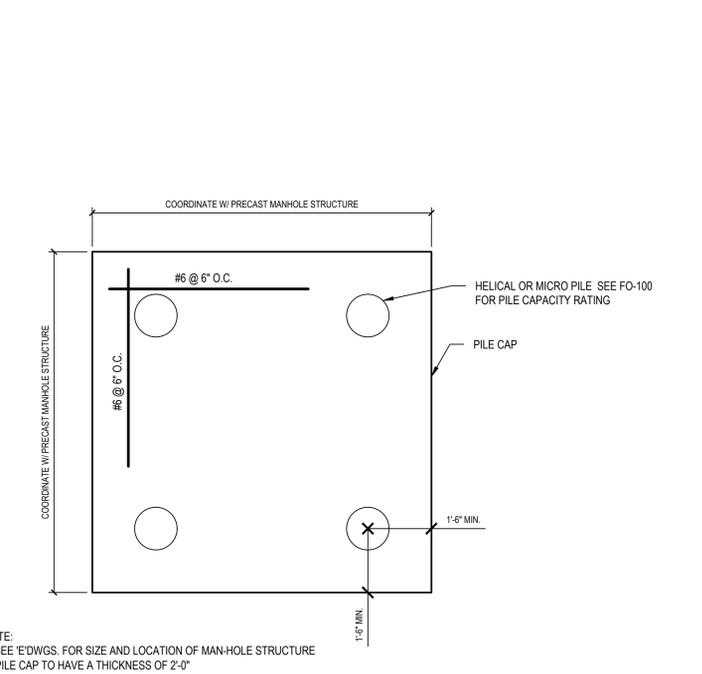
1 Typical Micro Pile Detail
SCALE: N.T.S.



2 Typical Micro Pile Cap Detail
SCALE: N.T.S.



3 Typical Helical Pile Detail
SCALE: N.T.S.



4 Typical Man-Hole Structure Support Detail
SCALE: N.T.S.

CLIENT: BROOKLYN NAVY YARD
 CONTRACT: ALL CONTRACTS
 STATUS: FINAL BID DOCUMENTS
 SHEET TITLE: FOUNDATION DETAILS
 DRAWING No. FO-601.00
 SHEET No. 14 OF 54

CONSULTANTS:

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	03-03-2020	60% Submission
	11-08-2019	30% Submission

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DESIGNED BY: DJA	DRAWN BY: DJA	CHECKED BY: SDL	REVIEWED BY: SDL
PROJECT NO: BNYD 1905A	DATE: SEPT 2024	SCALE: AS SHOWN	

CLIENT
Brooklyn Navy Yard Development Corporation

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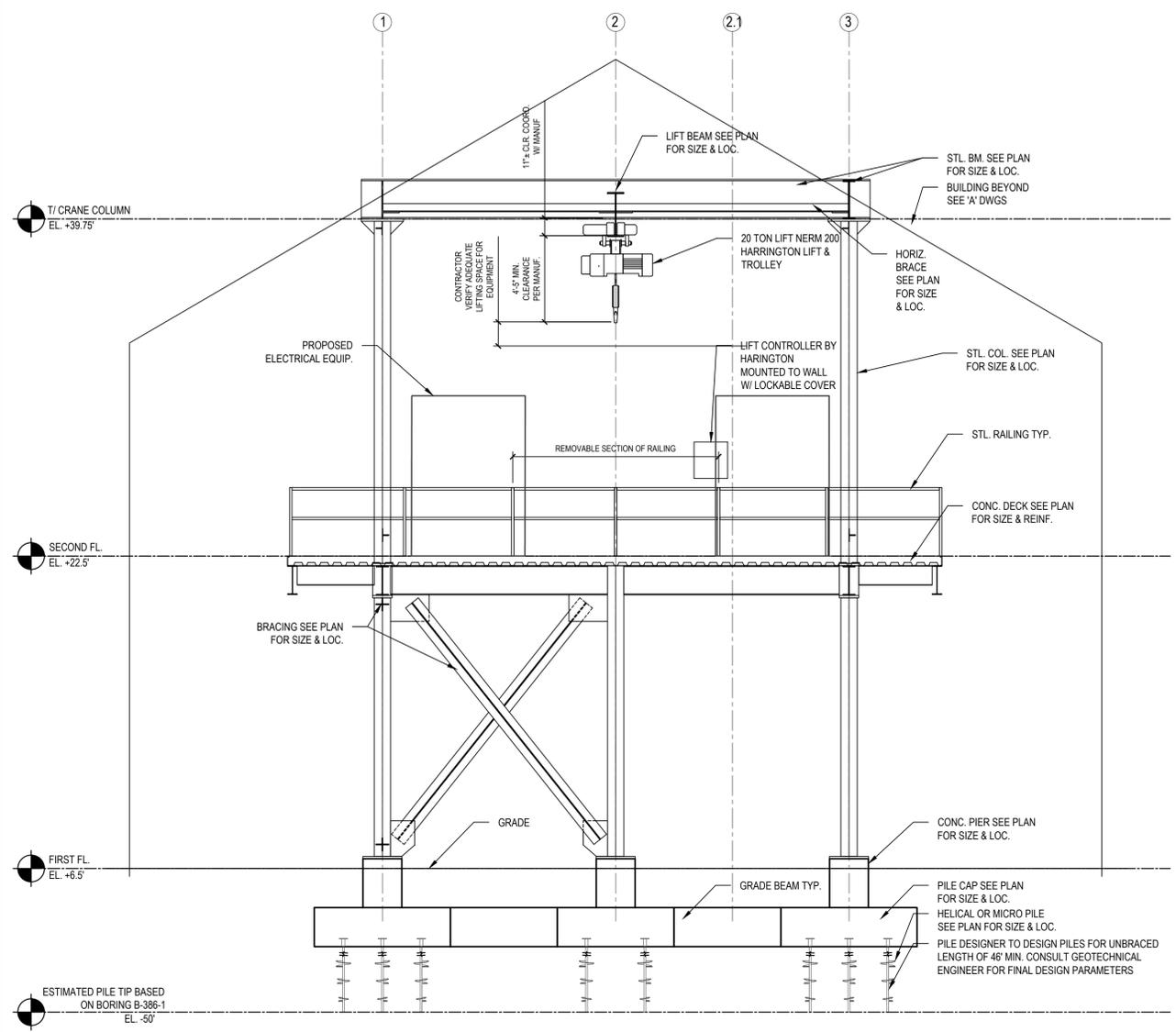
CONTRACT
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STATUS
FINAL BID DOCUMENTS

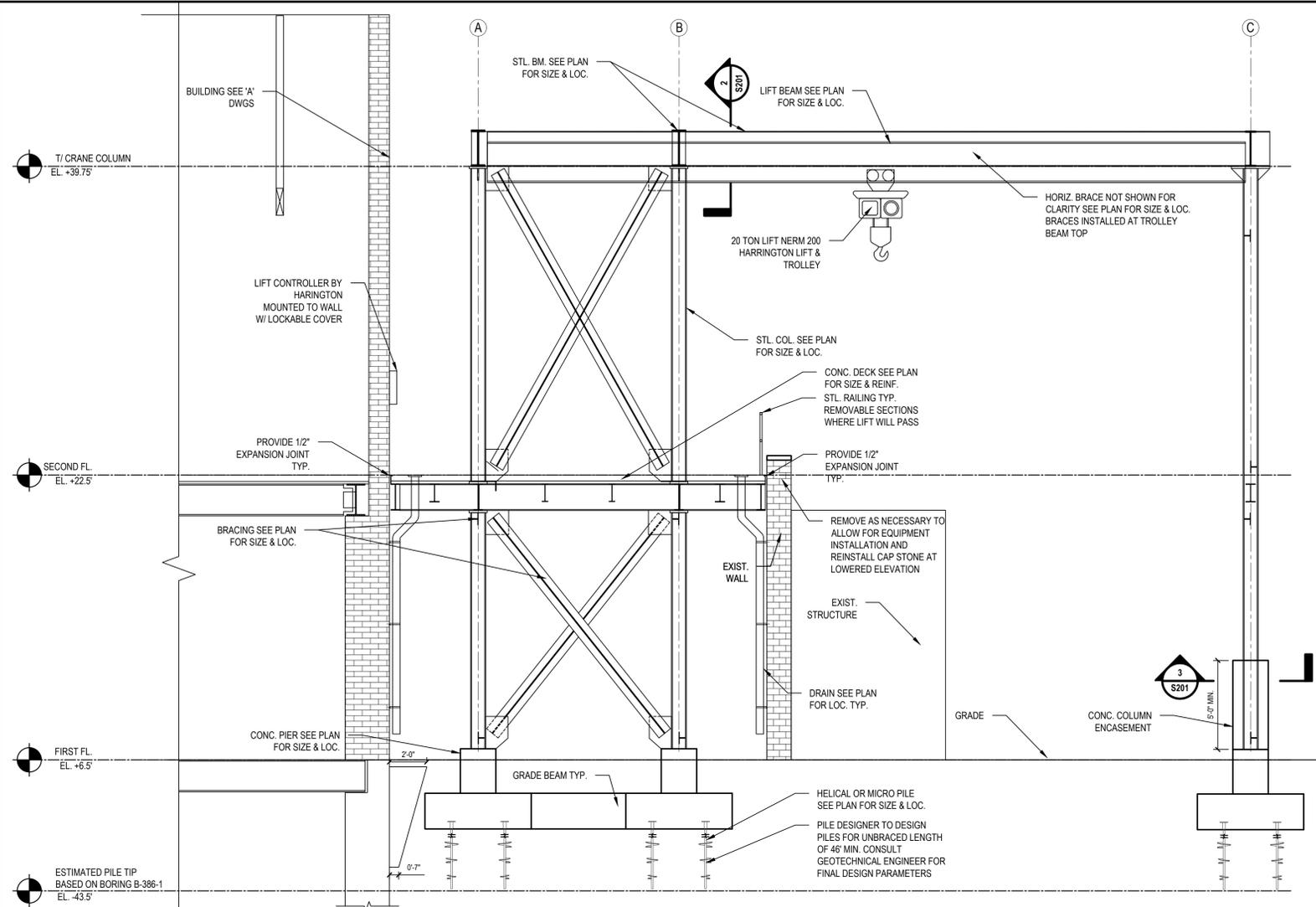
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STRUCTURAL ELEVATIONS

DRAWING No.
S-200.00

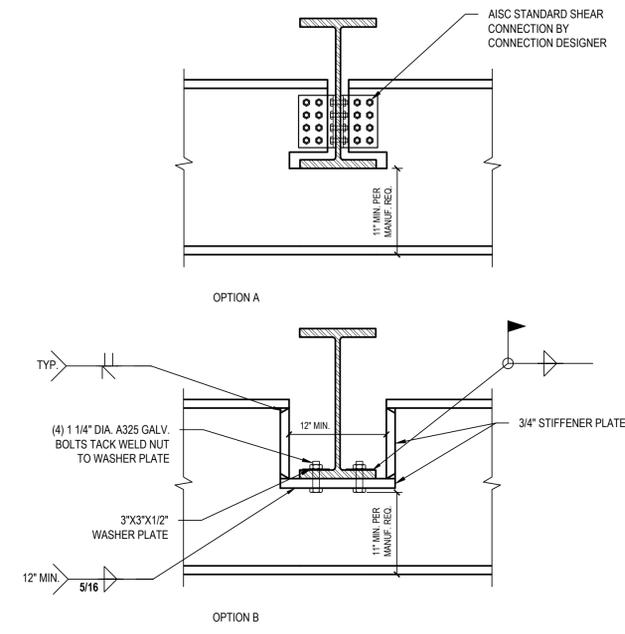
SHEET No.
16
OF
54



1 Typical Crane Frame Elevation
SCALE: 1/4"=1'-0"



1 Exterior Platform and Crane Frame Elevation
SCALE: 1/4"=1'-0"



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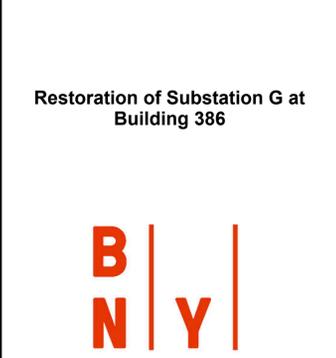
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 REVIEWED BY: SDL
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Restoration of Substation G at Building 386

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REVIEWED BY: SDL

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SCALE: AS SHOWN

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SHEET TITLE

STEEL DETAILS

DRAWING No.

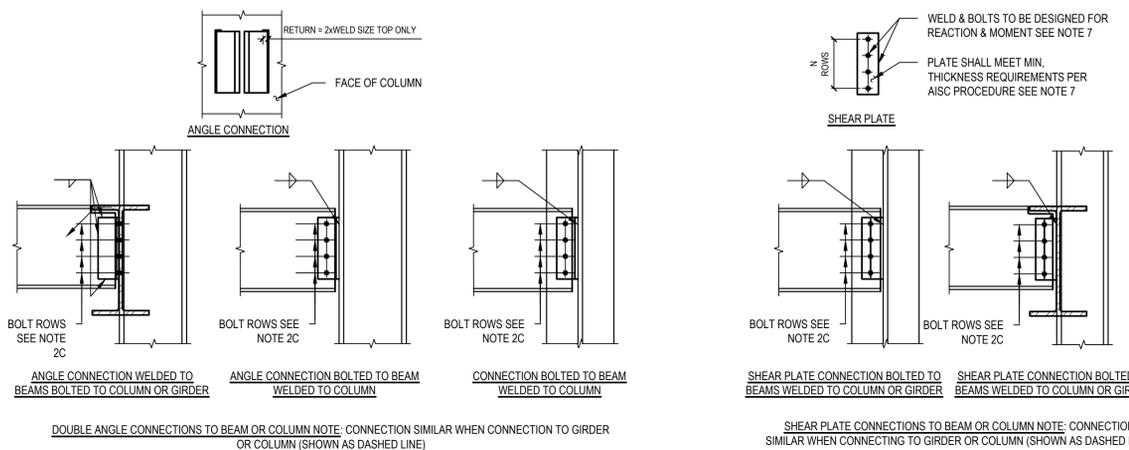
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19

OF

54



DESIGN OF SIMPLE SHEAR CONNECTIONS - REQUIREMENTS:

- WHERE BEAM END REACTIONS ARE SHOWN ON THE DRAWINGS, SIMPLE SHEAR CONNECTIONS SHALL BE DESIGNED FOR THE REACTIONS SHOWN, BUT IN NO CASE SHALL THE NUMBER OF BOLTS BE LESS THAN GIVEN IN TABLE A OR THE REACTION LESS THAN SHOWN ON TABLE B.
- WHERE BEAM END REACTIONS ARE NOT SHOWN ON THE DRAWINGS, THE GREATEST OF THE THREE FOLLOWING CRITERIA SHALL BE USED IN DESIGN OF SIMPLE SHEAR CONNECTIONS:
 - FOR COMPOSITE BEAMS, REACTION FROM AISC LRFD *MAXIMUM TOTAL UNIFORM LOAD TABLES MULTIPLIED BY 2.0.
 - FOR NON-COMPOSITE BEAMS, REACTIONS FROM UNIFORM LOAD TABLES CITED IN 2.a. MULTIPLIED BY 1.3.
 - FOR MINIMUM NUMBER OF BOLTS SEE TABLE A. FOR MIN. REACTION SEE TABLE B.
- IN ADDITION TO THE VERTICAL SHEAR BEAM TO BEAM END CONNECTIONS SHALL BE DESIGNED FOR THE MOST CRITICAL OF THE FOLLOWING:
 - AXIAL LOAD SHOWN ON DRAWINGS (±P) CONCOMITANT WITH THE VERTICAL SHEAR.
 - A DESIGN TENSION STRENGTH EQUAL TO THE LARGER OF THE PROVIDED SHEAR LOAD AT EITHER END BUT NOT LESS THAN 15K (LRFD), U.O.N. THE CONNECTION DESIGN FOR THIS REQUIREMENT SHALL BE IN ACCORDANCE WITH THE PROVISIONS OF N.Y. CITY BUILDING CODE SECTIONS BC 2213.2 ITEM 3.
- IN ADDITION TO THE VERTICAL SHEAR BEAM TO COLUMNS END CONNECTION SHALL BE DESIGNED FOR THE MOST CRITICAL OF THE FOLLOWING:
 - AXIAL LOAD SHOWN ON DRAWINGS (±P) CONCOMITANT WITH THE VERTICAL SHEAR.
 - A DESIGN TENSION STRENGTH EQUAL TO THE LARGER OF THE PROVIDED SHEAR LOAD AT EITHER END BUT NOT LESS THAN 15K (LRFD), U.O.N. THE CONNECTION DESIGN FOR THIS REQUIREMENT SHALL BE IN ACCORDANCE WITH THE PROVISIONS OF N.Y. CITY BUILDING CODE SECTIONS BC 2213.2 ITEM 3.
 - AN AXIAL LOAD EQUAL TO 0.02 OF COLUMN LOAD (FROM COLUMN SCHEDULE). THE CONNECTION DESIGN FOR THIS REQUIREMENT SHALL BE IN ACCORDANCE WITH THE PROVISIONS OF NYC BUILDING CODE SECTION BC 2213.2 ITEM 4.
- MINIMUM BOLT DIAMETER SHALL BE 3/8" INCH (CONTRACTOR MAY USE LARGER DIAMETER BOLTS AT HIS OPTION).
- BOLT TYPE SHALL BE ASTM A 325 (CONTRACTOR MAY USE A490 BOLTS AT THEIR OPTION, SUBJECT TO MINIMUM NUMBER OF BOLTS REQUIREMENT).
- ALL BOLTS SHALL BE FULLY PRE-TENSIONED.
- PROVIDE WEB REINFORCING AS REQUIRED DUE TO WEB CUTS, COPES, ETC.
- DESIGN OF DOUBLE ANGLE AND SHEAR PLATE CONNECTIONS SHALL BE BASED UPON THE LATEST AISC PROCEDURES SHOWN IN THE AISC MANUAL OF STEEL CONSTRUCTION.
- ALTERNATIVE CONNECTION SYSTEM (SINGLE ANGLE) MAY BE USED ONLY AT FILLER BEAM TO BEAM CONNECTIONS (EXCLUDING EDGE BEAMS) PROVIDED THE CONTRACTOR'S PROFESSIONAL ENGINEER SUBMITS THE DESIGN CALCULATIONS TO THE ENGINEER OF RECORD FOR REVIEW AND APPROVAL.

TABLE A MINIMUM NUMBER OF BOLTS FOR SIMPLE SHEAR CONN.

BEAM SIZE	"N"
W6	2
W8	2
W10	2
W12	3
W14	3
W16	3
W18	4
W21	4
W24	4
W27	5
W30	5
W33	6
W36	6
W40	7
W44	7

TABLE B MINIMUM CONN. FACTORED LOAD

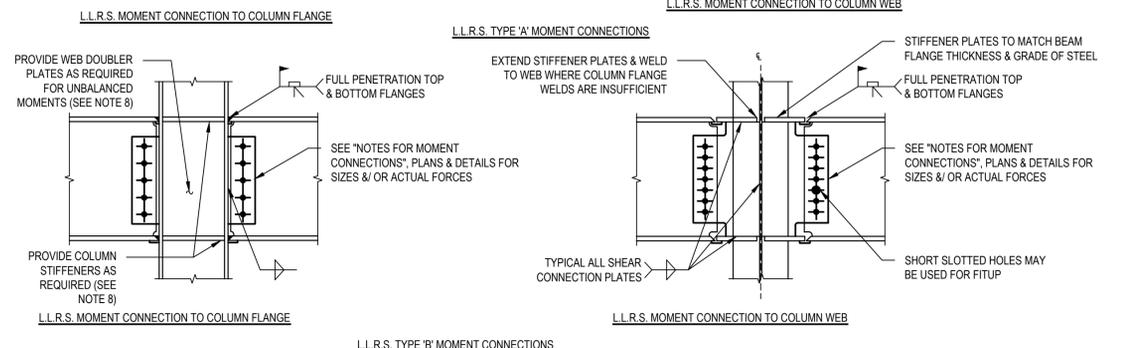
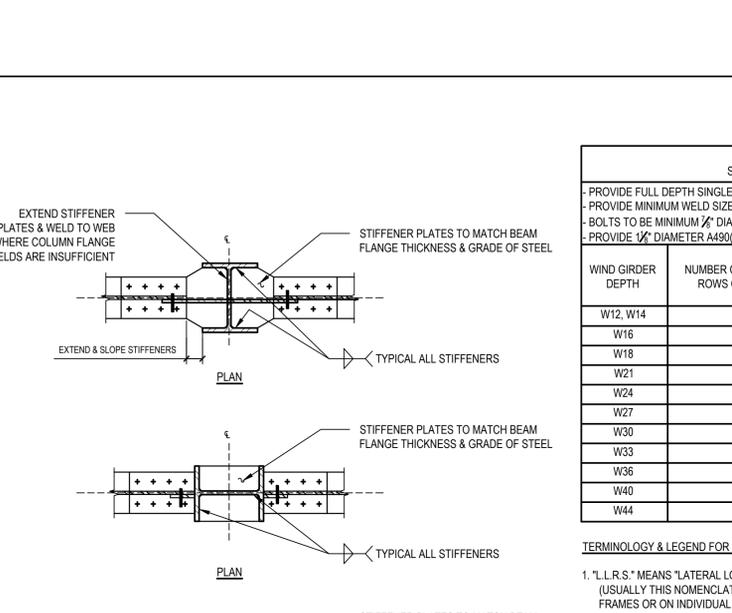
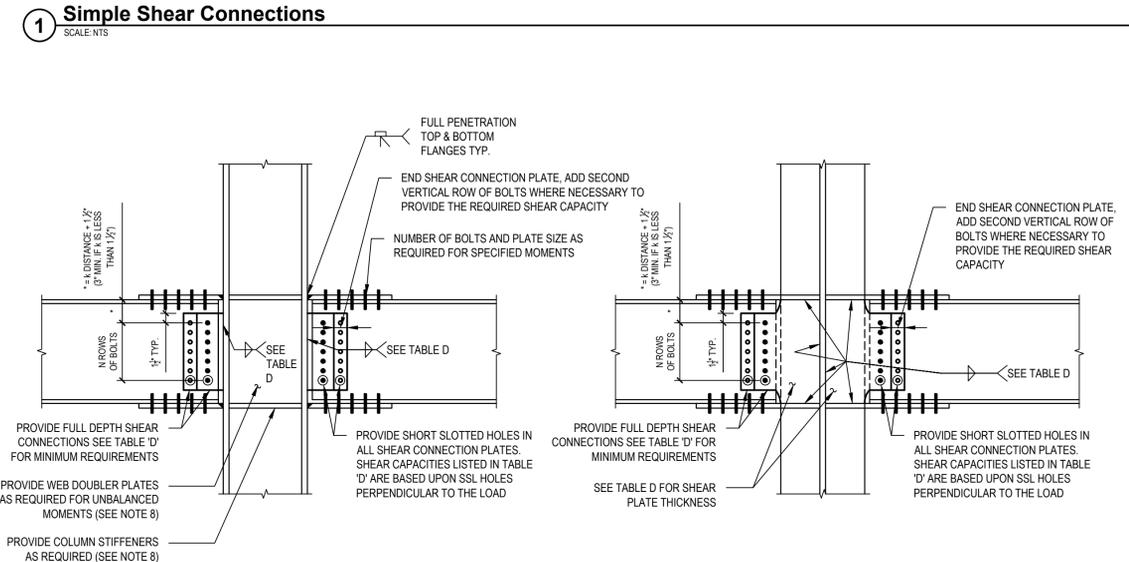
BEAM SIZE	FACTORED LOAD (K)
W6	15
W8	20
W10	25
W12	15
W14	40
W16	45
W18	45
W21	55
W24	55
W27	65
W30	65
W33	80
W36	80
W40	90
W44	90

TABLE C MINIMUM FILLET WELDS SIZE

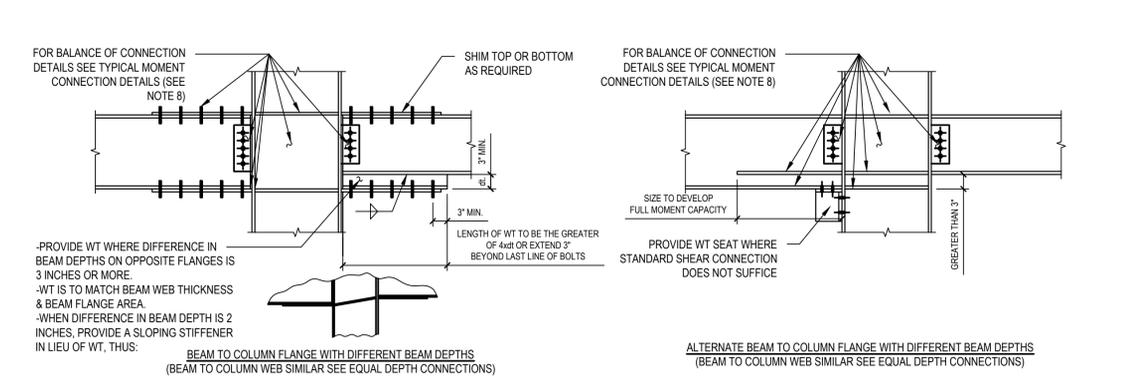
THINNER PART JOINED UP TO 3/4"	MINIMUM FILLET WELD
UP TO 3/4"	3/8"
OVER 3/4"	5/8"

"N" = MINIMUM NUMBER OF BOLTS REQUIRED PER CONNECTION. THE TABULATED MINIMUM NUMBER OF BOLTS WILL GENERALLY BE EXCEEDED BY OTHER DESIGN CRITERIA.

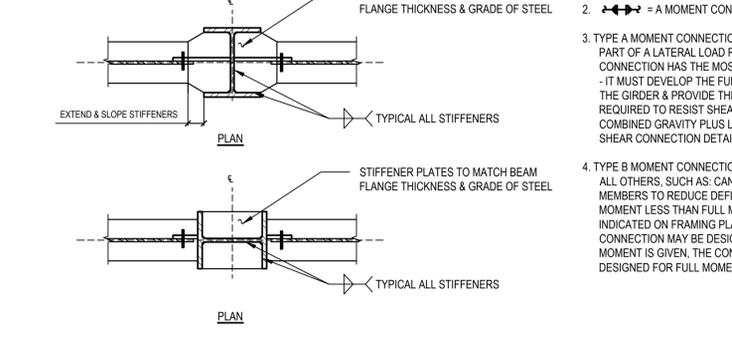
1 Simple Shear Connections



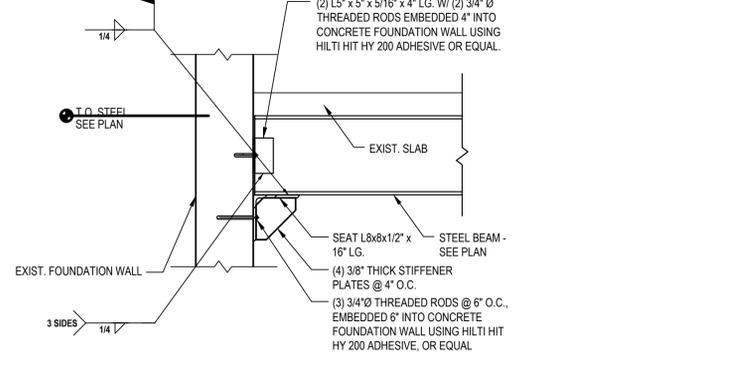
2 Typical Moment Connections



3 Beam-Column Moment Connections w/ Different Beam Depths



4 Typical Post Installed Beam at Vertical Duct Bank Opening



4 Typical Post Installed Beam at Vertical Duct Bank Opening

TABLE D SHEAR CONNECTION REQUIREMENTS FOR TYPE 'A' MOMENT CONNECTIONS

PROVIDE FULL DEPTH SINGLE SHEAR PLATE. PROVIDE MINIMUM WELD SIZE TABULATED. BOLTS TO BE MINIMUM 3/8" DIAMETER, A325(SC). PROVIDE 1/2" DIAMETER A490(SC) BOLTS WHERE ACTUAL GIRDER SHEAR EXCEEDS TABULATED CAPACITY

WIND GIRDER DEPTH	NUMBER OF HORIZONTAL ROWS OF BOLTS "N"	MINIMUM SHEAR PLATE THICKNESS		MINIMUM FILLET WELD SIZE (E70XX)	CONNECTION SHEAR CAPACITY (LRFD - KIPS) 3/8" A325
		Fy=50	Fy=36		
W12, W14	3	1/2	5/8	5/16	33
W16	4	1/2	5/8	5/16	44
W18	5	1/2	5/8	5/16	56
W21	6	1/2	5/8	5/16	67
W24	6	1/2	5/8	5/16	67
W27	7	1/2	5/8	5/16	78
W30	8	1/2	5/8	5/16	89
W33	9	1/2	5/8	5/16	100
W36	10	1/2	5/8	5/16	111
W40	11	1/2	5/8	5/16	122
W44	12	1/2	5/8	5/16	133

TERMINOLOGY & LEGEND FOR L.L.R.S. FRAMES

- "L.L.R.S." MEANS "LATERAL LOAD RESISTING SYSTEM" (USUALLY THIS NOMENCLATURE DOES NOT APPEAR ON FRAMES OR ON INDIVIDUAL MEMBERS.)
- = A MOMENT CONNECTION, TYPE A OR TYPE B.
- TYPE A MOMENT CONNECTION: PART OF A LATERAL LOAD RESISTING SYSTEM, THIS CONNECTION HAS THE MOST STRINGENT REQUIREMENT - IT MUST DEVELOP THE FULL MOMENT CAPACITY OF THE GIRDER & PROVIDE THE GREATER SHEAR CAPACITY REQUIRED TO RESIST SHEAR FORCES GENERATED BY COMBINED GRAVITY PLUS LATERAL LOADS (SEE TYPE A SHEAR CONNECTION DETAILS).
- TYPE B MOMENT CONNECTION: ALL OTHERS, SUCH AS: CANTILEVERS, STIFFENING OF MEMBERS TO REDUCE DEFLECTION, ETC. A DESIGN MOMENT LESS THAN FULL MOMENT CAPACITY MAY BE INDICATED ON FRAMING PLANS, IN WHICH CASE THE CONNECTION MAY BE DESIGNED FOR THIS VALUE. IF NO MOMENT IS GIVEN, THE CONNECTION MUST BE DESIGNED FOR FULL MOMENT CAPACITY.

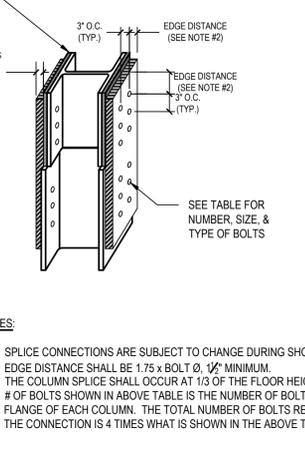
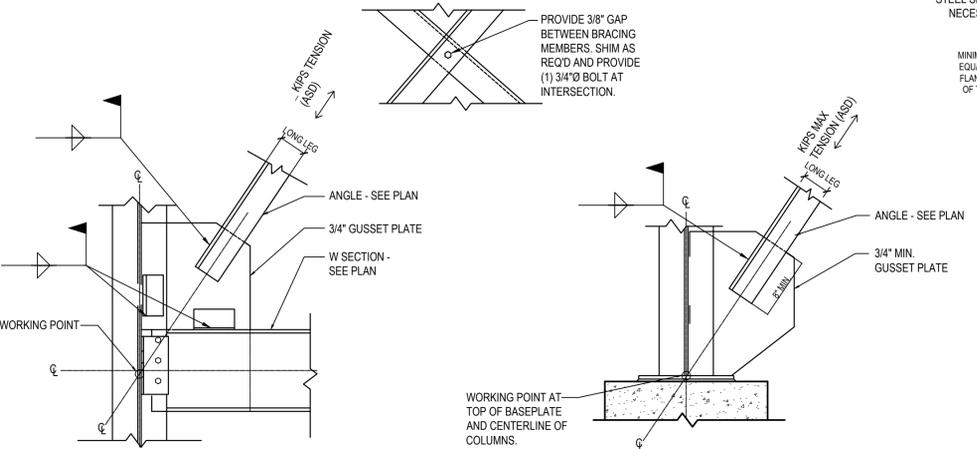
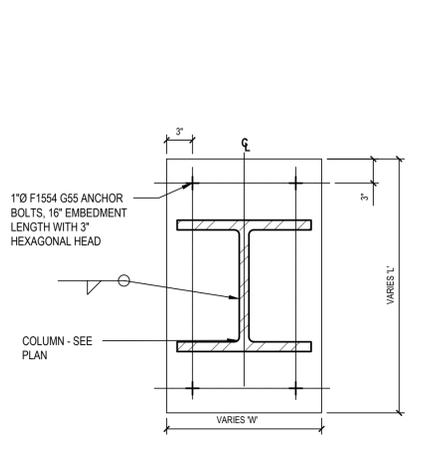
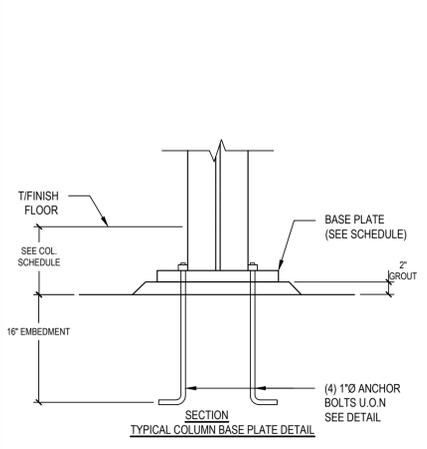
NOTES FOR MOMENT CONNECTIONS

- ALL MOMENT CONNECTIONS SHALL BE TYPE A MOMENT CONNECTIONS (SEE LEGEND FOR DEFINITION & REQUIREMENTS).
- SHEAR CONNECTIONS SHALL CONFORM TO TABLE D SHEAR CONNECTION REQUIREMENTS FOR TYPE A MOMENT CONNECTIONS.
- WELDS & BOLTS FOR MOMENT CONNECTIONS SHALL DEVELOP THE FULL MEMBER MOMENT CAPACITY.
- MOMENT CONNECTION PLATES SHALL BE SIZED AS REQUIRED FOR THE SPECIFIED MOMENT.
- WELD MAY BE SUBSTITUTED FOR BOLTS UPON PRIOR APPROVAL OF THE STRUCTURAL ENGINEER.
- PROVIDE WEB & OR FLANGE REINFORCING WHERE REQUIRED DUE TO WEB CUTS OR COPES FOR CONNECTIONS.
- PER THE PROVISIONS OF CHAPTER J OF THE AISC SPECIFICATIONS, PROVIDE COLUMN FLANGE STIFFENERS WHERE REQUIRED TO RESIST FORCES FROM MOMENT CONNECTIONS. PROVIDE COLUMN WEB DOUBLER PLATES AS REQUIRED FOR UNBALANCED MOMENT. (AT CONTRACTOR'S OPTION A HEAVIER COLUMN MAY BE SUBSTITUTED IN LIEU OF DOUBLER/STIFFENER PLATES, AT NO COST TO THE OWNER.)
- SLIP-CRITICAL BOLTS USED IN ALL MOMENT CONNECTIONS SHALL HAVE A MINIMUM DIAMETER OF 3/8" & SHALL BE BASED UPON BOLT VALUES GIVEN IN TABLE 7-4, "SLIP-CRITICAL CONNECTIONS, WHERE 'SLIP IS A STRENGTH LIMIT-STATE'. CLASS A OR B FAYING SURFACE (14TH EDITION OF AISC MANUAL).
- IF THE FABRICATOR PROPOSES TO USE CLASS B FAYING SURFACE & GREATER BOLT CAPACITY THAN TABLE 7-4 VALUES, THEY MUST SUBMIT THEIR PROPOSED DESIGN & FABRICATION PROCEDURES TO THE ENGINEER FOR PRIOR APPROVAL.
- NUMBER OF BOLTS SHOWN AT SHEAR & MOMENT CONNECTIONS DETAILS DO NOT REPRESENT THE ACTUAL NUMBER REQUIRED. SEE PLANS/DETAILS FOR DESIGN FORCES TO BE INCORPORATED BY THE STEEL FABRICATOR'S ENGINEER.
- MOMENT CONNECTIONS TO DEVELOP FULL MOMENT CAPACITY OF CANTILEVER BEAMS UNLESS SHOWN OTHERWISE ON PLAN.

COLUMN LOAD (K)	# OF BOLTS (SEE NOTE #4)	BOLT Ø AND TYPE
0-100	4	1"Ø A490N
101-200	8	1"Ø A490N
201-300	10	1"Ø A490N
301-400	8	1 1/2"Ø A490N
401-500	10	1 1/2"Ø A490N
501-600	12	1 1/2"Ø A490N
601-700	14	1 1/2"Ø A490N
701-800	16	1 1/2"Ø A490N
801-900	18	1 1/2"Ø A490N
901-1000	20	1 1/2"Ø A490N

NOTE:
1. SEE THE COLUMN SCHEDULE FOR COLUMN LOADS.

- NOTES
- SPLICE CONNECTIONS ARE SUBJECT TO CHANGE DURING SHOP DRAWING REVIEW.
 - EDGE DISTANCE SHALL BE 1.75 x BOLT Ø, 1/2" MINIMUM.
 - THE COLUMN SPLICE SHALL OCCUR AT 1/3 OF THE FLOOR HEIGHT.
 - # OF BOLTS SHOWN IN ABOVE TABLE IS THE NUMBER OF BOLTS IN EACH FLANGE OF EACH COLUMN. THE TOTAL NUMBER OF BOLTS REQUIRED FOR THE CONNECTION IS 4 TIMES WHAT IS SHOWN IN THE ABOVE TABLE.

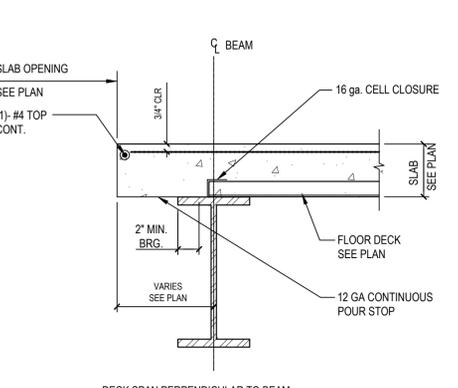
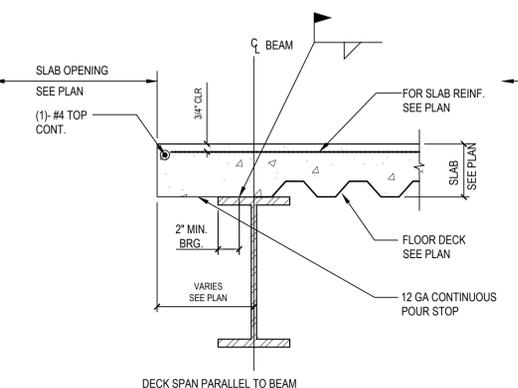
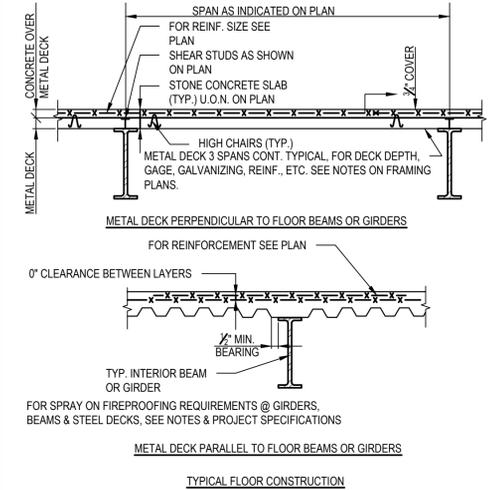


1 Base Plate Detail
SCALE: NTS

2 Non-Moment Base Plate
SCALE: NTS

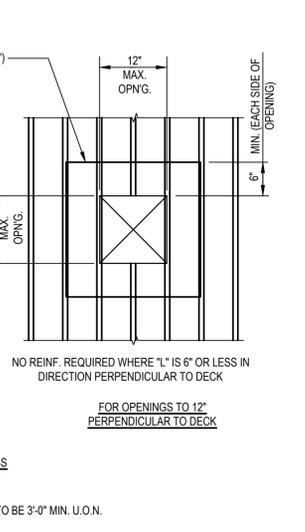
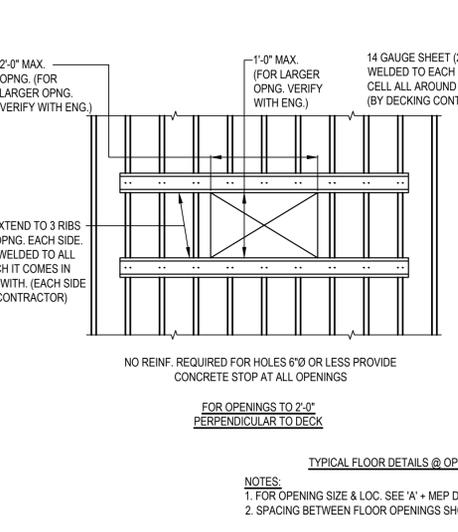
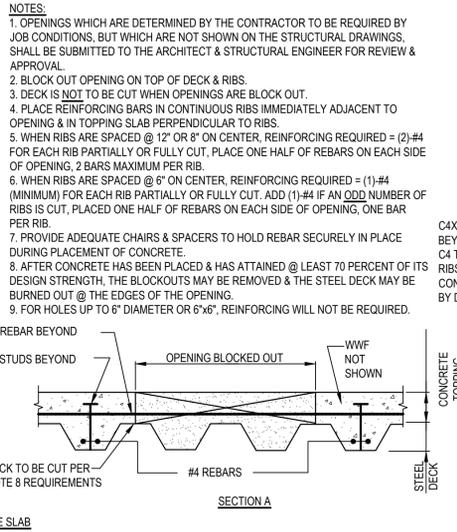
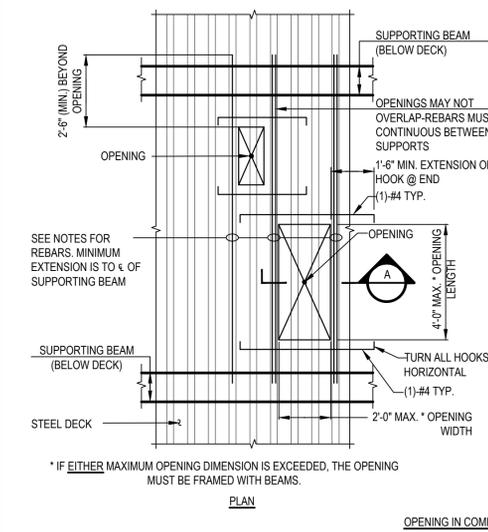
3 Bracing Connection Details
SCALE: NTS

4 Typical Column Splice Detail
SCALE: NTS



5 Typical Concrete Deck Detail
SCALE: NTS

6 Typical Concrete Deck Opening Detail
SCALE: NTS



END CLOSURE PLATE SCHEDULE				REMARKS
T= UP TO & INCLUDING 6"	GAGE OF PLATE	T= OVER 6" UP TO & INCLUDING 8"	GAGE OF PLATE	
UP TO 4"	14	UP TO 4"	12	FOR A=8" OR GREATER PROVIDE #4@18 TOP
OVER 4" TO 8"	12	OVER 4" TO 8"	10	
OVER 8" TO 10"	10	OVER 8" TO 12"	1/2" THICK PLATE	PROVIDE #4@18 TOP
10" TO 12"	1/2" THICK PLATE			PROVIDE #4@18 TOP
12" TO 18"	1/2" THICK PLATE			PROVIDE #4@18 TOP

- NOTES
- CLOSURE TO BEAR 2" ON FLANGE OF BEAM
 - WELD CLOSURE TO TOP FLANGE PER MANUFACTURER'S RECOMMENDATIONS
 - PROVIDE RETURN LIP AT ALL VERTICAL LEGS, 1" FOR 10 GAGE, 1/2" FOR 12 GAGE, 1/4" FOR 14 GAGE.
 - IF 'A' EXCEEDS DIMENSIONS SHOWN ABOVE, REINFORCE POUR STOP WITH STIFFENERS OR SHORE UP THE EDGE OF SLAB DURING POUR.

7 Typical Slab Opening Detail
SCALE: NTS

CONSULTANTS:

MARK	DATE	DESCRIPTION
	09-09-2024	Final Bid Documents
	09-29-2023	100% Submission
2	07-18-2023	DOB Objections
1	05-30-2023	DOB Objections
	01-04-2023	95% Submission
	10-12-2022	90% Submission
	08-10-2020	60% Resubmission
	03-03-2020	60% Submission
	11-08-2019	30% Submission

ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
DJA	DJA	SDL	SDL

PROJECT NO.:	DATE:	SCALE:
BNYD 1905A	SEPT 2024	AS SHOWN

Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386



141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

CONTRACT
ALL CONTRACTS

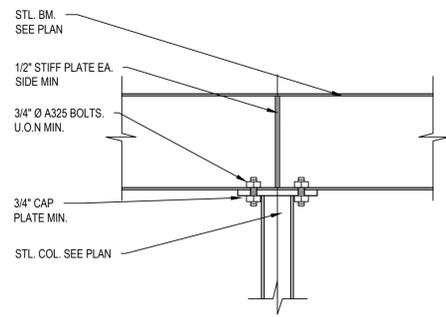
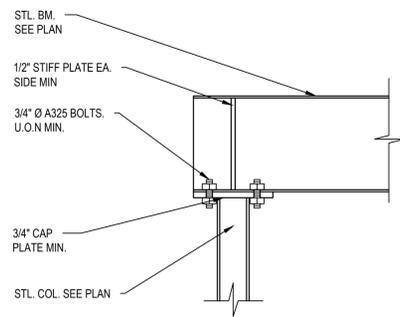
STATUS
FINAL BID DOCUMENTS

SHEET TITLE
STEEL DETAILS

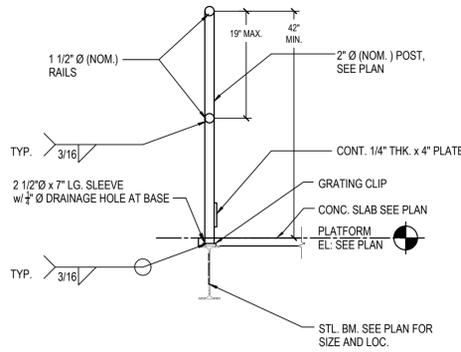
DRAWING No.
S-601.00

SHEET No.
20
OF
54

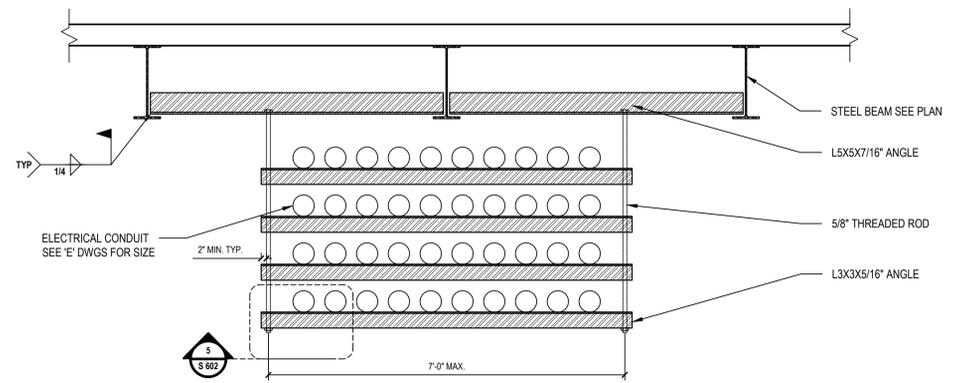
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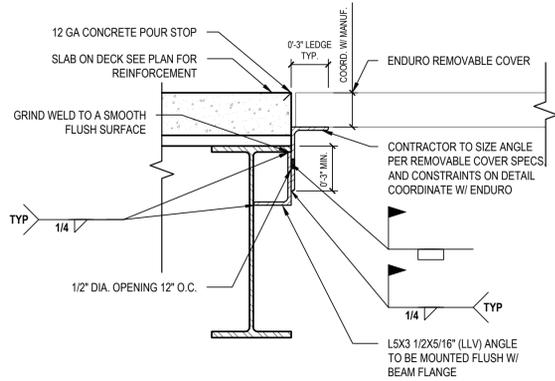
1 Typical W-Section to Column Detail at Exterior Platform
SCALE: N.T.S.



2 Typical Guardrail Connection Detail
SCALE: N.T.S.

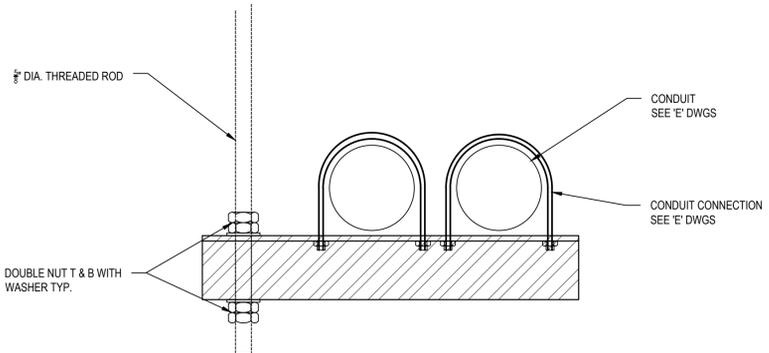


3 Conduit Pipe Support Section Detail
SCALE: 3/4"=1'-0"

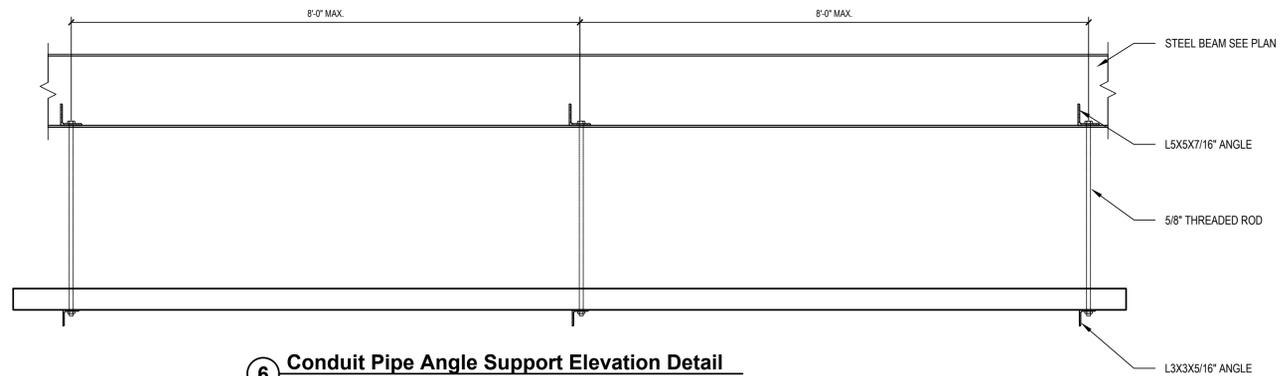


- NOTE:
- CONTRACTOR TO PERFORM ALL INFIELD WELDS OF HATCH CONNECTION PRIOR TO POURING CONCRETE SLAB
 - ANGLES TO BE A MINIMUM THICKNESS OF 5/16"

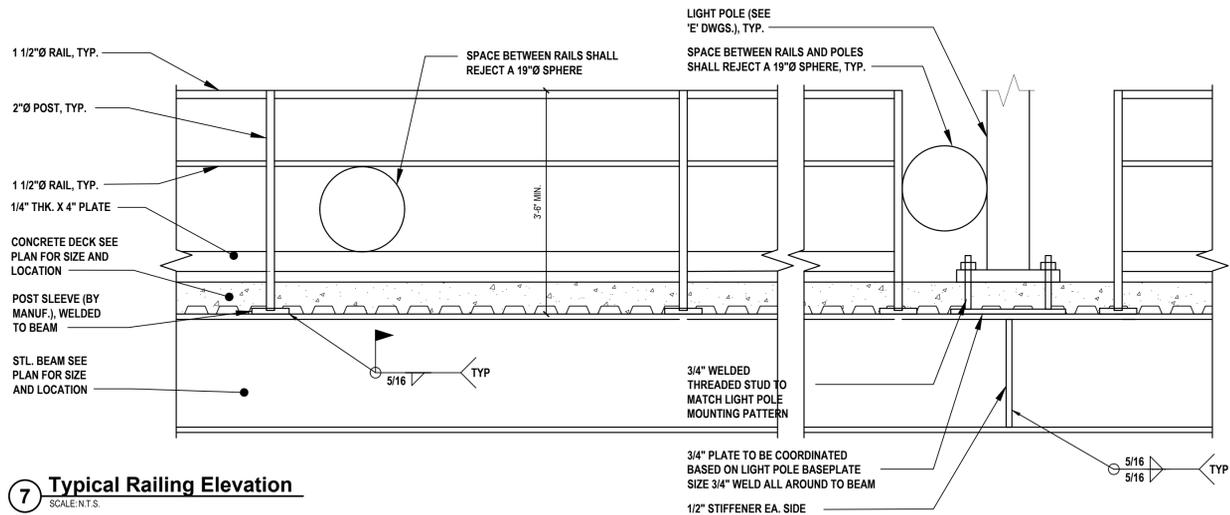
4 Removable Cover Connection Detail
SCALE: N.T.S.



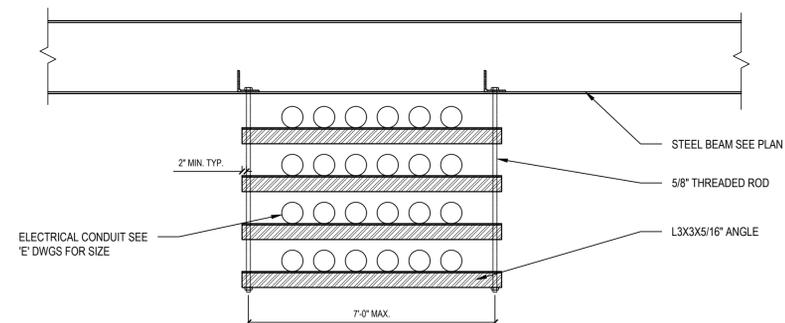
5 Conduit Pipe Connection Detail
SCALE: 1-1/2"=1'-0"



6 Conduit Pipe Angle Support Elevation Detail
SCALE: 3/4"=1'-0"



7 Typical Railing Elevation
SCALE: N.T.S.



8 Conduit Pipe Support Along Beam Span
SCALE: 3/4"=1'-0"

CONSULTANTS:

MARK	DATE	DESCRIPTION
	09-09-2024	Final Bid Documents
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2	07-18-2023	DOB Objections
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	01-04-2023	95% Submission
	10-12-2022	90% Submission
	08-10-2020	60% Resubmission
	03-03-2020	60% Submission
	11-08-2019	30% Submission

DESIGNED BY: DJA
DRAWN BY: DJA
CHECKED BY: SDL
REVIEWED BY: SDL

PROJECT NO: BNYD 1905A
DATE: SEPT 2024
SCALE: AS SHOWN

CLIENT

Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386



141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

CONTRACT
ALL CONTRACTS

STATUS
FINAL BID DOCUMENTS

SHEET TITLE
STEEL DETAILS

DRAWING No.
S-602.00

SHEET No.
21
OF
54

COLUMN SCHEDULE								
COLUMN DESIGNATION	A			B			C	
	1	2	3	1	2	3	2	3
COLUMN SECTION	W10x68	W10x54	W10x68	W10x68	W10x54	W10x68	W10x68	W10x68
CRANE T/ COLUMN [37.0']								
2nd FLOOR [22.5']								
FINISHED 1st FLOOR [6.5']								
BASE PLATE TYPE	BP1	BP1	BP1	BP1	BP1	BP1	BP2	BP2

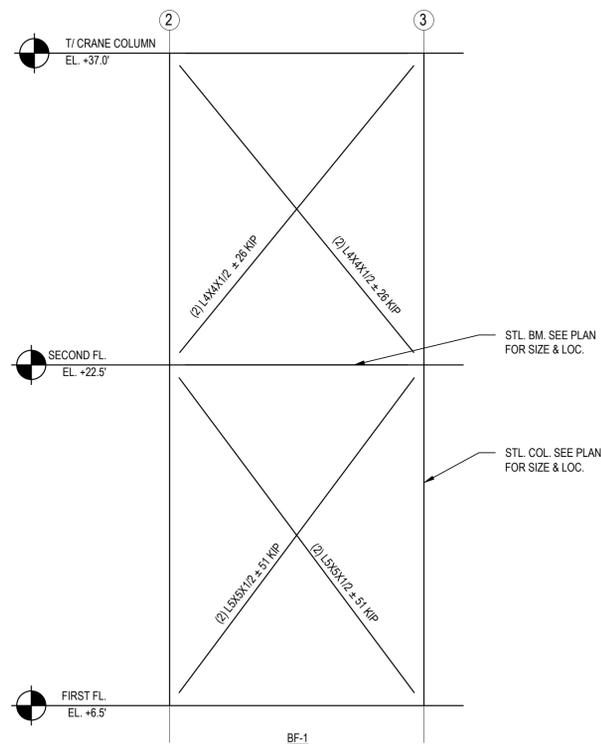
NOTES:

- INDICATES TOP OF COLUMN/TOP PLATE
- INDICATES TOP OF CONC. PEIR
- SEE BASE PLATE DETAIL AND TO DETERMINE BOTTOM OF COLUMN ELEVATION.
- ALL BASE PLATES TO BEAR ON CONCRETE SHALL BE SHIMMED USING 1" NON-METALLIC, NON-SHRINK GROUT.
- CONTRACTOR IS RESPONSIBLE FOR COORDINATING HEIGHT OF LIFT FRAMING FOR ADEQUATE PASSAGE OF TRANSFORMER OVER EXISTING WALL COLUMN SIZES TO BE ADJUSTED AS NECESSARY.

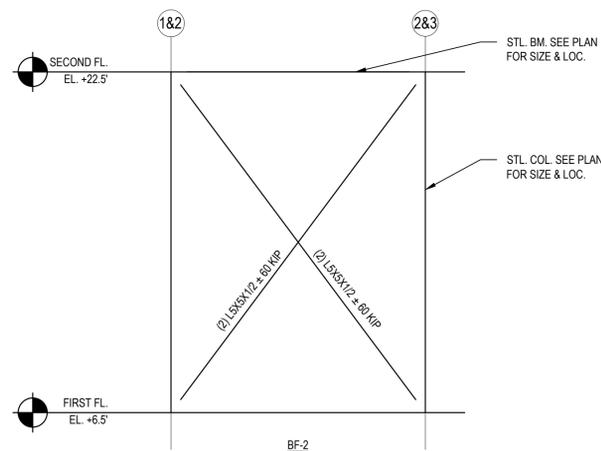
BASE PLATE SCHEDULE				
MARK	WIDTH	LENGTH	THICKNESS	NOTE
BP1	17"	25"	1 1/2"	1
BP2	16"	22"	1 1/2"	1

NOTES:

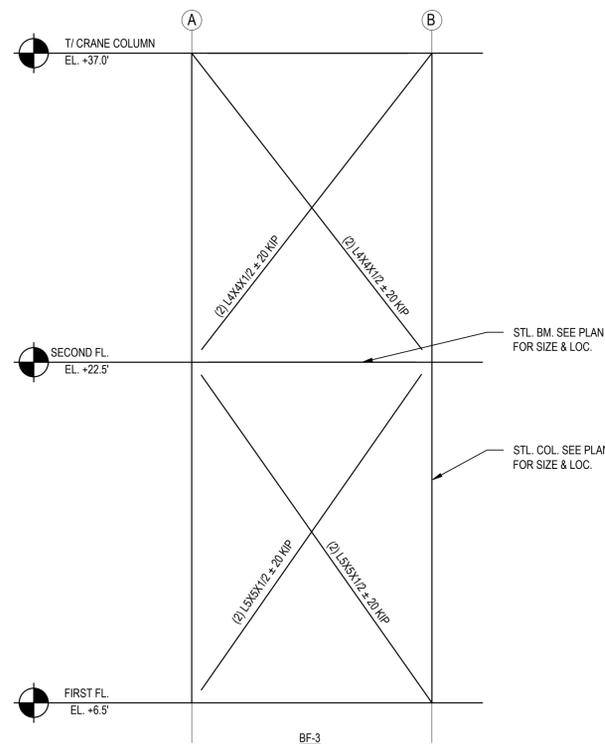
- PROVIDE 1"Ø A307 ANCHOR BOLTS FOR NON-MOMENT BASE PLATE EMBEDDED 16" MIN.
- REFER TO BASE PLATE DETAILS FOR ANCHOR BOLT LOCATIONS AND ADDITIONAL REQUIREMENTS.



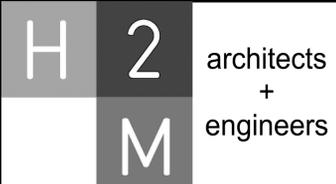
1 BF-1 ELEVATION
SCALE: N.T.S.



2 BF-2 ELEVATION
SCALE: N.T.S.



3 BF-3 ELEVATION
SCALE: N.T.S.



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Melville, NY 11747
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	11-08-2019	30% Submission

DESIGNED BY: DJA
DRAWN BY: DJA
CHECKED BY: SDL
REVIEWED BY: SDL

PROJECT NO: BNYD 1905A
DATE: SEPT 2024
SCALE: AS SHOWN

CLIENT
Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386



141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

CONTRACT
ALL CONTRACTS

STATUS
FINAL BID DOCUMENTS

SHEET TITLE
COLUMN & BRACED FRAME SCHEDULES

DRAWING No. **S-620.00**
SHEET No. **23**
OF **54**

COMcheck Software Version 4.1.5.5
Mechanical Compliance Certificate

Project Information
 Energy Code: 2020 New York City Energy Conservation Code, Appendix CA (modified 90.1-2016)
 Project Title: New York, New York
 Location: 4a
 Climate Zone: Alteration

Construction Start: _____ Owner/Agent: _____ Designer/Contractor: _____

Mechanical Systems List

Quantity System Type & Description

- HVAC System 1**
 Heating 1 each - Unit Heater, Electric, Capacity = 17 MBtu/h
 No minimum efficiency requirement applies
 Fan System: EUH-1 - EUH-4 FAN - Compliance (Motor nameplate HP method) - Passes
 Fans:
 FAN 1 Supply, Constant Volume, 460 CFM, 0.3 motor nameplate hp, 67.0 fan efficiency grade
 SYSTEM VERIFICATION REQUIRED.
- HVAC System 2**
 VRF Condensing Unit, Air Cooled Heat Pump
 Heating Mode Capacity = 69 MBtu/h
 Proposed Efficiency = 10.00 HSPF, Required Efficiency = 7.70 HSPF
 Cooling Mode Capacity = 69 MBtu/h
 Proposed Efficiency = 13.00 SEER, Required Efficiency = 13.00 SEER
 Fan System: None
 SYSTEM VERIFICATION REQUIRED.
- HVAC System 3**
 Cooling 1 each - VRF Zone Fan Unit, Capacity = 30 MBtu/h
 No minimum efficiency requirement applies
 Fan System: DSEU-1 - DSEU-4 FAN - Compliance (Motor nameplate HP method) - Passes
 Fans:
 FAN 2 Supply, Constant Volume, 770 CFM, 0.1 motor nameplate hp, 67.0 fan efficiency grade
 SYSTEM VERIFICATION REQUIRED.

Mechanical Compliance Statement
 Compliance Statement: The proposed mechanical alteration project represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 2020 New York City Energy Conservation Code, Appendix CA (modified 90.1-2016) requirements in COMcheck Version 4.1.5.5 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Name - Title _____ Signature _____ Date _____

Project Title: X:\BNYD (Brooklyn Navy Yard) - 40700\BNYD1905A - 4275V1 - Mitigation01-Reports\BNYD Report date: 04/06/23
 Data filename: X:\BNYD (Brooklyn Navy Yard) - 40700\BNYD1905A - 4275V1 - Mitigation01-Reports\BNYD Page 1 of 11
 1905.cck

Section # & Req. ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.5.3.6 [ME72]†	Motors for fans >= 1/2 hp and < 1 hp are electrically commutated motors or have a minimum motor efficiency of 70%. These motors are also speed adjustable for either balancing or remote control.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.5.3.6 [ME72]†	Motors for fans >= 1/2 hp and < 1 hp are electrically commutated motors or have a minimum motor efficiency of 70%. These motors are also speed adjustable for either balancing or remote control.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.5.3.4 [ME108]†	Parallel-flow fan-powered VAV air terminals have automatic controls to a) turn off the terminal fan except when space heating is required or if required for ventilation; b) turn on the terminal fan as the first stage of heating before the heating coil is activated; and c) during heating for warmup or setback temperature control, either operate the terminal fan and heating coil without primary air or reverse the terminal damper logic and provide heating from the central air handler through primary air.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.5.3.4 [ME108]†	Parallel-flow fan-powered VAV air terminals have automatic controls to a) turn off the terminal fan except when space heating is required or if required for ventilation; b) turn on the terminal fan as the first stage of heating before the heating coil is activated; and c) during heating for warmup or setback temperature control, either operate the terminal fan and heating coil without primary air or reverse the terminal damper logic and provide heating from the central air handler through primary air.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.

Project Title: X:\BNYD (Brooklyn Navy Yard) - 40700\BNYD1905A - 4275V1 - Mitigation01-Reports\BNYD Report date: 04/06/23
 Data filename: X:\BNYD (Brooklyn Navy Yard) - 40700\BNYD1905A - 4275V1 - Mitigation01-Reports\BNYD Page 6 of 11
 1905.cck

COMcheck Software Version 4.1.5.5
Inspection Checklist

Energy Code: 2020 New York City Energy Conservation Code, Appendix CA
 Requirements: 68.0% were addressed directly in the COMcheck software
 Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req. ID	Plan Review	Complies?	Comments/Assumptions
4.2.2, 6.4.4.2.1, 6.4.2.1, 6.7.2 [PR2]†	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the mechanical systems and equipment. Load calculations per acceptable engineering standards and handbooks.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
4.2.2, 6.4.1.1, 6.4.1.2, 6.7 [PR6]†	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the electrical systems and equipment and document where exceptions are claimed. Load calculations per acceptable engineering standards and handbooks.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
6.7.2.4 [PRS]†	Detailed inventories for HVAC systems commissioning included on the plans or specifications for projects >= 50,000 ft ² .	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.4.5 [PR1]†	Electrical meters for tenant spaces in covered buildings. Each covered tenant space in a new building shall be equipped with a separate meter or sub-meter to measure the electrical consumption of such space when let or sub-let. See section details and Section 28.311.2 of the Administrative Code. As new covered tenant spaces are created, they shall be equipped with meters or sub-meters as provided in this section.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	

Additional Comments/Assumptions:

1 | High Impact (Tier 1) | 2 | Medium Impact (Tier 2) | 3 | Low Impact (Tier 3)

Project Title: X:\BNYD (Brooklyn Navy Yard) - 40700\BNYD1905A - 4275V1 - Mitigation01-Reports\BNYD Report date: 04/06/23
 Data filename: X:\BNYD (Brooklyn Navy Yard) - 40700\BNYD1905A - 4275V1 - Mitigation01-Reports\BNYD Page 2 of 11
 1905.cck

Section # & Req. ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.5.3.7 [ME109]†	Required minimum outdoor air rate is the larger of minimum outdoor air rate required by Standard 62.1, Standard 170, or applicable codes or accreditation standards. Outdoor air ventilation systems shall comply with one of the following: a) design minimum outdoor air rate, b) dampers, ductwork, and controls allow the system to supply <= the required minimum outdoor air rate with a single set point adjustment, or c) system includes exhaust air energy recovery complying with Section 6.5.6.1.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.5.3.7 [ME109]†	Required minimum outdoor air rate is the larger of minimum outdoor air rate required by Standard 62.1, Standard 170, or applicable codes or accreditation standards. Outdoor air ventilation systems shall comply with one of the following: a) design minimum outdoor air rate, b) dampers, ductwork, and controls allow the system to supply <= the required minimum outdoor air rate with a single set point adjustment, or c) system includes exhaust air energy recovery complying with Section 6.5.6.1.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.5.3.3 [ME42]†	Multiple zone VAV systems with DDC of individual zone boxes have static pressure reset control.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.5.3.3 [ME42]†	Multiple zone VAV systems with DDC of individual zone boxes have static pressure reset control.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.5.3.3 [ME42]†	Multiple zone VAV systems with DDC of individual zone boxes have static pressure reset control.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.5.4.2 [ME23]†	HVAC pumping systems with >= 3 control valves designed for variable fluid flow (see section details).			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.5.6.1 [ME56]†	Exhaust air energy recovery air systems meeting Tables 6.5.6.1-1, and 6.5.6.1-2.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.

Project Title: X:\BNYD (Brooklyn Navy Yard) - 40700\BNYD1905A - 4275V1 - Mitigation01-Reports\BNYD Report date: 04/06/23
 Data filename: X:\BNYD (Brooklyn Navy Yard) - 40700\BNYD1905A - 4275V1 - Mitigation01-Reports\BNYD Page 7 of 11
 1905.cck

Section # & Req. ID	Footing / Foundation Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.4.1.7 [FO9]†	Freeze protection and snow/ice melting system sensors for future connection to controls.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.

Additional Comments/Assumptions:

1 | High Impact (Tier 1) | 2 | Medium Impact (Tier 2) | 3 | Low Impact (Tier 3)

Project Title: X:\BNYD (Brooklyn Navy Yard) - 40700\BNYD1905A - 4275V1 - Mitigation01-Reports\BNYD Report date: 04/06/23
 Data filename: X:\BNYD (Brooklyn Navy Yard) - 40700\BNYD1905A - 4275V1 - Mitigation01-Reports\BNYD Page 3 of 11
 1905.cck

Section # & Req. ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.5.7.1 [ME100]†	Conditioned supply air to space with mechanical exhaust <= the greater of criteria of supply flow, required ventilation rate, exhaust flow minus the available transfer air (see section details).			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.5.7.1 [ME100]†	Conditioned supply air to space with mechanical exhaust <= the greater of criteria of supply flow, required ventilation rate, exhaust flow minus the available transfer air (see section details).			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.5.7.2.1 [ME2]†	Kitchen hoods >= 5,000 cfm have make up air >= 50% of exhaust air volume.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.5.7.2.4 [ME49]†	Approved field test used to evaluate design air flow rates and demonstrate proper capture and containment of kitchen exhaust systems.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.5.8.1 [ME34]†	Unenclosed spaces that are heated use only radiant heat.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.4.3.9 [ME83]†	Heating for vestibules and air curtains with integral heating include automatic controls that shut off the heating system when outdoor air temperatures > 45F. Vestibule heating and cooling systems controlled by a thermostat in the vestibule with heating setpoint <= 60F and cooling setpoint >= 60F.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.5.10 [ME73]†	Doors separating conditioned space from the outdoors have controls that disable/respect heating and cooling system when open.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Building entrances have automatic closing devices.

Additional Comments/Assumptions:

Project Title: X:\BNYD (Brooklyn Navy Yard) - 40700\BNYD1905A - 4275V1 - Mitigation01-Reports\BNYD Report date: 04/06/23
 Data filename: X:\BNYD (Brooklyn Navy Yard) - 40700\BNYD1905A - 4275V1 - Mitigation01-Reports\BNYD Page 8 of 11
 1905.cck

Section # & Req. ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.4.1.4 [ME1]†	HVAC equipment efficiency verified. Non-NAECA HVAC equipment labeled as meeting 90.1.	Efficiency: _____	Efficiency: _____	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	See the Mechanical Systems list for values.
6.4.3.4.1 [ME3]†	Stair and elevator shaft vents have motorized dampers that automatically close.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.4.3.4.2 [ME4]†	Outdoor air and exhaust systems have motorized dampers that automatically shut when not in use and meet maximum leakage rates. Check gravity dampers where allowed.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.4.3.4.3 [ME35]†	Enclosed parking garage ventilation has automatic contaminant detection and capacity to stage or modulate fans to 50% or less of design capacity.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.4.3.4.4 [ME5]†	Ventilation fans >= 75 hp have automatic controls to shut off fan when not required.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.3.8 [ME6]†	Demand control ventilation provided for spaces >= 200 ft ² and >= 25 people/1000 ft ² occupant density and served by systems with air side economizer, auto modulating outside air damper control, or design airflow > 3,000 cfm.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.5.3.2.1 [ME40]†	DX cooling systems >= 75 kBtu/h (or >= 45 MBtu/h effective 1/2016) and chilled water and evaporative cooling fan motor >= 1/2 hp are equipped with fan airflow as a function of load and comply with operational requirements.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.4.4.1.1 [ME7]†	Insulation exposed to weather protected from damage. Insulation outside of conditioned space and associated with cooling systems is vapor retardant.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.4.1.2 [ME3]†	HVAC ducts and plenums insulated per Table 6.5.2. Where ducts or plenums are installed in or under a slab, verification may need to occur during Foundation Inspection.	R: _____	R: _____	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.4.1.3 [ME9]†	HVAC piping insulation thickness, where piping is installed in or under a slab, verification may need to occur during Foundation Inspection.	in. _____	in. _____	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.

1 | High Impact (Tier 1) | 2 | Medium Impact (Tier 2) | 3 | Low Impact (Tier 3)

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 1905.cck

Section # & Req. ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
8.4.2 [EL10]†	At least 50% of all 125 volt 15- and 20-amp receptacles are controlled by an automatic control device.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
8.4.3 [EL11]†	New buildings have electrical energy measurement devices installed. Where tenant spaces exist, each building is monitored separately. In buildings with a digital control system the energy use is transmitted to control system and displayed graphically.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
10.4.1 [EL9]†	Electric motor meet requirements where applicable.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

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 1905.cck

Section # & Req. ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.4.4.1.4 [ME41]†	Thermally ineffective panel surfaces of sensible heating panels have insulation >= R-3.5.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.4.4.2.1 [ME10]†	Ducts and plenums having pressure class ratings are Seal Class A construction.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.8.1.15, 6.8.1.16 [ME110]†	Electrically operated DX-DOAS units meet requirements per Tables 6.8.1.15 or 6.8.1.16.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.4.4.2.2 [ME11]†	Ductwork operating > 3 in. water column requires air leakage testing.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.4.4.2.2 [ME11]†	Ductwork operating > 3 in. water column requires air leakage testing.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.4.4.2.2 [ME11]†	Ductwork operating > 3 in. water column requires air leakage testing.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.5.2.3 [ME19]†	Humidification controls provided to prevent reheating, recirculating, mixing of hot and cold airstreams or concurrent heating and cooling of the same airstream.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.5.2.4.1 [ME68]†	Humidifiers with airstream mounted preheating jackets have preheat auto-shutoff valve set to activate when humidification is not required.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.5.2.4.2 [ME69]†	Humidification system dispersion tube net surfaces in the airstreams of ducts or air-handling units insulated >= R-0.5.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.5.2.5 [ME70]†	Preheat coils controlled to stop heat output whenever mechanical cooling, including economizer operation, is active.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.5.2.6 [ME105]†	Units that provide ventilation air to multiple zones and operate in conjunction with zone heating and cooling systems are prevented from using heating or heat recovery to warm supply air above 60°F when representative building loads or outdoor air temperature indicate that most zones demand cooling.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.

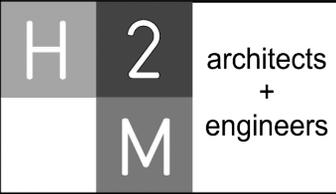
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 1905.cck

Section # & Req. ID	Final Inspection	Complies?	Comments/Assumptions
6.4.3.1.2 [F13]†	Thermostatic controls have a 5°F deadband.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.3.2 [F10]†	Temperature controls have setpoint override restrictions.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.3.3.1 [F11]†	HVAC systems equipped with at least one automatic shutdown control.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.3.3.2 [F22]†	Setback controls allow automatic restart and temporary operation as required for maintenance.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.3.6 [F6]†	When humidification and dehumidification are provided to a zone, simultaneous operation is prohibited. Humidity control prohibits the use of fossil fuel or electricity to produce RH > 30% in the warmest zone humidified and RH < 60% in the coldest zone dehumidified.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.7.2.1 [F5]†	Furnished HVAC as-built drawings submitted within 90 days of system acceptance.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.7.2.2 [F8]†	Furnished O&M manuals for HVAC systems within 90 days of system acceptance.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.7.2.3 [F9]†	An air and/or hydronic system balancing report is provided for HVAC systems serving zones >= 5,000 ft ² conditioned area.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.7.2.4 [F10]†	HVAC control systems have been tested to ensure proper operation, calibration and adjustment of controls.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
10.4.3 [F124]†	Elevators are designed with the proper lighting, ventilation power, and standby mode.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.

Additional Comments/Assumptions:

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 1905.cck



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	03-03-2020	60% Submission
	11-08-2019	30% Submission

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JJH	JJH	PDF	

ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR
BCU	BUILDING CONTROL UNIT
BTU	BRITISH THERMAL UNIT
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CLG	CEILING
COMM.	COMMUNICATION
CV	CONTROL VALVE
(D)	DEMOLISH
DB	DRY BULB
DCV	DEMAND CONTROLLED VENTILATION
DEG. F	DEGREES FAHRENHEIT
DIA	DIAMETER
DX	DIRECT EXPANSION
'E'	ELECTRICAL CONTRACTOR
(E)	EXISTING
EA	EACH
EAT	ENTERING AIR TEMPERATURE
EER	ENERGY EFFICIENCY RATING
ESP	EXTERNAL STATIC PRESSURE
FAI	FRESH AIR INTAKE
FD	FLOOR DRAIN
FLA	FULL LOAD AMPS
FT. H2O	FEET OF WATER
'G'	GENERAL CONSTRUCTION CONTRACTOR
GPM	GALLONS PER MINUTE
GPH	GALLONS PER HOUR
H	HEIGHT
'H'	HVAC CONTRACTOR
HP	HORSEPOWER
IN.	INCHES
IN. W.C. (W.G.)	INCHES WATER COLUMN (WATER GAUGE)
KW	KILOWATTS
L	LENGTH
LAT	LEAVING AIR TEMPERATURE
LBS	POUNDS
LCD	LIQUID CRYSTAL DISPLAY
LDB	LEAVING DRY BULB TEMPERATURE
LWB	LEAVING WET BULB TEMPERATURE
LWT	LEAVING WATER TEMPERATURE
M	METER
MAX	MAXIMUM
MBH	1,000 BTU PER HOUR
MCA	MINIMUM CIRCUIT AMPACITY
MIN	MINIMUM
MANF.	MANUFACTURER
N.C.	NORMALLY CLOSED
N.O.	NORMALLY OPEN
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NPT	NATIONAL PIPE THREAD
NTS	NOT TO SCALE
OAI	OUTDOOR AIR INTAKE
OD	OUTER DIAMETER
OED	OPEN ENDED DUCT
'P'	PLUMBING CONTRACTOR
PD	PRESSURE DROP
PSIG	LBS / SQUARE INCH (GAUGE PRESSURE)
RD	ROOF DRAIN
RPM	REVOLUTIONS PER MINUTE
RPZ	REDUCED PRESSURE ZONE
SAT	SUPPLY AIR TEMPERATURE
SEER	SEASONAL ENERGY EFFICIENCY RATING
TEMP	TEMPERATURE
TG	TRANSFER GRILLE
TYP	TYPICAL
VFD	VARIABLE FREQUENCY DRIVE
W	WIDTH
WB	WET BULB
WMS	WIRE MESH SCREEN

DUCTWORK LEGEND

SYMBOL	ABBREV	DESCRIPTION
		DUCTWORK BRANCH CONNECTION
	VD	VOLUME DAMPER
	CD	ROUND FACE SUPPLY DIFFUSER
	SEE AIR DEVICE SCHEDULE	SIDEWALL SUPPLY, RETURN OR EXHAUST GRILLE/REGISTER
	SEE AIR DEVICE SCHEDULE	SQUARE FACE SUPPLY DIFFUSER
	SEE AIR DEVICE SCHEDULE	BOTTOM RETURN OR EXHAUST GRILLE/REGISTER
	FC	FLEXIBLE CONNECTION
		TURNING VANES
		RECTANGULAR TO ROUND TRANSITION
	AL	ACOUSTICAL LINING
		END CAP
	SEE AIR DEVICE SCHEDULE	SUPPLY DIFFUSER WITH DIRECTIONAL FLOW (SOLID HATCH INDICATES BLANK OFF PANEL)
		SUPPLY DUCT DROP (TURN DOWN)
		RETURN/EXHAUST DUCT DROP (TURN DOWN)
		SUPPLY DUCT RISE
		RETURN/EXHAUST DUCT RISE
	DSD	DUCT SMOKE DETECTOR
	MD	MOTORIZED DAMPER WITH ACTUATOR
	AD	ACCESS DOOR
	FD/AD	FIRE DAMPER WITH ACCESS DOOR
	FSD/AD	FIRE SMOKE DAMPER WITH ACCESS DOOR
	FAN	FAN
		WORK TO BE REMOVED
		POINT OF DISCONNECTION FROM EXISTING
		POINT OF CONNECTION TO EXISTING

CONTROLS LEGEND

SYMBOL	ABBREV	DESCRIPTION
		THERMOSTAT
	H2	HYDROGEN SENSOR

PIPING LEGEND

SYMBOL	ABBREV	DESCRIPTION
		NEW WORK
		PIPING DOWN/PIPING UP
		BALL VALVE WITH HOSE END CONNECTION
	TH	THERMOMETER
	U	UNION
	FPC	FLEXIBLE PIPE CONNECTION
		DIRECTION OF FLOW
	PSR	PRESSURE SAFETY AND RELIEF VALVE
	PRV	PRESSURE REDUCING VALVE
	BV	BALL VALVE
	BA	BALANCING VALVE
	BFV	BUTTERFLY VALVE
		TEMPERATURE SENSOR WITH THERMOWELL
	GA	GATE VALVE
	GB	GLOBE VALVE
	AV	AUTOMATIC AIR VENT
	CV	2-WAY ELECTRONIC CONTROL VALVE
	CV	3-WAY ELECTRONIC CONTROL VALVE
	CV	2-WAY PNEUMATIC CONTROL VALVE
	CV	3-WAY PNEUMATIC CONTROL VALVE
	STR	STRAINER WITH BLOW OFF VALVE WITH HOSE END CONNECTION
	FD	FLOOR DRAIN
		AIR SEPARATOR
	F&T	STEAM TRAPS (INDICATE TYPE)
	CH	CHECK VALVE
	PG	PRESSURE GAUGE WITH GAUGE COCK
	RED	REDUCER
	CO	CLEANOUT END CAP
		PIPE GUIDE
		PIPE ANCHOR
		CAPPED PIPE
		PUMP
		WORK TO BE REMOVED
		POINT OF DISCONNECTION FROM EXISTING
		POINT OF CONNECTION TO EXISTING
	TDV	TRIPLE DUTY VALVE

Sheet List Table

Sheet Number	Sheet Title
M-000.00	HVAC LEGENDS, SYMBOLS, ABBREVIATIONS, AND GENERAL NOTES
M-100.00	HVAC DEMO AND NEW WORK PLAN
M-200.00	HVAC SCHEDULES AND DETAILS

GENERAL NOTES

- PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE MECHANICAL SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
- THE CONTRACTOR, BY PRESENTING THEIR BID FOR THE WORK, REPRESENTS THAT HE/SHE HAS INSPECTED THE SITE AND IS COMPLETELY FAMILIAR WITH THE SCOPE OF WORK AND ALL FIELD CONDITIONS RELATED TO, AND AFFECTING THE WORK AND ITS PERFORMANCE. EXCEPTIONS AFFECTING THE WORK AND ITS PERFORMANCE, OR CONFLICTS BETWEEN FIELD CONDITIONS, SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT PRIOR TO THE SUBMISSION OF BIDS.
- PERFORM ALL WORK IN ACCORDANCE WITH THE 2022 PLUMBING CODE, FIRE CODE, MECHANICAL CODE, FUEL GAS CODE, AND 2020 ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK CITY AND THE REQUIREMENTS OF THE LOCAL AUTHORITIES HAVING JURISDICTION.
- COMPLY WITH THE NATIONAL ELECTRIC CODE AND THE REQUIREMENTS OF DIVISION 26 FOR ALL ELECTRICAL INSTALLATIONS.
- FIRE STOP ALL OPENINGS IN FIRE RATED CONSTRUCTION FOR PIPING, DUCTWORK, CONDUIT, ETC. PROVIDE FIRE DAMPERS AND ACCESS DOORS IN ALL OPENINGS IN FIRE RATED FLOORS, PARTITIONS, AND WALLS FOR DUCTWORK AS PER THE MECHANICAL CODE OF NEW YORK CITY. (SEE ARCHITECTURAL DRAWINGS FOR LOCATIONS OF FIRE RATED CONSTRUCTION.)
- DO NOT SCALE DRAWINGS. DRAWINGS FOR HVAC WORK ARE DIAGRAMMATIC AND ARE INTENDED TO CONVEY SCOPE AND GENERAL ARRANGEMENT ONLY. THE LOCATIONS OF ALL ITEMS SHOWN ON THE DRAWINGS OR CALLED FOR IN THE SPECIFICATIONS THAT ARE NOT DEFINITELY FIXED BY DIMENSIONS ARE APPROXIMATE. COORDINATE CONTRACT DOCUMENTS, PROJECT REQUIREMENTS, WORK OF OTHERS, AND EQUIPMENT AND MATERIALS PURCHASED WITH FIELD DIMENSIONS. INSTALL ALL EQUIPMENT AS PER MANUFACTURER'S REQUIREMENTS TO PROVIDE PROPER CLEARANCE FOR INSTALLATION, OPERATION, AND MAINTENANCE. CONTRACTOR'S INTENDED MEANS AND METHODS OF INSTALLATION AND CONTRACTOR'S FABRICATED ITEMS SHALL ENSURE A PROPER "FIT" AND INSTALLATION. BRING ANY CONFLICTS TO THE ATTENTION OF THE ARCHITECT/ENGINEER DURING THE SUBMITTAL PHASE FOR RESOLUTION PRIOR TO PURCHASING ANY EQUIPMENT.
- MAINTAIN MAXIMUM HEADROOM AND SPACE CONDITIONS AT ALL POINTS. WHERE HEADROOM AND SPACE CONDITIONS APPEAR INADEQUATE, NOTIFY THE ARCHITECT/ENGINEER PRIOR TO PROCEEDING WITH INSTALLATION. MAINTAIN A MINIMUM OF 6'-0" CLEARANCE FROM FINISHED FLOOR TO UNDERSIDE OF PIPES, DUCTS, CONDUITS, SUSPENDED EQUIPMENT, ETC., THROUGHOUT ACCESS ROUTES IN MECHANICAL ROOMS.
- FIELD VERIFY AND COORDINATE ALL DUCT AND PIPING DIMENSIONS BEFORE FABRICATION. MAKE MODIFICATIONS IN THE LAYOUT AS NEEDED TO PREVENT CONFLICT WITH WORK OF OTHER TRADES OR FOR PROPER EXECUTION OF THE WORK. OBTAIN THE APPROVAL OF THE ARCHITECT/ENGINEER FOR MODIFICATIONS.
- PROVIDE PRODUCTS OF ONE MANUFACTURER WHERE TWO OR MORE ITEMS OF THE SAME TYPE OF MATERIAL OR EQUIPMENT IS REQUIRED.
- INSTALL ALL EQUIPMENT AND APPURTENANCES IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, CONTRACT DOCUMENTS, AND APPLICABLE CODES AND REGULATIONS. REFER TO DETAILS FOR ADDITIONAL PIPING AND EQUIPMENT INSTALLATION REQUIREMENTS.
- LOCATE ALL TEMPERATURE, PRESSURE, AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH STRAIGHT SECTION OF PIPE OR DUCT UP AND DOWNSTREAM AS RECOMMENDED BY THE MANUFACTURER TO ENSURE MANUFACTURER CERTIFIED ACCURACY.
- COORDINATE ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. COORDINATE AND PROVIDE ALL PIPING AND DUCT TRANSITIONS REQUIRED FOR FINAL CONNECTIONS TO EQUIPMENT.
- COORDINATE LOCATIONS AND SIZES OF ALL FLOOR, WALL, AND ROOF OPENINGS WITH ALL OTHER TRADES. COORDINATE ALL PIPING AND EQUIPMENT SUPPORTED FROM STRUCTURE WITH GENERAL CONSTRUCTION WORK.
- COORDINATE INSTALLATION OF SUPPLY AND RETURN GRILLES WITH INSTALLATION OF FINISHED CEILINGS.
- COMPLETE ALL PRESSURE TESTS BEFORE ANY MECHANICAL EQUIPMENT, DUCTWORK, OR PIPING INSULATION IS APPLIED.
- TESTING, ADJUSTING, AND BALANCING AGENCY SHALL BE A MEMBER OF THE ASSOCIATED AIR BALANCE COUNCIL (AABC) OR THE NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB). PERFORM ALL TESTING, ADJUSTING, AND BALANCING IN ACCORDANCE WITH THE SPECIFICATIONS.
- MAKE ALL ATTACHMENTS TO JOISTS, TRUSSES, OR JOIST GIRDERS AT PANEL POINTS. PROVIDE BEAM CLAMPS MEETING MSS STANDARDS. THE USE OF C-CLAMPS IS NOT PERMITTED.
- PROVIDE CONCRETE PADS A MINIMUM OF 6 INCHES HIGH FOR ALL FLOOR MOUNTED EQUIPMENT. EXTEND PAD 4 INCHES BEYOND THE EQUIPMENT ON ALL SIDES.
- INTERNALLY LINE ALL SUPPLY AND RETURN DUCTWORK WITHIN 20 FEET UPSTREAM AND DOWNSTREAM OF FANS WITH 1" THICK INSULATION. INTERNALLY LINED DUCTWORK MEETING THIS REQUIREMENT SHALL ALSO BE PROVIDED WITH EXTERNALLY APPLIED INSULATION AS REQUIRED BY THE SPECIFICATIONS. SEE SPECIFICATION SECTION 230719 FOR ADDITIONAL REQUIREMENTS.
- PROVIDE TRAPPED DRAIN PIPING FROM DRAIN PANS OF ALL COOLING COILS, FANS, AND OTHER ACTIVE DRAINS EXPOSED TO SYSTEM AIR STREAM. PROVIDE TRAP AT CONNECTION, WATER SEAL DEPTH 1 INCH GREATER THAN UNIT OPERATING PRESSURE. DIRECT DRAINS TO NEAREST FLOOR DRAIN, MOP SINK, OR OTHER LOCATION APPROVED BY THE ARCHITECT/ENGINEER.
- INSTALL PIPING, DUCTWORK, AND CONDUIT CONCEALED IN AREAS HAVING HUNG CEILINGS AND/OR FURRED SPACES UNLESS OTHERWISE INDICATED ON THE DRAWINGS.

WORK IN EXISTING AREAS

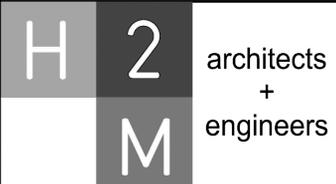
- EXISTING CONDITIONS, INCLUDING EQUIPMENT, DUCT AND PIPE SIZES AND LOCATIONS, INDICATED ON THE DRAWINGS ARE DIAGRAMMATIC. CONFIRM ALL EXISTING CONDITIONS PRIOR TO PROCEEDING WITH THE WORK.
- CUT AND ROUGH PATCH EXISTING CONSTRUCTION AS REQUIRED FOR THE PERFORMANCE OF THE WORK. ARCHITECTURAL DRAWINGS TO SHOW FINISH PATCHING OF HVAC WORK SUCH AS PENETRATION THROUGH BRICK WALL. PERFORM ALL CUTTING AND PATCHING WORK IN A MANNER SUCH THAT ANY EXISTING WARRANTIES/GUARANTEES ARE NOT VOIDED. USE QUALIFIED PERSONNEL IN PERFORMANCE OF THE WORK.

CONTRACT 'H' SCOPE NOTES

- FURNISH AND INSTALL ALL NECESSARY CONTROL WIRING, CONDUIT, AND ACCESSORIES AS REQUIRED TO PROVIDE FULLY FUNCTIONING SYSTEMS AND SEQUENCES OF OPERATION.
- FURNISH ALL LITELS FOR DUCT AND PIPE PENETRATIONS IN INTERIOR MASONRY WALLS FOR INSTALLATION BY CONTRACT 'G'.
- FURNISH ALL SLEEVES FOR PIPE AND CONDUIT FLOOR, WALL, PARTITION, AND ROOF PENETRATIONS FOR INSTALLATION BY CONTRACT 'G'.
- FURNISH ALL CURBS FOR ALL ROOF MOUNTED EQUIPMENT AND DUCT PENETRATIONS FOR INSTALLATION BY CONTRACT 'G'.
- REMOVE CHASE ENCLOSURE COVER WHEN PERFORMING WORK IN ANY CHASE, AND REINSTALL THE CHASE ENCLOSURE COVER WHEN WORK IS COMPLETE.
- PERFORM ALL CUTTING AND ROUGH PATCHING AS REQUIRED IN THE EXECUTION OF THE WORK. FINISH PATCHING AND FLASHING IS PART OF CONTRACT 'G'.

LEGENDS/ABBREVIATIONS NOTES

- ABBREVIATIONS AND SYMBOLS ON THIS SHEET DO NOT DEFINE THE SCOPE OF WORK.



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PROJECT NO.:	DATE:	SCALE:	AS SHOWN:
BNYD 1905A	SEPT 2024		AS SHOWN

Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386



**141 Flushing Avenue, Suite 801
Brooklyn, NY 11205**

CONTRACT
ALL CONTRACTS

STATUS
FINAL BID DOCUMENTS

SHEET TITLE
HVAC LEGENDS, SYMBOLS, ABBREVIATIONS, AND GENERAL NOTES

DRAWING No.
M-000.00

SHEET No.
25
OF
54

C:\Users\pmp\appdata\local\temp\pdp\hvac_555201010101\Hvac Legends, Symbols, Abbreviations, and General Notes.dwg, last Modified: Feb 01, 2024 - 1:20pm, Printed on: Sep 06, 2024 - 11:26am, By: pmp

CONSULTANTS:

MARK	DATE	DESCRIPTION
	09-09-2024	Final Bid Documents
	09-29-2023	100% Submission
2	07-18-2023	DOB Objections
1	05-30-2023	DOB Objections
	01-04-2023	95% Submission
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	11-08-2019	30% Submission

DESIGNED BY: JHJ
DRAWN BY: JHJ
CHECKED BY: PDF
REVIEWED BY:

PROJECT NO.: BNYD 1905A
DATE: SEPT 2024
SCALE: AS SHOWN

CLIENT:

**Brooklyn Navy Yard
Development Corporation**

**Restoration of Substation G at
Building 386**

**141 Flushing Avenue, Suite 801
Brooklyn, NY 11205**

CONTRACT:

ALL CONTRACTS

STATUS:

FINAL BID DOCUMENTS

SHEET TITLE:

**HVAC SCHEDULES
AND DETAILS**

DRAWING NO. **M-200.00**
SHEET NO. **27**
OF **54**

EQUIPMENT NO.	SYSTEM SERVED	AREA SERVED	PERFORMANCE/CONSTRUCTION REQUIREMENTS				BASIS OF DESIGN INFORMATION						REMARKS		
			REFRIGERANT TYPE	SUPPLY UNIT DATA			MNF	MODEL NO.	NOMINAL DIMENSIONS LxWxH (IN.)	NOMINAL OPERATING WEIGHT (LBS.)	ELECTRICAL DATA				
				FLOW (CFM)	TOTAL COOLING CAPACITY (MBH)	TOTAL HEATING CAPACITY (MBH)					MAX SOUND PRESSURE (dB)	VOLTS/PHASE		MCA	MOCP
DSEU-1	DSCU-1	SUBSTATION G	R-410A	770	30.0	34.0	48	CARRIER	40VMW030-3	10-1/8 x 47 x 13-1/2	38	208/1φ	0.86	15	1-2
DSEU-2	DSCU-1	SUBSTATION G	R-410A	770	30.0	34.0	48	CARRIER	40VMW030-3	10-1/8 x 47 x 13-1/2	38	208/1φ	0.86	15	1-2
DSEU-3	DSCU-2	SUBSTATION G	R-410A	770	30.0	34.0	48	CARRIER	40VMW030-3	10-1/8 x 47 x 13-1/2	38	208/1φ	0.86	15	1-2
DSEU-4	DSCU-2	SUBSTATION G	R-410A	770	30.0	34.0	48	CARRIER	40VMW030-3	10-1/8 x 47 x 13-1/2	38	208/1φ	0.86	15	1-2

NOTES:
1. ELECTRICAL TO PROVIDE DISCONNECT SWITCH
2. LOW VOLTAGE WIRED REMOTE CONTROLLER

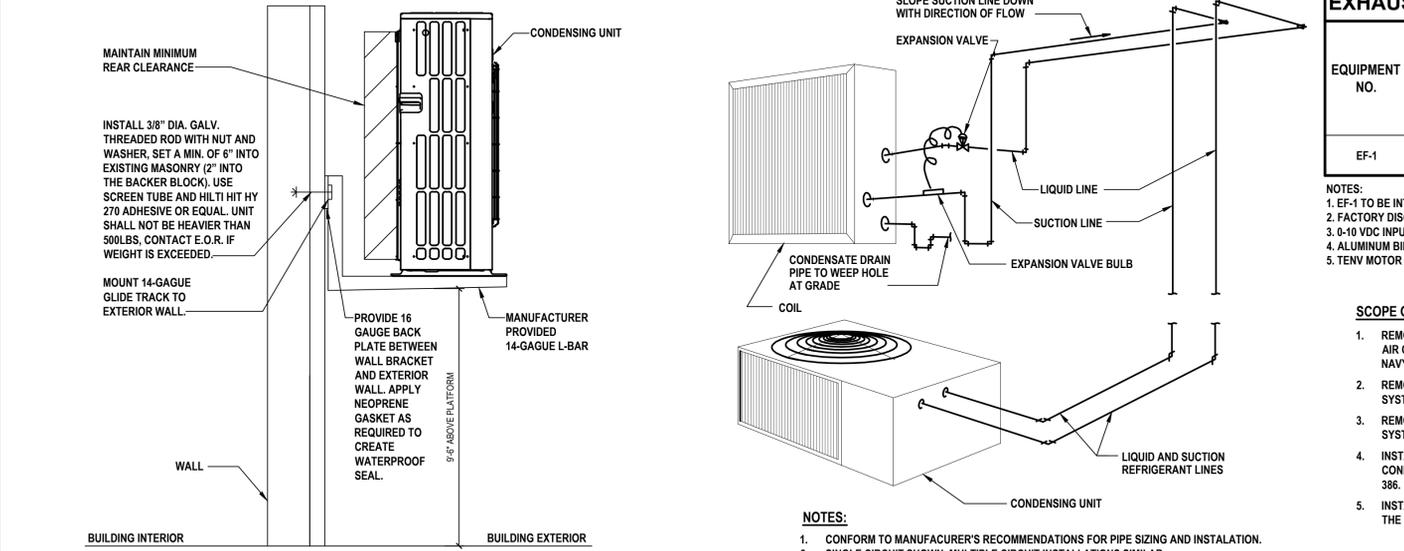
NYSECC CITATION	PROVISION	ITEM DESCRIPTION	PROPOSED DESIGN VALUE	CODE DESCRIPTIVE VALUE (ECC)	SUPPORTING DOCUMENTATION
C403.1.1	Calculation of heating and cooling loads.	Load calculations for HVAC systems	Design loads are determined in accordance with the procedures described in the ANSI/ASHRAE/ACCA Standard 183.	Determined in accordance with ANSI/ASHRAE/ACCA Standard 183 HVAC Systems and Equipment Handbook	Carrier HAP load calculations and ASHRAE 183 procedural compliance certificate
C403.3.1	Equipment sizing.	HVAC systems sizing based on load calculations	Specified equipment sized within load calculation limits	Heating and cooling equipment shall not exceed calculated loads	Signed and sealed statement from Engineer certifying compliance with Energy Code, see M200.00.
C403.3.2 (2)	Minimum efficiency requirements: electrically operated unitary and applied heat pumps	Heat pump DX cooling and heating split system.	18.6 SEER	14.0 SEER	DSCU-1, DSCU-2 on schedule, sheet M-200.00.
C403.4.1	Thermostatic controls.	Thermostats/humidistats for mechanical zones	One thermostat is provided for DSEU	Minimum one thermostat/humidistat required per zone	Thermostats shown on sheet M-100.00

EQUIPMENT NO.	LOCATION	SYSTEM SERVED	TYPE	PERFORMANCE/CONSTRUCTION REQUIREMENTS				BASIS OF DESIGN INFORMATION						REMARKS		
				OA TEMPERATURE RANGE (°F)	COOLING CAPACITY (MBH)	HEATING CAPACITY (MBH)	REFRIGERANT TYPE	NO. OF FANS	SEER	MNF	MODEL NO.	NOMINAL DIMENSIONS LxWxH (IN.)	ELECTRICAL DATA			
													VOLTS/PHASE		MCA	MOCP
DSCU-1	ROOF	DSEU-1 - DSEU-2	HEAT PUMP	-13 - 118	60.0	66.0	R-410A	2	18.6	CARRIER	38VMB060HDS3-1	15-3/4 x 35-1/2 x 52-1/4	208/1φ	40	45	1-3
DSCU-2	ROOF	DSEU-3 - DSEU-4	HEAT PUMP	-13 - 118	60.0	66.0	R-410A	2	18.6	CARRIER	38VMB060HDS3-1	15-3/4 x 35-1/2 x 52-1/4	208/1φ	40	45	1-3

NOTES:
1. ELECTRICAL TO PROVIDE DISCONNECT
2. PROVIDE BACNET CARD FOR FUTURE INTEGRATION INTO BMS
3. FACTORY HERESITE COATING

EQUIPMENT NO.	LOCATION	PERFORMANCE/CONSTRUCTION REQUIREMENTS				BASIS OF DESIGN INFORMATION						REMARKS
		FAN DATA FLOW (CFM)	TOTAL CAPACITY (MBH)	AIR DATA		HEATING COIL DATA		MNF	MODEL NO.	NOMINAL DIMENSIONS L x W x H (IN.)	NOMINAL OPERATING WEIGHT (LBS.)	
				HEAT RISE (°F)	THROW (FT.)	VOLTS/PHASE	TOTAL KW					
EUH-1 - EUH-4	FIRST FLOOR	450	17.0	35	31	208/1	5.0	STELPRO	ASHU0581TCHAR	22-3/4 x 18-3/4 x 12-1/16	40	1-4

NOTES:
1. FACTORY PROVIDED DISCONNECT SWITCH
2. BUILT IN DOUBLE POLE THERMOSTAT
3. WALL MOUNTING BRACKET
4. THERMAL PROTECTION WITH AUTOMATIC RESET



1 Wall Support Detail
SCALE: NTS

2 Refrigerant Piping Detail
SCALE: NTS

EQUIPMENT NO.	LOCATION	TYPE	SYSTEM SERVED	PERFORMANCE/CONSTRUCTION REQUIREMENTS				BASIS OF DESIGN INFORMATION						REMARKS			
				CFM	EXT S. P. (IN. W.C.)	FAN/MOTOR RPM	BHP	MNF	MODEL NO.	NOMINAL DIMENSIONS L x W x H (IN.)	NOMINAL OPERATING WEIGHT (LBS.)	ELECTRICAL DATA					
												VOLTS/PHASE	FLA		MCA	MOCP	MOTOR HP
EF-1	SECOND FLOOR	INLINE	HYDROGEN GAS EXHAUST	200	0.3	1673 / 1725	0.04	GREENHECK	SQ-70-VG	16 x 12 x 12	47	115/1	1.38	2	15	1/10	1-5

NOTES:
1. EF-1 TO BE INTERLOCKED WITH HYDROGEN GAS DETECTION PANEL
2. FACTORY DISCONNECT
3. 0-10 VDC INPUT
4. ALUMINUM BIRDSCREEN WITH GRAVITY BRACKDRAFT DAMPER
5. TENV MOTOR WITH COMPOSITE WHEEL

SCOPE OF WORK:

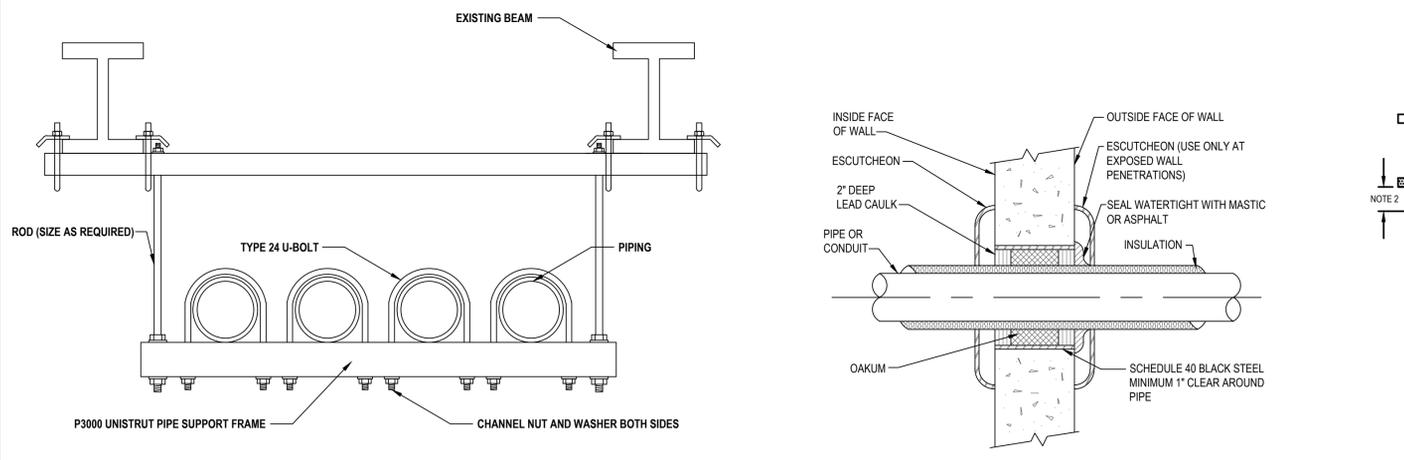
- REMOVAL AND SALVAGING OF THREE (3) EXISTING SPLIT AIR HANDLING UNITS AND AIR COOLED CONDENSERS. EQUIPMENT TO BE TURNED OVER TO THE BROOKLYN NAVY YARD UPON REMOVAL FROM BUILDING 386.
- REMOVAL OF REFRIGERANT PIPING ASSOCIATED WITH THE SPLIT COOLING SYSTEMS.
- REMOVAL OF SHEET METAL DUCTWORK ASSOCIATED WITH SPLIT COOLING SYSTEMS.
- INSTALLATION OF (2) NEW MULTISPLIT DUCTLESS SPLIT SYSTEMS WITH CONDENSER UNITS LOCATED ON ELEVATED STEEL PLATFORM OUTSIDE BUILDING 386.
- INSTALLATION OF REFRIGERANT AND CONDENSATE PIPING K ASSOCIATED WITH THE MULTISPLIT SYSTEM TO PROVIDE COOLING AND HEATING TO BUILDING 386.

NOTES:

- ENERGY ANALYSIS OF CONSTRUCTED CONDITIONS SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 28-104.3 OF THE ADMINISTRATIVE CODE. IF CONSTRUCTED WORK DIFFERS FROM THE LAST-APPROVED FULL ENERGY ANALYSIS, AN AS-BUILT ENERGY ANALYSIS SHALL BE SUBMITTED AS A POST-APPROVAL AMENDMENT, LISTING THE ACTUAL VALUES USED IN THE BUILDING FOR ANY APPLICABLE ENERGY CODE-REGULATED ITEMS DEMONSTRATING THAT THE BUILDING COMPLIES WITH THE ENERGY CODE. SUCH ENERGY ANALYSIS SHALL BE SIGNED BY A REGISTERED DESIGN PROFESSIONAL, WHO SHALL CERTIFY THAT TO THE BEST OF HIS OR HER KNOWLEDGE AND BELIEF THE BUILDING BUILT COMPLIES WITH THE ENERGY CODE; WHERE NO TRADE-OFFS HAVE BEEN USED AMONG DISCIPLINES, MORE THAN ONE REGISTERED DESIGN PROFESSIONAL MAY SIGN AND SEAL THE ENERGY ANALYSIS; THE ENERGY ANALYSIS SHALL BE APPROVED BY THE DEPARTMENT PRIOR TO SIGN-OFF OR ISSUANCE OF THE CERTIFICATE OF OCCUPANCY.

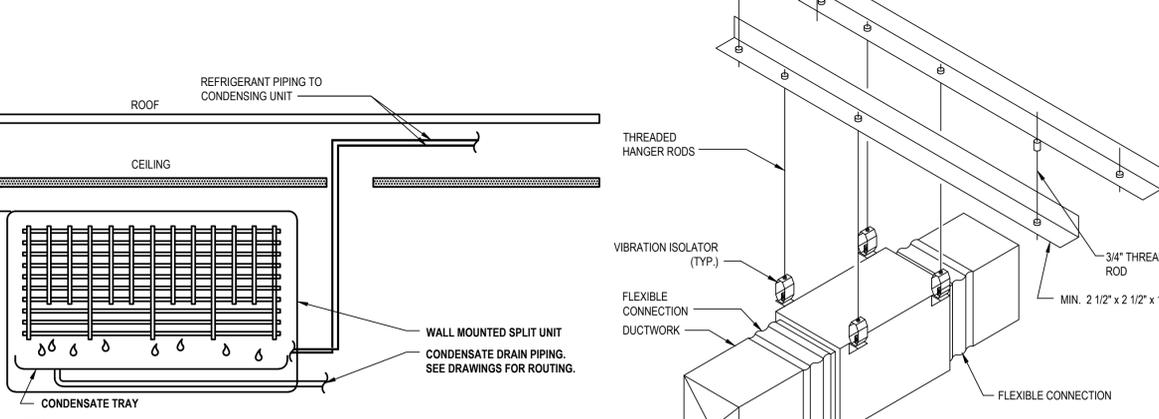
NYSECC CODE:

"TO THE BEST OF MY KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE NEW YORK CITY ENERGY CONSERVATION CONSTRUCTION CODE" - 2020 CHAPTER C4



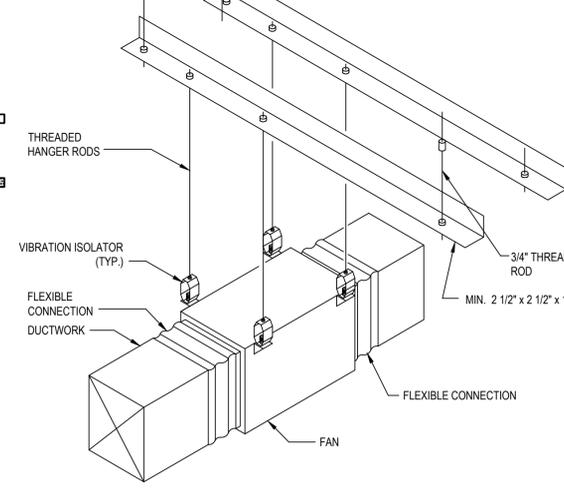
3 Copper Tubing Hanger Details
SCALE: NTS

4 Pipe or Conduit Penetration Through Exterior Walls
SCALE: NTS



NOTES:
1. PROVIDE REMOTE WALL MOUNTED THERMOSTAT.
2. REFER TO MANUFACTURER'S REQUIREMENTS FOR MOUNTING CLEARANCE REQUIREMENTS.
3. CONTRACTOR TO RUN REFRIGERANT PIPING AND CONDENSATE DRAIN PIPING OUT THE BACK OF THE UNIT INTO THE WALL, IF EXISTING STRUCTURE ALLOWS. OTHERWISE, CONTRACTOR TO PROVIDE PIPE ENCLOSURE.

5 Ductless Split Condensate Drain Piping Detail
SCALE: NTS



6 Inline Fan Hanging Support Detail
SCALE: NTS

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"ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL"

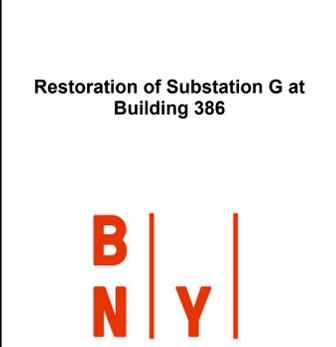
DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
MJS	MJS		

PROJECT NO.:	DATE:	SCALE:	AS SHOWN:
BNYD 1905A	SEPT 2024		AS SHOWN

CLIENT

Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386



141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

CONTRACT

STATUS **FINAL BID DOCUMENTS**

SHEET TITLE **ELECTRICAL SITE PLAN**

DRAWING NO. **E-100.00**

SHEET No. **29**
OF **54**

SITE PLAN LEGEND

	CURB
	UTILITY POWER/TELEPHONE POLE
	EXISTING NATURAL GAS SERVICE
	EXISTING SEWER SERVICE
	EXISTING WATER SERVICE
	EXISTING TELEPHONE SERVICE
	NEW TELEPHONE SERVICE
	EXISTING ELECTRICAL LINES
	NEW ELECTRICAL LINES
	EXISTING PRIMARY ELECTRIC SERVICE
	NEW PRIMARY ELECTRIC SERVICE
	EXISTING OVERHEAD ELECTRIC LINES
	EXISTING FENCE
	ELECTRIC PULL BOX
	HANDHOLE
	TRANSFORMER

ELECTRICAL SITE PLAN GENERAL NOTES:

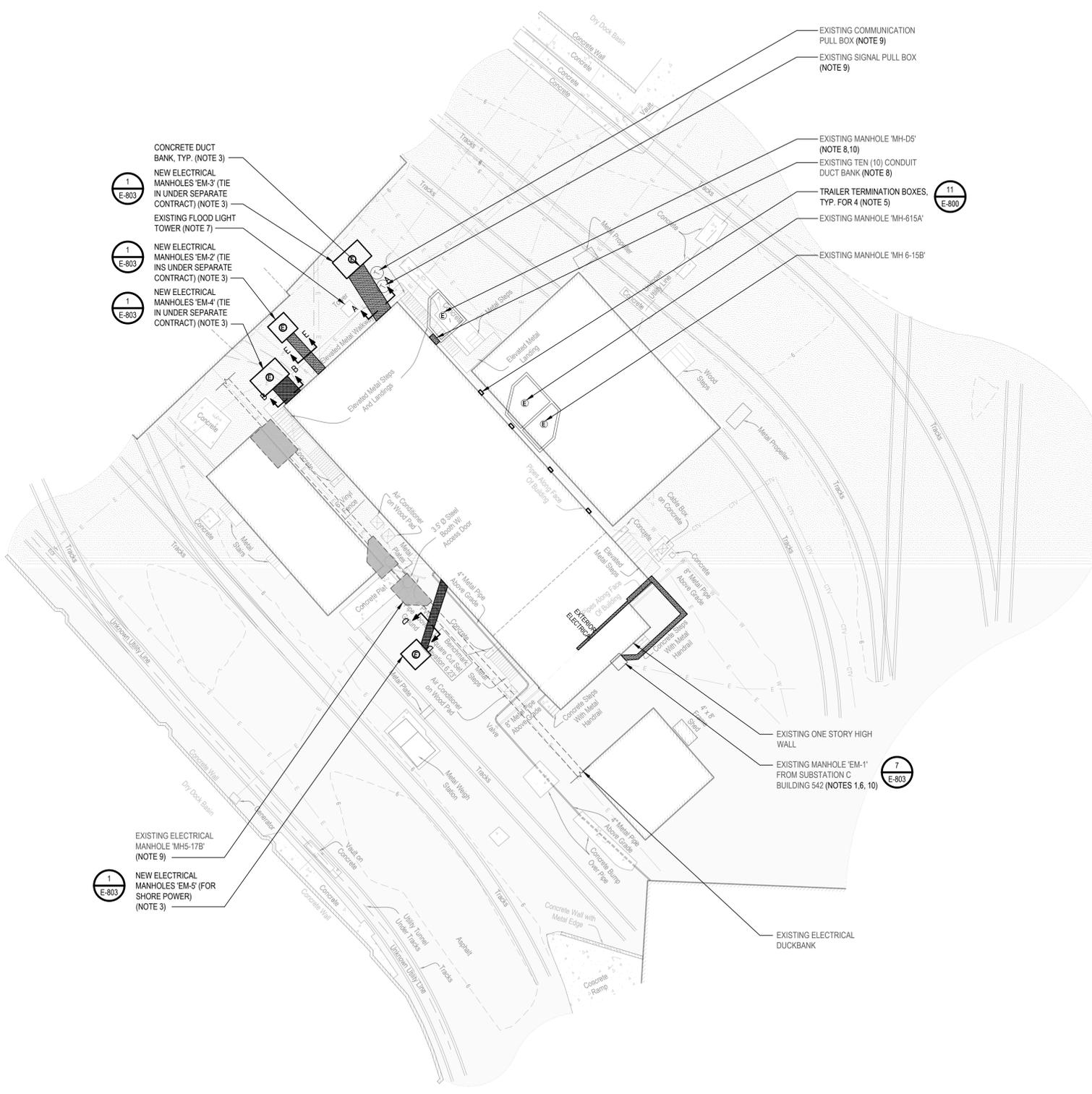
- CONTRACTOR SHALL INSPECT CONSTRUCTION SITE PRIOR TO SUBMISSION OF BIDS AND SHALL MAKE NO ADDITIONAL CLAIMS REGARDING SITE CONDITIONS THEREAFTER.
- LOCATION OF ALL UNDERGROUND UTILITIES BOTH PUBLIC AND CUSTOMER OWNED, WERE OBTAINED FROM EITHER MAPS, SURVEYS, DRAWINGS AND RECORDS SUPPLIED BY OTHERS. THE OWNER AND ENGINEER DO NOT GUARANTEE OR ACCEPT RESPONSIBILITY FOR ANY DAMAGE TO SUCH UTILITIES DUE TO DISCREPANCIES IN LOCATION AND SIZE SHOWN ON THE PLANS OR THOSE UTILITIES NOT SHOWN. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING A PRIVATE MARKOUT COMPANY FOR DETERMINING THE LOCATION OF ALL UNDERGROUND UTILITIES PRIOR TO BEGINNING WORK. CONTRACTOR SHALL LOCATE ALL UTILITIES WITHIN PROXIMITY OF CONSTRUCTION LIMITS.
- CONTRACTOR SHALL COMPLETELY RESTORE ALL AREAS DISTURBED DURING CONSTRUCTION, INCLUDING BUT NOT LIMITED TO GRASS AREAS, LANDSCAPING, PAVEMENTS, SIDEWALKS, CURBING AND IN-GROUND SPRINKLER SYSTEMS.
- THE CONTRACTOR SHALL PERFORM DAILY CLEAN-UP OPERATIONS WHICH INCLUDE REMOVAL OF DEBRIS AND EXCESS CONSTRUCTION MATERIAL TO THE SATISFACTION OF THE OWNER AND THE ENGINEER.
- DURING ALL NON-WORKING HOURS, THE CONTRACTOR WILL BE REQUIRED TO STORE ALL EQUIPMENT AND MATERIALS WITHIN THE AREA DESIGNATED BY THE ENGINEER AT THE PROJECT SITE.
- PROVIDE TEMPORARY FENCING TO PROTECT WORK AREAS.

ELECTRICAL SITE PLAN KEY NOTES:

- CONTRACTOR SHALL REMOVE ALL EXISTING MANHOLE CABLE SUPPORT ARMS AND BRACKETS AND REPLACE WITH NEW. SECURELY FASTEN/SUPPORT EXISTING CABLES TO NEW HARDWARE.
- SAWCUT EXISTING PAVEMENT/SIDEWALK/CURBING FOR INSTALLATION OF NEW DUCT BANKS. REMOVE AND DISPOSE OF ALL DEBRIS.
- PROPOSED ELECTRICAL MANHOLE AND DUCT BANK LOCATIONS MAY INTERCEPT OR CROSS EXISTING BELOW GRADE ELECTRICAL DUCT BANK. CONTRACTOR SHALL HAND DIG THE AREA IDENTIFIED TO OBTAIN EXISTING DUCT BANK, LOCATION AND PROVIDE PROPOSED CONDUIT DUCT BANK ROUTING AS TO MINIMALLY DISTURB THE EXISTING DUCT BANKS. IN THE EVENT THE EXISTING DUCT BANK MUST BE DISTURBED TO ALLOW FOR THE INSTALLATION OF THE NEW ELECTRICAL MANHOLE, AND IS NOT DETERMINED TO BE ABANDONED, THE CONTRACTOR SHALL PROVIDE A PLAN OF ACTION TO DISCONNECT THE FEEDERS, CUT BACK THE DUCT BANK, AND INCORPORATE THE EXISTING DUCT BANK WITH THE NEW ELECTRICAL MANHOLE. PROVIDE ALL FEEDER SPLICING AND EXTENSIONS AS REQUIRED TO RE-ROUTE THE EXISTING FEEDERS THROUGH THE NEW ELECTRICAL MANHOLE.
- FOR EACH MEDIUM VOLTAGE FEEDER, THE CONTRACTOR SHALL PROVIDE AND INSTALL A NEW ELECTRICAL MANHOLE INTERCEPTING THE EXISTING 13.8KV FEEDER DUCT BANKS. PRIOR TO INSTALLING THE NEW MANHOLES, CONTRACTOR SHALL DISCONNECT THE EXISTING 13.8KV FEEDERS FROM THE MEDIUM VOLTAGE TRANSFORMER AND PULL BACK FEEDERS TO THE EXISTING MANHOLE 'EM1'. MEDIUM VOLTAGE TRANSFORMER SHALL BE REMOVED AND DISPOSED OF, AND THE NEW ELECTRICAL MANHOLE SHALL BE INSTALLED. CONTRACTOR SHALL HAND DIG AND CUT INTO THE EXISTING CONCRETE DUCT BANK TO INTERCEPT THE EXISTING CONDUIT AND INTEGRATE IT WITH THE NEW MANHOLE. PULL THE EXISTING FEEDERS FROM 'EM1' TO THE NEW MANHOLE AND SPLICE THE WIRES WITH SUBMERSIBLE RATED SPLICE KITS TO ALLOW FOR THE EXTENSIONS AND RE-TERMINATION OF THE MEDIUM VOLTAGE FEEDERS TO THE NEW MEDIUM VOLTAGE TRANSFORMERS LOCATED ON THE ELEVATED PLATFORM. REFER TO DIVISION 01 MOBO SPECIFICATION 017001 FOR ADDITIONAL INFORMATION.
- CONTRACTOR SHALL PROVIDE ALL MOUNTING HARDWARE AS REQUIRED TO SECURELY MOUNT TRAILER TERMINATION BOX. PROVIDE AND INSTALL 150A RATED MULTI-CONDUCTOR MINING CABLES FROM THE TRAILER TERMINATION BOX, WITH STRAIN RELIEF CONNECTORS, TO THE CORRESPONDING TRAILERS DISTRIBUTION PANEL. DISCONNECT, REMOVE AND DISPOSE OF THE EXISTING TRAILER FEEDERS. REFER TO MOBO SPECIFICATION 071001 AND SHEETS E200 AND E300 FOR ADDITIONAL INFORMATION.
- MEDIUM VOLTAGE FEEDERS WITHIN THE INDICATED ELECTRICAL MANHOLE ARE ASSUMED ASBESTOS INSULATED. FOR ALL DISCONNECTIONS, CONNECTIONS, SPLICING AND EXTENSIONS THE ELECTRICIAN SHALL HOLD A CURRENT 'NYS DOL RESTRICTED ASBESTOS CERTIFICATION', INCLUDING PROPER OSHA ASBESTOS AWARENESS TRAINING.
- CONTRACTOR SHALL BE RESPONSIBLE FOR PERFORMING A TEST PIT OF THE LIGHT TOWER FOUNDATION PRIOR TO INSTALLING ANY SHEETING OR SHORING TO ALLOW FOR THE CONSTRUCTION OF THE VAULTS AND DUCT BANKS. THIS TEST PIT SHALL BE INSPECTED BY THE CONTRACTOR'S NYS REGISTERED ENGINEER PRIOR TO THE DESIGNING OF THE REQUIRED SHEETING/SHORING. DRAWING FOR SAID SHEETING AND SHORING SHALL BE PROVIDED TO THE EOR FOR REVIEW PRIOR TO INSTALLING.
- CONTRACTOR SHALL HAND DIG THE AREA BETWEEN THE BUILDING AND EXISTING MANHOLE 'MH-D5' TO EXPOSE THE CONCRETE DUCT BANK BETWEEN THE BUILDING AND THE MANHOLE. THE EXISTING TEN (10) CONDUIT DUCT BANK SHALL BE REMOVED AND DISPOSED OF IN ITS ENTIRETY AND REPLACED WITH A NEW TEN (10) CONDUIT DUCT BANK. EXISTING STAIR FOOTINGS AND EXISTING CONCRETE DUCT BANK TO REMAIN SHALL BE SHORED UP, SECURED, AND MAINTAINED AS REQUIRED TO CONSTRUCT NEW CONCRETE DUCT BANK.
- EXISTING MANHOLES SHALL BE PROTECTED AND MAINTAINED THROUGHOUT THE CONSTRUCTION OF THE NEW ELECTRICAL DUCT BANKS.
- CONTRACTOR RESPONSIBLE FOR INITIAL AND CONTINUED DE-WATERING AND MAINTENANCE OF THE EXISTING ELECTRICAL MANHOLES THROUGHOUT CONSTRUCTION.

SITE MANAGEMENT PLAN COMPLIANCE NOTES:

- CONSTRUCTION WORK AT THE BROOKLYN NAVY YARD INDUSTRIAL PARK IS REQUIRED TO COMPLY WITH THE SITE MANAGEMENT PLAN (SMP) PREPARED BY CORE ENVIRONMENTAL CONSULTANTS, INC. LATEST DATE: 10/15/2022. CORE IS BNYDC'S ENVIRONMENTAL CONSULTANT. AN ELECTRONIC COPY OF THE SMP WILL BE MADE AVAILABLE TO THE CONTRACTOR.
- THE CONTRACTOR WILL BE REQUIRED TO REVIEW AND CONFORM TO THE EXCAVATION WORK PLAN (EWP) INCLUDED IN APPENDIX E OF THE SMP. CONTRACTOR SHALL SIGN THE EXCAVATION WORK PLAN CERTIFICATION PROVIDED BY BNYDC.
- THE CONTRACTOR WILL BE REQUIRED TO FOLLOW THE HEALTH AND SAFETY PLAN (HASP) INCLUDED IN APPENDIX F OF THE SMP.
 - THE CONTRACTOR MUST DESIGNATE A SITE HEALTH AND SAFETY OFFICER (HSO).
- ALL PERSONNEL WHO WILL BE INVOLVED WITH EARTHWORK (EXCAVATION, TRENCHING, SAMPLING OR ANY ACTIVITY THAT RESULTS IN A COVER BREACH) ON SITE MUST HAVE COMPLETED THE APPROPRIATE 40-HOUR OSHA HAZWOPER SITE WORKER TRAINING. THE CONTRACTOR SHALL SUBMIT THESE CERTIFICATES TO BNYDC PRIOR TO WORK.
- THIS PROJECT CONSTITUTES A MAJOR COVER BREACH. PRIOR GROUND INTRUSIVE ACTIVITIES A 60-DAY ADVANCE NOTICE SUBMISSION IS REQUIRED TO BE SUBMITTED TO NYSDEC. THE SUBMISSION INCLUDES A SITE SPECIFIC EXCAVATION WORK PLAN. CORE WILL BE RESPONSIBLE FOR SUBMITTING THE NOTIFICATION AND EWP. IN ORDER TO PREPARE THE EWP, THE CONTRACTOR SHALL SUBMIT THE FOLLOWING INFORMATION TO CORE:
 - SCOPE OF WORK OF GROUND INTRUSIVE ACTIVITIES
 - SCHEDULE
 - PROPOSED BACKFILL MATERIALS
 - PROPOSED DISPOSAL FACILITIES
 - DEWATERING INFORMATION
 - HAZWOPER CERTIFICATES
 - DETAILS OF COVER RESTORATION
- EXCAVATED SOILS WILL BE CONSIDERED APPROPRIATE FOR REUSE AS ON-SITE BACKFILL IF THE SOIL DOES NOT EXHIBIT OBVIOUS SIGNS OF IMPACTS, AS DETERMINED BY CORE.
- THE CONTRACTOR SHALL SUBMIT A REQUEST TO IMPORT FILL FORM TO CORE ENVIRONMENTAL PRIOR TO IMPORTING BACKFILL MATERIALS TO THE SITE. IMPORTED MATERIALS WILL BE TESTED AT A RATE CONSISTENT WITH TABLE 5.4(E)10 OF DER-10, INCLUDED IN THE APPENDIX E OF THE SMP.
- THE FOLLOWING MATERIAL MAY BE IMPORTED, WITHOUT CHEMICAL TESTING, TO BE USED AS BACKFILL BENEATH PAVEMENT, BUILDINGS OR AS PART OF THE FINAL SITE COVER, PROVIDED THAT IT CONTAINS LESS THAN 10% BY WEIGHT MATERIAL WHICH WOULD PASS THROUGH A SIZE 80 SIEVE AND CONSISTS OF:
 - GRAVEL, ROCK OR STONE, CONSISTING OF VIRGIN MATERIAL FROM A PERMITTED MINE OR QUARRY; OR
 - RECYCLED CONCRETE OR BRICK FROM A DEC REGISTERED CONSTRUCTION AND DEMOLITION DEBRIS PROCESSING FACILITY IF THE MATERIAL CONFORMS TO THE REQUIREMENTS OF SECTION 304 OF THE NEW YORK STATE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS CONSTRUCTION AND MATERIALS VOLUME 1 (2002).
 - ASTM #57, APPROVED SOURCE NYS 10-12R FROM NEW YORK STAND AND STONE
- AS PART OF THE BID, THE CONTRACTOR SHALL IDENTIFY A POTENTIAL DISPOSAL FACILITY IN THE EVENT THAT EXCAVATED SOIL IS DETERMINED TO BE INADEQUATE FOR ON-SITE RE-USE. THE CONTRACTOR SHALL ASSUME THAT ANY SOIL DETERMINED TO BE INADEQUATE FOR ON-SITE RE-USE IS NON-HAZARDOUS. ANY PROPOSED DISPOSAL FACILITY SHALL BE PERMITTED TO ACCEPT PCB-IMPACTED SOIL.
- A TRUCK WASH MUST BE OPERATED ON SITE FOR ANY EXCAVATION LOAD OUT.
- ALL INTRUSIVE WORK IS SUBJECT TO THE SITE-SPECIFIC COMMUNITY AIR MONITORING PLAN (CAMP). AN ON-SITE QEP (CORE) WILL BE PRESENT DURING ALL INTRUSIVE ACTIVITIES AND WILL PERFORM CAMP MONITORING AS PART OF THIS PROJECT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTROLLING ANY DUST GENERATED AS PART OF THE WORK. THE CONTRACTOR SHALL APPLY DUST-CONTROL METHODS AT THE REQUEST OF THE QEP AND/OR BNY IN THE EVENT THAT DUST IS OBSERVED OR CAMP MONITORING INDICATES THAT DUST IS MIGRATING OUT OF THE WORK AREA. THE CONTRACTOR IS NOT RESPONSIBLE FOR PERFORMING ANY CAMP MONITORING.
- IN THE EVENT THAT INADEQUATE SOIL IS EXCAVATED AND MUST BE DISPOSED OF OFF-SITE, THE CONTRACTOR SHALL BE PREPARED TO STAGE THIS SOIL IN AN ON-SITE STAGING AREA. SOIL SHALL BE SEGREGATED INTO STOCKPILES BASED ON QEP SCREENING. SOIL STOCKPILES SHALL BE CONTINUOUSLY ENCIRCLED WITH A BERM AND/OR SILT FENCE. HAY BALES SHALL BE USED AS NEEDED NEAR CATCH BASINS, SURFACE WATERS, AND OTHER DISCHARGE POINTS. STOCKPILES SHALL BE KEPT COVERED AT ALL TIMES WITH APPROPRIATELY ANCHORED TARPS. STOCKPILES SHALL BE ROUTINELY INSPECTED AND DAMAGED TARP COVERS SHALL BE PROMPTLY REPLACED. IN THE EVENT THAT AN ON-SITE SOIL STAGING AREA IS NECESSARY THE BNY WILL AUTHORIZE CONSTRUCTION OF THIS STAGING AREA, IN WRITING, AND THE CONTRACTOR SHALL SUBMIT A COST TO CONSTRUCT THIS AREA AND STAGE THE SOIL FOR THE REVIEW AND APPROVAL BY THE BNY.
- IN THE EVENT THAT INADEQUATE SOIL MUST BE DISPOSED OF OFF-SITE, THE CONTRACTOR SHALL ARRANGE FOR ALL SOILS TO BE PROPERLY TRANSPORTED OFF-SITE. ALL LOADED VEHICLES LEAVING THE SITE SHALL BE APPROPRIATELY LINED, TARPED, SECURELY COVERED, MANIFESTED, AND PLACARDED IN ACCORDANCE WITH APPROPRIATE FEDERAL, STATE (INCLUDING 6 NYCRR PART 360), LOCAL, AND NYS DOT REQUIREMENTS, AS WELL AS ANY OTHER APPLICABLE TRANSPORTATION REQUIREMENTS.
- ALL LIQUIDS TO BE REMOVED FROM THE SITE INCLUDING, BUT NOT LIMITED TO, EXCAVATION DEWATERING, DECONTAMINATION WATERS, AND GROUNDWATER MONITORING WELL PURGE AND DEVELOPMENT WATERS, WILL BE HANDLED, TRANSPORTED, AND DISPOSED OF IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SAMPLING DEWATERING FLUIDS, DETERMINING THE LEVEL OF CONTAMINATION OF THE WATER, AND DETERMINING THE APPROPRIATE DISPOSAL METHOD. IN THE EVENT THAT DEWATERING FLUID IS DETERMINED TO BE CONTAMINATED AND SPECIAL OFF-SITE DISPOSAL IS REQUIRED, THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING AND PROVIDING THE BNYDC WITH DISPOSAL MANIFESTS FOR THIS WASTE STREAM. DEWATERING, PURGE, AND DEVELOPMENT FLUIDS WILL NOT BE RECHARGED BACK TO THE LAND SURFACE OR SUBSURFACE ON THE SITE AND WILL BE MANAGED OFF-SITE UNLESS PRIOR APPROVAL IS OBTAINED FROM NYSDEC.
- IF UNDERGROUND STORAGE TANKS (USTS) OR PREVIOUSLY UNIDENTIFIED SOURCES FOR IMPACTS TO SUBSURFACE MEDIA ARE FOUND DURING DEVELOPMENT-RELATED CONSTRUCTION, EXCAVATION ACTIVITIES SHALL BE SUSPENDED UNTIL SUFFICIENT EQUIPMENT IS MOBILIZED TO ADDRESS THE CONDITION.
- IF NUISANCE ODORS ARE IDENTIFIED AT THE SITE BOUNDARY, OR IF ODOR COMPLAINTS ARE RECEIVED AS A RESULT OF THE WORK BEING PERFORMED, WORK SHALL BE HALTED AND THE SOURCE OF ODORS SHALL BE IDENTIFIED AND CORRECTED. WORK SHALL NOT RESUME UNTIL ALL NUISANCE ODORS HAVE BEEN ABATED. NYSDEC AND THE NEW YORK STATE DEPARTMENT OF HEALTH (NYSDOH) WILL BE NOTIFIED OF ALL ODOR EVENTS AND OF ANY OTHER COMPLAINTS ABOUT THE PROJECT. IMPLEMENTATION OF ALL ODOR CONTROLS, INCLUDING THE HALT OF WORK, IS THE RESPONSIBILITY OF THE QEP.
- AFTER THE COMPLETION OF SOIL REMOVAL AND ANY OTHER INTRUSIVE ACTIVITIES, THE SITE-WIDE COVER SHALL BE RESTORED IN A MANNER THAT COMPLIES WITH THE SMP. THE EXISTING SITE-WIDE COVER IS COMPOSED OF BUILDINGS, CONCRETE, AND ASPHALT PAVEMENT, AND MILLINGS. THE RESTORED SITE-WIDE COVERED SHALL BE COMPOSED OF AT LEAST 12 INCHES OF SOIL MEETING THE COMMERCIAL USE SCOS AS SET FORTH IN 6 NYCRR PART 375-6.7(B), A BUILDING, OR CONCRETE, ASPHALT, OR MILLINGS AT LEAST 6 INCHES IN THICKNESS.



Electrical Site Plan
SCALE: 1"=20'-0"



USAYD (Brooklyn Navy Yard) - 401068BNYD1905A - 02/24/24 - Electrical Site Plan (Rev) Last Modified: Sep 27, 2024, 9:43am By: reganm

CONSULTANTS:

MARK	DATE	DESCRIPTION
	09-09-2024	Final Bid Documents
	09-29-2023	100% Submission
2	07-18-2023	DOB Objections
1	05-30-2023	DOB Objections
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	10-12-2022	90% Submission
	08-10-2020	60% Resubmission
	03-03-2020	60% Submission
	11-08-2019	30% Submission

DESIGNED BY: CJD/CJS | DRAWN BY: CJD | CHECKED BY: EVI | REVIEWED BY: CJS
PROJECT NO: BNYD 1905A | DATE: SEPT 2024 | SCALE: AS SHOWN

**Brooklyn Navy Yard
Development Corporation**

**Restoration of Substation G at
Building 386**



141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

CONTRACT

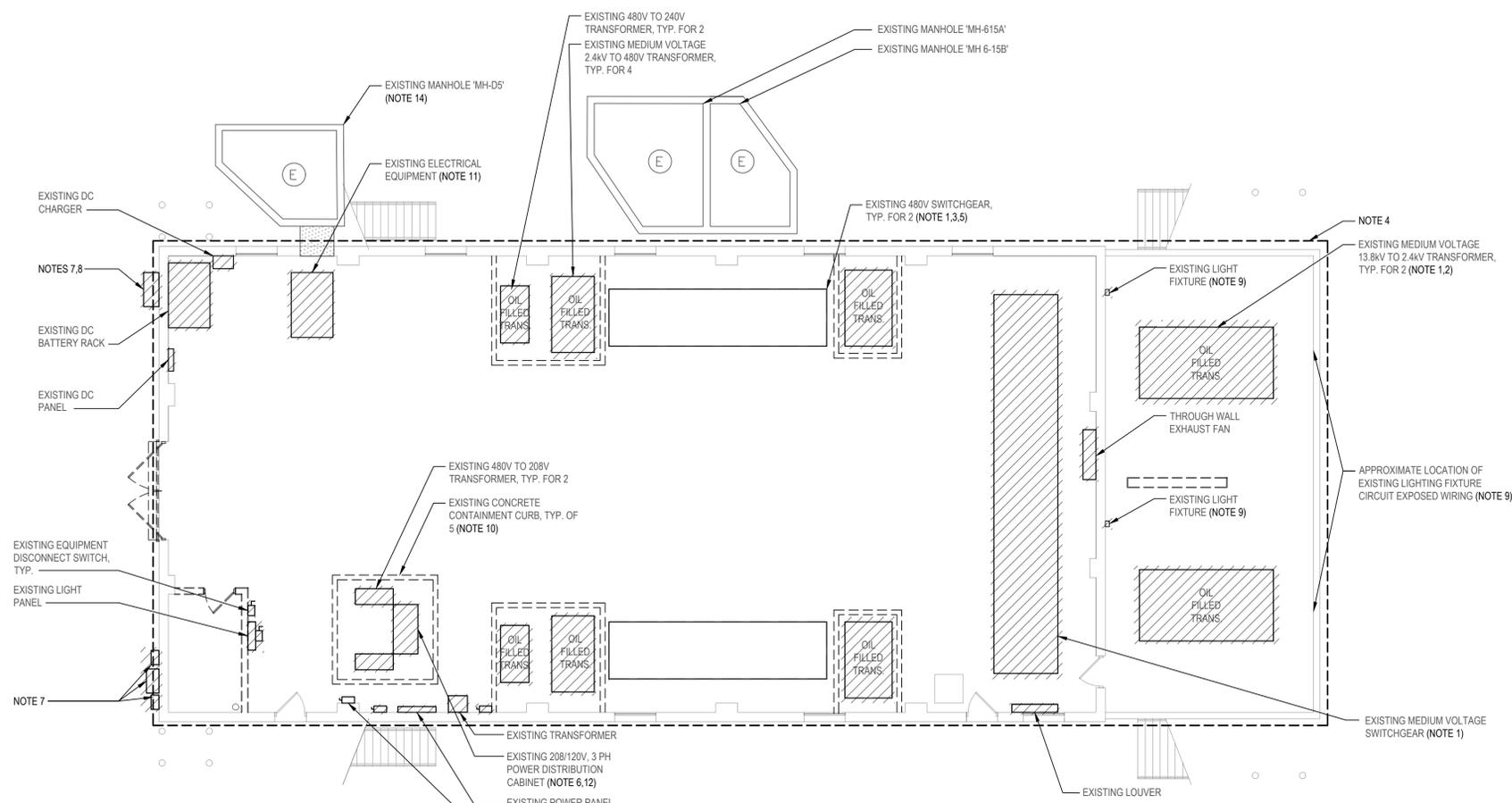
STATUS: **FINAL BID DOCUMENTS**

SHEET TITLE: **ELECTRICAL FIRST FLOOR DEMOLITION PLAN**

DRAWING NO: **E-200.00** | SHEET NO: **30** OF **54**

- DEMOLITION GENERAL NOTES:**
- REMOVE AND DISPOSE OF INCLUDES REMOVAL OF ITEM IDENTIFIED INCLUDING ALL CONDUITS, WIRES, AND CABLES, BACK TO SOURCE UNLESS OTHERWISE NOTED.
 - ALL CONDUITS ABANDONED AND/OR IDENTIFIED TO BE REMOVED SHALL BE CUT FLUSH WITH THE SURFACE AND SURFACE SHALL BE PATCHED UNLESS OTHERWISE NOTED. SURFACE SHALL BE PRIMED AND PAINTED TO MATCH EXISTING.
 - REFER TO DIVISION 01 MOBO SPECIFICATION SECTION '017001' PRIOR TO PERFORMING ANY DEMOLITION AND/OR NEW WORK FOR ADDITIONAL INFORMATION REGARDING PHASING OF WORK AND MAINTENANCE OF OPERATIONS.
 - CONTRACTOR SHALL PROVIDE TEMPORARY SUPPORTS FOR ALL EXISTING CEILING MOUNTED CIRCUITS, DEVICES, AND EQUIPMENT THAT ARE TO REMAIN ACTIVE DURING THE DEMOLITION AND CONSTRUCTION OF THE NEW SECOND FLOOR FOUNDATION.

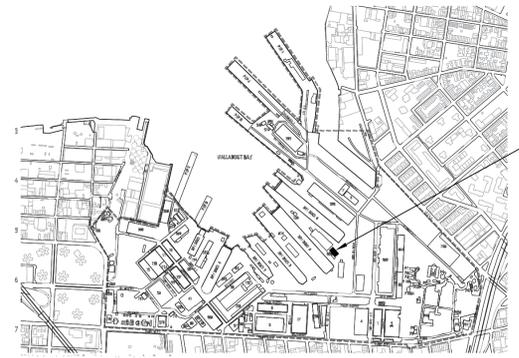
- NOTES:**
- REMOVE AND DISPOSE OF EXISTING SUBSTATION, INCLUDING BUT NOT LIMITED TO MEDIUM VOLTAGE TRANSFORMER, MEDIUM VOLTAGE SWITCHGEAR, AND LOW VOLTAGE SWITCHGEAR. COORDINATE SHUTDOWN AND TRANSFER OF LOADS TO NEW SUBSTATION WITH CLIENT AND ENGINEER IN ACCORDANCE WITH DIVISION 01 MOBO SPECIFICATION '017001'. REFER TO DRAWING E-301.00 FOR ADDITIONAL INFORMATION.
 - DISCONNECT, PULL BACK, AND SAFE OFF EXISTING 13.8kV PRIMARY FEEDERS TO THE EXISTING ELECTRICAL MANHOLE INDICATED FOR EXTENSIONS, RE-ROUTING, AND RE-TERMINATION TO NEW MEDIUM VOLTAGE TRANSFORMERS LOCATED ON AN ELEVATED PLATFORM. REFER TO DRAWING E-300 AND E301 FOR ADDITIONAL INFORMATION.
 - PRIOR TO THE DECOMMISSIONING OF THE 480V SWITCHGEAR, THE CONTRACTOR SHALL COORDINATE WITH CLIENT, GMD SHIPYARD, AND ENGINEER IN FIELD TO IDENTIFY ALL EXISTING LOADS THAT ARE REQUIRED TO REMAIN ACTIVE DURING CONSTRUCTION. THE TRANSFER AND SHUTDOWN OF THOSE LOADS SHALL BE PERFORMED IN A MANNER THAT MINIMIZES DOWNTIME. ALL LOADS INDICATED TO REMAIN ACTIVE SHALL BE FED FROM THE NEW 480V SWITCHGEAR. REFER TO DIVISION 01 MOBO SPECIFICATION '017001' AND DRAWING E300 AND E301 FOR ADDITIONAL INFORMATION.
 - REMOVE AND DISPOSE OF ALL LIGHT FIXTURES, EMERGENCY LIGHTING FIXTURES, SWITCHES, AND RECEPTACLES. ALL CONDUIT AND WIRE SHALL BE REMOVED AND DISPOSED OF BACK TO SOURCE. ALL DISTURBED SURFACES SHALL BE PRIMED AND PAINTED TO MATCH EXISTING SURROUNDINGS. UNLESS OTHERWISE NOTED.
 - CONTRACTOR SHALL UTILIZE THE EXISTING 480V SWITCHGEAR ENCLOSURES AS A PULL BOX FOR EXTENDING AND RE-ROUTING ALL CONDUCTORS IDENTIFIED AS ACTIVE TO TERMINATE AT THE NEW 480V SWITCHGEAR. CONTRACTOR SHALL UTILIZE CABLE TRAYS TO SUPPORT AND RE-ROUTE ALL FEEDERS. REFER TO DRAWING E300 AND E301 FOR ADDITIONAL INFORMATION.
 - PRIOR TO THE REMOVAL DISPOSAL OF THE EXISTING 208V DISTRIBUTION CABINET, THE CONTRACTOR SHALL COORDINATE WITH THE CLIENT, GMD SHIPYARD, AND ENGINEER IN FIELD TO IDENTIFY ALL EXISTING LOADS THAT ARE REQUIRED TO REMAIN ACTIVE THROUGHOUT CONSTRUCTION. THE TRANSFER AND SHUTDOWN OF THOSE LOADS SHALL BE PERFORMED IN A MANNER THAT MINIMIZES DOWNTIME. ALL LOADS IDENTIFIED AS TRAILER LOADS SHALL BE REPLACED WITH NEW AND TERMINATED TO THE NEW TRAILER TERMINATION JUNCTION BOXES ON THE NORTH-EAST EXTERIOR WALL. ANY ADDITIONAL LOADS THAT ARE TO REMAIN ACTIVE SHALL BE DISCONNECTED, LABELED, AND SAFED OFF FOR EXTENSION AND RE-TERMINATION TO NEW 120/208V DISTRIBUTION PANEL. REFER TO DIVISION 01 MOBO SPECIFICATION '017001' AND DRAWING E300 FOR ADDITIONAL INFORMATION.
 - CONTRACTOR SHALL REMOVE AND DISPOSE OF DEAD PANELS ALONG THE EXTERIOR WALL, U.O.N.
 - EXISTING POWER CONDUCTORS WITHIN EXISTING PULL BOX INDICATED SHALL BE RE-ROUTED TO NEW 120/208V DISTRIBUTION PANEL 'LPA'. SEE SHEET E 301 FOR ADDITIONAL INFORMATION.
 - EXISTING LIGHT FIXTURES SHALL BE REMOVED AND DISPOSED OF. ALL ASSOCIATED CONDUIT AND WIRE FOR EXISTING LIGHTING CIRCUIT INDICATED SHALL REMAIN INTACT FOR RE-USE AND RE-TERMINATION TO NEW LIGHT FIXTURE. REFER TO DRAWING E400 FOR ADDITIONAL INFORMATION.
 - CONTRACTOR WILL BE RESPONSIBLE FOR REMOVING ALL CONTAINMENT CURBS AND GRINDING THE AREA BELOW THE CURBS TO A SMOOTH FINISH. REMOVAL SHALL ONLY BE MADE TO THE CURB MATERIAL ABOVE THE EXISTING STRUCTURAL SLAB. REMOVAL OR GOUGING OF THE STRUCTURAL SLAB SHALL NOT OCCUR.
 - REMOVE AND DISPOSE OF THE EXISTING ENCLOSURE EQUIPMENT, INCLUDING BUT NOT LIMITED TO ALL ASSOCIATED CABLE TRAYS, CABLING, ETC. BACK TO SOURCE AND LOAD.
 - EXISTING 120/208V LOADS THAT REQUIRE EXTENSION AND RE-TERMINATION TO THE NEW DISTRIBUTION PANEL, SHALL BE ROUTED VIA NEW JUNCTIONS BOXES AS SHOWN ON DRAWING E-300. EXISTING FEEDERS FROM ABOVE SHALL BE ROUTED TO THE NEW DISTRIBUTION PANEL VIA A NEW CEILING MOUNTED JUNCTION BOX. EXISTING FEEDERS FROM BELOW THE SLAB SHALL BE ROUTED TO THE NEW DISTRIBUTION PANEL VIA A NEW FLOOR MOUNTED JUNCTION BOX. REFER TO DRAWING E-300 FOR ADDITIONAL INFORMATION.
 - DISCONNECT INDICATED SHALL REMAIN INTACT AND OPERATIONAL THROUGHOUT CONSTRUCTION. UPON WRITTEN APPROVAL FROM THE OWNER, ASSOCIATED LOAD CONDUCTORS SHALL BE REMOVED AND DISPOSED OF BACK TO SOURCE AND NEW FEEDERS FROM NEW DISTRIBUTION PANEL SHALL BE INSTALLED AND TERMINATED TO RE-FEED THE EXISTING THE LOAD.
 - CONTRACTOR SHALL HAND DIG THE AREA BETWEEN THE BUILDING AND EXISTING MANHOLE 'MH-05' TO EXPOSE THE CONCRETE DUCT BANK BETWEEN THE BUILDING AND THE MANHOLE. THE EXISTING TEN (10) CONDUIT DUCT BANK SHALL BE REMOVED AND DISPOSED OF IN ITS ENTIRETY AND REPLACED WITH A NEW TEN (10) CONDUIT DUCT BANK. EXISTING STAIR FOOTINGS AND EXISTING CONCRETE DUCT BANK TO REMAIN SHALL BE SHORED UP, SECURED, AND MAINTAINED AS REQUIRED TO CONSTRUCT NEW CONCRETE DUCT BANK.



1 Electrical First Floor Demolition Plan
SCALE: 1/8"=1'-0"

LEGENDS

	REMOVE & DISPOSE OF
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Site Key Plan
SCALE: N.T.S.

CONSULTANTS:

MARK	DATE	DESCRIPTION
	09-09-2024	Final Bid Documents
	09-29-2023	100% Submission
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	08-10-2020	60% Resubmission
	03-03-2020	60% Submission
	11-08-2019	30% Submission

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DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
CJD/CJS	CJD	EVI	CJS

PROJECT NO.:	DATE:	SCALE:
BNYD 1905A	SEPT 2024	AS SHOWN

**Brooklyn Navy Yard
Development Corporation**

**Restoration of Substation G at
Building 386**



141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

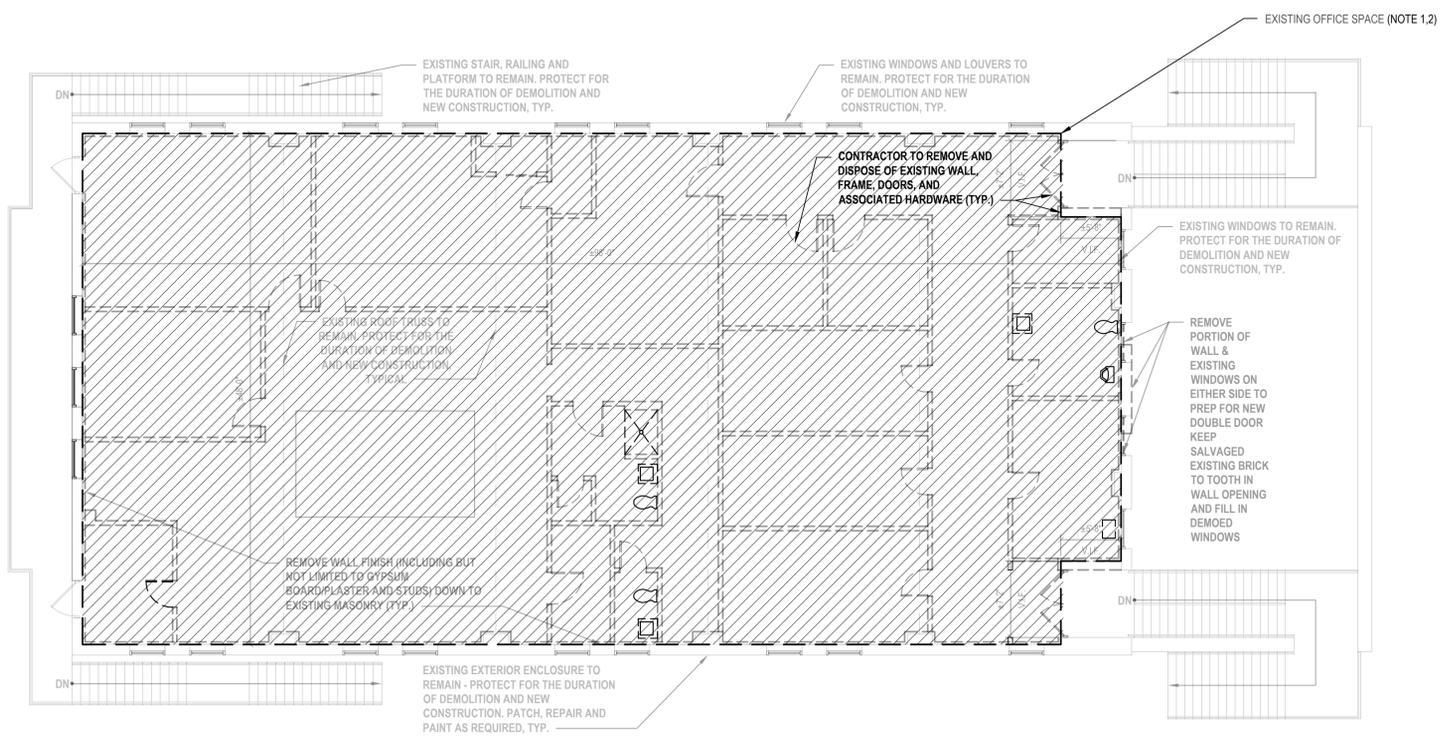
CONTRACT
ALL CONTRACTS

STATUS
FINAL BID DOCUMENTS

SHEET TITLE
**ELECTRICAL SECOND
FLOOR DEMOLITION
PLAN**

DRAWING No.
E-201.00

SHEET No.
31
OF
54



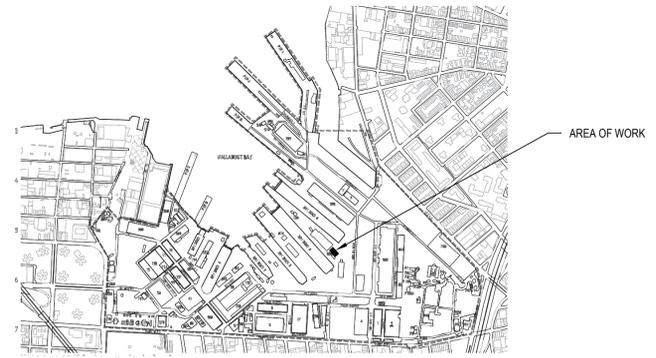
1 Electrical Second Floor Demolition Plan
SCALE: 1/4" = 1'-0"

DEMOLITION GENERAL NOTES:
G1. REFER TO DRAWING E-200.00 FOR ALL DEMOLITION GENERAL NOTES.

- NOTE:**
- EXISTING SECOND FLOOR OFFICE SPACE SHALL BE DEMOLISHED, THIS INCLUDES BUT IS NOT LIMITED TO ALL TELEPHONE AND DATA JACKS, LIGHTING FIXTURES AND ACCESSORIES, PANELBOARDS, AND ALL ASSOCIATED CONDUIT AND WIRE BACK TO SOURCE. CONTRACTORS SHALL REVIEW IN FIELD FOR BIDDING PURPOSES, AS EXISTING ITEMS THAT ARE TO BE REMOVED ARE NOT SHOWN AND MUST BE FIELD VERIFIED PRIOR TO PREPARATION OF BID.
 - REFER TO SHEETS D-100 AND M-100 FOR ADDITIONAL DEMOLITION BEYOND ELECTRICAL SCOPE.

LEGENDS

	REMOVE & DISPOSE OF
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Site Key Plan
SCALE: N.T.S.

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	08-10-2020	60% Resubmission
	03-03-2020	60% Submission
	11-08-2019	30% Submission

REVISIONS:

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
CJD/CJS	CJD	EVI	CJS

PROJECT NO: BNYD 1905A DATE: SEPT 2024 SCALE: AS SHOWN

Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386



141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

CONTRACT
ALL CONTRACTS

STATUS
FINAL BID DOCUMENTS

SHEET TITLE
ELECTRICAL FIRST FLOOR POWER PLAN

DRAWING No.
E-300.00

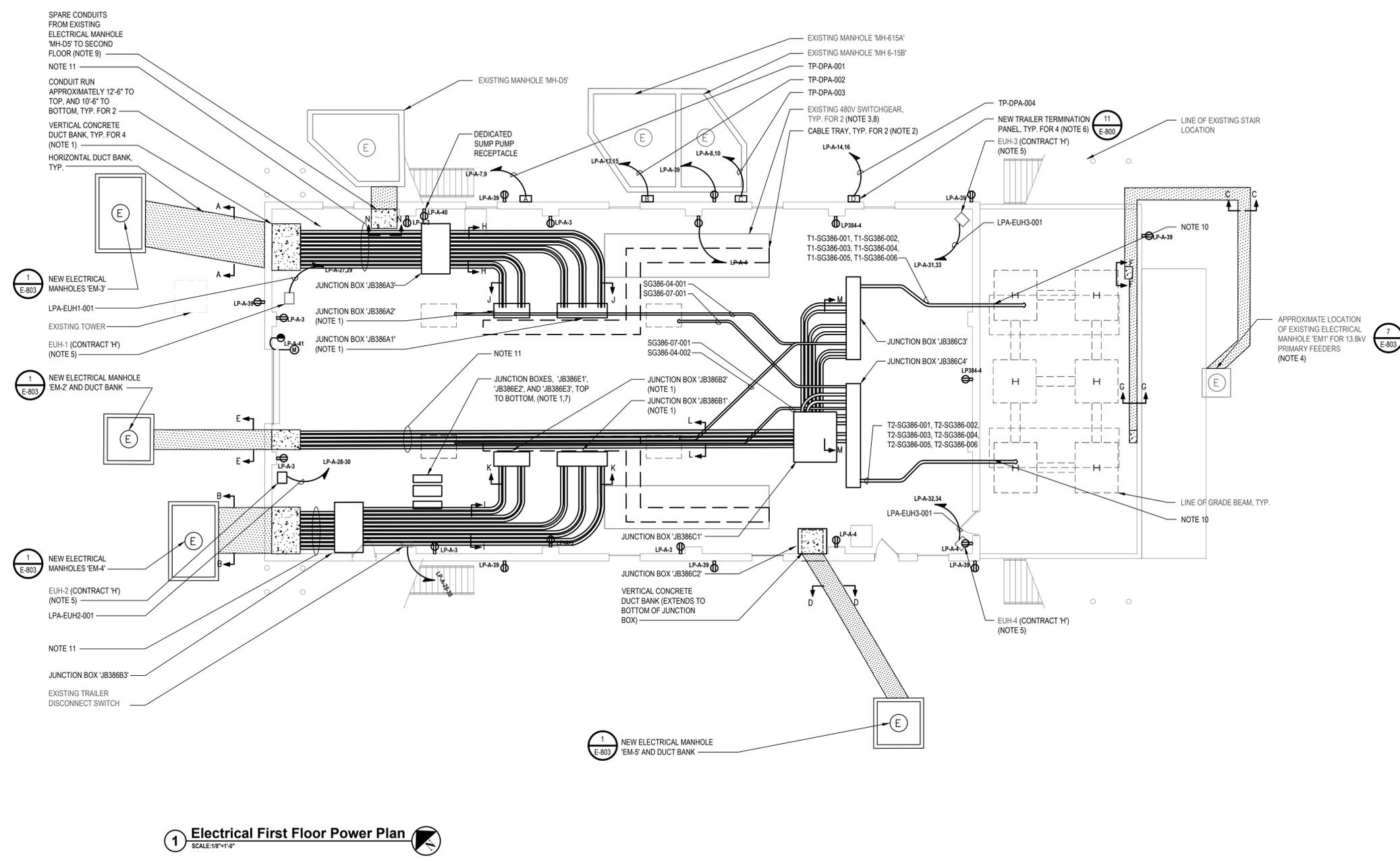
SHEET No.
32
OF
54

POWER PLAN GENERAL NOTES:

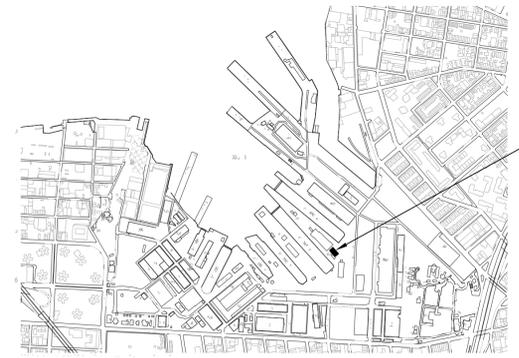
G1. REFER TO MOBO SPECIFICATION SECTION '017001' PRIOR TO PERFORMING ANY DEMOLITION AND/OR NEW WORK FOR ADDITIONAL INFORMATION REGARDING PHASING OF WORK AND MAINTENANCE OF OPERATIONS.

NOTE:

- JUNCTION BOXES INDICATED SHALL BE UTILIZED TO ROUTE EXISTING ELECTRICAL LOADS INDICATED TO BE SPICED, EXTENDED, AND TERMINATED TO THE NEW 208V OR 480V EQUIPMENT.
- CONTRACTOR SHALL PROVIDE AND INSTALL A CABLE TRAY ABOVE EACH EXISTING 480V SWITCHGEAR TO SPAN ACROSS TO THE NEWLY INSTALLED JUNCTION BOXES. CONTRACTOR SHALL UTILIZE THE CABLE TRAY FOR EXTENSION, RE-ROUTING, AND RE-TERMINATION OF ALL EXISTING FEEDERS INDICATED AS ACTIVE TO THE NEW SECOND FLOOR 480V SWITCHGEAR. CONTRACTOR SHALL UTILIZE TYPE G-GC MULTI-CONDUCTOR CABLES FOR SPICING AND EXTENDING EXISTING FEEDERS TO NEW SECOND FLOOR SWITCHGEAR. UPON TERMINATING FEEDERS TO THE NEW SWITCHGEAR, CONTRACTOR SHALL PROVIDE CABLE LIMITERS FOR EACH BREAKER SIZED BASED ON CABLE SIZE. ADJUST CIRCUIT BREAKER TRIP SETTINGS AS REQUIRED TO MATCH EXISTING OVER CURRENT PROTECTION. REFER TO DRAWING E301 AND THE E500 DRAWINGS FOR ADDITIONAL INFORMATION.
- EXISTING 480V SWITCHGEAR INDICATED SHALL BE UTILIZED AS A PULL BOX TO ALLOW FOR THE SPICING AND EXTENDING OF THE EXISTING FEEDERS INDICATED TO REMAIN ACTIVE THROUGHOUT CONSTRUCTION. PROVIDE FIBERGLASS SUPPORT BRACING FOR SUBMERSIBLE SPICING TO CONNECT ALL EXTENDED FEEDERS. CONTRACTOR SHALL LABEL ALL FEEDERS IDENTIFYING WHAT CIRCUIT IS BEING FED, THE ORIGINAL AND THE DESTINATION. COORDINATE ALL THE TRANSFER OF ALL LOADS FROM THE EXISTING TO NEW SWITCHGEAR WITH THE NAVY YARD, GMD SHIPYARD, AND ENGINEER IN FIELD.
- FOR EACH MEDIUM VOLTAGE FEEDER, THE CONTRACTOR SHALL PROVIDE AND INSTALL A NEW ELECTRICAL MANHOLE INTERCEPTING THE EXISTING 13.8KV FEEDER DUCT BANKS. PRIOR TO INSTALLING THE NEW MANHOLES, CONTRACTOR SHALL DISCONNECT THE EXISTING 13.8KV FEEDERS FROM THE MEDIUM VOLTAGE TRANSFORMER AND PULL BACK FEEDERS TO THE EXISTING MANHOLE 'EM1'. MEDIUM VOLTAGE TRANSFORMER SHALL BE REMOVED AND DISPOSED OF, AND THE NEW ELECTRICAL MANHOLE SHALL BE INSTALLED. CONTRACTOR SHALL HAND DIG AND CUT INTO THE EXISTING CONCRETE DUCT BANK TO INTERCEPT THE EXISTING CONDUIT AND INTEGRATE IT WITH THE NEW MANHOLE. PULL THE EXISTING FEEDERS FROM 'EM1' TO THE NEW MANHOLE AND SPLICE THE WIRES WITH SUBMERSIBLE RATED SPLICE KITS TO ALLOW FOR THE EXTENSIONS AND RE-TERMINATION OF THE MEDIUM VOLTAGE FEEDERS TO THE NEW MEDIUM VOLTAGE TRANSFORMERS LOCATED ON THE ELEVATED PLATFORM. REFER TO DIVISION 01 MOBO SPECIFICATION '017001' FOR ADDITIONAL INFORMATION.
- CONTRACTOR SHALL FIELD INSTALL DISCONNECT SWITCH PROVIDED BY EQUIPMENT MANUFACTURER. CONTRACTOR IS RESPONSIBLE TO INSTALL/INTEGRATE WITH UNIT IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
- CONTRACTOR SHALL PROVIDE AND INSTALL 150A RATED MULTI-CONDUCTOR TYPE G-GC MINING CABLES FROM EACH TRAILER TERMINATION PANEL TO RE-FEED EACH TRAILER. REFER TO MOBO SPECIFICATION '071001' AND SHEETS E100 AND E200 FOR ADDITIONAL INFORMATION.
- JUNCTION BOXES INDICATED SHALL BE UTILIZED FOR SPICING AND EXTENDING EXISTING 120/208V LOADS THAT REQUIRE RE-TERMINATION TO THE NEW 120/208V DISTRIBUTION PANEL. EXISTING FEEDERS ORIGINATING FROM ABOVE SHALL BE ROUTED TO THE NEW DISTRIBUTION PANEL VIA CEILING MOUNTED JUNCTION BOX 'JB386E2'. EXISTING FEEDERS FROM BELOW THE SLAB SHALL BE ROUTED TO THE NEW DISTRIBUTION PANEL VIA FLOOR MOUNTED JUNCTION BOXES 'JB386E1' AND 'JB386E3'. FLOOR MOUNTED JUNCTION BOXES SHALL BE BOLTED TO THE GROUND AND ALL SPLICES WITHIN THESE JUNCTION BOXES SHALL UTILIZE SUBMERSIBLE RATED SPLICE KITS.
- UPON DE-ENERGIZATION OF THE 480V SWITCHGEAR, THE CONTRACTOR SHALL REMOVE ALL SWITCHGEAR DOORS, CIRCUIT BREAKERS, BUS DETAIL, ETC. AND PROVIDE NEW COVER-PLATES WITH SCREWS AND COVERS. ALL OPENINGS SHALL BE COVERED. PULL BOX SHALL BE PRIMED AND PAINTED.
- CONTRACTOR SHALL CHOP OUT AND REMOVE THE EXISTING TEN (10) CONDUIT DUCT BANK FROM THE CRANIL SPACE OF BUILDING 386 TO EXISTING ELECTRICAL MANHOLE 'MH-D5'. CONSTRUCT A NEW TEN (10) CONDUIT DUCT BANK, ENCASE WITHIN CONCRETE, AND ROUTE CONDUITS FROM EXISTING MANHOLE 'MH-D5' TO BUILDING 386 SECOND FLOOR, PENETRATING THE FOUNDATION AND CAPPED OFF 12' ABOVE THE FINISHED SECOND FLOOR AS SPARE CONDUIT.
- CONTRACTOR SHALL COORDINATE CONDUIT PENETRATIONS THROUGH THE RAISED PLATFORM DURING CONSTRUCTION.
- CONTRACTOR SHALL PROVIDE EXPANSION/DEFLECTION COUPLINGS FOR ALL CONDUITS BEING TRANSITION FROM A CONCRETE DUCT BANK.



1 Electrical First Floor Power Plan
SCALE: 1/8"=1'-0"



Site Key Plan
SCALE: N.T.S.

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Melville, NY 11747
631.756.8000 • www.h2m.com
NY Architecture & Landscape Architecture: No Certificate Required
NY Engineering Certificate of Authorization No. 0018438

CONSULTANTS:

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	09-09-2024	Final Bid Documents
	09-29-2023	100% Submission
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1	05-30-2023	DOB Objections
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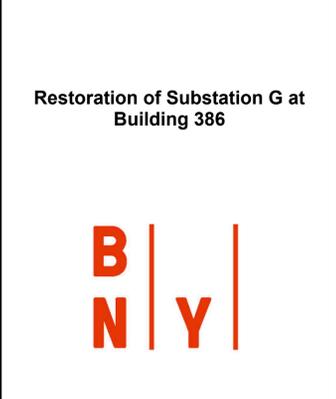
DESIGNED BY: CJD/CJS
DRAWN BY: CJD
CHECKED BY: -
REVIEWED BY: -

PROJECT NO: BNYD 1905A
DATE: SEPT 2024
SCALE: AS SHOWN

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Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386



141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

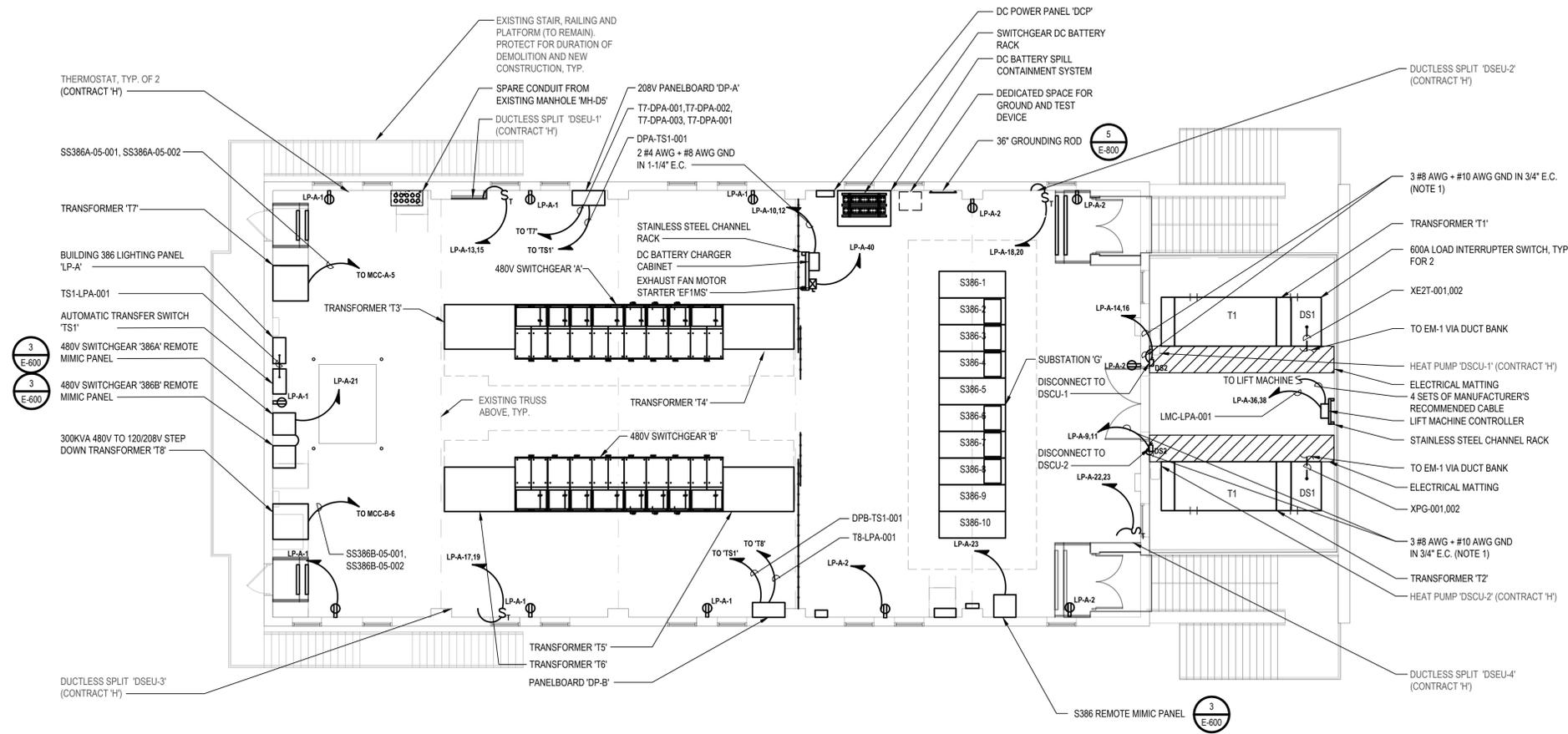
CONTRACT
ALL CONTRACTS

STATUS
FINAL BID DOCUMENTS

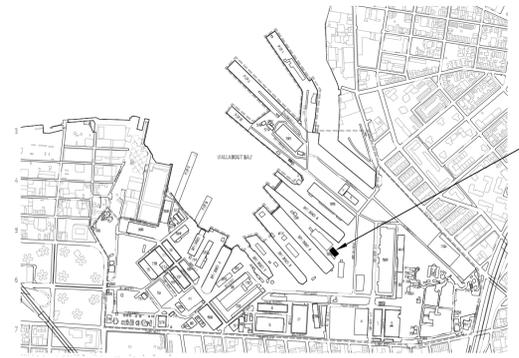
SHEET TITLE
SUBSTATION G ELECTRICAL SECOND FLOOR POWER PLAN

DRAWING No. **E-301.00**
SHEET No. **33**
OF **54**

POWER PLAN GENERAL NOTES:
G1. REFER TO DRAWING E-300.00 FOR ALL GENERAL POWER PLAN NOTES.
NOTE:
1. CONTRACTOR SHALL SEAL ALL EXTERIOR CONDUIT PENETRATIONS WITH NON-SHRINK GROUT PAINTED TO MATCH SURROUNDINGS.



1 Electrical Second Floor Power Plan
SCALE: 1/8"=1'-0"



Site Key Plan
SCALE: N.T.S.

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DESIGNED BY: CJD/CJS	DRAWN BY: CJD	CHECKED BY: EVI	REVIEWED BY: CJS
PROJECT NO: BNYD 1905A	DATE: SEPT 2024	SCALE: AS SHOWN	

Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386



141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

CONTRACT
ALL CONTRACTS

STATUS
FINAL BID DOCUMENTS

SHEET TITLE
ELECTRICAL FIRST FLOOR LIGHTING PLAN

DRAWING No.
E-400.00

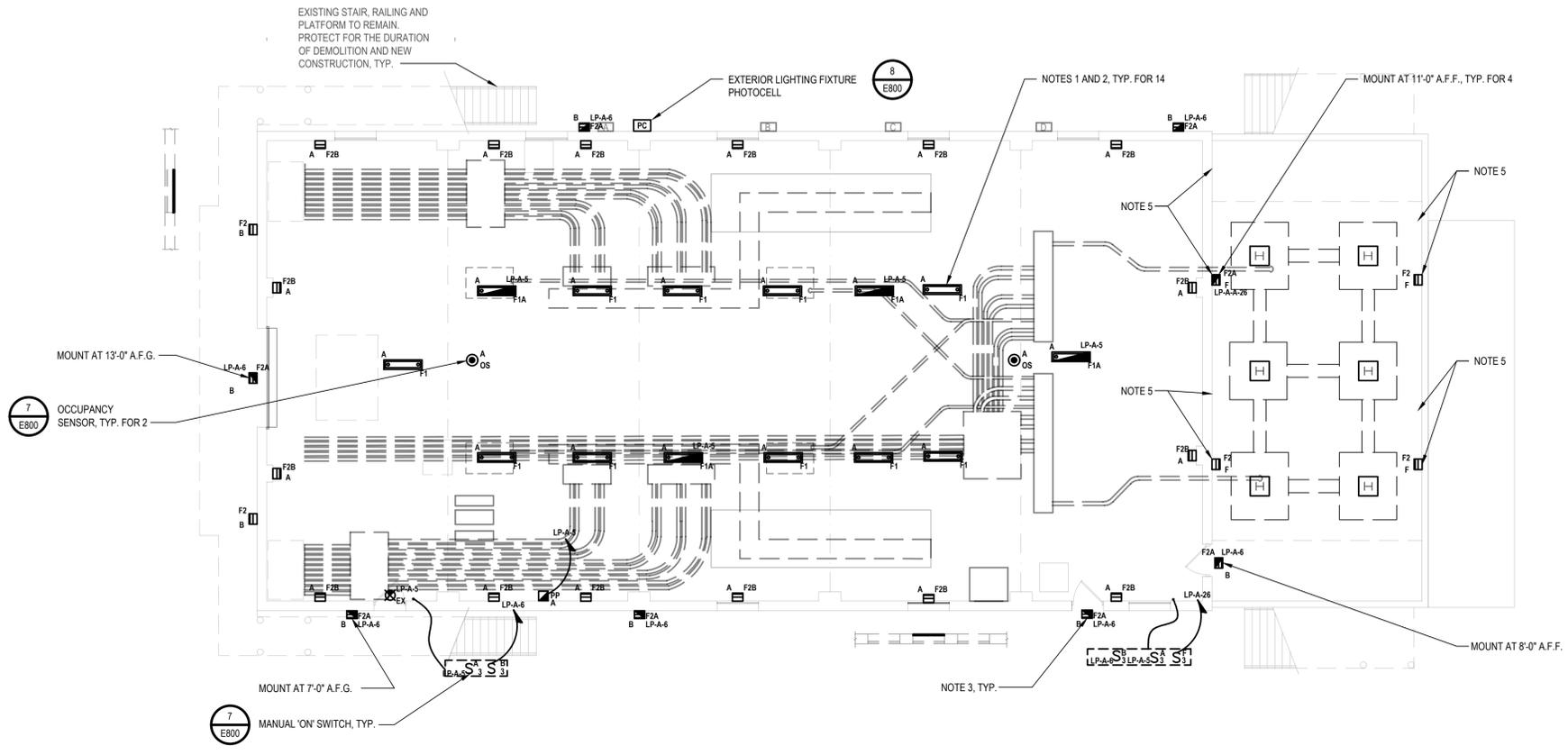
SHEET No.
34
OF
54

LIGHTING GENERAL NOTES:

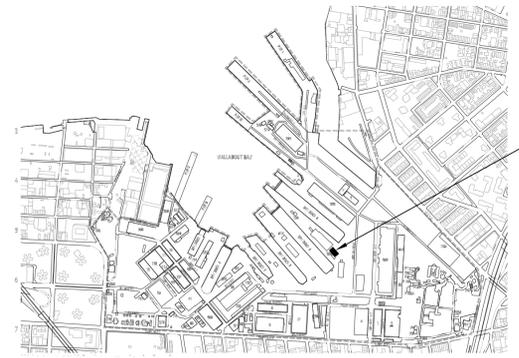
- PROVIDE ALL REQUIRED WIRING NECESSARY BETWEEN SWITCHES, CONTROLLERS AND/OR OCCUPANCY SENSORS FOR COMPLETE LIGHTING CONTROL. WHERE 3 OR 4 WAY SWITCHES ARE USED, PROVIDE ALL REQUIRED WIRING BETWEEN SWITCHES. WIRE SIZE SHALL EQUAL POWER FEED SIZE.
- FIXTURES INDICATED WITH CIRCUIT DESIGNATIONS SHALL BE CONNECTED TO LINE SIDE OF CIRCUIT.
- FIXTURES INDICATED WITH LETTER DESIGNATIONS SHALL BE CONNECTED TO THE SWITCH, OCCUPANCY SENSOR AND/OR POWER PACK WITH CORRESPONDING LETTER DESIGNATION.
- PROVIDE AND INSTALL A DEDICATED NEUTRAL FOR EACH CIRCUIT. CONTRACTOR IS NOT PERMITTED TO USE COMMON NEUTRALS.
- VERIFY EXACT LOCATIONS AND MOUNTING HEIGHTS WITH ARCHITECT/ENGINEER IN FIELD.
- ALL CEILING MOUNTED FIXTURES WITH EMERGENCY BALLASTS AND ALL FIXTURES THAT ARE PART OF AN EMERGENCY LIGHTING SYSTEM, SHALL BE LABELED. THESE LABELS SHALL BE EASILY READ FROM THE FLOOR LEVEL AND STATE THAT THE FIXTURE IS AN EMERGENCY FIXTURE AND CONTAIN THE PANEL NAME AND CIRCUIT NUMBER THAT IT IS FED FROM.
- WIRING FOR EMERGENCY BALLAST IS NOT SHOWN ON PLANS. FIXTURES WITH EMERGENCY BALLASTS SHALL BE PROVIDED WITH AN UNSWITCHED POWER FEED FROM CIRCUIT FEEDING LIGHT FIXTURE.
- PROVIDE ALL HARDWARE AND ACCESSORIES TO MOUNT FIXTURES SECURELY. COORDINATE EXACT MOUNTING HEIGHT WITH ARCHITECT/ENGINEER IN FIELD.

LIGHTING KEY NOTES:

- CONTRACTOR SHALL PROVIDE 3/8" OD THREADED ROD TO SECURELY INSTALL FIXTURES ON DUAL PENDANT BRACKETS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. PROVIDE ALL ADDITIONAL HARDWARE AND ACCESSORIES AS REQUIRED.
- CONTRACTOR SHALL PENDANT MOUNT FIXTURES 10'-0" A.F.F. TO BOTTOM.
- CONTRACTOR SHALL MOUNT EXTERIOR FIXTURES 8'-5" A.F.G., UON.
- IN ADDITION TO ALL OTHER TEMPORARY LIGHTING, CONTRACTOR SHALL PROVIDE TEMPORARY LED LIGHTING WITHIN THE CRAWL SPACE TO PROVIDE A MINIMUM OF 25 FOOT CANDLES THROUGHOUT. AT THE END OF THE CONTRACT, THE TEMPORARY LIGHTING WITHIN THE CRAWL SPACE SHALL REMAIN INTACT AND TURNED OVER TO THE OWNER.



1 First Floor Lighting Plan
SCALE: 1/8"=1'-0"



Site Key Plan
SCALE: N.T.S.

CONSULTANTS:

MARK	DATE	DESCRIPTION
	09-09-2024	Final Bid Documents
	09-29-2023	100% Submission
2	07-18-2023	DOB Objections
1	05-30-2023	DOB Objections
	01-04-2023	95% Submission
	10-12-2022	90% Submission
	08-10-2020	60% Resubmission
	03-03-2020	60% Submission
	11-08-2019	30% Submission

*ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL.

DESIGNED BY: CJD/CJS	DRAWN BY: CJD	CHECKED BY: EVI	REVIEWED BY: CJS
PROJECT NO: BNYD 1905A	DATE: SEPT 2024	SCALE: AS SHOWN	

**Brooklyn Navy Yard
Development Corporation**

**Restoration of Substation G at
Building 386**



141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

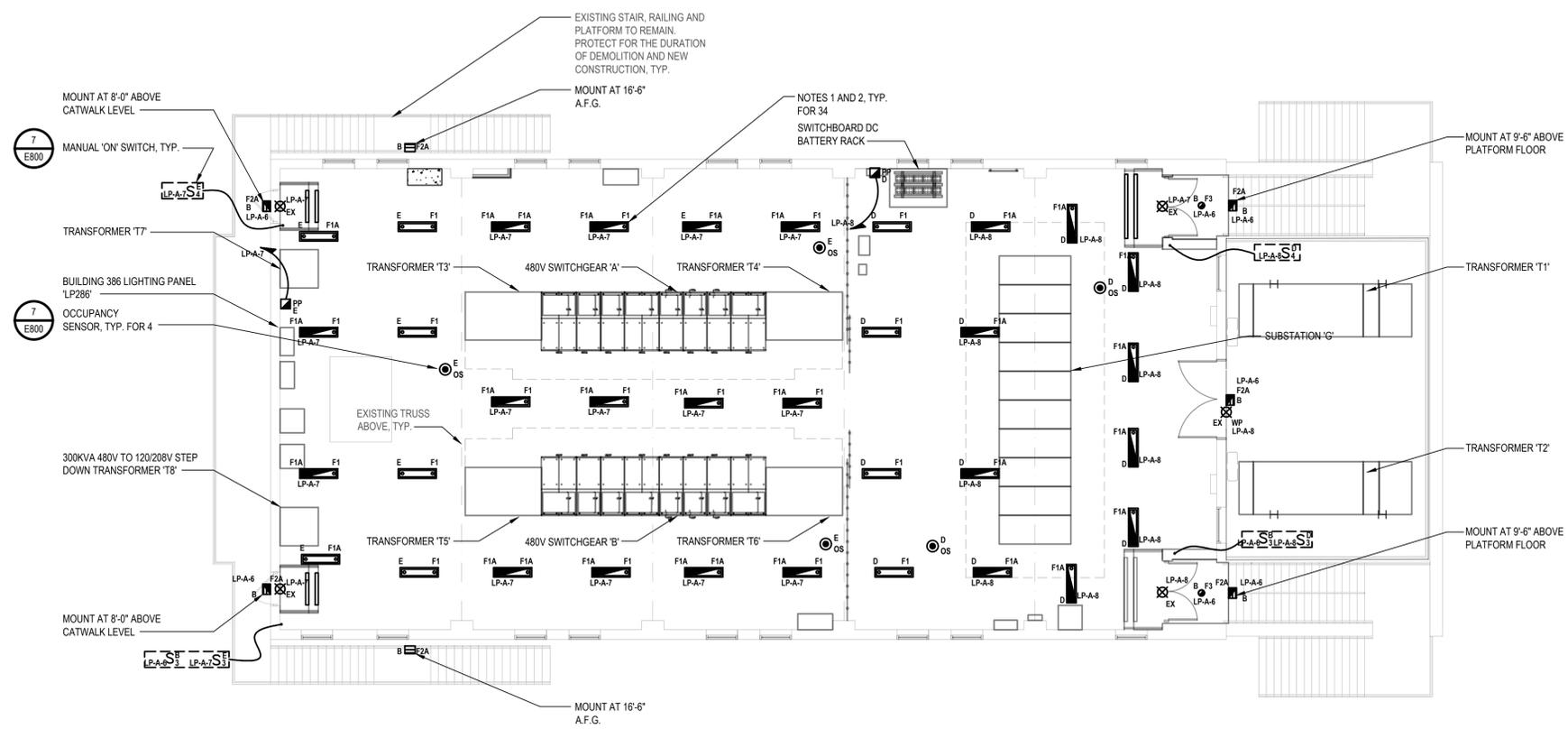
CONTRACT
ALL CONTRACTS

STATUS
FINAL BID DOCUMENTS

SHEET TITLE
**ELECTRICAL SECOND
FLOOR LIGHTING
PLAN**

DRAWING No.
E-401.00

SHEET No.
35
OF
54



7
E800
MOUNT AT 8'-0" ABOVE
CATWALK LEVEL
MANUAL 'ON' SWITCH, TYP.

7
E800
BUILDING 386 LIGHTING PANEL
'LP286'
OCCUPANCY
SENSOR, TYP. FOR 4

300KVA 480V TO 120/208V STEP
DOWN TRANSFORMER 'T8'

MOUNT AT 8'-0" ABOVE
CATWALK LEVEL

EXISTING STAIR, RAILING AND
PLATFORM TO REMAIN.
PROTECT FOR THE DURATION
OF DEMOLITION AND NEW
CONSTRUCTION, TYP.

MOUNT AT 16'-6"
A.F.G.

NOTES 1 AND 2, TYP.
FOR 34
SWITCHBOARD DC
BATTERY RACK

MOUNT AT 9'-6" ABOVE
PLATFORM FLOOR

TRANSFORMER 'T1'

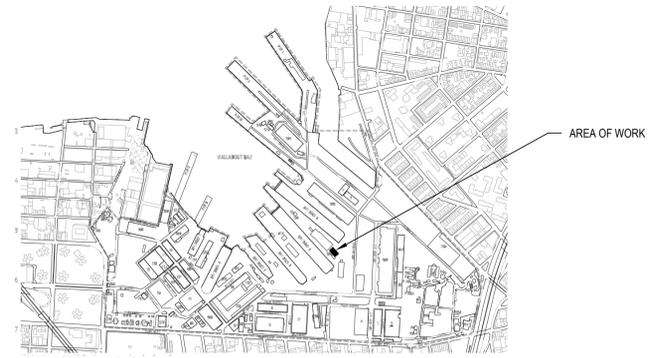
TRANSFORMER 'T2'

MOUNT AT 9'-6" ABOVE
PLATFORM FLOOR

1 Second Floor Lighting Plan
SCALE: 1/8"=1'-0"

LIGHTING GENERAL NOTES:
L1. REFER TO DRAWING E-400.00 FOR ALL ASSOCIATED GENERAL LIGHTING NOTES.

- LIGHTING KEY NOTES:**
- CONTRACTOR SHALL PROVIDE 3/8" OD THREADED ROD TO SECURELY INSTALL FIXTURES ON DUAL PENDANT BRACKETS. PROVIDE ALL ADDITIONAL HARDWARE AND ACCESSORIES AS REQUIRED.
 - CONTRACTOR SHALL PENDANT MOUNT FIXTURES 9'-0" AFF, UNLESS OTHERWISE NOTED.



Site Key Plan
SCALE: N.T.S.

CONSULTANTS:

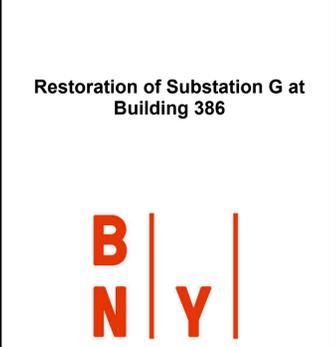
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	03-03-2020	60% Submission
	11-08-2019	30% Submission

DESIGNED BY: CJD/CJS
DRAWN BY: CJD
CHECKED BY: -
REVIEWED BY: -

PROJECT No: BNYD 1905A
DATE: SEPT 2024
SCALE: AS SHOWN

CLIENT: **Brooklyn Navy Yard Development Corporation**

Restoration of Substation G at Building 386



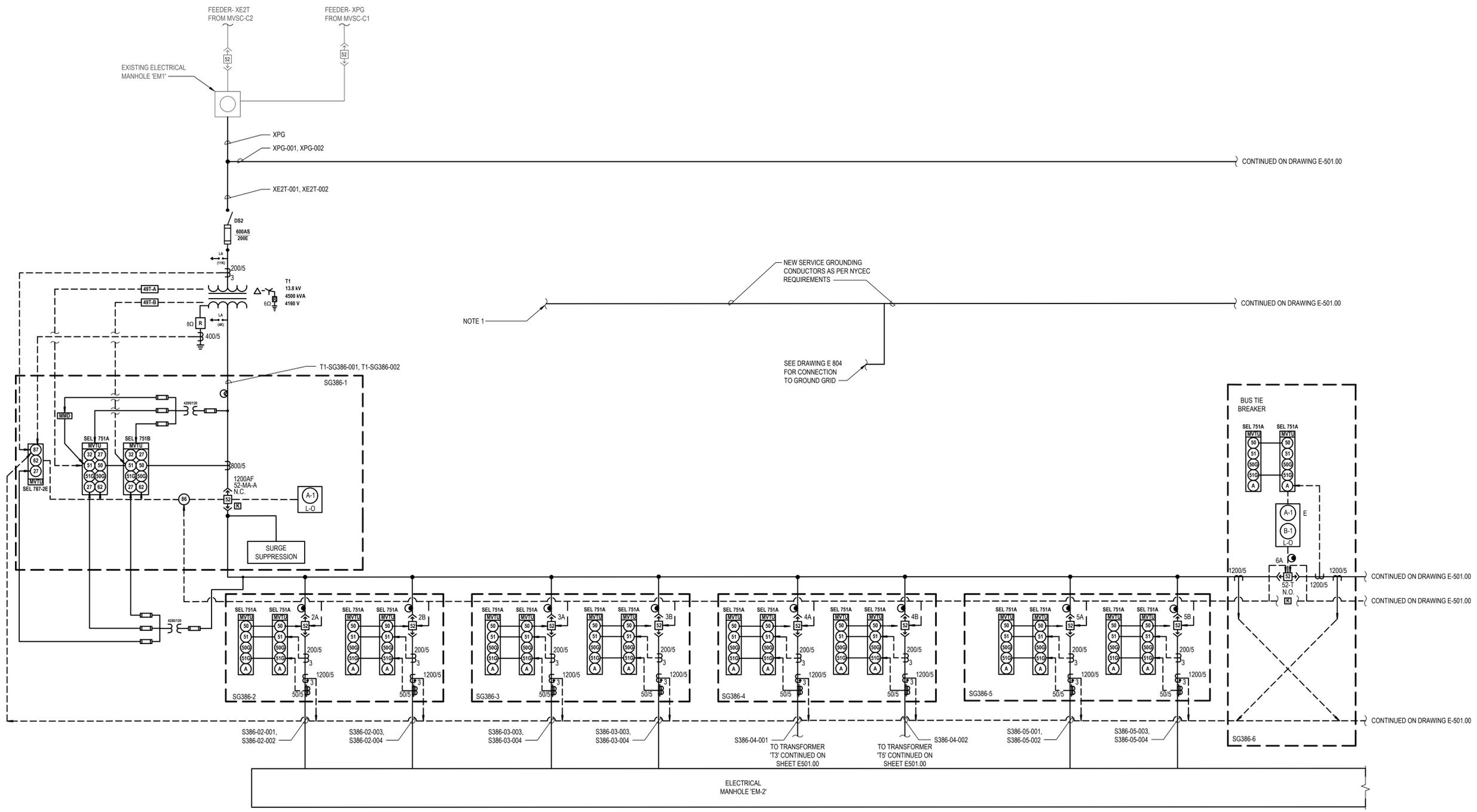
141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

CONTRACT: **ALL CONTRACTS**

STATUS: **FINAL BID DOCUMENTS**

SHEET TITLE: **MEDIUM VOLTAGE SIDE A ELECTRICAL SINGLE LINE DIAGRAM**

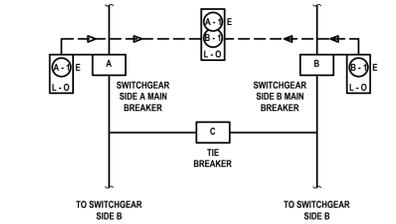
DRAWING No: **E-500.00**
SHEET No: **36**
OF **54**



1 Electrical Single Line Diagram
SCALE: N.T.S.

- NOTE:
- CONNECT SERVICE GROUND TO NEW SERVICE GROUNDING CONDUCTORS. SEE SHEET E-804 FOR ADDITIONAL INFORMATION.

2 Building 386 Medium Voltage Switchgear Key Interlock Diagram
SCALE: N.D. SCALE



- KEY INTERLOCK DETAIL:**
- BREAKER A IS CLOSED TO SUPPLY SWITCHGEAR SIDE A. BREAKER B IS CLOSED TO SUPPLY SWITCHGEAR SIDE B. TIE-BREAKER C IS OPEN. KEYS A-1 ARE HELD IN INTERLOCKS ON BOTH BREAKERS A AND B. THE BREAKER C CANNOT BE CLOSED UNLESS EITHER BREAKER A OR B IS LOCKED OPEN.
- TO TRANSFER SWITCHGEAR SIDE B TO BREAKER A, PROCEED AS FOLLOWS:
- K1. OPEN BREAKER B.
 - K2. TURN KEY A-1 IN L-O INTERLOCK ON BREAKER B TO LOCK OPEN, KEY A-1 IS NOW FREE.
 - K3. INSERT KEY A-1 IN L-O INTERLOCK ON THE BREAKER C AND TURN TO UNLOCK. KEY A-1 IS NOW HELD.
 - K4. CLOSE TIE BREAKER C.
- REVERSE SEQUENCE TO RESTORE SERVICE.
LOAD SWITCHGEAR SIDE A CAN BE SUPPLIED THROUGH BREAKER B IN A SIMILAR MANNER.

BNYD (Brooklyn Navy Yard) - 40108BNYD1905A - 02/24 - Electrical Medium Voltage A Single Line Diagram.dwg, Last Modified: Sep 27, 2024 - 8:48am By: rdelgim

CONSULTANTS:

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	11-08-2019	30% Submission

DESIGNED BY: CJD/CJS | DRAWN BY: CJD | CHECKED BY: | REVIEWED BY: |
PROJECT NO: BNYD 1905A | DATE: SEPT 2024 | SCALE: AS SHOWN

Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386



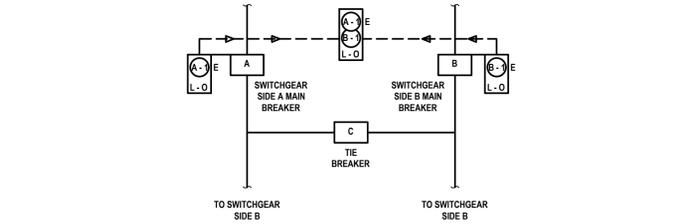
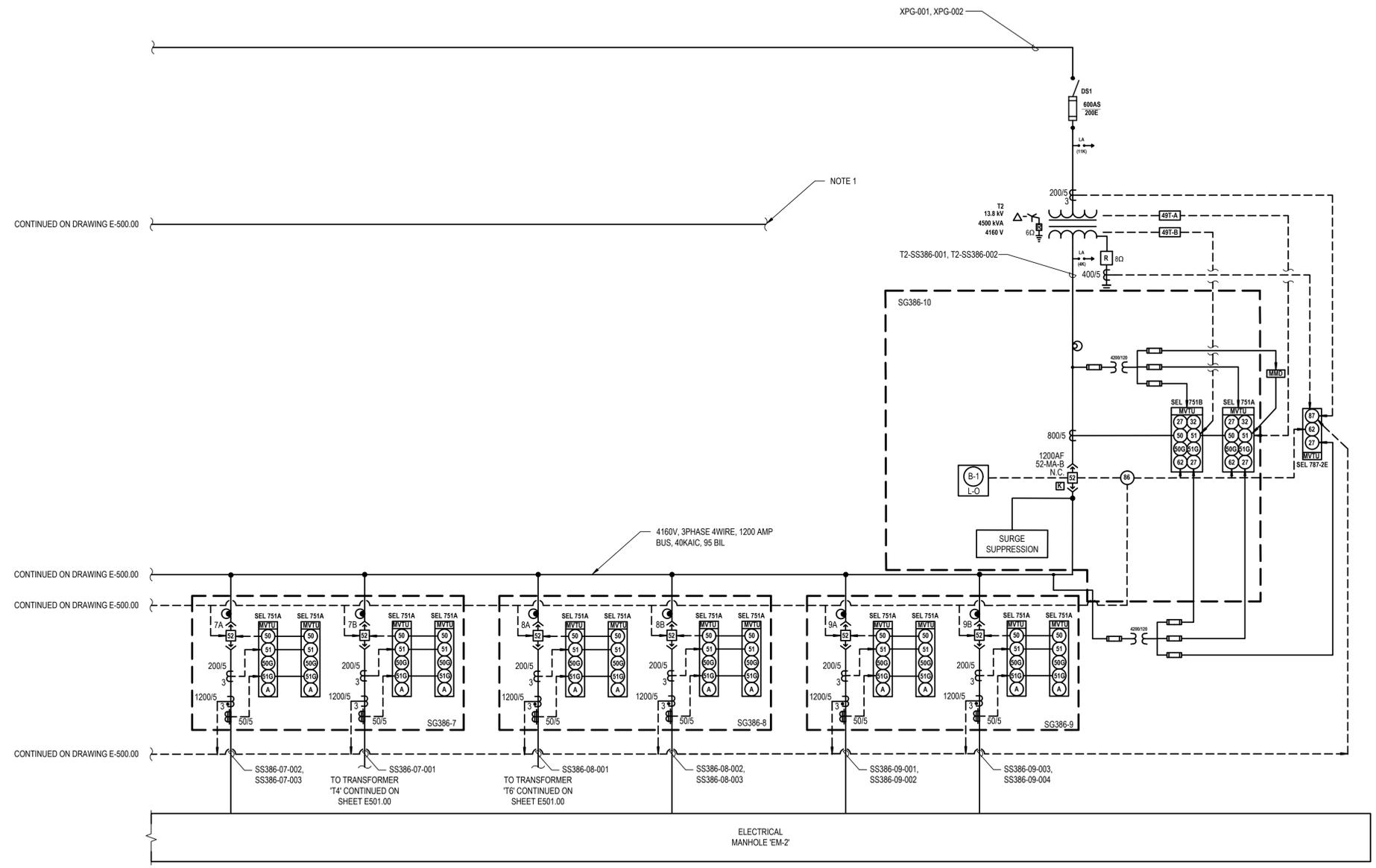
141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

ALL CONTRACTS

FINAL BID DOCUMENTS

MEDIUM VOLTAGE
SIDE B ELECTRICAL
SINGLE LINE
DIAGRAM

E-501.00
37 OF 54



2 Building 386 Medium Voltage Switchgear Key Interlock Diagram
SCALE: NO SCALE

KEY INTERLOCK DETAIL:
BREAKER A IS CLOSED TO SUPPLY SWITCHGEAR SIDE A. BREAKER B IS CLOSED TO SUPPLY SWITCHGEAR SIDE B. TIE-BREAKER C IS OPEN. KEYS A-1 ARE HELD IN INTERLOCKS ON BOTH BREAKERS A AND B. THE BREAKER C CANNOT BE CLOSED UNLESS EITHER BREAKER A OR B IS LOCKED OPEN.
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K2. TURN KEY A-1 IN L-O INTERLOCK ON BREAKER B TO LOCK OPEN, KEY A-1 IS NOW FREE.
K3. INSERT KEY A-1 IN L-O INTERLOCK ON TIE BREAKER C AND TURN TO UNLOCK. KEY A-1 IS NOW HELD.
K4. CLOSE TIE BREAKER C.
REVERSE SEQUENCE TO RESTORE SERVICE.
LOAD SWITCHGEAR SIDE A CAN BE SUPPLIED THROUGH BREAKER B IN A SIMILAR MANNER.

NOTE:
1. CONNECT SERVICE GROUND TO NEW SERVICE GROUNDING CONDUCTORS. SEE SHEET E-804 FOR ADDITIONAL INFORMATION.

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DESIGNED BY: CJD/CJS DRAWN BY: CJD CHECKED BY: REVIEWED BY: PROJECT NO: BNYD 1905A DATE: SEPT 2024 SCALE: AS SHOWN

Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386



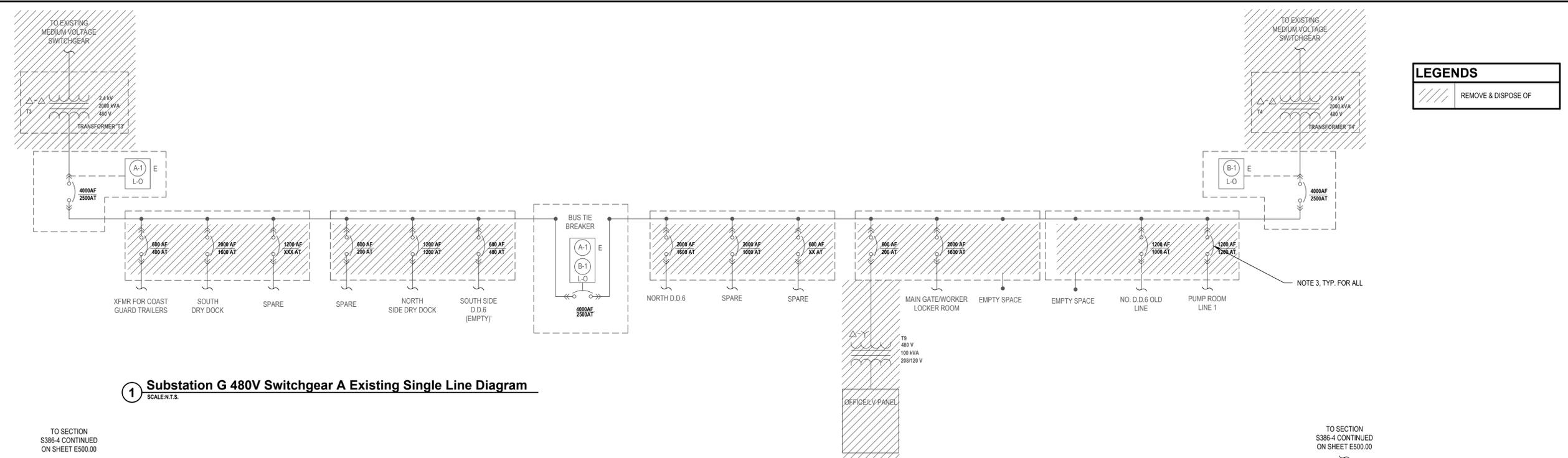
141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

ALL CONTRACTS

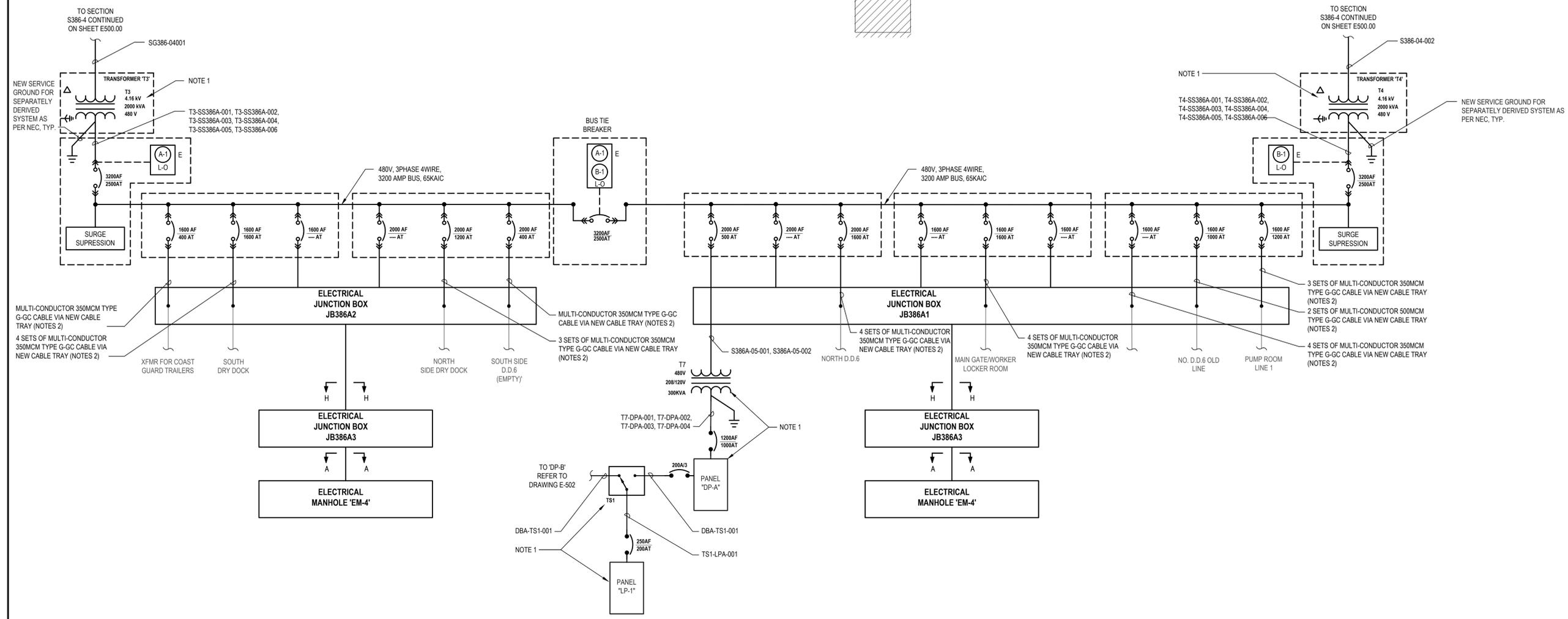
FINAL BID DOCUMENTS

LOW VOLTAGE SWITCHGEAR A ELECTRICAL SINGLE LINE DIAGRAM

E-502.00 SHEET No. 38 OF 54

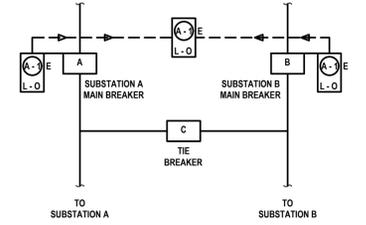


1 Substation G 480V Switchgear A Existing Single Line Diagram
SCALE: N.T.S.



2 Substation G 480V Switchgear A Single Line Diagram
SCALE: N.T.S.

- NOTE:**
- REFER TO SHEET E 700 FOR ADDITIONAL INFORMATION ON EQUIPMENT PARAMETERS AND SCHEDULES.
 - CONTRACTOR SHALL PROVIDE CABLE LIMITERS FOR ALL 480V LOADS BEING EXTENDED TO NEW 480V SWITCHGEAR. CABLE LIMITERS SHALL BE SIZED BASED ON CABLE SIZE.
 - ALL EXISTING CIRCUIT BREAKERS INDICATED SHALL BE RETURNED TO OWNER.



3 Building 386 Low Voltage Switchgear Key Interlock Diagram
SCALE: NO SCALE

- KEY INTERLOCK DETAIL:**
- BREAKER A IS CLOSED TO SUPPLY SWITCHGEAR SIDE A. BREAKER B IS CLOSED TO SUPPLY SWITCHGEAR SIDE B. TIE-BREAKER C IS OPEN. KEYS A-1 ARE HELD IN INTERLOCKS ON BOTH BREAKERS A AND B. THE BREAKER C CANNOT BE CLOSED UNLESS EITHER BREAKER A OR B IS LOCKED OPEN.
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 - CLOSE TIE BREAKER C.
- REVERSE SEQUENCE TO RESTORE SERVICE.
LOAD SWITCHGEAR SIDE A CAN BE SUPPLIED THROUGH BREAKER B IN A SIMILAR MANNER.

C:\386\Brooklyn Navy Yard - 40106\BND1905A - E-502.00 - Sub G 480V Switchgear A Single Line Diagram.dwg, Last Modified: Sep 27, 2024, 9:38am, Plotter on: Sep 27, 2024, 9:38am, Plotter on: Sep 27, 2024, 9:38am, By: celgms

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	03-03-2020	60% Submission
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DESIGNED BY: CJD/CJS
DRAWN BY: CJD
CHECKED BY: -
REVIEWED BY: -
PROJECT NO: BNYD 1905A
DATE: SEPT 2024
SCALE: AS SHOWN

CLIENT: **Brooklyn Navy Yard Development Corporation**

Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386



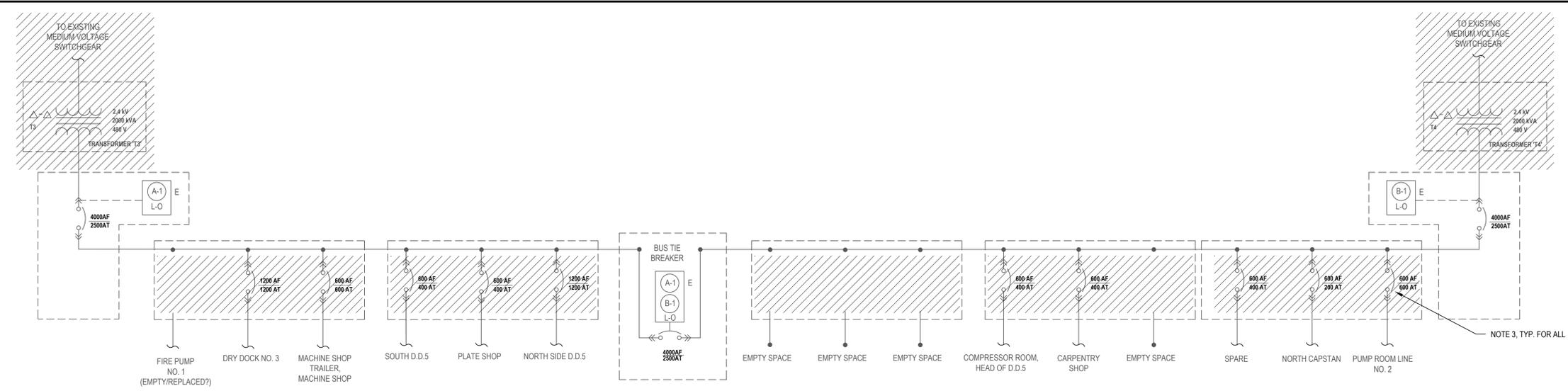
141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

CONTRACT: **ALL CONTRACTS**

STATUS: **FINAL BID DOCUMENTS**

SHEET TITLE: **LOW VOLTAGE SWITCHGEAR B ELECTRICAL SINGLE LINE DIAGRAM**

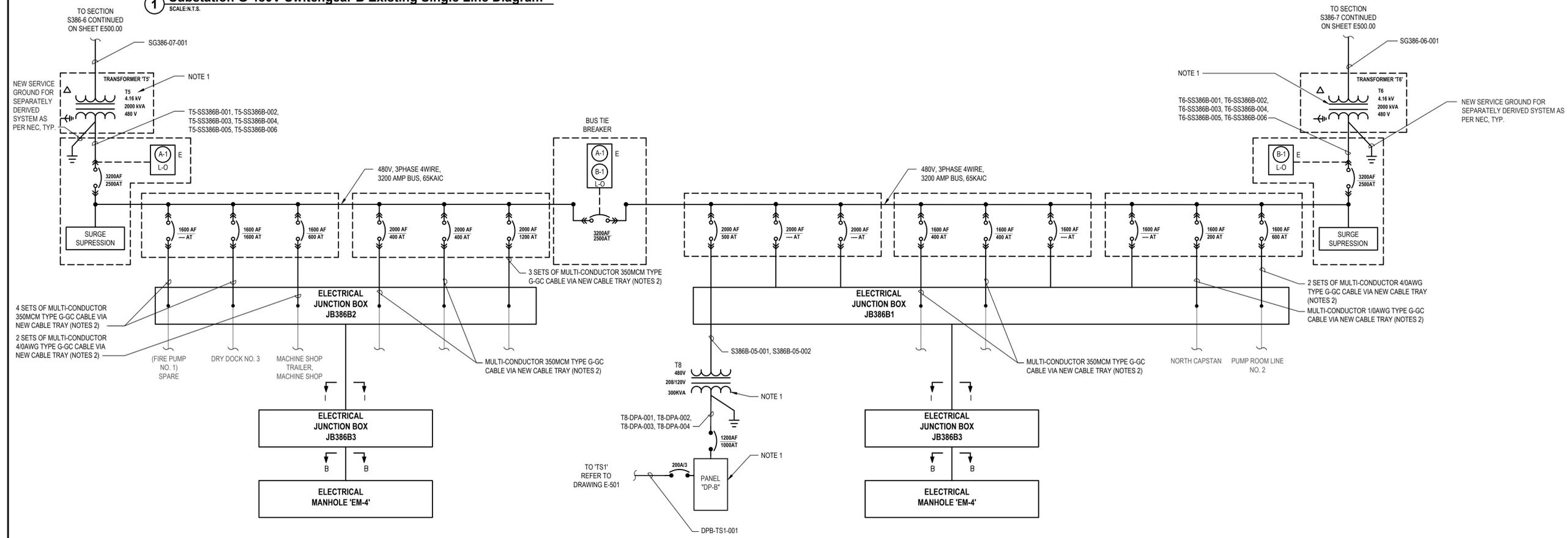
DRAWING NO: **E-503.00**
SHEET NO: **39**
OF **54**



LEGENDS

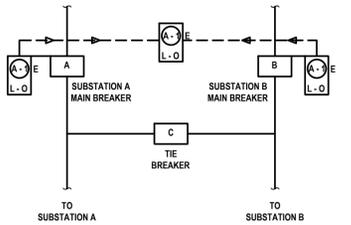
	REMOVE & DISPOSE OF
--	---------------------

1 Substation G 480V Switchgear B Existing Single Line Diagram
SCALE: N.T.S.



2 Substation G 480V Switchgear B Single Line Diagram
SCALE: N.T.S.

- NOTE:**
- REFER TO SHEET E 700 FOR ADDITIONAL INFORMATION ON EQUIPMENT PARAMETERS AND SCHEDULES.
 - CONTRACTOR SHALL PROVIDE CABLE LIMITERS FOR ALL 480V LOADS BEING EXTENDED TO NEW 480V SWITCHGEAR. CABLE LIMITERS SHALL BE SIZED BASED ON CABLE SIZE.
 - ALL EXISTING CIRCUIT BREAKERS INDICATED SHALL BE RETURNED TO OWNER.



3 Building 386 Low Voltage Switchgear Key Interlock Diagram
SCALE: NO SCALE

- KEY INTERLOCK DETAIL:**
- BREAKER A IS CLOSED TO SUPPLY SWITCHGEAR SIDE A. BREAKER B IS CLOSED TO SUPPLY SWITCHGEAR SIDE B. TIE-BREAKER C IS OPEN. KEYS A-1 ARE HELD IN INTERLOCKS ON BOTH BREAKERS A AND B. THE BREAKER C CANNOT BE CLOSED UNLESS EITHER BREAKER A OR B IS LOCKED OPEN.
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 - CLOSE TIE BREAKER C.
- REVERSE SEQUENCE TO RESTORE SERVICE. LOAD SWITCHGEAR SIDE A CAN BE SUPPLIED THROUGH BREAKER B IN A SIMILAR MANNER.

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	08-10-2020	60% Resubmission
	03-03-2020	60% Submission
	11-08-2019	30% Submission

DESIGNED BY: CJD/CJS | DRAWN BY: CJD | CHECKED BY: - | REVIEWED BY: -
PROJECT NO: BNYD 1905A | DATE: SEPT 2024 | SCALE: AS SHOWN

Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386



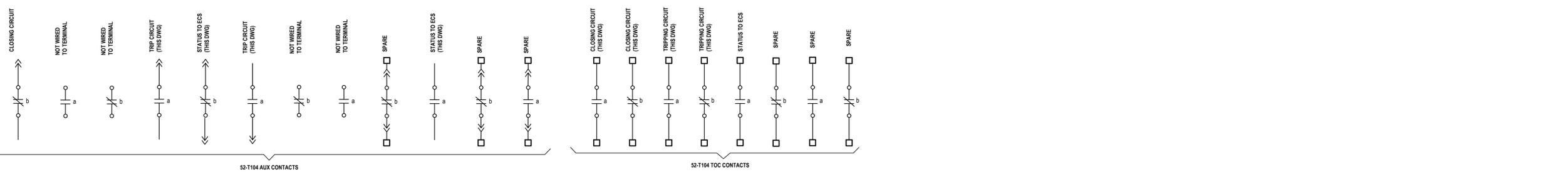
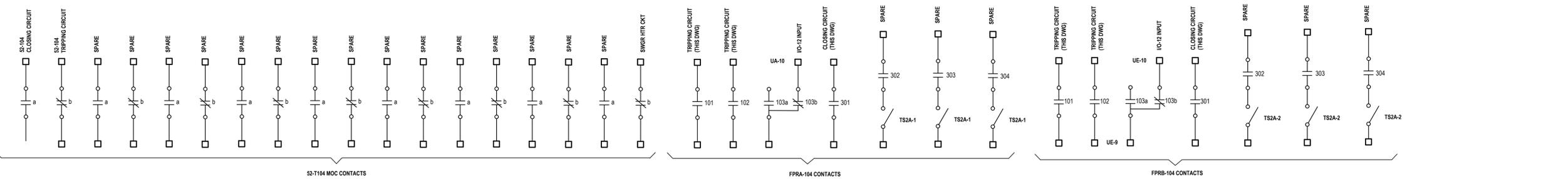
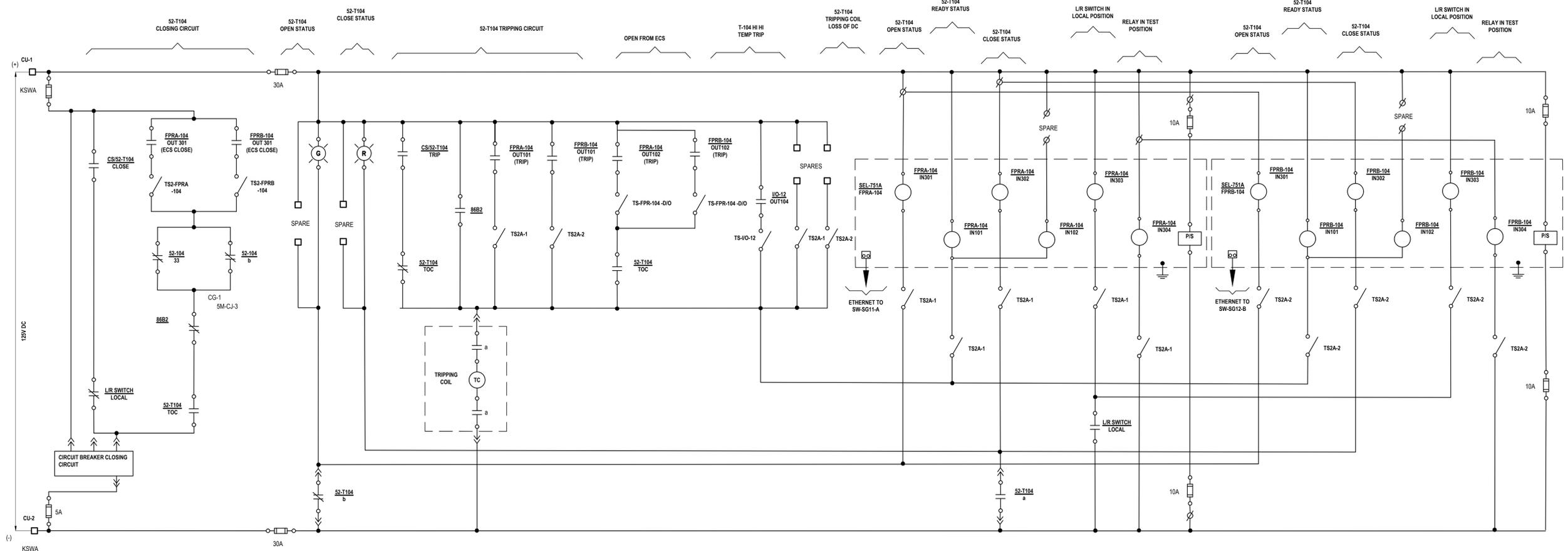
141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

ALL CONTRACTS

FINAL BID DOCUMENTS

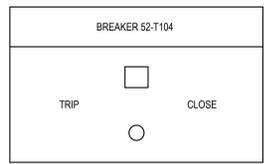
TYPICAL MEDIUM VOLTAGE CIRCUIT BREAKER SCHEMATIC DIAGRAM

E-504.00



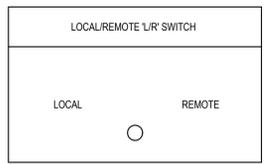
CS/S2-T104 TEST SWITCH

DECK	CONTACTS	TRIP	NORMAL	CLOSE	REFERENCE DWG
1		X			THIS DWG
				X	THIS DWG



LOCAL/REMOTE 'L/R' SWITCH

DECK	CONTACTS	LOCAL	REMOTE	REFERENCE DWG
1		X		THIS DWG
			X	THIS DWG



- NOTES:**
- MOC AND AUXILIARY CONTACTS ARE SHOWN WITH BREAKER OPEN.
 - TOC CONTACTS ARE SHOWN WITH BREAKER IN TEST POSITION.
 - SPARE CONTACTS SHALL BE WIRED TO TERMINAL BLOCKS FOR FUTURE USE.
 - TERMINATION POINTS ARE PREFIXED WITH 8M UNLESS OTHERWISE NOTED.

CONSULTANTS:

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PROJECT NO: BNYD 1905A	DATE: SEPT 2024	SCALE: AS SHOWN	

CLIENT
**Brooklyn Navy Yard
Development Corporation**

Restoration of Substation G at
Building 386



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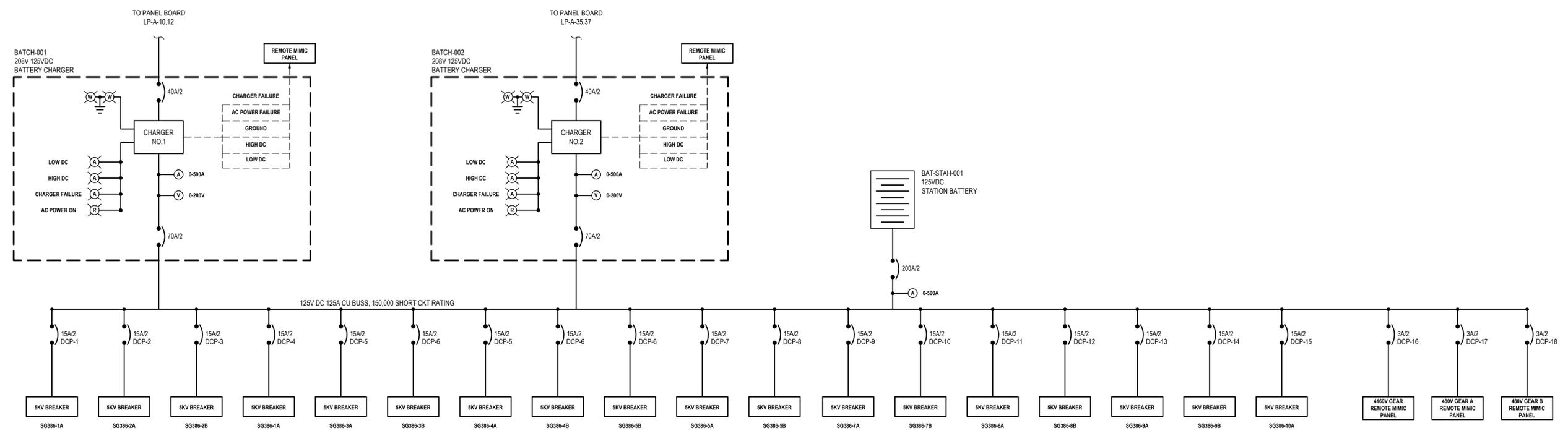
CONTRACT
ALL CONTRACTS

STATUS
FINAL BID DOCUMENTS

SHEET TITLE
**ELECTRICAL 125VDC
SINGLE LINE
DIAGRAM**

DRAWING No.
E-505.00

SHEET No.
41
OF
54



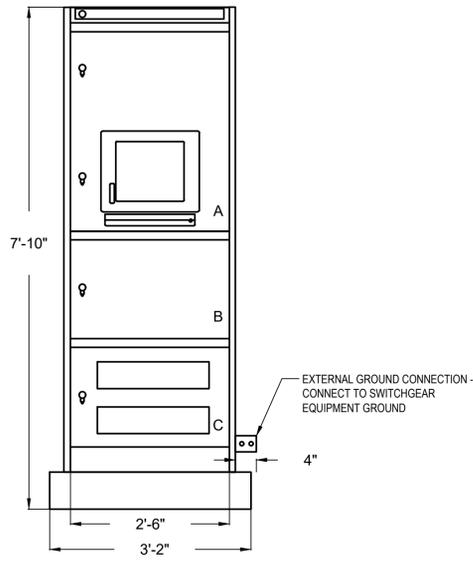
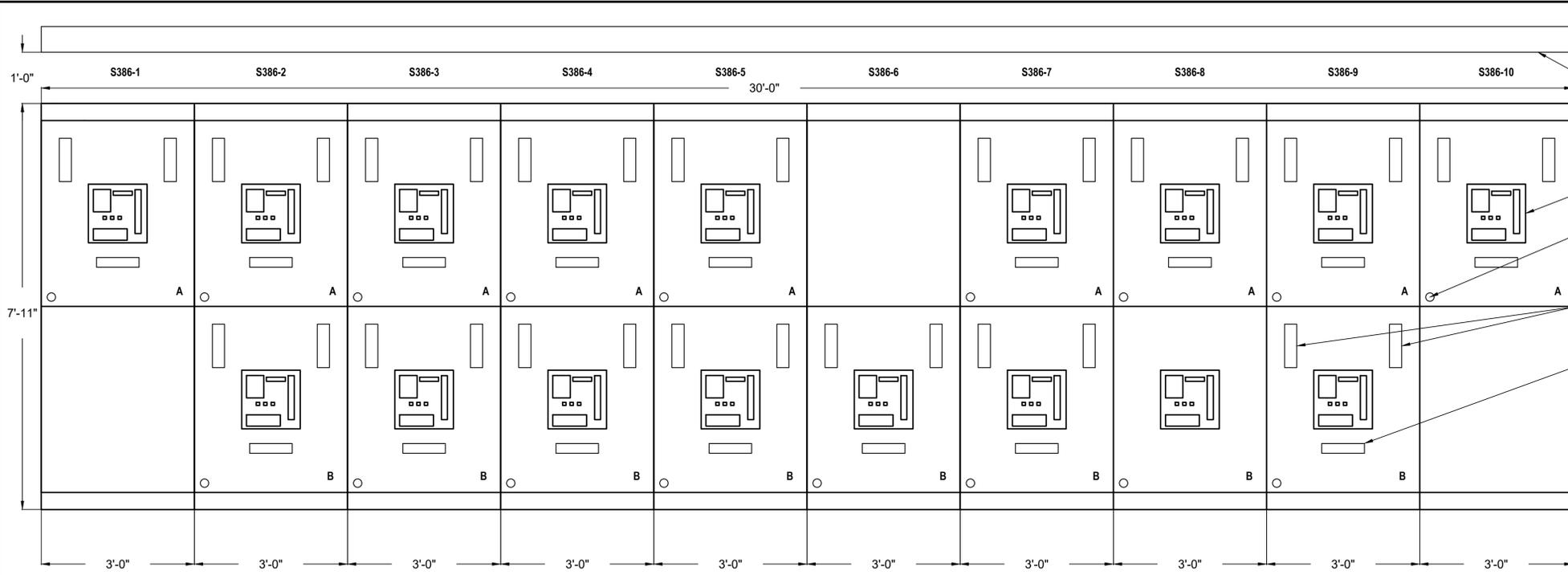
1 Electrical 125V DC Single Line Diagram
SCALE: NTS

- NOTES:**
- THE DC SWITCHBOARD SHALL BE DEAD-FRONT, NEMA 1 ENCLOSURE WITH DOOR, FREE STANDING AND FLOOR ANCHORED. SWITCHBOARD SHALL BE COLORED ANSI 61 GRAY. SWITCHBOARD SHALL ALLOW ZERO REAR WALL CLEARANCE (MOUNTED NEAR A WALL) AND BE FRONT CONNECTED AND FRONT ACCESSIBLE ONLY. BUS SHALL BE INSULATED COPPER BUS. THE DC SWITCHBOARD SHALL BE SUITABLE FOR USE ON A TWO WIRE, 125-140BDC UNDERGROUND SYSTEM.

C:\3860 (Brooklyn Navy Yard) - 40108BNYD1905A - 025511 - Merged\02-BM-CAD\02-Circuit-Diagram-505.00 - 125VDC Single Line Diagram.dwg Last Modified: Sep 27, 2024, 3:58pm Plot on: Sep 27, 2024, 3:51pm By: cshgms

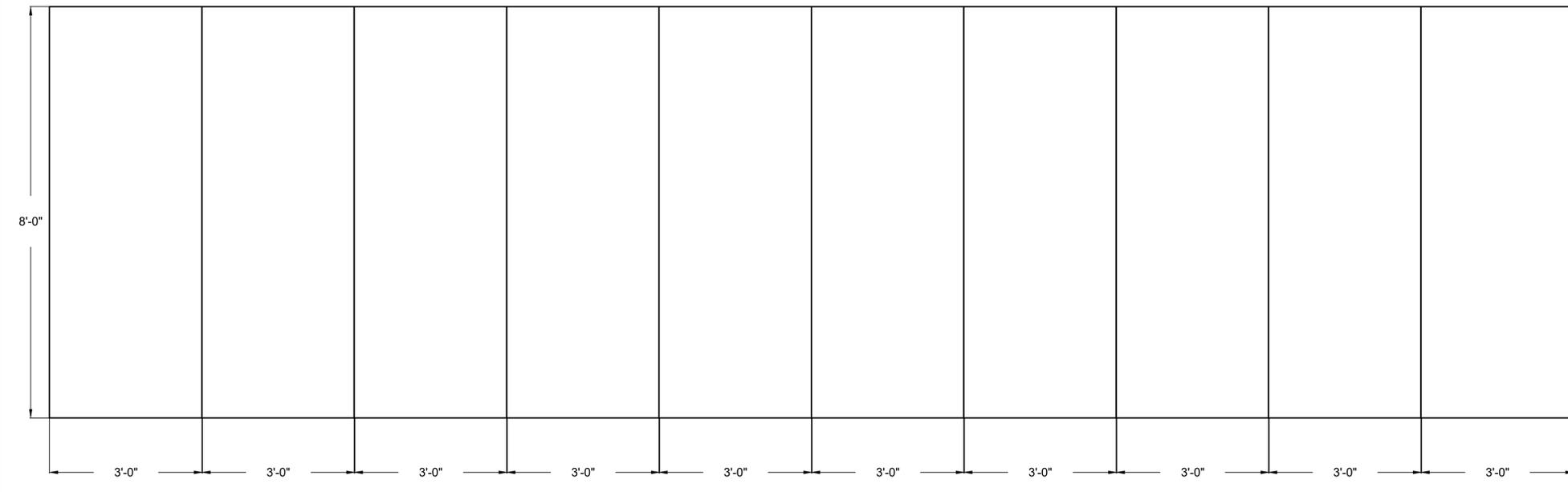
CONSULTANTS:

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	08-10-2020	60% Resubmission
	03-03-2020	60% Submission
	11-08-2019	30% Submission



3 Typical Building 386 Remote Mimic Panel
SCALE: 3/4"=1'-0"

1 Substation 'G' 4160 V Switchgear Elevation
SCALE: 3/4"=1'-0"



2 Substation 'G' 4160 V Switchgear Plan View
SCALE: 3/4"=1'-0"

SWITCHGEAR ELEVATION SCHEDULE	
SECTION	DESCRIPTION
S386-1A	MAIN BREAKER FROM FEEDER - XE2T FROM MVSC-C2
S386-2A	SPARE
S386-2B	SPARE
S386-3A	SPARE
S386-3B	SPARE
S386-4A	SPARE
S386-4B	BREAKER TO TRANS. T3
S386-5A	BREAKER TO TRANS. T4
S386-5B	SPARE
S386-6B	TIE BREAKER
S386-7A	SPARE
S386-7B	BREAKER TO TRANS. T5
S386-8A	BREAKER TO TRANS. T6
S386-8B	SPARE
S386-9A	SPARE
S386-9B	SPARE
S386-10A	MAIN BREAKER FROM FEEDER - XPG FROM MVSC-C1

- NOTES:
- SURGE SUPPRESSOR SHALL BE INSTALLED WITHIN THE SAME SECTION AS THE MAIN BREAKER REFER TO SPECIFICATION SECTION '262300' FOR ADDITIONAL INFORMATION.
 - SEE SHEET E 301 FOR LOCATION OF GROUND AND TEST DEVICE.

ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL

DESIGNED BY: CJD/CJS	DRAWN BY: CJD	CHECKED BY: -	REVIEWED BY: -
PROJECT NO: BNYD 1905A	DATE: SEPT 2024	SCALE: AS SHOWN	

CLIENT
Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386



141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

CONTRACT
ALL CONTRACTS

STATUS
FINAL BID DOCUMENTS

SHEET TITLE
MEDIUM VOLTAGE 4160V SWITCHGEAR ELEVATION AND PLAN VIEW

DRAWING No.
E-600.00

SHEET No.
42
OF
54

C:\BVD (Brooklyn Navy Yard) - 40106\BVD1905A - 02551 - Mfg\gen\02\BMA\CA\B\Doc\dwg\42-000 - Sub G 4160V Switchgear Elevation and Plan View.dwg Last Modified: Sep 10, 2024 - 10:52am Printed on: Sep 27, 2024 - 5:56pm By: rcbgarn

CONSULTANTS:

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DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
CJD/CJS	CJD	-	-
PROJECT NO.:	DATE:	SCALE:	
BNYD 1905A	SEPT 2024	AS SHOWN	

CLIENT
Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386



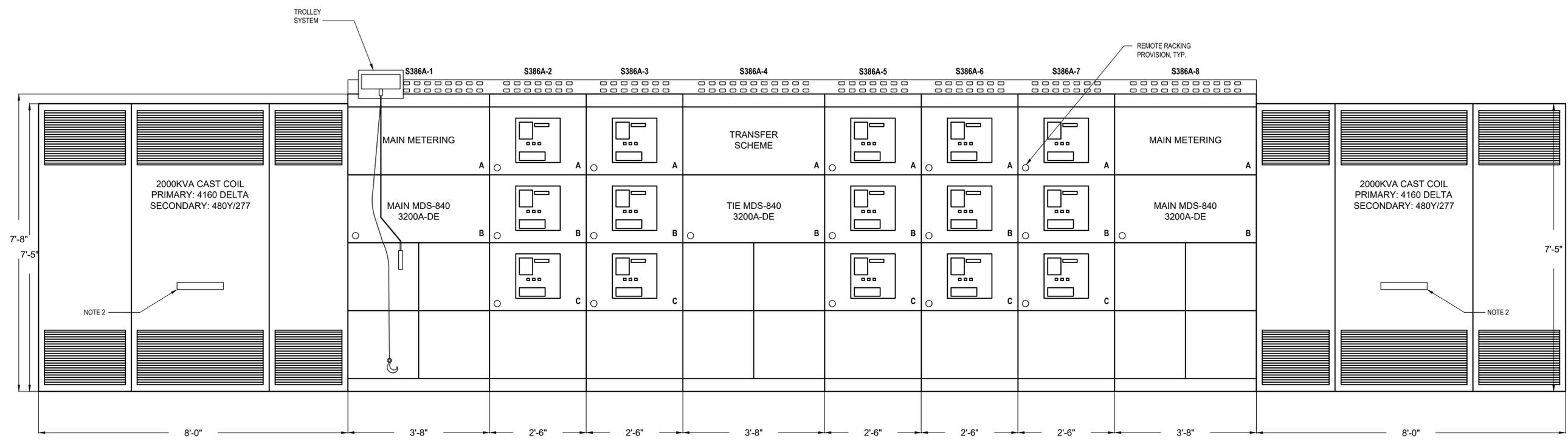
141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

CONTRACT
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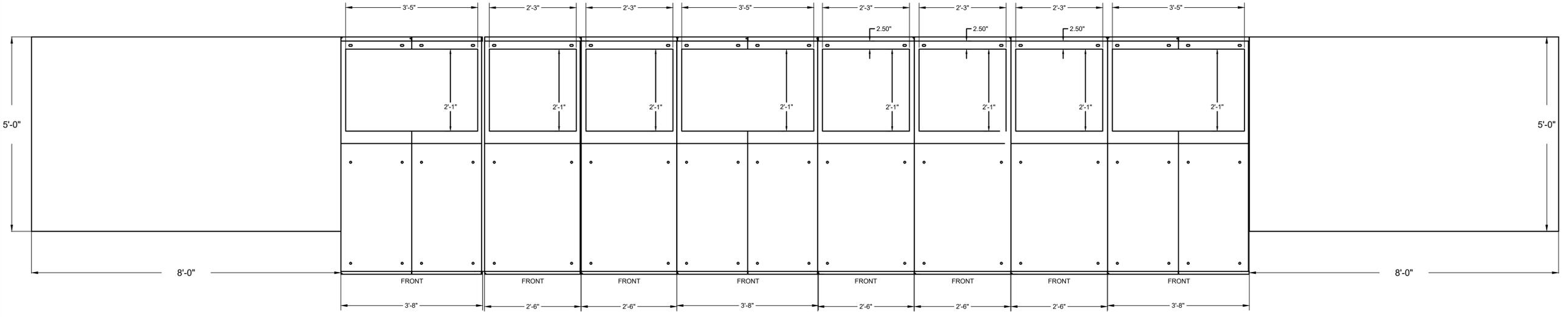
STATUS
FINAL BID DOCUMENTS

SHEET TITLE
LOW VOLTAGE SWITCHGEAR ELEVATION AND PLAN VIEW 1 OF 2

DRAWING NO. **E-601.00**
SHEET NO. **43**
OF **54**



1 Substation 'G' 480 V Switchgear 'A' Elevation
SCALE:3/4"=1'-0"



2 Substation 'G' 480 V Switchgear 'A' Plan View
SCALE:3/4"=1'-0"

SWITCHGEAR ELEVATION SCHEDULE			
SECTION	DESCRIPTION	SECTION	DESCRIPTION
S386A-1A	MAIN METERING	S386A-6B	BREAKER TO N-STAND CAPSTANS MAIN GATE, TRAILERS
S386A-1B	MAIN CIRCUIT BREAKER SIDE A	S386A-6C	BREAKER TO SHORE POWEER DD#6 TOP PIER
S386A-2A	BREAKER TO RECT. CRANE 309	S386A-7A	BREAKER TO HEAD CAPSTAN DD#6 / CAISSON #6 CRANE
S386A-2B	BREAKER TO DD-6 SOUTH CS-12 / TRANS. NO. 7 CS-5 A&B	S386A-7B	BREAKER TO SHORE POWER DD#6 TOP PIER
S386A-2C	BREAKER TO TRANS. OUTSIDE OFFICE	S386A-7C	BREAKER TO PUMP ROOM LINE 1 / MACHINE SHOP / ELECT. SHOP
S386A-3A	BREAKER TO SOUTH SIDE DD#6 / 6-S2A-B-C-D	S386A-8A	MAIN METERING
S386A-3B	BREAKER TO DD-6 NORTH	S386A-8B	MAIN CIRCUIT BREAKER SIDE B
S386A-3C	BREAKER TO FLOOD TOWER NO. 8		
S386A-4A	TRANSFER SCHEME		
S386A-4B	TIE BREAKER		
S386A-5A	BREAKER TO TRANS. T7		
S386A-5B	SPARE		
S386A-5C	SPARE		
S386A-6A	SPARE		

- NOTES:
- SURGE SUPPRESSOR SHALL BE INSTALLED WITHIN THE SAME SECTION AS THE MAIN BREAKER REFER TO SPECIFICATION SECTION '262300' FOR ADDITIONAL INFORMATION.
 - CONTRACTOR SHALL PROVIDE A LABEL STATING THE LOCATION OF THE BREAKER FEEDING THE TRANSFORMER WITHIN SUBSTATION G 4160V GEAR.

CONSULTANTS:

MARK	DATE	DESCRIPTION
	09-09-2024	Final Bid Documents
	09-29-2023	100% Submission
2	07-18-2023	DOB Objections
1	05-30-2023	DOB Objections
	01-04-2023	95% Submission
	10-12-2022	90% Submission
	08-10-2020	60% Resubmission
	03-03-2020	60% Submission
	11-08-2019	30% Submission

DESIGNED BY: CJD/CJS | DRAWN BY: CJD | CHECKED BY: - | REVIEWED BY: -
PROJECT NO: BNYD 1905A | DATE: SEPT 2024 | SCALE: AS SHOWN

Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386



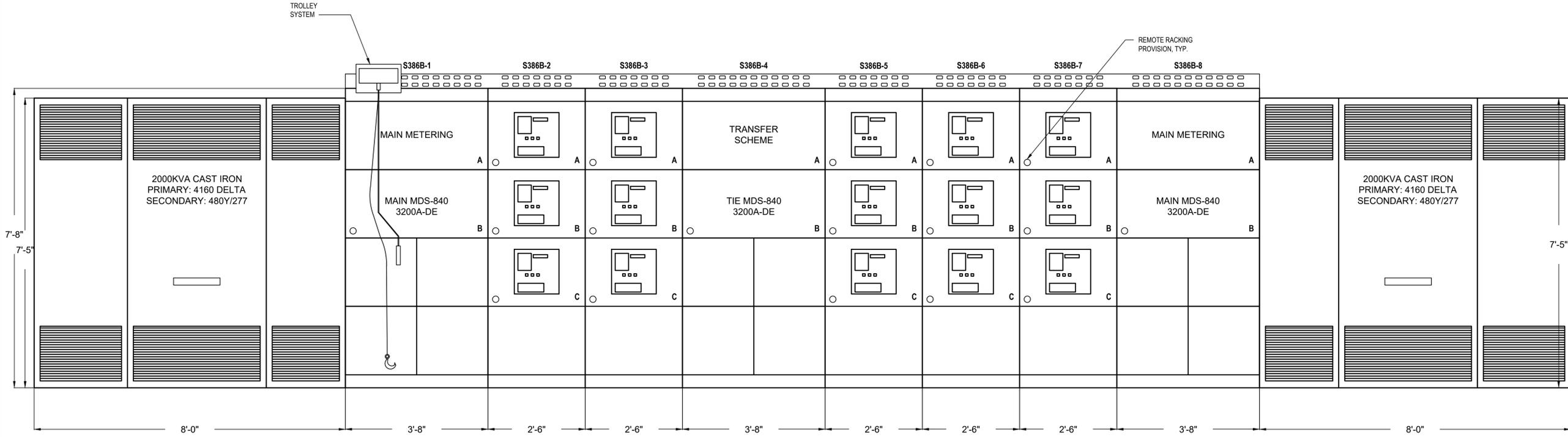
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CONTRACT: **ALL CONTRACTS**

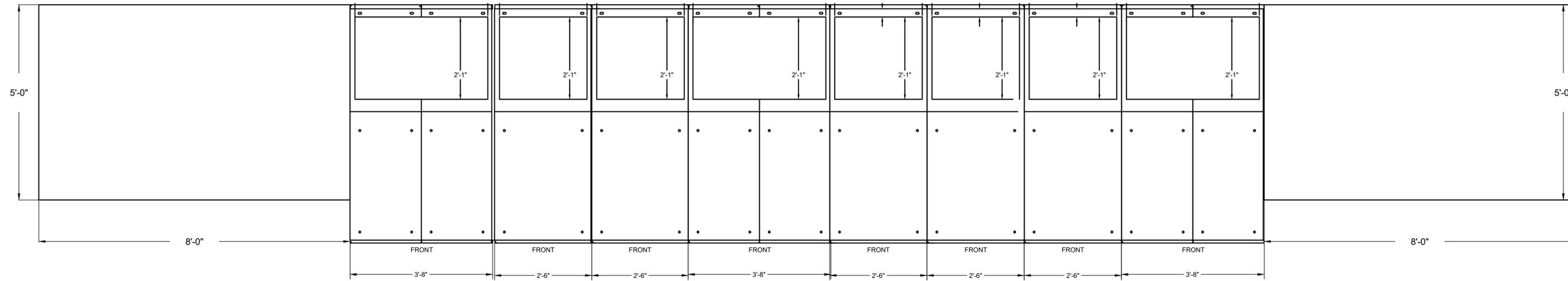
STATUS: **FINAL BID DOCUMENTS**

SHEET TITLE: **LOW VOLTAGE SWITCHGEAR ELEVATION AND PLAN VIEW 2 OF 2**

DRAWING NO: **E-602.00** | SHEET NO: **44** OF **54**



1 Substation 'G' 480 V Switchgear 'B' Elevation
SCALE: 3/4"=1'-0"



2 Substation 'G' 480 V Switchgear 'B' Plan View
SCALE: 3/4"=1'-0"

SWITCHGEAR ELEVATION SCHEDULE			
SECTION	DESCRIPTION	SECTION	DESCRIPTION
S386B-1A	MAIN METERING	S386B-6B	BREAKER TO YELLOW BOX NO.1
S386B-1B	MAIN CIRCUIT BREAKER SIDE A	S386B-6C	BREAKER TO PLATE SHOP
S386B-2A	BREAKER TO FIRE PUMP NO. 1	S386B-7A	BREAKER TO COMPRESSOR ROOM / CAPSTAN S.S.D.D.5
S386B-2B	BREAKER TO EM. BUS TIE/S. B. 5&6 FOR EM. GEN. CAISSON 5	S386B-7B	BREAKER TO MACHINE SHOP ARTURO
S386B-2C	BREAKER TO MACHINE SHOP TRAILER / MACHINE SHOP	S386B-7C	BREAKER TO PUMP WELL LINE NO. 2, PUMP ROOM 5
S386B-3A	BREAKER TO YELLOW BOX NO. 5	S386B-8A	MAIN METERING
S386B-3B	BREAKER TO CHEM PINONER / NO. SIDE DD#5 / YELLOW BOX NO. 2	S386B-8B	MAIN CIRCUIT BREAKER SIDE B
S386B-3C	SPARE		
S386B-4A	TRANSFER SCHEME		
S386B-4B	TIE BREAKER		
S386B-5A	BREAKER TO TRANS. T8		
S386B-5B	SPARE		
S386B-5C	BREAKER TO NO. SIDE D.D.5 / SS2-A-B-C		
S386B-6A	BREAKER TO TRANSFORMER NO. 11 SUB STATION L-7		

- NOTES:
- SURGE SUPPRESSOR SHALL BE INSTALLED WITHIN THE SAME SECTION AS THE MAIN BREAKER REFER TO SPECIFICATION SECTION '262300' FOR ADDITIONAL INFORMATION.
 - CONTRACTOR SHALL PROVIDE A LABEL STATING THE LOCATION OF THE BREAKER FEEDING THE TRANSFORMER WITHIN SUBSTATION G 4160V GEAR.

CONSULTANTS:

MARK	DATE	DESCRIPTION
	09-09-2024	Final Bid Documents
	09-29-2023	100% Submission
2	07-18-2023	DOB Objections
1	05-30-2023	DOB Objections
	01-04-2023	95% Submission
	10-12-2022	90% Submission
	08-10-2020	60% Resubmission
	03-03-2020	60% Submission
	11-08-2019	30% Submission

DESIGNED BY: CJD/CJS DRAWN BY: CJD CHECKED BY: - REVIEWED BY: -
PROJECT NO: BNYD 1905A DATE: SEPT 2024 SCALE: AS SHOWN

Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386



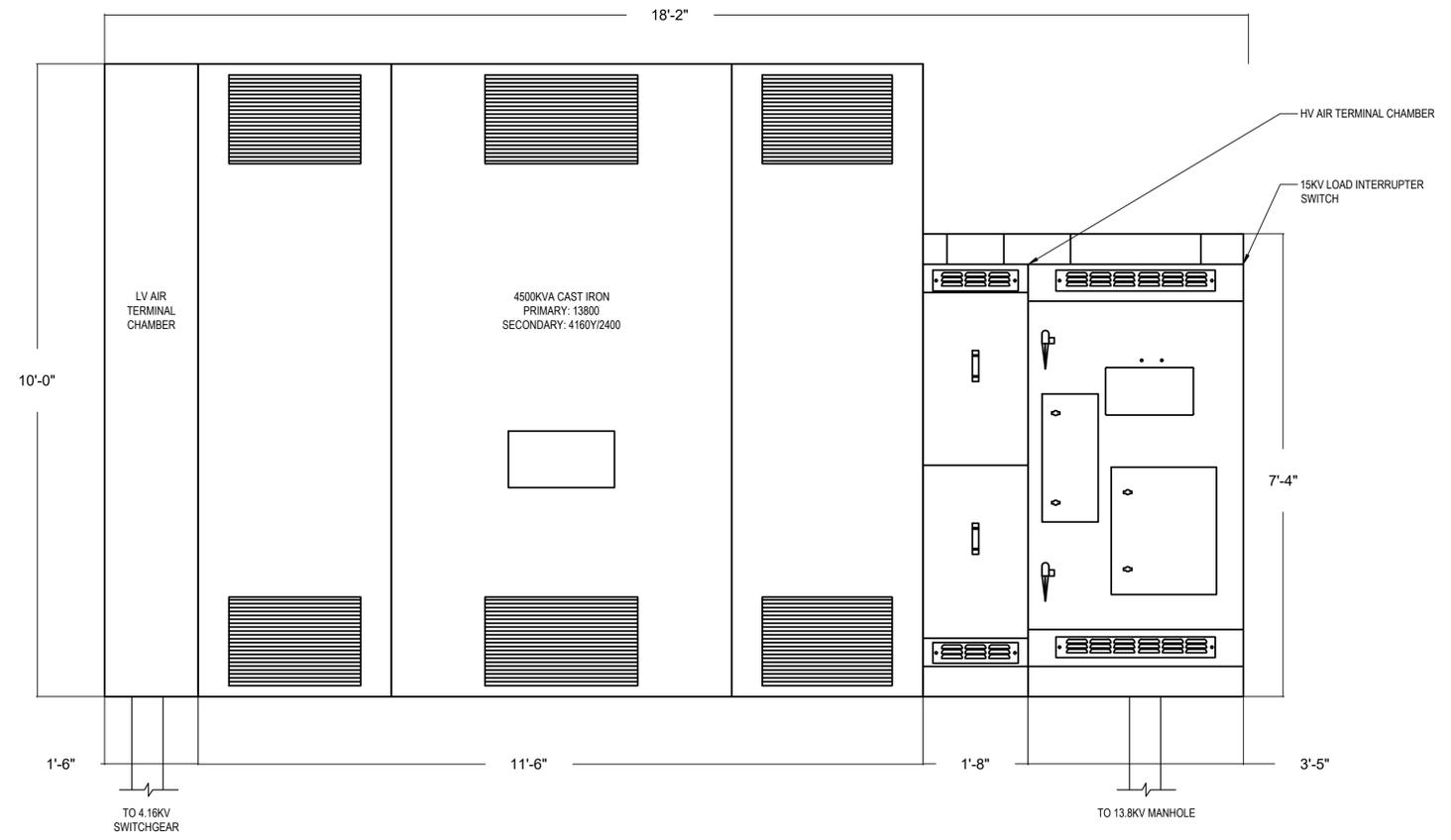
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CONTRACT
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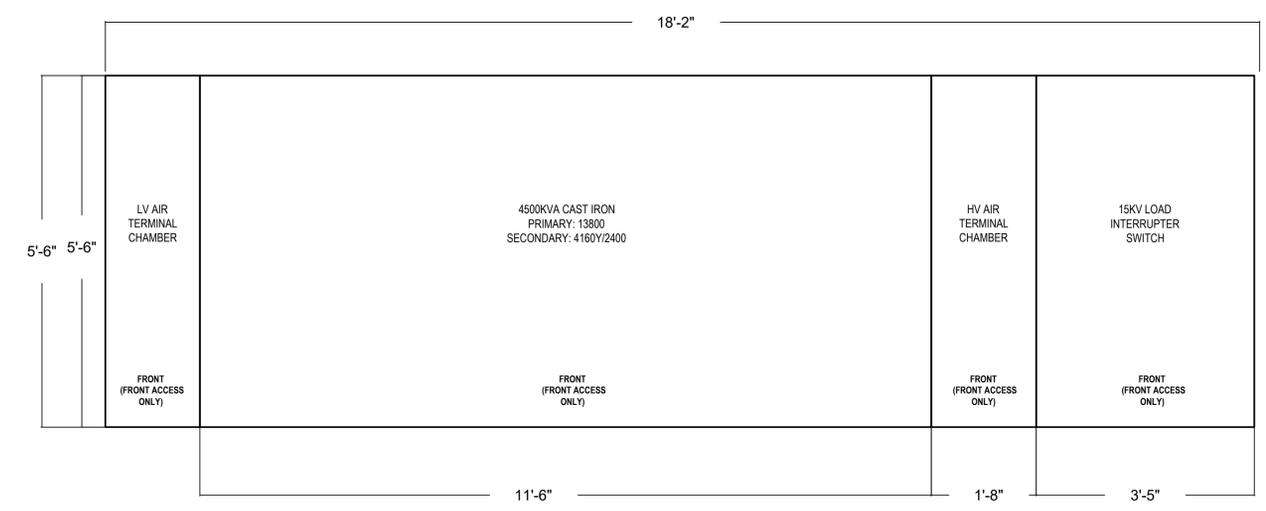
STATUS
FINAL BID DOCUMENTS

SHEET TITLE
EXTERIOR MEDIUM VOLTAGE SWITCHGEAR ELEVATION AND PLAN VIEW

DRAWING No. **E-603.00** SHEET No. **45** OF **54**



1 Exterior Medium Voltage Equipment Elevation
SCALE: 3/4"=1'-0"



2 Exterior Medium Voltage Equipment Plan View
SCALE: 3/4"=1'-0"

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CONSULTANTS:

MARK	DATE	DESCRIPTION
	09-09-2024	Final Bid Documents
	09-29-2023	100% Submission
2	07-18-2023	DOB Objections
1	05-30-2023	DOB Objections
	01-04-2023	95% Submission
	10-12-2022	90% Submission
	08-10-2020	60% Resubmission
	03-03-2020	60% Submission
	11-08-2019	30% Submission

CLIENT

Brooklyn Navy Yard Development Corporation

RESTORATION OF THE DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL.

DESIGNED BY: CJD/CJS	DRAWN BY: CJD	CHECKED BY: EVI	REVIEWED BY: CJS
PROJECT NO: BNYD 1905A	DATE: SEPT 2024	SCALE:	AS SHOWN

Restoration of Substation G at Building 386

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CONTRACT

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STATUS

FINAL BID DOCUMENTS

SHEET TITLE

ELECTRICAL PANEL SCHEDULES

DRAWING NO. **E-700.00**

SHEET NO. **46** OF **54**

Panel Wiring Schedule (3-Phase)

Panelboard: DP-A Voltage: 120/208V Phase: 3 Wire: 4 AIC Rating: 42,000
Manufacturer: EATON Mains: 1000A Mains Rating: 1200A
Panel Type: PRL4X Mounting: Note:
NEMA Type Enclosure: 12

LOAD DESCRIPTION	BREAKER OPTION	TRIP AMPS AND POLES	CONNECTED LOAD			CIRC. NO.	A	B	C	CONNECTED LOAD			TRIP AMPS AND POLES	BREAKER OPTION	LOAD DESCRIPTION
			ØA	ØB	ØC					ØA	ØB	ØC			
LPA FEED A (NOTE 2)		200A/3P	1000	1000	1000	1	1	2	3	400A/3P		SPARE			
TERMINATION PANEL A		150A/2P				7	8	9	10	150A/2P		TERMINATION PANEL C			
SPARE		20A/1P				11	12	13	14	20A/1P		TERMINATION PANEL D			
TERMINATION PANEL B		150A/2P				15	16	17	18	150A/2P		SPARE			
SPARE		20A/1P				19	20	21	22	20A/1P		SPARE			
SPARE		100A/3P				23	24	25	26	100A/3P		SPARE			
SPARE		200A/3P				27	28	29	30	200A/3P		SPARE			
SPARE		200A/3P				31	32	33	34	200A/3P		SPARE			
SPARE		200A/3P				35	36	37	38	200A/3P		SPARE			
SPARE		200A/3P				39	40	41	42	400A/3P		SPARE			

Connected Totals: ØA: KVA, ØB: KVA, ØC: KVA, Total: KVA Amperes

Breaker Options: AFCI - Arc Fault Circuit Interrupter, AS - Powerlink AS Breaker, AUX - Auxiliary Contacts, GFCI - Ground Fault Circuit Interrupter, HACR - Heating, A/C & Refrigeration, LD - Handle Lock-off Device, PA - Handle Padlock Attachment, SF - Subfeed, ST - Shunt Trip Type, TC - Time Clock Control

NOTES:

1. CONTRACTOR SHALL PROVIDE A NEW TYPED CIRCUIT DIRECTORY IN ACCORDANCE WITH NEC SECTIONS 110.22 AND 408.4. CIRCUITS SHALL BE LABELED WITH DETAILED INFORMATION DESCRIBING THE SWITCHES FUNCTION AND EQUIPMENT LOCATION.

Panel Wiring Schedule (3-Phase)

Panelboard: DP-B Voltage: 120/208V Phase: 3 Wire: 4 AIC Rating: 42,000
Manufacturer: EATON Mains: 1000A Mains Rating: 1200A
Panel Type: PRL4X Mounting: Note:
NEMA Type Enclosure: 12

LOAD DESCRIPTION	BREAKER OPTION	TRIP AMPS AND POLES	CONNECTED LOAD			CIRC. NO.	A	B	C	CONNECTED LOAD			TRIP AMPS AND POLES	BREAKER OPTION	LOAD DESCRIPTION
			ØA	ØB	ØC					ØA	ØB	ØC			
LPA FEED B (NOTE 2)		200A/3P	1000	1000	1000	1	1	2	3	400A/3P		SPARE			
SPARE		100A/3P				3	4	5	6	100A/3P		SPARE			
SPARE		100A/3P				7	8	9	10	100A/3P		SPARE			
SPARE		100A/3P				11	12	13	14	100A/3P		SPARE			
SPARE		100A/3P				15	16	17	18	100A/3P		SPARE			
SPARE		100A/3P				19	20	21	22	100A/3P		SPARE			
SPARE		200A/3P				23	24	25	26	200A/3P		SPARE			
SPARE		200A/3P				27	28	29	30	200A/3P		SPARE			
SPARE		200A/3P				31	32	33	34	200A/3P		SPARE			
SPARE		200A/3P				35	36	37	38	200A/3P		SPARE			
SPARE		200A/3P				39	40	41	42	400A/3P		SPARE			

Connected Totals: ØA: KVA, ØB: KVA, ØC: KVA, Total: KVA Amperes

Breaker Options: AFCI - Arc Fault Circuit Interrupter, AS - Powerlink AS Breaker, AUX - Auxiliary Contacts, GFCI - Ground Fault Circuit Interrupter, HACR - Heating, A/C & Refrigeration, LD - Handle Lock-off Device, PA - Handle Padlock Attachment, SF - Subfeed, ST - Shunt Trip Type, TC - Time Clock Control

NOTES:

1. CONTRACTOR SHALL PROVIDE A NEW TYPED CIRCUIT DIRECTORY IN ACCORDANCE WITH NEC SECTIONS 110.22 AND 408.4. CIRCUITS SHALL BE LABELED WITH DETAILED INFORMATION DESCRIBING THE SWITCHES FUNCTION AND EQUIPMENT LOCATION.

DISCONNECT SWITCH SCHEDULE

DISCONNECT SWITCH IDENTIFICATION	TYPE	ENCLOSURE	VOLTS	POLES	FRAME SIZE AMPS	FUSE RATING
DS1	FUSED	NEMA 4X	13800	3	600A	200A
DS2	UNFUSED	NEMA 4X	208	2	60A	-
FCO	FUSED	NEMA 12	208	2	60A	60A

TRANSFORMER SCHEDULE

TRANSFORMER IDENTIFICATION	SIZE	PRIMARY VOLTAGE / PHASE	SECONDARY VOLTAGE / PHASE / WIRE	TYPE	ENCLOSURE	MOUNTING LOCATION
T1	4500 KVA	13.8KV / 3Ø	4.16KV / 3Ø / 4W	DRY	NEMA 3R	FLOOR
T2	4500 KVA	13.8KV / 3Ø	4.16KV / 3Ø / 4W	DRY	NEMA 3R	FLOOR
T3	2000 KVA	4.16KV / 3Ø	480/277V / 3Ø / 4W	DRY	NEMA 1	FLOOR
T4	2000 KVA	4.16KV / 3Ø	480/277V / 3Ø / 4W	DRY	NEMA 1	FLOOR
T5	2000 KVA	4.16KV / 3Ø	480/277V / 3Ø / 4W	DRY	NEMA 1	FLOOR
T6	2000 KVA	4.16KV / 3Ø	480/277V / 3Ø / 4W	DRY	NEMA 1	FLOOR
T7	300 KVA	480 / 3Ø	120/208V / 3Ø / 4W	DRY	NEMA 3R	FLOOR
T8	300 KVA	480 / 3Ø	120/208V / 3Ø / 4W	DRY	NEMA 3R	FLOOR

LIGHTING FIXTURE SCHEDULE

DESIGNATION	SYMBOL	MANUFACTURER	MODEL NUMBER	TYPE	WATTS	COLOR TEMPERATURE	VOLTAGE	LUMENS	MOUNTING	REMARKS	MOUNTING HEIGHT
F1	[Symbol]	COLUMBIA LIGHTING	LXEM4-40ML-EDU	LED	42	4500K	120	5000	PENDANT		8' A.F.F.
F1A	[Symbol]	COLUMBIA LIGHTING	LXEM4-40ML-EDU-ELL14	LED	42	4500K	120	5000	PENDANT	INTEGRAL EMERGENCY BACKUP WITH 90 MINUTES OF BACKUP CAPACITY	8' A.F.F.
F2	[Symbol]	HUBBELL	TRP2-24L-30-3K7-1-UNV	LED	28	3000K	UNV	4065	WALL		8' A.F.F., UON
F2A	[Symbol]	HUBBELL	TRP2-24L-30-3K7-1-UNV-E	LED	28	3000K	UNV	4065	WALL	INTEGRAL EMERGENCY BACKUP WITH 90 MINUTES OF BACKUP CAPACITY	8' A.F.F., UON
F2B	[Symbol]	HUBBELL	TRP2-24L-50-4K7-4-UNV	LED	50	4000K	UNV	5660	WALL		9' A.F.F., UON
F3	[Symbol]	HUBBELL	HOUSING: KTR-4RD-H-SL15L-DM1-1C-EM TRIM: LTR-4RD-T-SL-35K8WDS-EM	LED	19	3500K	UNV	1520	CEILING	INTEGRAL EMERGENCY BACKUP WITH 90 MINUTES OF BACKUP CAPACITY	CEILING
EX	[Symbol]	COMPASS	CER	LED	2	-	120	-	SURFACE	INTEGRAL EMERGENCY BACKUP WITH 90 MINUTES OF BACKUP CAPACITY	CEILING

LIGHTING CONTROL SCHEDULE

DESIGNATION	SYMBOL	MANUFACTURER	MODEL NUMBER	TYPE	WATTS	COLOR TEMPERATURE	VOLTAGE	LUMENS	MOUNTING	REMARKS	MOUNTING HEIGHT
PP	[Symbol]	HUBBELL	UVPP	-	-	-	120	-	WALL		14'-0" A.F.F.
-	[Symbol]	HUBBELL	OMN2000	-	-	-	24	-	PENDANT		10'-0" A.F.F.
-	[Symbol]	HUBBELL	LHMTS10G	-	-	-	120	-	WALL		-
-	[Symbol]	INTERMATICS	K4221C	-	-	-	120	-	WALL		10'-0" ABOVE FIRST FLOOR LEVEL

Panel Wiring Schedule (3-Phase)

Panelboard: LP-A Voltage: 120/208V Phase: 3 Wire: 4 AIC Rating: 42,000
Manufacturer: EATON Mains: 200A Mains Rating: 225A
Panel Type: PRL1X Mounting: Note:
NEMA Type Enclosure: 12

LOAD DESCRIPTION	BREAKER OPTION	TRIP AMPS AND POLES	CONNECTED LOAD			CIRC. NO.	A	B	C	CONNECTED LOAD			TRIP AMPS AND POLES	BREAKER OPTION	LOAD DESCRIPTION
			ØA	ØB	ØC					ØA	ØB	ØC			
SECOND FLOOR RECEPTACLES		20A/1P	1260	1080	1080	1	1	2	3	900	1080	20A/1P		SECOND FLOOR RECEPTACLES	
FIRST FLOOR RECEPTACLES		20A/1P	1080	1300	1300	4	4	5	6	1080	452	20A/1P		FIRST FLOOR RECEPTACLES	
FIRST FLOOR LIGHTING		20A/1P	756	4160	4160	7	7	8	8	882	3120	20A/1P		EXIT/EXTERIOR LIGHTING	
SECOND FLOOR LIGHTING		20A/1P	756	4160	4160	9	9	10	10	882	3120	20A/1P		SECOND FLOOR LIGHTING	
DSCU-2	HACR	40A/2P	43	43	43	11	11	12	12	43	43	40A/2P		BATTERY CHARGER CABINET NO. 1	
DSEU-1	HACR	15A/2P	43	43	43	13	13	14	14	4160	4160	40A/2P	HACR	DSCU-2	
DSEU-3	HACR	15A/2P	43	43	43	15	15	16	16	43	43	15A/2P	HACR	DSEU-2	
480V SWGR REMOTE MIMIC PANELS		20A/1P	1000	500	500	17	17	18	18	43	43	15A/2P	HACR	DSEU-4	
MV SWGR REMOTE MIMIC PANEL		20A/1P	1000	500	500	19	19	20	20	43	43	15A/2P	HACR	DSEU-4	
FACP		60A/1P	1000	2500	2500	21	21	22	22	168	2500	20A/1P		UNDER PLATFORM LIGHTING	
EUH-1	HACR	35A/2P	2500	2500	2500	23	23	24	24	2500	2500	35A/2P	HACR	EUH-2	
EUH-3	HACR	35A/2P	2500	2500	2500	25	25	26	26	2500	2500	35A/2P	HACR	EUH-4	
BATTERY CHARGER CABINET NO. 2		40A/2P	3120	3120	3120	27	27	28	28	2500	2500	50A/2P		LIFT MACHINE CONTROLLER	
EF-1		20A/1P	170	170	170	29	29	30	30	-	-	20A/1P		SUMP PUMP RECEPTACLE	
GD-1		20A/1P	250	250	250	31	31	32	32	-	-	20A/1P		SPARE	

Connected Totals: ØA: 17.4 KVA, ØB: 24.3 KVA, ØC: 17.8 KVA, Total: 60.1 KVA 167 Amperes

Breaker Options: AFCI - Arc Fault Circuit Interrupter, AS - Powerlink AS Breaker, AUX - Auxiliary Contacts, GFCI - Ground Fault Circuit Interrupter, HACR - Heating, A/C & Refrigeration, LD - Handle Lock-off Device, PA - Handle Padlock Attachment, SF - Subfeed, ST - Shunt Trip Type, TC - Time Clock Control

NOTES:

1. CONTRACTOR SHALL PROVIDE A NEW TYPED CIRCUIT DIRECTORY IN ACCORDANCE WITH NEC SECTIONS 110.22 AND 408.4. CIRCUITS SHALL BE LABELED WITH DETAILED INFORMATION DESCRIBING THE SWITCHES FUNCTION AND EQUIPMENT LOCATION.

TRANSFER SWITCH SCHEDULE

TRANSFER SWITCH IDENTIFICATION	TYPE	ENCLOSURE	VOLTS	PHASE	POLES	AMPS
TS1	AUTOMATIC	NEMA 12	208	3Ø	3	400
ATSF0	AUTOMATIC	NEMA 12	208	3Ø	4	60

ELECTRIC JUNCTION BOX SCHEDULE

JUNCTION BOX IDENTIFICATION	DIMENSION (L X W X H)	ENCLOSURE
JB386C1	7' X 6' X 3'	NEMA 1
JB386C2	4' X 3.5' X 3'	NEMA 1
JB386C3	11.5' X 2' X 3'	NEMA 1
JB386C4	14.5' X 2' X 3'	NEMA 1
JB386A1	2' X 7.5' X 3'	NEMA 1
JB386B1	2' X 7.5' X 3'	NEMA 1
JB386A2	2' X 5' X 3'	NEMA 1
JB386B2	2' X 5' X 3'	NEMA 1
JB386A3	7' X 4' X 3'	NEMA 1
JB386B3	7' X 4' X 3'	NEMA 1

NEW ELECTRIC MANHOLE SCHEDULE

MANHOLE IDENTIFICATION	DIMENSION (L X W X H)
EM-2	5' X 5' X 8.5'
EM-3	9' X 5' X 8.5'
EM-4	9' X 5' X 8.5'

CONSULTANTS:

MARK	DATE	DESCRIPTION
	09-09-2024	Final Bid Documents
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2	07-18-2023	DOB Objections
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	10-12-2022	90% Submission
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	03-03-2020	60% Submission
	11-08-2019	30% Submission

ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
CJD/CJS	CJD	EVI	CJS

PROJECT NO.:	DATE:	SCALE:
BNYD 1905A	SEPT 2024	AS SHOWN

CLIENT

**Brooklyn Navy Yard
Development Corporation**

Restoration of Substation G at
Building 386

141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

CONTRACT

ALL CONTRACTS

STATUS

FINAL BID DOCUMENTS

SHEET TITLE

ELECTRICAL DETAILS

DRAWING No.

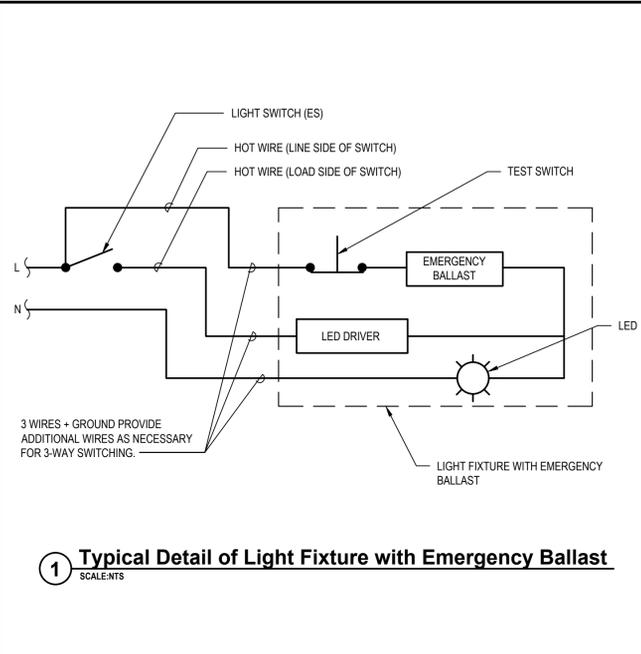
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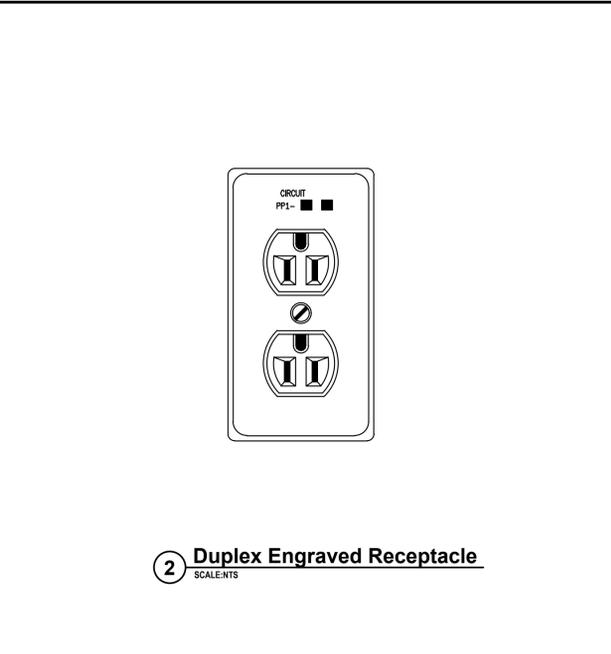
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OF

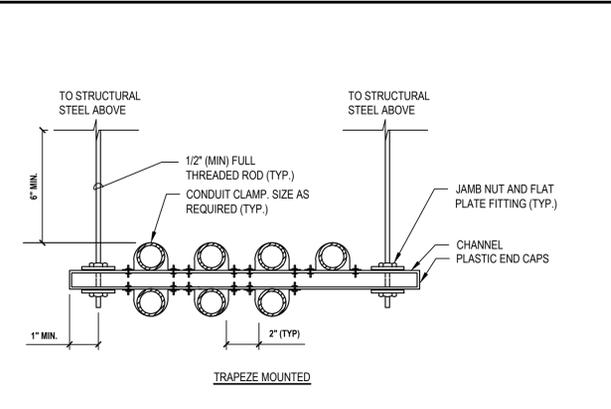
54



1 Typical Detail of Light Fixture with Emergency Ballast
SCALE:N.T.S.



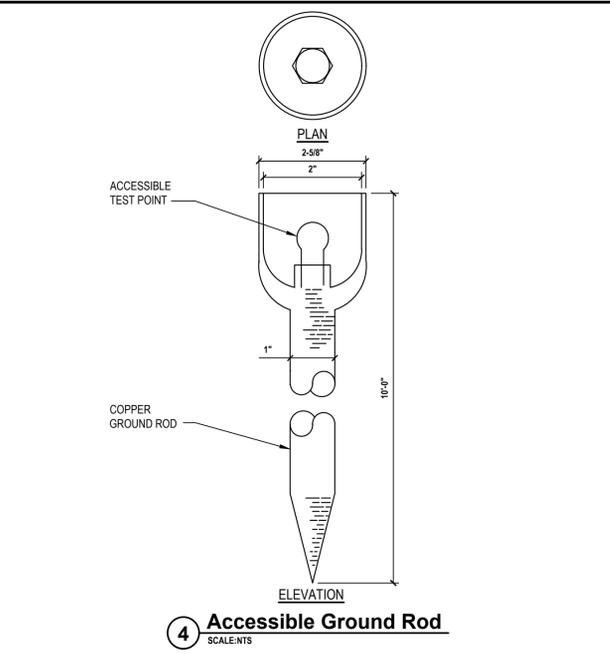
2 Duplex Engraved Receptacle
SCALE:N.T.S.



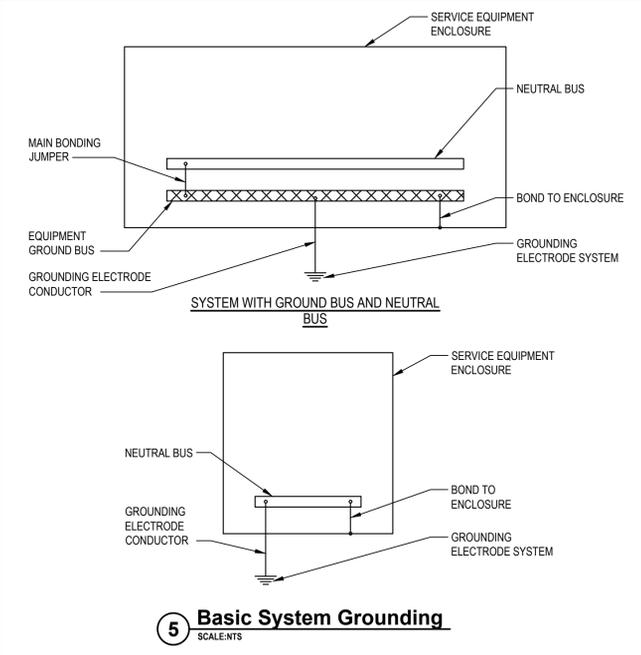
3 Conduit Mounting Details (First Floor)
SCALE:N.T.S.

NOTE:

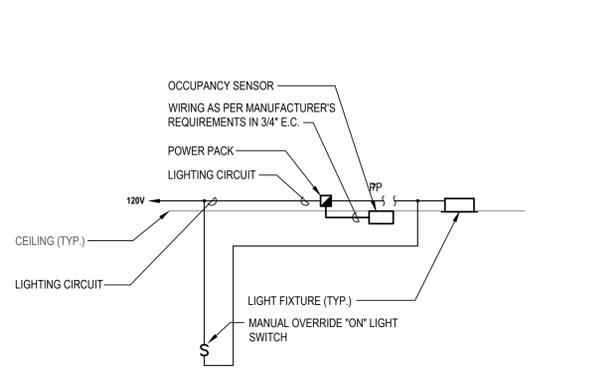
1. PROVIDE ALL MOUNTING HARDWARE INCLUDING BUT NOT LIMITED TO STEEL CHANNELS, THREADED RODS, BEAM CLAMPS, ETC. AS REQUIRED TO SECURELY SUPPORT CONDUIT FROM STRUCTURAL STEEL ABOVE.



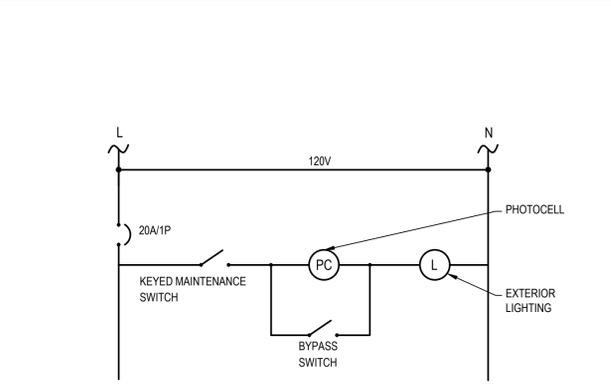
4 Accessible Ground Rod
SCALE:N.T.S.



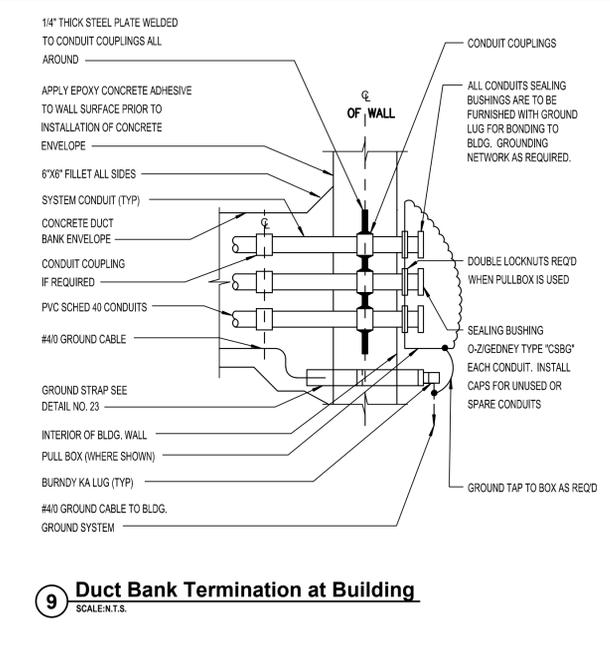
5 Basic System Grounding
SCALE:N.T.S.



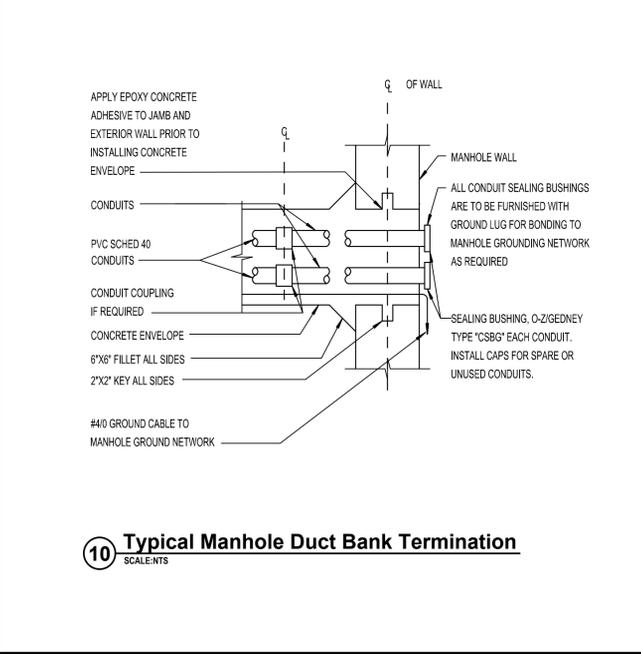
7 Light Fixture with Occupancy Control Sensor
SCALE:N.T.S.



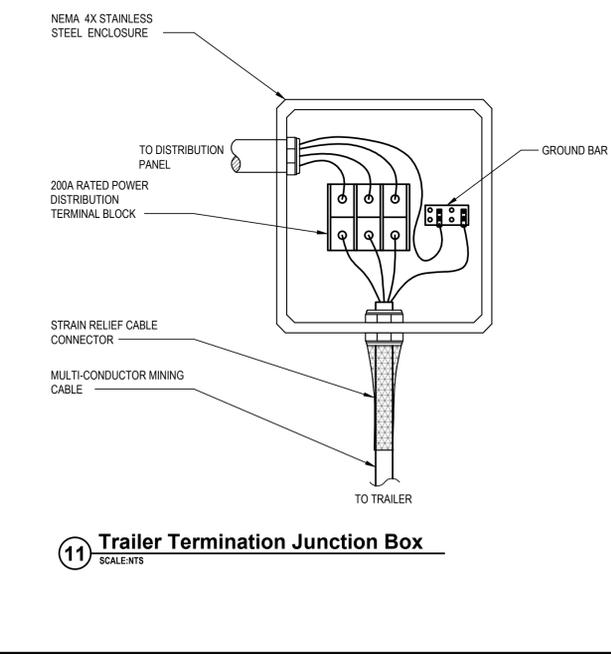
8 Exterior Lighting Wiring Detail
SCALE:N.T.S.



9 Duct Bank Termination at Building
SCALE:N.T.S.



10 Typical Manhole Duct Bank Termination
SCALE:N.T.S.



11 Trailer Termination Junction Box
SCALE:N.T.S.

CONSULTANTS:

MARK	DATE	DESCRIPTION
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	03-03-2020	60% Submission
	11-08-2019	30% Submission

DESIGNED BY: CJD/CJS
DRAWN BY: CJD
CHECKED BY: EVI
REVIEWED BY: CJS

PROJECT NO: BNYD 1905A
DATE: SEPT 2024
SCALE: AS SHOWN

Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386

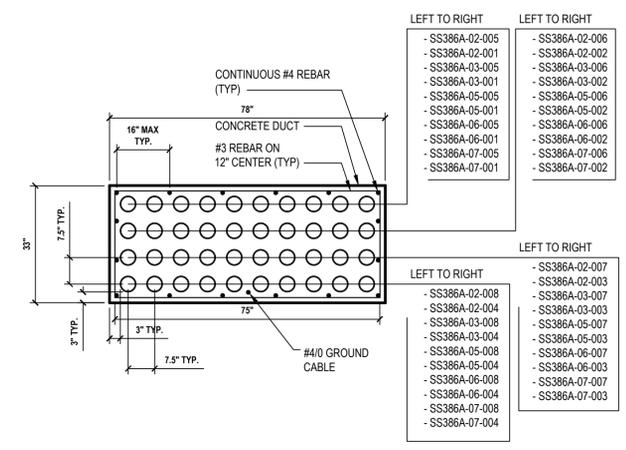


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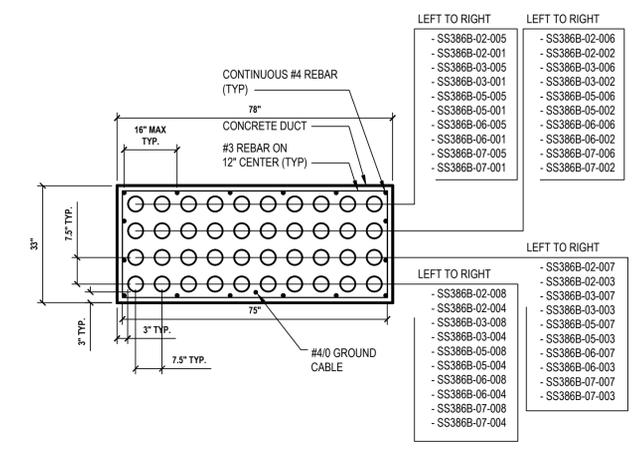
ALL CONTRACTS

FINAL BID DOCUMENTS

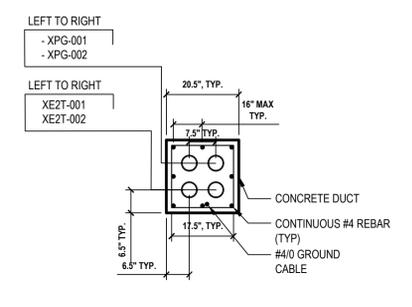
DUCT BANK CROSS SECTIONS



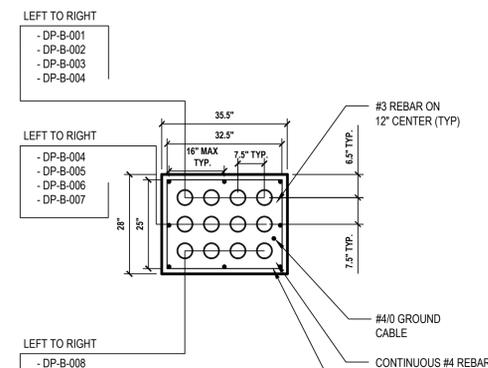
Section A
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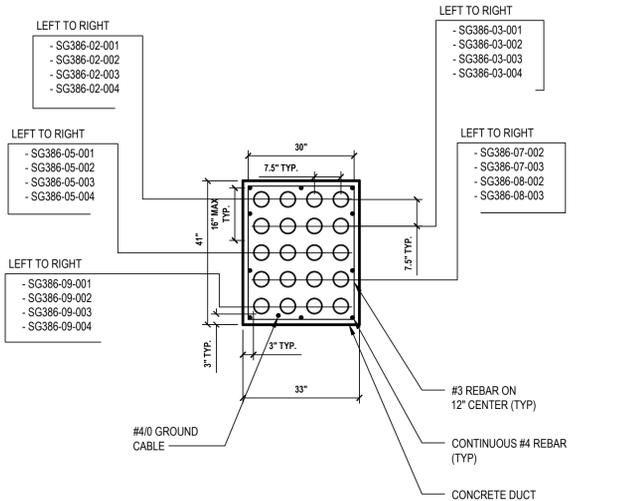
Section B
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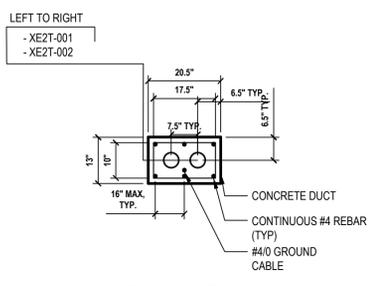
Section C
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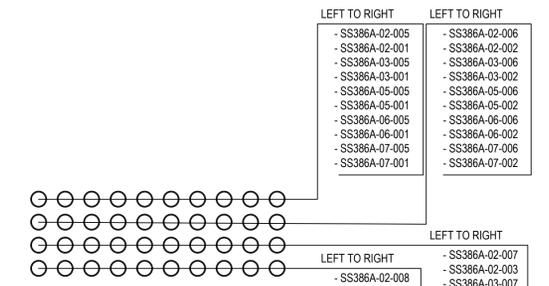
Section D
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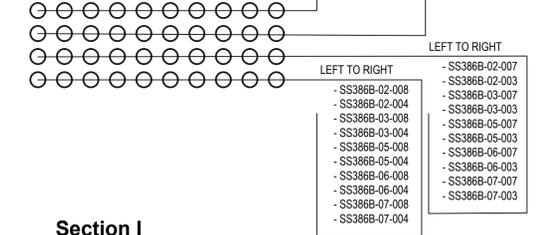
Section E
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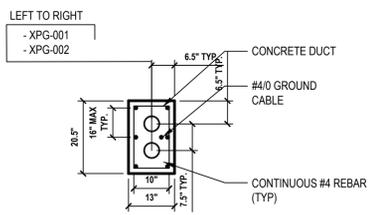
Section F
SCALE: 1/2"=1'-0"



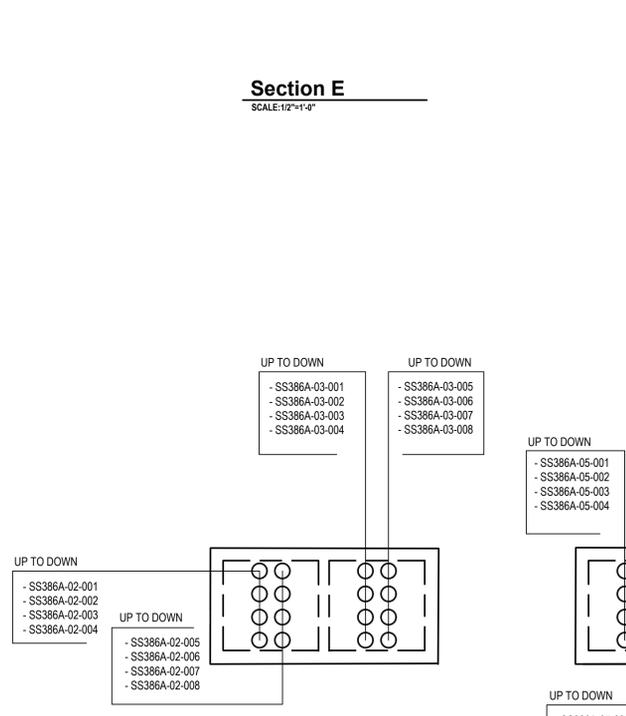
Section H
SCALE: 1/2"=1'-0"



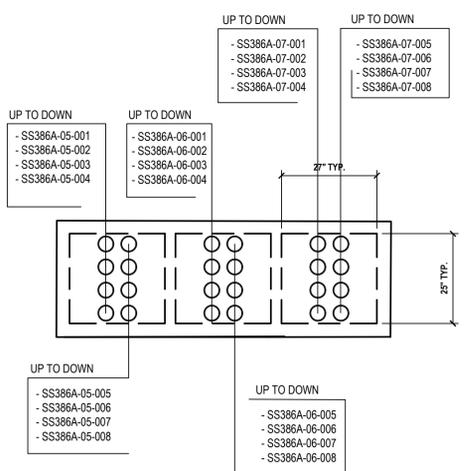
Section I
SCALE: 1/2"=1'-0"



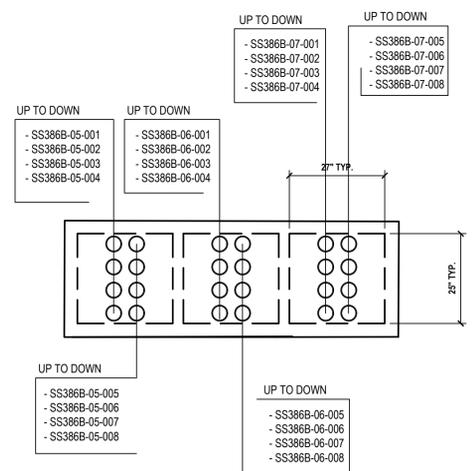
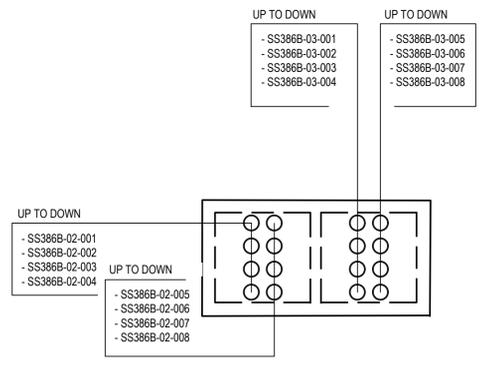
Section G
SCALE: 1/2"=1'-0"



Section J
SCALE: 1/2"=1'-0"



Section K
SCALE: 1/2"=1'-0"



C:\SV01 (Brooklyn Navy Yard) - 40108\BNYD1905A - E2591 - Merged\02-Duct Bank Cross Sections.dwg Last Modified: Sep 11, 2024 11:03:27am Plotted on: Sep 27, 2024 9:58am By: rcs@h2m

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	03-03-2020	60% Submission
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DESIGNED BY: CJD/CJS
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CHECKED BY: EVI
REVIEWED BY: CJS

PROJECT NO: BNYD 1905A
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SCALE: AS SHOWN

CLIENT

Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386

141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

CONTRACT

ALL CONTRACTS

STATUS

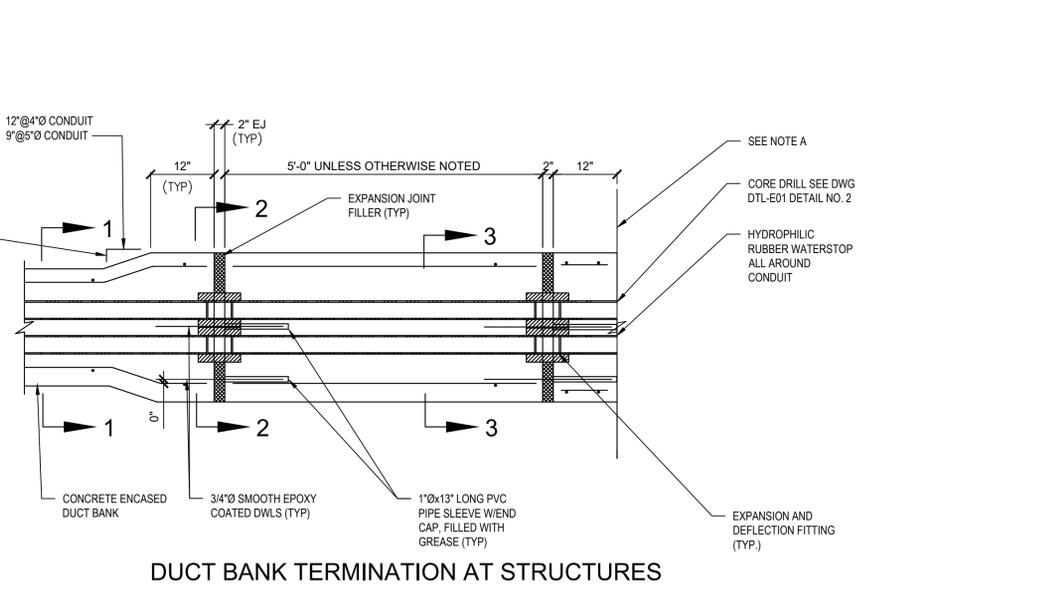
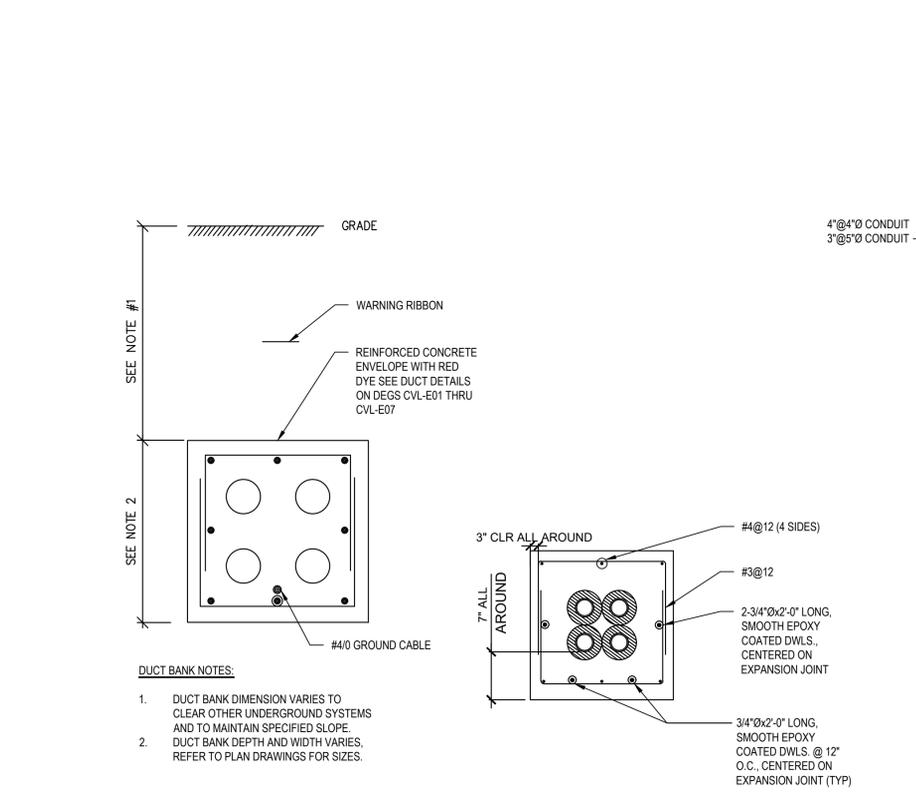
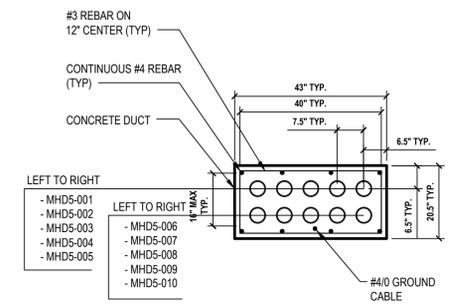
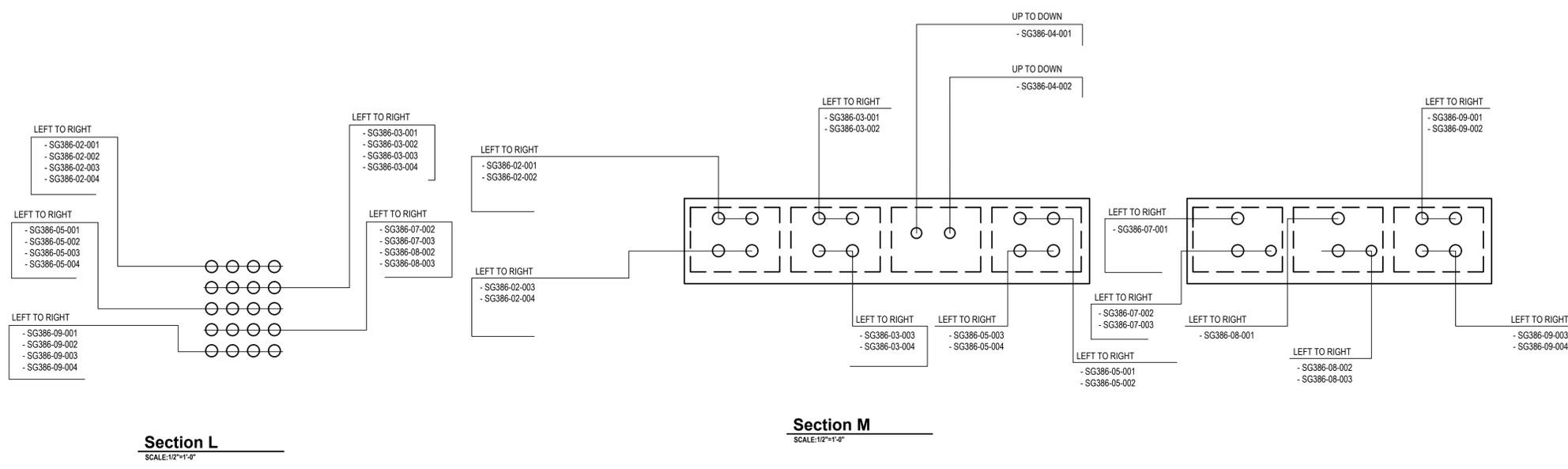
FINAL BID DOCUMENTS

SHEET TITLE

DUCT BANK CROSS SECTIONS 2

DRAWING NO. **E-802.00**

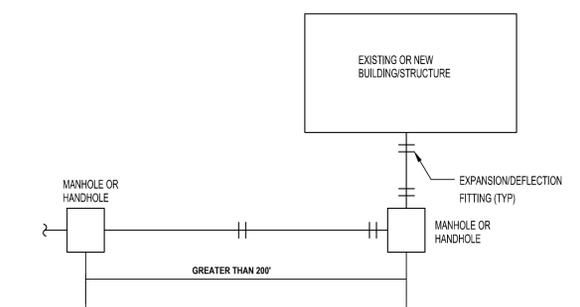
SHEET NO. **49**
OF **54**



DUCT BANK TERMINATION AT STRUCTURES

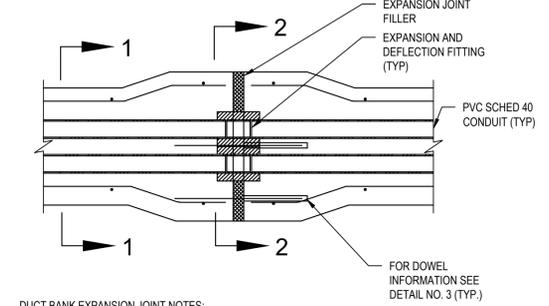
NOTE:
A. FOR CONTINUATION OF CONNECTION AT MANHOLES/HANDHOLES, SEE SHEET E800 DETAIL NO. 10.
B. FOR CONTINUATION OF CONNECTION AT BUILDINGS, SEE SHEET E800 DETAIL NO. 9.
C. SEE DETAIL NO. 3 (THIS SHEET) FOR ADDITIONAL LOCATIONS OF EXPANSION/DEFLECTION FITTINGS.

1 Duct Bank Termination At Structures
SCALE: 1/2"=1'-0"



3 Location of Expansion/Deflection Fittings
SCALE: 1/2"=1'-0"

NOTES:
A. EXPANSION/DEFLECTION FITTINGS SHALL BE INSTALLED AT THE FIRST MANHOLES AND HANDHOLES FROM A STRUCTURE WHERE CONDUIT ENTERS.
B. EXPANSION/DEFLECTION FITTINGS SHALL ALSO BE INSTALLED WHERE DISTANCES BETWEEN MANHOLES AND DISTANCES BETWEEN HANDHOLES ARE SPACED 200 FEET OR GREATER.
C. IN ADDITION, EXPANSION/DEFLECTION FITTINGS SHALL BE INSTALLED AT ALL EXPANSION JOINTS.



DUCT BANK EXPANSION JOINT NOTES:

- DUCT BANKS BETWEEN MANHOLES SPACED AT DISTANCES OF 200 FEET OR GREATER SHALL BE PROVIDED WITH AN EXPANSION JOINT AT MID DISTANCE BETWEEN THE MANHOLE.
- WHEN RUNNING UNDER AND PERPENDICULAR TO A ROADWAY PROVIDE THREE JOINTS, ONE AT THE CENTER AND TWO JOINTS 5'-0" BEYOND THE EDGES OF THE ROADWAY.
- WHEN CROSSING OVER PILE SUPPORTED PIPES OR OTHER STRUCTURES PROVIDE THREE JOINTS ONE AT THE CENTER AND TWO OTHERS TEN FEET ON BOTH SIDES.
- INSTALL EXPANSION/DEFLECTION FITTINGS WHEREVER EXPANSION JOINTS ARE LOCATED. SEE DETAIL NO. 3 (THIS SHEET) FOR ADDITIONAL LOCATIONS OF EXPANSION/DEFLECTION FITTINGS.

2 Duct Bank Expansion Joint
SCALE: 1/2"=1'-0"

- DUCT BANK NOTES:**
- DUCT BANK DIMENSION VARIES TO CLEAR OTHER UNDERGROUND SYSTEMS AND TO MAINTAIN SPECIFIED SLOPE.
 - DUCT BANK DEPTH AND WIDTH VARIES. REFER TO PLAN DRAWINGS FOR SIZES.
- NOTES:**
- WATERPROOFING FOR ALL STRUCTURAL WALLS AND SLABS BELOW GRADE SHALL BE PROVIDED AS REQUIRED BY THE SPECIFICATIONS.
 - MANHOLE WINDOW OPENING SIZES SHALL BE BASED ON DUCT BANK CONFIGURATIONS. THE LOCATION AND ELEVATION OF THE DUCT BANK ENTERING THE MANHOLE AND HANDHOLE SHALL BE DETERMINED BY THE CONTRACTOR BASED ON ACTUAL FIELD CONDITIONS.
 - DIMENSION MAY VARY BASED ON ACTUAL DUCT BANK ELEVATION AND POINT OF PENETRATION INTO MANHOLE OR HANDHOLE.
 - AFTER INSTALLATION OF MANHOLES AND HANDHOLES, THE CONTRACTOR SHALL BE RESPONSIBLE FOR SEALING ALL WATER LEAKS THAT MAY OCCUR DUE TO INSTALLATION OF DUCT BANKS THRU WINDOW OPENINGS, AND WATER LEAKS AT CONSTRUCTION JOINTS.
 - FOR NOTES ON STRUCTURAL ELEMENTS SEE GENERAL STRUCTURAL NOTES AND STANDARD DETAILS ON STRUCTURAL DRAWINGS.
 - ALL MANHOLES AND HAND HOLES COVERS SHALL BE OF HEAVY DUTY CASTINGS SUITABLE FOR HIGHWAY TRAFFIC WITH H20 WHEEL LOADS AND 30% IMPACT ALLOWANCE.
 - ADJUST GROUND ROD LENGTH AND QUANTITY AS NECESSARY TO MEET GROUNDING REQUIREMENTS.

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	08-10-2020	60% Resubmission
	03-03-2020	60% Submission
	11-08-2019	30% Submission

RESTORATION OF SUBSTATION G AT BUILDING 386

DESIGNED BY: CJD/CJS	DRAWN BY: CJD	CHECKED BY: EVI	REVIEWED BY: CJS
PROJECT NO: BNYD 1905A	DATE: SEPT 2024	SCALE: AS SHOWN	

Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386



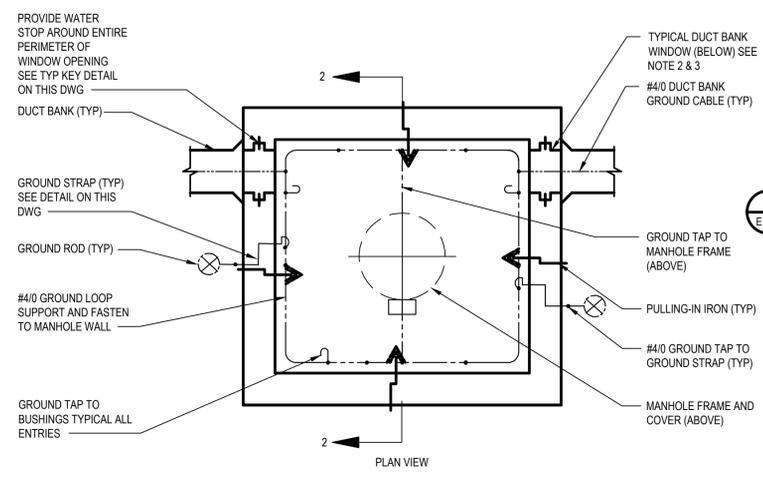
141 Flushing Avenue, Suite 801
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ALL CONTRACTS

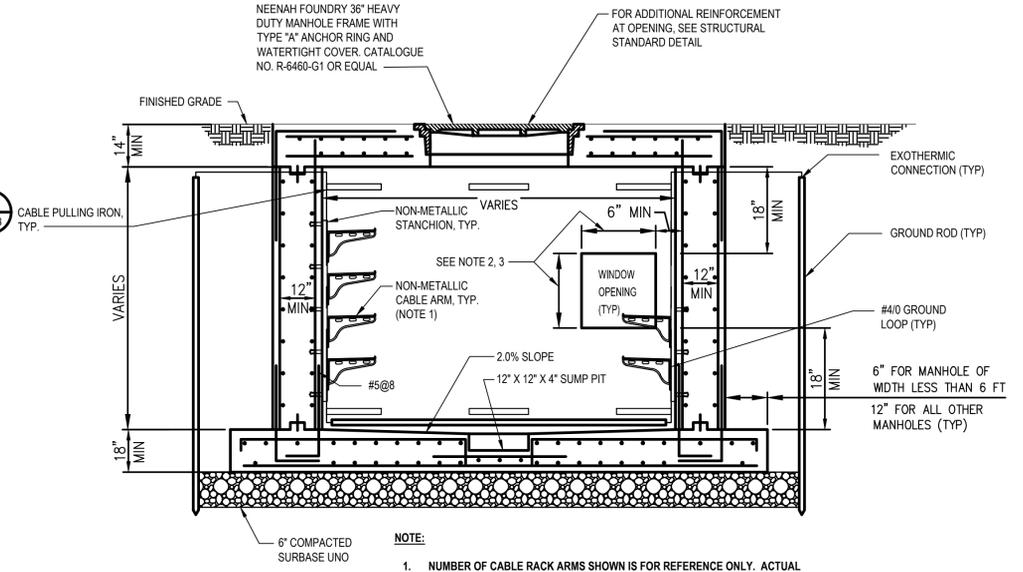
FINAL BID DOCUMENTS

ELECTRICAL MANHOLE DETAILS

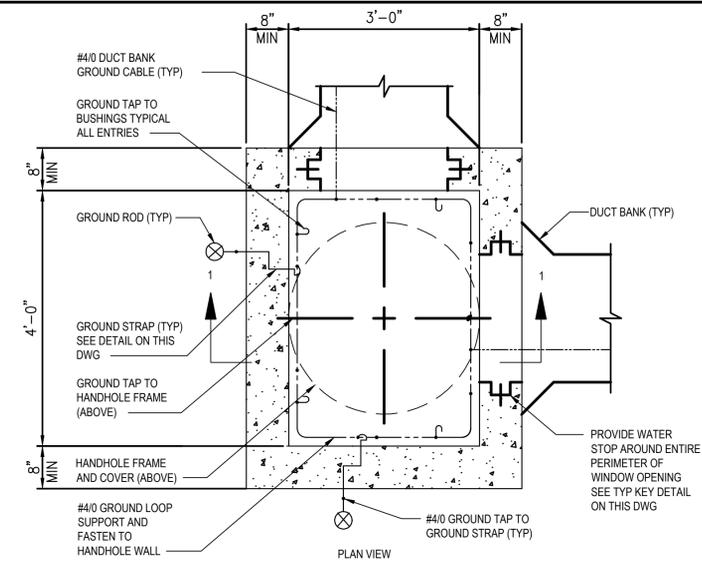
E-803.00
50 OF 54



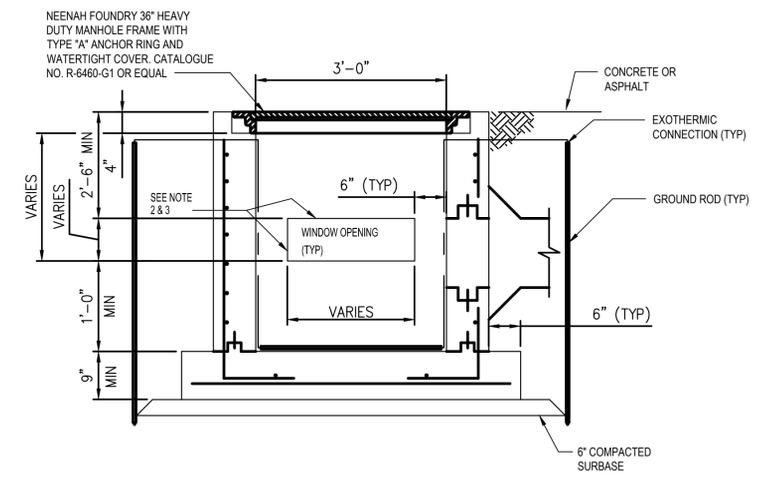
1 Typical Electrical Manhole Detail
SCALE: 1/8" = 1'-0"



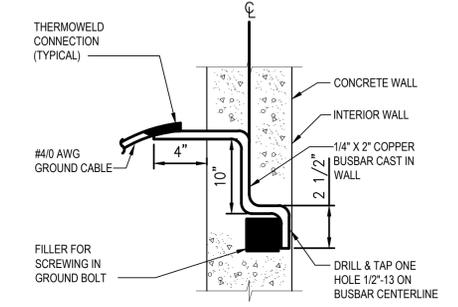
2 Section 2-2
SCALE: 1/8" = 1'-0"



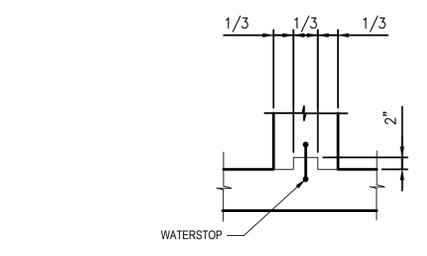
3 Typical Handhole Manhole Detail
SCALE: 1/8" = 1'-0"



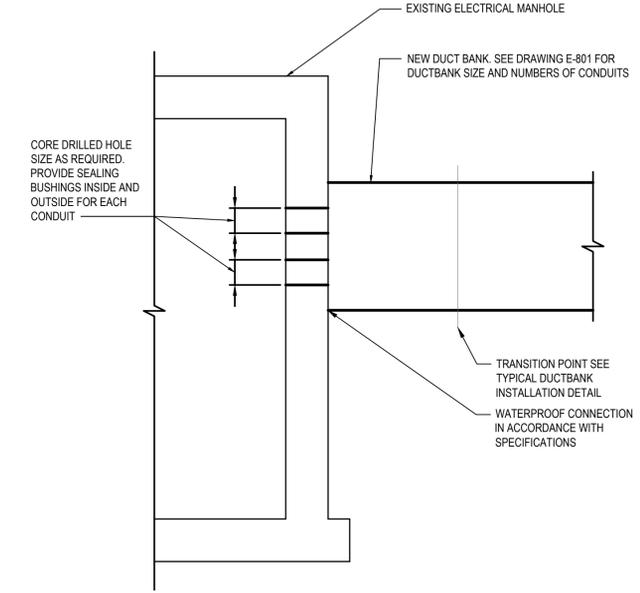
4 Section 1-1
SCALE: 1/8" = 1'-0"



5 Ground Strap
SCALE: 1/8" = 1'-0"



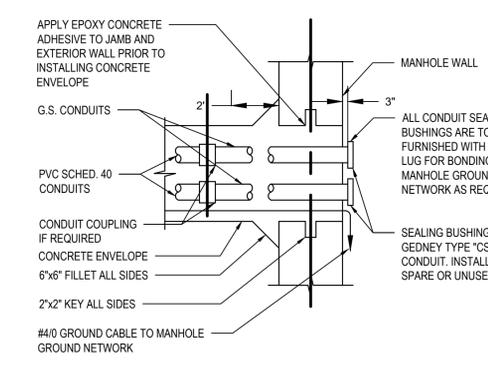
6 Elevation Typ Key Detail At Construction Joints
SCALE: 1/8" = 1'-0"



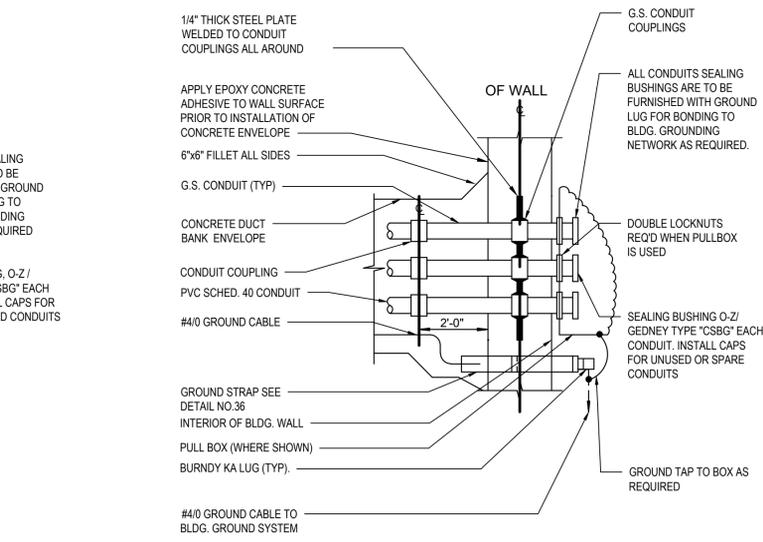
7 Connection To Existing Electrical Manhole
SCALE: 1/8" = 1'-0"

GENERAL ELECTRICAL MANHOLE AND HANDHOLE NOTES:

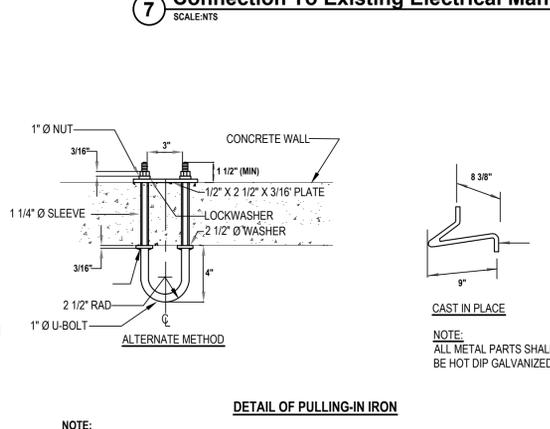
- WATERPROOFING FOR ALL ELECTRICAL MANHOLES SHALL BE IN ACCORDANCE WITH SPECIFICATION 260533.
- MANHOLE WINDOW OPENING SIZES SHALL BE BASED ON DUCT BANK CONFIGURATIONS. THE LOCATION AND ELEVATION OF THE DUCT BANK ENTERING THE MANHOLE SHALL BE DETERMINED BY THE CONTRACTOR BASED ON ACTUAL FIELD CONDITIONS.
- DIMENSION MAY VARY BASED ON ACTUAL DUCT BANK ELEVATION AND POINT OF PENETRATION INTO MANHOLE.
- AFTER INSTALLATION OF MANHOLES, THE CONTRACTOR SHALL BE RESPONSIBLE FOR SEALING ALL WATER LEAKS THAT MAY OCCUR DUE TO INSTALLATION OF DUCT BANKS THROUGH WINDOW OPENINGS, AND WATER LEAKS AT CONSTRUCTION JOINTS.
- FOR NOTES ON STRUCTURAL ELEMENTS, SEE GENERAL STRUCTURAL NOTES AND STANDARD DETAILS ON STRUCTURAL DRAWING.
- ALL MANHOLE COVERS SHALL BE OF HEAVY DUTY CASTINGS SUITABLE FOR HIGHWAY TRAFFIC WITH H20 WHEEL LOADS AND 30% IMPACT ALLOWANCE.
- ADJUST GROUND ROD LENGTH AND NUMBERS AS NECESSARY TO MEET GROUNDING REQUIREMENTS.
- NUMBER OF CABLE RACK ARMS SHOWN IS FOR REFERENCE ONLY. ACTUAL NUMBER OF RACK ARMS MAY VARY PER MANHOLE. PROVIDE MINIMUM OF FOUR (4) CABLE RACKS PER INTERIOR WALL.



8 Typical Manhole Duct Bank Termination
SCALE: 1/8" = 1'-0"



9 Duct Bank Termination at Building
SCALE: 1/8" = 1'-0"



- NOTE:**
- CABLE PULLING IRONS TO BE MADE FROM GALVANIZED ROD AND HARDWARE. PULLING IRONS SHALL BE LOCATED DIRECTLY OPPOSITE AND BELOW DUCT LINE ENTRANCE AND HOOK ENDS TO BE PLACED BACK OF REINFORCING RODS. ADDITIONAL IRONS SHALL BE LOCATED ON ADJACENT WALLS TO FACILITATE CABLE PULLING ARRANGEMENT.

10 Pulling Iron Detail
SCALE: 1/8" = 1'-0"

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	11-08-2019	30% Submission

"ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL."

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
CJD/CJS	CJD	EVI	CJS

PROJECT NO.:	DATE:	SCALE:
BNYD 1905A	SEPT 2024	AS SHOWN

CLIENT
Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386



141 Flushing Avenue, Suite 801
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CONTRACT
ALL CONTRACTS

STATUS
FINAL BID DOCUMENTS

SHEET TITLE
ELECTRICAL FIRST FLOOR GROUNDING PLAN

DRAWING No.
E-804.00

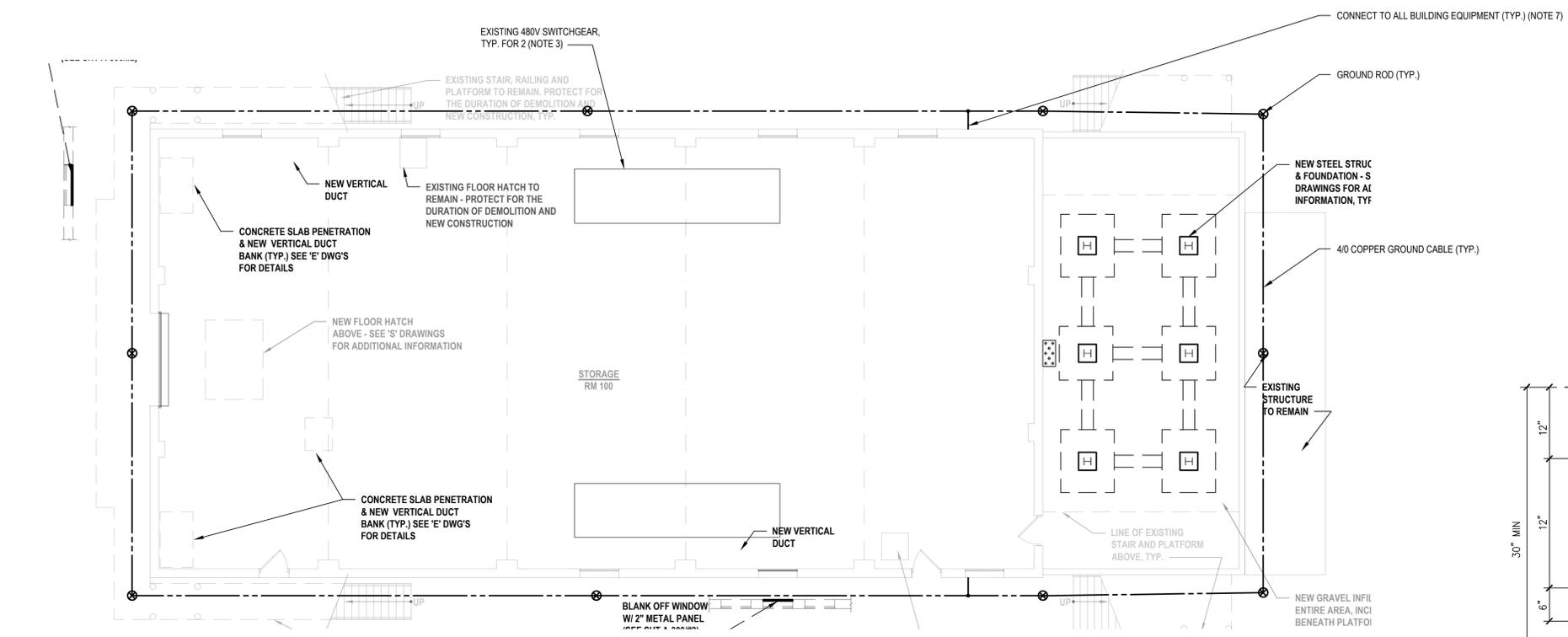
SHEET No.
51
OF
54

POWER PLAN GENERAL NOTES:

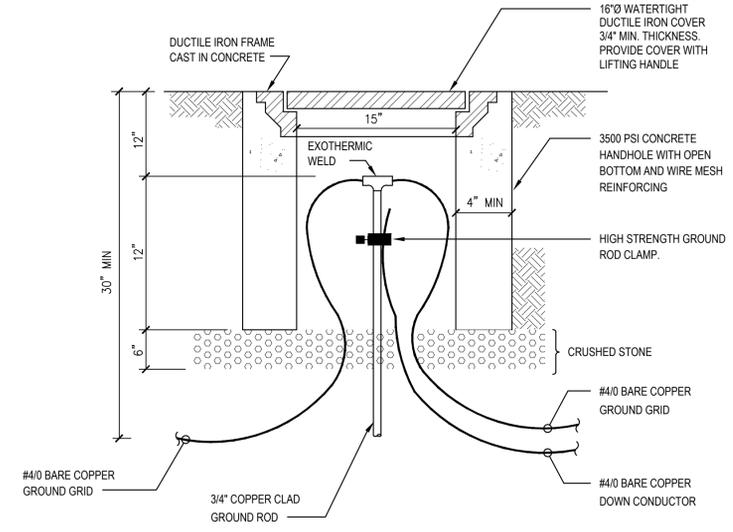
- G1. FOR ADDITIONAL GROUNDING DETAILS AND REQUIREMENTS, REFER TO SPECIFICATION SECTION 260526

NOTE:

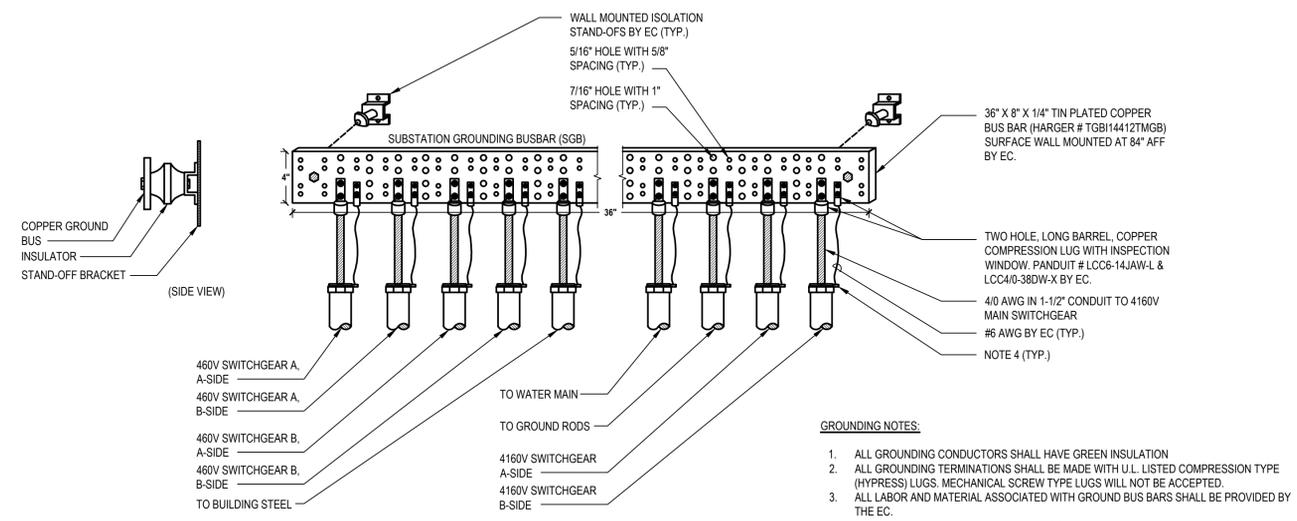
- GROUND TERMINAL (ROD) SHALL BE 3/4" IN DIAMETER AND 10 FT LONG COPPER CLAD STEEL AND SHALL BE LOCATED 1 FT (MINIMUM) BELOW GRADE AND 2 FT FROM THE BUILDING FOUNDATION.
- GROUND ROD CONNECTION SHALL BE WELDING, BRAZING, OR CLAMPS. CLAMPS SHALL BE SECURED WITH AT LEAST TWO (2) BOLTS.
- INSTALL GROUND TEST WELL (SEE DETAIL NO. 2 BELOW) AT EACH GROUND ROD LOCATION.
- GROUND ALL STEEL ELECTRICAL EQUIPMENT, MECHANICAL EQUIPMENT, PROCESS PIPING, TRANSFORMERS, SITE LIGHTING, FENCES, AND GATES IN ACCORDANCE WITH THE REQUIREMENTS OF SECTION 260526.
- ALL GROUND CONDUCTORS STUBBED-UP SHALL BE INSTALLED IN SCHEDULE 80 PVC CONDUIT.
- IF GROUND RODS CANNOT BE DRIVEN VERTICALLY DUE TO SUB-GRADE CONDITIONS/OBSTRUCTIONS, GROUND RODS SHALL BE BURIED HORIZONTALLY A MINIMUM OF 2'-6" BELOW GRADE.
- CORE DRILL AS REQUIRED FOR GROUNDING. PENETRATION TO ENTER BUILDING. SEAL PENETRATION WITH NON-SHRINK GROUT PAINT TO MATCH THE SURROUNDING.



1 Electrical First Floor Power Plan
SCALE: 1/4"=1'-0"



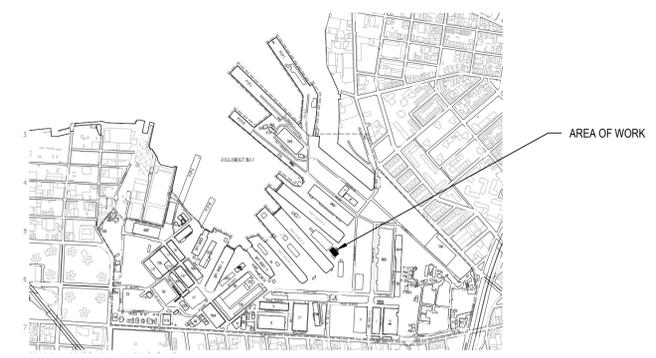
2 Ground Test Well
SCALE: 1/2"=1'-0"



GROUNDING NOTES:

- ALL GROUNDING CONDUCTORS SHALL HAVE GREEN INSULATION
- ALL GROUNDING TERMINATIONS SHALL BE MADE WITH U.L. LISTED COMPRESSION TYPE (HYPRESS) LUGS. MECHANICAL SCREW TYPE LUGS WILL NOT BE ACCEPTED.
- ALL LABOR AND MATERIAL ASSOCIATED WITH GROUND BUS BARS SHALL BE PROVIDED BY THE EC.
- THE EC SHALL INCLUDE A U.L. LISTED GROUND CLAMP BUSHING AT THE END OF ALL GROUND CONDUIT RACEWAYS TO GROUND CONDUCTOR OR SUBSTATION GROUNDING BUSBAR AT THE BUSHING CONNECTOR.

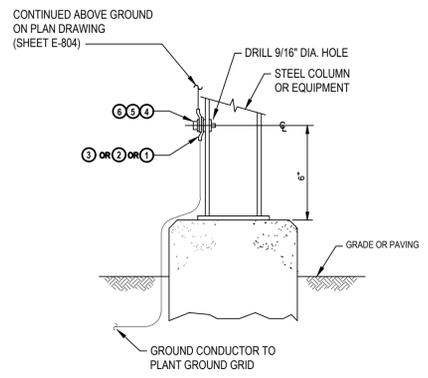
3 Grounding BusBar Detail
SCALE: N.T.S.



Site Key Plan
SCALE: N.T.S.

CONSULTANTS:

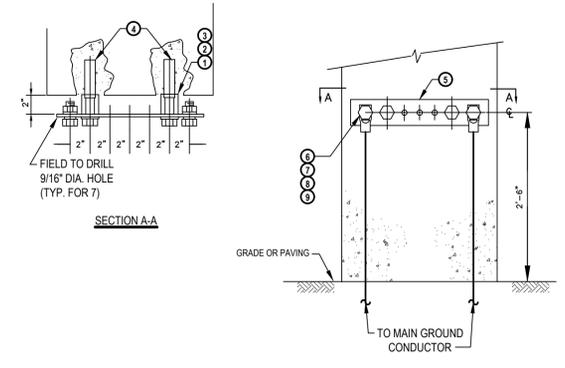
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G02A - #2 AWG
G02B - #2/0 AWG
G02C - #4/0 AWG
G02D - #4/0 WITH #2 AWG CONTINUED ABOVEGROUND
G02E - #4/0 WITH #2/0 AWG CONTINUED ABOVEGROUND
G02F - #4/0 WITH #4/0 AWG CONTINUED ABOVEGROUND

ITEM	DESCRIPTION	QUANTITY					
		G02A	G02B	G02C	G02D	G02E	G02F
1	CABLE LUG, COMPRESSION, COPPER, #2 AWG - 1/2" STUD	1	—	—	1	—	—
2	CABLE LUG, COMPRESSION, COPPER, #2/0 AWG - 1/2" STUD	—	1	—	—	1	—
3	CABLE LUG, COMPRESSION, COPPER, #4/0 AWG - 1/2" STUD	—	—	1	—	—	—
4	BOLT, HEX, 1/2"-13 X 2", SILICON BRONZE	1	1	1	1	1	1
5	LOCKWASHER, 1/2", SILICON BRONZE	1	1	1	1	1	1
6	NUT, HEX, 1/2"-13, SILICON BRONZE	1	1	1	1	1	1

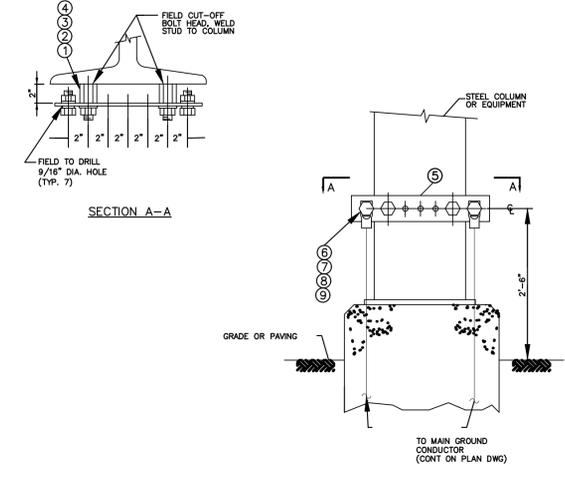
1 Steel Column Grounding Assembly
SCALE: N.T.S.



NOTE:
GROUND BAR MAY BE INSTALLED EITHER HORIZONTALLY OR VERTICALLY, DEPENDING ON AVAILABLE SPACE.

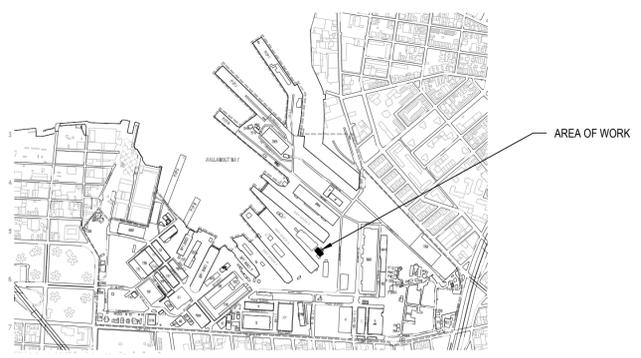
ITEM	DESCRIPTION	QUANTITY
		G03
1	CONDUIT SLEEVE, 1" RGS, 2" LONG	2
2	BOLT, MACH, 1/2"-13 X 3", ZINC PLATED STEEL	2
3	LOCKWASHER, 1/2", ZINC PLATED STEEL	2
4	EXPANSION ANCHOR, 1/2"-13	2
5	BAR, COPPER, 1/4" X 2" X 14"	1
6	BOLT, HEX, 1/2"-13 X 2", SILICON BRONZE	2
7	LOCKWASHER, 1/2", SILICON BRONZE	2
8	NUT, HEX, 1/2"-13, SILICON BRONZE	2
9	CABLE LUG, COMPRESSION, COPPER, #4/0 AWG - 1/2" STUD	2

2 Ground Bus Bar Concrete Mouted Assembly
SCALE: N.T.S.



NOTE:
GROUND BAR MAY BE INSTALLED EITHER HORIZONTALLY OR VERTICALLY, DEPENDING ON AVAILABLE SPACE.

ITEM	DESCRIPTION	QUANTITY
		G04
1	CONDUIT SLEEVE, 1" RGS, 2" LONG	2
2	BOLT, MACH, 1/2"-13 X 3", ZINC PLATED STEEL	2
3	LOCKWASHER, 1/2", ZINC PLATED STEEL	2
4	NUT, HEX, 1/2"-13, ZINC PLATED STEEL	2
5	BAR, COPPER, 1/4" X 2" X 14"	1
6	BOLT, HEX, 1/2"-13 X 2", SILICON BRONZE	2
7	LOCKWASHER, 1/2", SILICON BRONZE	2
8	NUT, HEX, 1/2"-13, SILICON BRONZE	2
9	CABLE LUG, COMPRESSION, COPPER, #4/0 AWG - 1/2" STUD	2



Site Key Plan
SCALE: N.T.S.

ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
CJD/CJS	CJD	EVI	CJS

PROJECT NO.:	DATE:	SCALE:
BNYD 1905A	SEPT 2024	AS SHOWN

Brooklyn Navy Yard Development Corporation

Restoration of Substation G at Building 386



141 Flushing Avenue, Suite 801
Brooklyn, NY 11205

CONTRACT
ALL CONTRACTS

STATUS
FINAL BID DOCUMENTS

SHEET TITLE
ELECTRICAL GROUNDING DETAIL

DRAWING No.
E-805.00

SHEET No.
52
OF
54

C:\S\NYD\Brooklyn Navy Yard - 40708\BND1905A - 022524 - 1033am\02-BM-CAD\02-Conceptual-805.00 - Electrical Grounding Detail.dwg last Modified: Jan 05, 2024 - 2:09pm Printed on: Sep 27, 2024 - 10:03am By: rchegani

TABLE OF CONTENTS

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

000010 SMP COMPLIANCE

DIVISION 01 - GENERAL REQUIREMENTS

011113 SUMMARY OF WORK
 011400 WORK RESTRICTIONS
 012100 ALLOWANCES
 012500 PRODUCT SUBSTITUTION PROCEDURES
 012900 PAYMENT PROCEDURES
 012973 SCHEDULE OF VALUES
 013100 PROJECT MANAGEMENT & COORDINATION
 013119 PROGRESS MEETINGS
 013216 CONSTRUCTION SCHEDULE
 013223 SURVEYING
 013233 CONSTRUCTION PHOTOGRAPHS
 013300 SUBMITTAL PROCEDURES
 014100 REGULATORY REQUIREMENTS
 014320 PRE-INSTALLATION MEETINGS
 014500 QUALITY CONTROL
 014550 ENVIRONMENTAL PROTECTION
 015000 TEMPORARY FACILITIES AND CONTROLS
 015210 OWNER'S AND CONSTRUCTION MANAGER'S FIELD OFFICE
 015213 FIELD OFFICES AND SHEDS
 015719 TEMPORARY ENVIRONMENTAL CONTROLS
 016100 COMMON PRODUCT REQUIREMENTS
 016500 PRODUCT DELIVERY, STORAGE AND HANDLING
 017001 MAINTENANCE OF BUILDING OPERATIONS
 017423 CLEANING
 017500 STARTING AND ADJUSTING
 017800 CLOSEOUT SUBMITTALS
 017823 OPERATING AND MAINTENANCE DATA
 017839 PROJECT RECORD DOCUMENTS
 017843 SPARE PARTS
 017900 DEMONSTRATION AND TRAINING
 015213 FIELD OFFICES AND SHEDS

DIVISION 02 - EXISTING CONDITIONS

022423 CHEMICAL SAMPLING AND ANALYSIS OF SOILS
 022600 HAZARDOUS MATERIALS ASSESSMENT
 024116 STRUCTURE DEMOLITION
 024119 SELECTIVE DEMOLITION
 026100 REMOVAL, TRANSPORT AND DISPOSAL OF CONTAMINATED SOIL
 026120 STAGING, HANDLING, TRANSPORTATION AND DISPOSAL OF NON-HAZARDOUS AND PETROLEUM CONTAMINATED MATERIALS
 028200 ASBESTOS REMEDIATION
 028304 HANDLING OF LEAD CONTAINING MATERIALS

028400	POLYCHLORINATE BIPHENYL (PCB) REMEDIATION
028400.11	MANAGEMENT OF POLYCHLORINATED BIPHENYL (PCB) EQUIPMENT
028600	DISPOSAL OF HAZARDOUS WASTE
028700	REMOVAL AND DISPOSAL OF UNIVERSAL WASTE AND FLUORESCENT LAMPS

DIVISION 03 - CONCRETE

030000	CONCRETE
030130.71	CONCRETE REHABILITATION
033000	CAST-IN PLACE CONCRETE

DIVISION 04 - MASONRY

042113	BRICK MASONRY
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DIVISION 05 - METALS

051200	STRUCTURAL STEEL FRAMING
053100	STEEL DECKING
054000	COLD-FORMED METAL FRAMING
055000	METAL FABRICATIONS
055100	METAL STAIRS AND RAILINGS
055305.11	METAL GRATINGS

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

061000	ROUGH CARPENTRY
061600	SHEATHING

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

072100	THERMAL INSULATION
072800	FLUID-APPLIED MEMBRANE AIR AND WATER BARRIERS
074133.11	GLASS FIBER REINFORCED PLASTIC TANK COVERS
076200	SHEET METAL FLASHING AND TRIM
079200	JOINT SEALANTS

DIVISION 08 - OPENINGS

081113	HOLLOW METAL DOORS AND FRAMES
083336	INSULATED OVERHEAD COILING DOORS
087100	DOOR HARDWARE
088000	GLAZING

DIVISION 09 - FINISHES

092216	NON-STRUCTURAL METAL FRAMING
092900	GYPSUM BOARD
095000	ACOUSTICAL METAL CEILINGS
099100	\PLAIN\RTLCH\AF1\AFS20\ALANG0\AB\LTRCH\F1\FS20\LANG0\LANGNP0\LANGFE0\LANGFENP0PAINTING
099113	EXTERIOR PAINTING

DIVISION 10 - SPECIALTIES

104416 FIRE EXTINGUISHERS

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

230010 GENERAL MECHANICAL REQUIREMENTS
 230015 MECHANICAL DEMOLITION
 230529 PIPE HANGERS AND SUPPORTS
 230555 MECHANICAL SYSTEM IDENTIFICATION
 230594.12 BALANCING OF AIR SYSTEM
 230700 PIPE INSULATION
 230993 SEQUENCE OF OPERATIONS
 232001 CONDENSATE DRAIN PIPING
 232300 REFRIGERANT PIPING
 233113 SHEET METAL WORK
 233416 EXHAUST FANS
 238126 DUCTLESS SPLIT SYSTEM AIR CONDITIONER
 238239 ELECTRIC HEATERS

DIVISION 26 - ELECTRICAL

260000 ELECTRICAL
 260010 ELECTRICAL DEMOLITION
 260513 MEDIUM-VOLTAGE CABLES
 260519 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
 260526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
 260529 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
 260533 RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
 260534 UNDERGROUND DUCTS - DUCTS IN CONCRETE
 260536 CABLE TRAYS FOR ELECTRICAL SYSTEMS
 260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS
 260574 ARC FLASH HAZARD ANALYSIS AND SHORT CIRCUIT COORDINATION STUDY
 261216 SUBSTATION TRANSFORMERS
 261317 MEDIUM VOLTAGE LOAD INTERRUPTER SWITCHGEAR
 261326 METAL-CLAD MEDIUM VOLTAGE SWITCHGEAR
 262200 LOW VOLTAGE TRANSFORMERS
 262300 LOW VOLTAGE METAL-ENCLOSED DRAWOUT SWITCHGEAR
 262400 PANELBOARDS
 262726 WIRING DEVICES
 262816 ENCLOSED SWITCHES AND CIRCUIT BREAKERS
 262917 TRANSFER SWITCH (WALL MOUNT)
 265000 LIGHTING
 265900 CABLE AND CONDUIT SCHEDULE
 267174 TEMPORARY ELECTRICAL SERVICE AND CONTROLS

DIVISION 31 - EARTHWORK

311110 SITE CLEARING
 312213 ROUGH GRADING
 312316 EXCAVATION
 312323.13 BACKFILL
 312333 TRENCHING

314116 EXCAVATION SUPPORT AND PROTECTION
316333 MICRO-PILE SPECIFICATION
316615 HELICAL FOUNDATION PILES

DIVISION 32 - EXTERIOR IMPROVEMENTS

321123.16 RECYCLED CONCRETE AGGREGATE BASE COURSE
321216 ASPHALTIC CONCRETE PAVING
321440 BLUESTONE PAVING

**DIVISION 41 - MATERIAL
PROCESSING AND HANDLING
EQUIPMENT**

412213 BRIDGE CRANE AND
APPURTENANCES

APPENDIX

APPENDIX-A SOIL BORINGS

SECTION 000010 – SMP COMPLIANCE

PART 1 - GENERAL

1.01 SMP COMPLIANCE FOR THE PROJECT

- A. The Work for this project falls within the Voluntary Cleanup Agreement (VCA) area of the Brooklyn Navy Yard (BNY) site. As such, this Work is subject to the requirements of the Site Management Plan (SMP) that is in place.
- B. All Work performed within the VCA area shall comply with the SMP.

1.02 NOMENCLATURE

- A. Where the terms “Qualified Environmental Professional” or “QEP” are used throughout this specification, they shall mean the firm of CORE Environmental Consultants, Inc. as may be abbreviated by CORE.
- B. This Article shall serve as a supplement to Section 011113, “Summary of Work,” Article 1.01, “Nomenclature,” of these Contract Documents.
- C. The Brooklyn Navy Yard (BNY) shall refer to the entire property owned and operated by the Brooklyn Navy Yard Development Corporation (BNYDC).
- D. The Voluntary Cleanup Agreement (VCA) area shall refer to the entire BNY property, with the exception of the areas noted in the Site Management Plan.
- E. The Site Management Plan (SMP) refers to the document titled “Brooklyn Navy Yard Industrial Park, Kings County, Brooklyn, New York Site Management Plan, NYSDEC Site Number V00120,” prepared by CORE Environmental Consultants, Inc. (CORE) for the BNYDC, dated February 2022.
- F. The Excavation Work Plan (EWP) refers to Appendix E of the above-referenced SMP.
- G. Intrusive Activities are defined as any Work activities that breach the on-site engineered cover system that is in place within the VCA area of the Site.
- H. Contamination shall refer to the contaminants of concern for the BNY VCA area, as described in Article 1.04 of this Section.

1.03 PARTIAL LISTING OF OVERALL CONTRACT REQUIREMENTS

- A. Unless otherwise specified, the Contractor shall perform all Work in accordance with the SMP.

1.04 EXISTING CONDITIONS

- A. As stated in Article 1.01, the majority of this project work falls within the VCA area, which is subject to the requirements of the SMP. The main contaminant of concern on the site are polychlorinated biphenyls (PCBs), with the potential for exposure to secondary contamination such as VOCs, SVOCs, and heavy metals.
- B. The existing conditions at the Site require additional protections and requirements that are presented within this Section.

1.05 SUBMITTALS

- A. Submit the following under provisions of Section 013300:
 - a. As part of the Environmental Protection Plan / Erosion Control Plan, as described in Section 015719, “Temporary Environmental Controls,” the Contractor shall provide the following:
 - i. A description of how the Work will be performed;
 - ii. Methods to be employed for excavation;
 - iii. Dewatering;
 - iv. Removal/restoration of pavement.

SECTION 000010 – SMP COMPLIANCE

- b. In the event that inadequate soil must be disposed of off-site as part of this project, the Contractor shall submit the following prior to transportation and disposal off-site:
 - i. An example transportation and disposal manifest for review and approval by BNYDC.
- c. The Contractor shall submit a Site-Specific Health and Safety Plan (SSHASP) to BNYDC a minimum of twenty (20) calendar days prior to the start of any intrusive activities.
- d. Notification of Intrusive Activities prior to the start of intrusive activities.

1.06 SITE ACCESS AND CONTROL

- A. The Contractor shall provide site security in accordance with Appendix E, “Excavation Work Plan,” Section E.2, “Site Security” of the SMP. This includes restricting public access to any open excavations or excavated soil in accordance with the EWP.

1.07 SITE PERSONNEL REQUIREMENTS

- A. All on-site Contractor personnel that may come into contact with soils below the 1’ thick site-wide engineered cover system during intrusive work shall be 40-hour HAZWOPER trained. The Contractor shall submit the certificates of HAZWOPER training completion for these designated personnel as part of the Site-Specific Health and Safety Plan (SSHASP).

1.08 NOTIFICATION OF INTRUSIVE WORK

- A. The Contractor shall notify the BNY of any intrusive activities a minimum of twenty (20) calendar days prior to the start of these intrusive activities. This notification shall include a schedule detailing the start and completion of all intrusive activities.
- B. These intrusive activities may not commence until written authorization to proceed is received from the BNY. BNY is required to notify the NYSDEC of any Site-wide cover breaches a minimum of fifteen (15) calendar days prior to the start of Work.

1.09 TESTING REQUIREMENTS

- A. Any fill material brought to the Site shall meet the lower of the Commercial Use SCOs and the Protection of Groundwater SCOs as set forth in 6 NYCRR Part 375-6.7(d). The Contractor shall identify a clean backfill source meeting these requirements prior to Site mobilization.
- B. The QEP will be responsible for collecting and analyzing backfill samples to ensure that these samples meet the criteria set forth above.
- C. The BNY reserves the right to reject any proposed backfill source for any reason. In the event that a backfill source is rejected, the Contractor shall propose secondary backfill sources to be used. All materials proposed for import onto the Site will be approved by the QEP and will be in compliance with provisions in the SMP prior to receipt at the Site.
- D. The Contractor shall select and notify the BNY of any potential borrow source ten (10) business days prior to importing the material to the Site to allow for testing and laboratory analysis. The BNYDC and QEP are not responsible for any delays to the project associated with sampling and analysis of potential borrow sources.

1.10 ON-SITE RE-USE OF EXCAVATED MATERIAL

- A. Soil excavated from beneath the site-wide engineering cover may be re-used as fill on-site based on soil screening by a QEP. Visual, olfactory, and instrument-based (e.g. photo-ionization detector) soil screening will be performed by a QEP during all excavations into known or potentially impacted material (remaining contamination).
- B. Soil screening will be performed when intrusive work is done and will include all excavation and intrusive work performed.

SECTION 000010 – SMP COMPLIANCE

1.11 DISPOSAL OF SUITABLE EXCESS EXCAVATED MATERIAL

- A. Excess, inadequate material excavated by the Contractor shall become the Contractor's property and is to be properly disposed of at the Contractor's expense. The BNYDC reserves the right to have the Contractor dispose of the material on another site within the yard at no additional cost to the BNYDC.
- B. All excess material excavated from below the site-wide engineered cover shall be properly disposed of off-site at a disposal facility permitted to accept PCB-impacted waste. Prior to off-site transportation and disposal, the Contractor shall propose a disposal facility that is permitted to receive the excess material generated and provide example transportation and disposal waste manifests for review and approval by BNYDC as described in Article 1.05 of this Section.
- C. The Contractor is responsible for obtaining any necessary permits for the transportation and off-site disposal of any excess excavated soil or materials generated from beneath the 1' thick site-wide engineered cover.

1.12 COVER SYSTEM RESTORATION

- A. After completion of soil removal and any other intrusive activities, the site-wide cover system shall be restored in a manner that complies with the SMP. The existing site-wide cover is comprised of buildings, concrete and asphalt pavement, and millings.
- B. The restored site-wide cover shall be comprised of at least 12 inches of soil meeting the Commercial Use SCOs as set forth in 6 NYCRR Part 375-6.7(b), a building, or concrete, asphalt, or millings at least 6 inches in thickness.

1.13 DEWATERING

- A. Means and Methods of construction of the Work are the sole responsibility of the Contractor. The Contractor shall conduct the Work in such a manner that the potential for dewatering fluid generation is limited.
- B. Impacted water originating from equipment decontamination, excavation dewatering, and monitoring well purging shall be pumped into storage tanks for off-site disposal. A licensed liquid hauler shall remove, transport, and dispose of the liquid in compliance with all applicable regulations.
- C. Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream, or river), if any, will be performed under a State Pollutant Discharge Elimination System (SPDES) permit.
- D. The Contractor shall take proper care to protect the excavation from storm events and to ensure that large quantities of dewatering fluid are not generated unnecessarily.
- E. In the event that the Contractor does not include adequate protections during a storm event that results in excavation flooding, the Contractor shall be solely responsible for removal, handling, sampling, and disposal of the excess dewatering fluid at no additional cost to the BNYDC. The Contractor shall not hold BNYDC responsible for any schedule delays experienced due to excavation flooding or additional required dewatering work.

1.14 REFERENCES

- A. This specification shall serve as a supplement to the following specification sections of these Contract Documents:
 - a. Section 011113, "Summary of Work"
 - i. Article 1.01, "Brief Purpose of Project – General"
 - ii. Article 1.02, "Nomenclature"
 - iii. Article 1.05, "Partial Listing of Overall Contract Requirements"
 - iv. Article 1.06, "Existing Conditions"
 - b. Section 011400, "Work Restrictions"
 - i. Article 1.02, "Site Access and Control"
 - ii. Article 1.03, "Work Hours, Employee Conduct and Employee Requirements"

SECTION 000010 – SMP COMPLIANCE

- c. Section 013216, “Construction Schedule”
 - i. Article 1.02, “Schedule Preparation Milestone Dates & Requirements”
- d. Section 014100, “Regulatory Requirements”
 - i. Article 1.02, “Codes”
 - ii. Article 1.03, “Governing Agencies”
- e. Section 015719, “Temporary Environmental Controls”
 - i. Article 1.02, “Definitions”
 - ii. Article 3.01, “Protection of Environmental Resources”
- f. Section 017839, “Project Record Documents”
 - i. Article 1.05, Submittal of Record Documents
- g. Section 312319, “Dewatering”
 - i. Article 1.03, “Project Conditions”
 - ii. Article 1.04, “Regulatory Requirements”
- h. Section 312323, “Backfilling”
 - i. Article 2.01, “Fill Materials”
- i. Section 312333, “Trenching”
 - i. Article 2.01, “Materials”
 - ii. Article 2.04, “Excavation”
 - iii. Article 2.05, “Backfilling”

PART 2 - PRODUCTS
NOT USED

PART 3 – EXECUTION
NOT USED

END OF SECTION 000010

PART 1 - GENERAL

1.01 BRIEF PURPOSE OF PROJECT - GENERAL

- A. The Brooklyn Navy Yard Development Corporation is proceeding with repair damage from Hurricane Sandy and mitigation efforts against future flood-related losses at utility substations and boilers in the Brooklyn Navy Yard. To that end, Building 386 within the Brooklyn Navy Yard is to be addressed with following general scope of work:
1. Electrical:
 - a. Remove two (2) existing 4500kVA oil-filled transformers that step down the voltage from 13.8kV to 2.4kV and replace with two (2) 4500kVA dry-type cast coil transformers that step down the voltage from 13.8kV to 4.16kV;
 - b. Remove four (4) existing 2000kVA oil-filled transformers that step down the voltage from 2.4kV to 480V and replace with four (4) 2000kVA dry-type cast coil transformers that step down the voltage from 4.16kV to 480V;
 - c. Remove 2.4kV switchgear and replace with 4.16kV switchgear;
 - d. Remove and replace two (2) 480V switchgears rated for 2000A;
 - e. Remove two (2) existing 450kVA oil filled transformers that step down the voltage from 480V to 120/240V;
 - f. Remove two (2) existing 100kVA oil-filled transformers that step down the voltage from 480V to 120/208V and replace with two (2) 300kVA dry-type cast coil transformers;
 - g. Remove and replace of all other low voltage equipment;
 - h. Provide associated 120/208V panelboards for new equipment.
 - i. Provide and install new electrical manholes and concrete encased conduit ductbanks.
 - j. Dedicated power for HVAC equipment and stationary crane.
 2. Mechanical:
 - a. Provide a new multi-ductless split heat pump system to provide heating and cooling to the second floor;
 - b. Provide new electric unit heaters on the first floor.
 3. Architectural:
 - a. Build new equipment room on 2nd floor including walls, doors, floor and ceiling with proper fire-rating and sound attenuation;
 4. Structural:
 - a. Remove and replace the entire 2nd floor foundation slab with a new reinforced slab to accommodate new substation.
 - b. Provide additional steel supports to accommodate equipment loads;
 - c. Provide removable concrete floor hatch on second floor slab for equipment replacement access;
 - d. Provide new foundation (i.e. piles, wall and grade beams, etc.), reinforcements and structural steel support structure for stationary crane;

1.02 NOMENCLATURE

- A. Where the terms "Engineer/Architect" or "Architect/Engineer" are used throughout these Contract Documents, they shall mean the firm of H2M architects + engineers as may be abbreviated by H2M.
- B. The terms "Contractor" and/or "Prime Contractor" where used shall refer to the individual or company who has entered into an agreement with the Owner to perform the work contained within these Contract Documents. The lack of word capitalization shall be incidental.
- C. The Contractor may be referred to as the "General Contractor", "Prime Contractor" or similar wording. The lack of word capitalization shall be incidental.

1.03 ABBREVIATED SUMMARY OF WORK

- A. Furnish all labor, equipment, materials, tools, means, methods, and incidentals necessary to complete the Work as required by the Contract Documents for this Construction Contract.
- B. The work included is as shown on the Contract Plans and as outlined in the technical specifications.
- C. All other work shown and specified within the Contract Documents.

1.04 PARTIAL LISTING OF SPECIFIC CONTRACT REQUIREMENTS

- A. The Contract Documents detail the work included in the Contract. Related requirements and conditions covered by the Contract Documents include, but is not limited to, the following:
 - 1. Guidelines and requirements of the New York City Department of Environmental Protection (NYCDEP) and Occupational Safety & Health Administration (OSHA).
 - 2. Coordination with Department of Buildings to obtain required permits and permit inspections.
 - 3. Local laws and ordinances of the City of New York and the Brooklyn Navy Yard Development Corporation.
 - 4. Guidelines and requirements of OSHA.

1.05 PARTIAL LISTING OF OVERALL CONTRACT REQUIREMENTS

- A. The Contract Documents detail the work included in the Contract. Related requirements and conditions covered by the Contract Documents include, but is not limited to, the following:
 - 1. Coordination with the Brooklyn Navy Yard Development Corporation and local consumers (tenants) regarding the interruption of electrical service and subsequent shut-downs of existing electrical;
 - 2. Coordination with utility companies necessary to schedule utility mark-out services and in the event of damage to existing facilities;
 - 3. Coordination with the Brooklyn Navy Yard Development Corporation and the Engineer during testing operations;
 - 4. Coordination with the NYC Electrical Advisory Board (NYCEAB);
 - 5. Coordination with the Brooklyn Navy Yard Development Corporation, the Engineer, the Special Inspector, the Department of Buildings to obtain required permits and permit inspections.
 - 6. Site safety in accordance with all applicable federal, state, and local regulations.

1.06 EXISTING CONDITIONS

- A. The Drawings show certain information that has been obtained by the Owner and various utilities regarding the location of various pipelines, utilities, and structures that exist at the location of the project both below and above grade.
- B. The Owner and the Engineer/Architect expressly disclaims all responsibility for the accuracy or completeness of the information given on the Drawings with regard to existing facilities.
- C. In the case where the Contractor discovers an obstruction not indicated on the Drawings or not described via specification reference, then the Contractor shall immediately notify the Engineer/Architect of the obstructions' existence.
- D. The Engineer/Architect will determine if the obstruction is to be relocated or removed.

- E. Compensation for this extra work will be paid for in accordance with the provisions in the Contract for "EXTRA WORK".

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Site access and control of areas outside of site.
- B. Work hours, employee conduct and miscellaneous employee requirements.
- C. Contract requirements related to maintaining Owner's current operations and excess inspection required.

1.02 SITE ACCESS AND CONTROL

- A. The Contractor shall not close any road for any period in time unless approved ahead of time by the Brooklyn Navy Yard Development Corporation. The Contractor shall take whatever measures are necessary to not cause any inconvenience to the area's residents.
- B. The Contractor is responsible to employ methods to prevent construction materials and/or debris from leaving the work areas. The Contractor is responsible to routinely monitor the areas surrounding the site during the day as well as at the end of the work-day and to immediately clean-up any area to its previous condition.
- C. The Contractor shall employ methods to prevent the transmission of dirt from vehicles driving on exposed areas of the work area from reaching the surrounding roadways. The Contractor will be responsible to immediately clean the roadway, should the measures being taken by the Contractor not satisfactorily control the transmission of any dirt to the roadway.
- D. Any damages to areas outside the site, spills of soil, liquid, or any other material shall immediately be repaired, cleaned and restored to its previous condition.
- E. The Contractor shall comply with all state and local requirements for allowable weight limits of vehicles on all public roads and the requirements of the BNYDC upon their roads.
- F. The Owner reserves the right to back charge the Contractor for all costs associated with maintaining areas outside the work area, which may be disturbed by the Contractor should the Contractor fail to maintain or repair the aforementioned in a condition acceptable to the Owner.
- G. The Contractor shall maintain the premises in a safe condition throughout the construction period. Compliance with OSHA regulations and site safety shall be the responsibility of the Contractor as it relates to work of the Contract. The posting of all applicable OSHA safety signs shall be the responsibility of the Contractor.
- H. Contractor shall be responsible for protecting private property. All existing buildings, structures, shrubs, trees, lawn fixtures, sculptures and misc. equipment shall be protected at all times. Any removals or relocation of said objects, if allowed shall be as directed by the Engineer or Brooklyn Navy Yard Development Corporation. Contractor shall protect all of the physical structures, property and improvements from damage by their Work and shall immediately repair or replace damage caused by construction operations, employees or equipment employed by the Contractor. All labor, materials and equipment and outside contractors that are employed by the Owner to repair damage caused by the Contractor shall be billed to the Contractor directly or withheld from money due the Contractor for work already completed.
- I. Keep all existing driveways, roads, and parking areas free and clear of materials and equipment. Do not unreasonably encumber the work area with materials and equipment.
- J. Immediately remove excess excavated material or relocate to areas on the site requiring placement of fill. Do not stockpile excess material.

- K. The Contractor is responsible for cleaning up the work area. Failure to maintain a clean work site daily, will result in others performing the work and the contractor being back charged for the cleaning cost plus construction administration fees.
- L. Do not discard or dispose of any waste on-site.
- M. The Contractor shall be responsible for managing dust.

1.03 WORK HOURS, EMPLOYEE CONDUCT AND EMPLOYEE REQUIREMENTS

- A. The Contractor will be permitted to schedule working days and hours as specified in the Contract, if no times are specified therein then the work hours shall be Monday - Friday 7:00 am to 3:00 pm unless otherwise noted on the contract plans or applicable permits.
- B. Employees are to act in a professional manner. Any employee using inappropriate language or who is disruptive to the work environment will be banned from the site. Proper work attire is required. Shirts are to be worn at all times and no short pants are permitted.
- C. Any employee found under the influence of any drug or alcohol will be banned from the site.

1.04 CONTRACT REQUIREMENTS RELATED TO MAINTAINING OWNER'S CURRENT OPERATIONS AND EXCESS INSPECTION REQUIRED

- A. The Contractor shall schedule working days and hours as specified. The Contractor shall pay all excess costs for inspection services provided by the Owner/Engineer/Architect for working beyond the times specified.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Allowance pricing for the following items:
 - 1. Independent Laboratory Testing Allowance
 - 2. Contingency Allowance for Additional Work
- B. This Section covers the requirements for use of the cash allowances listed above contained in the proposal (Bid Forms, Price Schedule) and included in the Contract Price bid by the Contractor and defines and stipulates the charges that will be paid for out of the stipulated allowances.
- C. The Contractor shall include the cash allowances stipulated in this Section in the amount bid (Base Bid).
- D. Eligible costs described in this Section, and Sections referenced herein, will be the only costs paid for out of the stipulated allowances.
- E. All other costs associated with the project as specified and/or shown, including but not limited to the delivery, installation and all Contractor overhead and/or collateral expenses are to be distributed among the other portions of the work and shall be included in the lump sum base bid.

1.02 SUBMITTALS

- A. Make all submissions under the provisions of Section 013300.
- B. For each type of product/material specified to be furnished under allowance pricing provide documentation of the unit pricing on manufacturer's letterhead certifying pricing of the product/material.
- C. Submit additional backup information to substantiate the invoiced amount(s) as the Engineer/Architect may require for review and approval, prior to order or payment of item.
- D. Provide written breakdowns for extra work as the Owner may require.

1.03 CHANGES TO STIPULATED (CASH) ALLOWANCE

- A. If the actual cost of services differs from the cash allowance, then the Contract Price will be adjusted accordingly.

1.04 PAYMENTS TO BE MADE OUT OF TESTING ALLOWANCE

- A. Include the cash allowance of \$20,000.00 (TWENTY thousand Dollars and Zero Cents) in the amount bid for independent testing laboratory services specified in Section 014500.
- B. The actual invoiced charges of the testing laboratory, including toning companies where called for, incurred for field and laboratory tests, as specified only in Section 014500 - Quality Control, shall be paid for out of the cash allowance.
 - 1. Any other requirement specified herein throughout these specifications for providing the services of an independent testing laboratory, underground utility location company, or similar outside independent service are to be borne by the Contractor.
 - 2. All costs for quality control services are to be included as part of the Contract Price (Base bid).

- C. One (1) week prior to each partial payment, submit a certified invoice from each company listing and detailing the total costs incurred since the last invoice.
 - 1. The invoice shall be on company letterhead signed by an authorized representative of the company and shall include man-hours, tests conducted, date of tests and associated costs and fees.
 - 2. Payment for costs will not be made unless the information is provided and certified. Payment for costs will not be made unless the typed test data reports have been received by the Engineer.
 - 3. In the case of pipe toning, flags must be set to delineate the route of underground pipes and utilities prior to submission of partial payment request.
- D. If in the event test results (provided by the independent testing laboratory) show non-compliance with these specifications, then at the option of the Contractor and only with the approval of the Owner, he may re-test samples to verify the original test results at his/her own expense.
- E. Costs for re-testing failed components of the work, when ordered by the Engineer/Architect, will not be paid for out of the cash allowance and will be directly borne by the Contractor.
- F. Funds remaining at project closeout shall be credited to the Owner.
- G. Include allowance in lump sum amount in proposal statement. Show as separate line item in Schedule of Values.

1.05 PAYMENTS TO BE MADE OUT OF CONTINGENCY ALLOWANCE FOR ADDITIONAL WORK

- A. Include the cash allowance of \$25,000.00 (TWENTY-FIVE thousand Dollars and Zero Cents) in the amount bid for use upon the Owner's instructions.
- B. Should any additional work be required due to unforeseen conditions or Owner requests, the cost shall be negotiated by the Engineer and paid for out of the allowance. Include allowance in lump sum amount in proposal statement. Show as separate line item in Schedule of Values.
- C. One (1) week prior to each partial payment, submit a certified invoice listing and detailing the total costs incurred since the last invoice. The invoice shall be on company letterhead signed by an authorized representative of the company and shall include man-hours, work conducted, date of work and associated costs and fees.
- D. Funds remaining at project closeout shall be credited to the Owner.

1.06 PAYMENTS TO SUBCONTRACTOR FOR REMOVAL/REPLACEMENT OF WINDOW

- A. Include the cash allowance of \$15,000.00 (FIFTEEN thousand Dollars and Zero Cents) in the amount bid for use upon the Owner's instructions.
- B. One (1) week prior to each partial payment, submit a certified invoice listing and detailing the total costs incurred since the last invoice. The invoice shall be on company letterhead signed by an authorized representative of the company and shall include man-hours, work conducted, date of work and associated costs and fees.
- C. Funds remaining at project closeout shall be credited to the Owner.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section includes the requirements for substitution of specified products during construction.
- B. The Engineer/Architect will consider requests for substitutions only within thirty (30) days from the date of the Notice to Proceed.
- C. Only products not specifically named in the bid are eligible for substitution in accordance with the requirements contained herein these specifications.
- D. Products named by the Bidder, at the time of bid, shall be furnished and installed and substitutions will not be considered by the Owner/Engineer/Architect for those products named in the bid.

1.02 CONTRACTOR'S OPTIONS

- A. For products specified only by reference standard, select any product meeting that standard.
- B. For products specified by naming several products or manufacturers, select any one of the products or manufacturers named which complies with the Specifications.
- C. Where products are not named, then submit products that meet the specifications.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

- A. Name - The Drawings and Specifications list acceptable manufacturers, commercial names, trademarks, brands and other product, material and equipment designations. Such names are provided to establish the required type, quality and other salient requirements of procurement.
- B. Equals - An item equal to that named or described on the Drawings or in the Specifications may be provided by Contractor if accepted by the Engineer/Architect.
- C. A request for product substitution constitutes a representation that the Contractor:
 - 1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
 - 2. Shall provide the same warranty for the Substitution as for the specified Product.
 - 3. Shall coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner, including extra charges by other Prime Contractors, material suppliers, and vendors.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
 - 5. Shall reimburse the Owner and the Engineer/Architect for review or redesign services associated with re-approval by authorities.
 - 6. Shall reimburse the Owner for all additional engineering services claimed by the Engineer for extra services associated with the review of the Contractor's substituted item since it could not have been originally included in the Engineer's professional engineering services agreement. Reimbursement shall be based on the man-hours expended, at current billing rates.
 - 7. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

8. Substitution Submittal Procedure:
 - a. The Contractor shall submit three (3) copies of the Request for Substitution FORM for consideration including all required information.
 - b. The Contractor shall use the form included within this Section.
 - c. All forms shall be type written.
 - d. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.
9. The burden to prove product equivalence rests on the Contractor.
10. The Engineer will notify Contractor in writing of decision to accept or reject request and at that time the Contractor can make a formal submittal in accordance with the requirements contained in Section 013300.
11. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.

PART 3 - EXECUTION

3.01 NOT USED

3.02 REQUEST FOR SUBSTITUTION FORM

3.03 PROJECT: _ SUBSTITUTION REQUEST NUMBER:

3.04 CONTRACTOR:

3.05 ADDRESS:

3.06 DATE:

3.07 H2M PROJECT NUMBER: OWNER:

3.08 CONTRACT NAME: CONTRACT NO.

3.09 SPECIFICATION TITLE:

3.10 SECTION: PAGE: ARTICLE/PARAGRAPH:

3.11 DRAWING NO(S):

3.12 PROPOSED SUBSTITUTION:

3.13 MANUFACTURER: ADDRESS:

3.14 TRADE NAME: PHONE #:

3.15 INSTALLER: ADDRESS:

3.16 PHONE #: () _____

3.17 HISTORY: NEW PRODUCT 2-5 YEARS OLD 5-10 YEARS OLD MORE THAN 10 YEARS OLD

3.18 DIFFERENCES BETWEEN PROPOSED SUBSTITUTION AND SPECIFIED PRODUCT:

3.19 POINT-BY-POINT COMPARATIVE DATA ATTACHED

3.20 REASON FOR NOT PROVIDING SPECIFIED ITEM (ATTACH SEPARATE SHEET IF NECESSARY):

3.21 TYPICAL SIMILAR INSTALLATION:

3.22 PROJECT:

3.23 ENGINEER/ARCHITECT:

3.24 ADDRESS:

3.25 OWNER:

3.26 DATE INSTALLED:

3.27 SUBMIT COMPLETE INSTALLATION LIST ON SEPARATE SHEETS.

3.28 PROPOSED SUBSTITUTION AFFECTS OTHER PARTS OF WORK: NO
YES

3.29 EXPLAIN:

3.30 GROSS SAVINGS TO OWNER FOR ACCEPTING SUBSTITUTION: \$

3.31 PROPOSED SUBSTITUTION CHANGES CONTRACT TIME: NO YES

3.32 ADD / DEDUCT (CIRCLE): DAYS

3.33 SUPPORTING DATA ATTACHED FOR EVALUATION OF THE PROPOSED SUBSTITUTION:

3.34 PRODUCT DATA PHOTOS DRAWINGS TESTS REPORTS
SAMPLES

3.35 OTHER (EXPLAIN):

3.36 ATTACHED DATA INCLUDES DESCRIPTION, SPECIFICATIONS, DRAWINGS, PHOTOGRAPHS, PERFORMANCE AND TEST DATA ADEQUATE FOR EVALUATION OF REQUEST; APPLICABLE PORTIONS OF DATA ARE CLEARLY IDENTIFIED.

3.37 ATTACHED DATA ALSO INCLUDES A DESCRIPTION OF CHANGES TO CONTRACT DOCUMENTS THAT PROPOSED SUBSTITUTION WILL REQUIRE FOR ITS PROPER INSTALLATION.

3.38 THE UNDERSIGNED CERTIFIES THAT THE FOLLOWING PARAGRAPHS, UNLESS MODIFIED BY ATTACHMENTS, ARE CORRECT:

- A. Proposed Substitution has been fully checked and coordinated with Contract Documents.
- B. Proposed Substitution does not affect dimensions shown on Drawings.
- C. Proposed Substitution does not require revisions to any other Prime Contractor's work.
- D. The undersigned will pay for changes to building design, including Architectural and Engineering design, detailing, and construction costs caused by requested Substitution.
- E. Proposed Substitution will have no adverse affect on other trades, construction schedule, or specified warranty requirements.
- F. Maintenance and service parts will be locally available for proposed substitution.
- G. The undersigned further states that the function, appearance, and quality of proposed Substitution are equivalent or superior to specified item.

3.39 THIS REQUEST FOR PRODUCT SUBSTITUTION ALSO CONSTITUTES A REPRESENTATION THAT I, AS THE CONTRACTOR:

- A. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
- B. Shall provide the same warranty for the Substitution as for the specified Product.

- C. Shall coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner, including extra charges by other Prime Contractors, material suppliers, and vendors.
- D. Waives claims for additional costs or time extension that may subsequently become apparent.
- E. Shall reimburse the Owner and the Engineer/Architect for review or redesign services associated with re-approval by authorities.
- F. Shall reimburse the Owner for all additional engineering/architectural services claimed by the Engineer/Architect for extra services associated with the review of the Contractor's substituted item since it could not have been originally included in the Engineer/Architect's professional services agreement. Reimbursement shall be based on the man-hours expended, at current billing rates.

3.40 CONTRACTOR'S AUTHORIZED REPRESENTATIVE (TYPEWRITTEN):

3.41 AUTHORIZED SIGNATURE:

3.42 DATE: _____

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work under this Section specifies the procedures used to process partial payments

1.02 APPLICATIONS FOR PAYMENT

- A. The form of application for payment shall be AIA Document G702, application and certificate for payment supported by AIA Document G703, Continuation Sheet.
- B. Submit one (1) copy of each payment application, completed, signed and notarized.
- C. Submit one (1) copy of the Brooklyn Navy Yard Development Corporation voucher or other required documentation.
- D. Submit certified payroll receipts for all works and subcontractors. Payroll receipts shall be submitted with every application for payment. All payroll receipts shall be certified correct and notarized by a Notary in the State of New York. Application for Payment will not be processed unless all payroll receipts are received.
- E. Applications must be first filled out in Construction Management's chosen platform for payment.
- F. The Brooklyn Navy Yard Development Corporation will not pay for any stored materials and equipment that is not installed.
- G. Contractor shall pay all workers and have all subcontractors pay all workers the prevailing New York State Dept. of Labor wage rates.
- H. The Brooklyn Navy Yard Development Corporation may conduct on-site interviews with all workers to verify payment of prevailing wage rates is enforced.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Schedule of Values

1.02 SCHEDULE OF VALUES

- A. Submit for approval prior to the start of the work a Schedule of Values that indicates a breakdown of the labor, materials and equipment and other costs used in the preparation of the bid. This schedule shall be in sufficient detail to indicate separate figures for such items as excavation, concrete, equipment and all other items making up the lump sum price. The cost breakdown shall be separately itemized for each lump sum bid item in the project.
- B. Where the cost breakdown includes items for bond payment, insurance payment, job set-up, or job mobilization, these items will be paid based on paid invoices and copies of cancelled checks.
- C. Submit a Schedule of Values to the Engineer/Architect for review and approval within fifteen (15) calendar days from the date shown on the Notice to Proceed.

1.03 FORM OF SUBMITTAL

- A. Submit typewritten Contract Cost Breakdown on AIA Form G703 - Application and Certificate for Payment Continuation Sheet or EJCDC 1910-8-E. The Engineer reserves the right to revise the form or provide a form prepared by the Engineer.
- B. Use the Table of Contents of the Contract Specifications as a basis for format for listing costs of work for Sections under Divisions 1-48 as sections apply to work. Not all Sections need be assigned a breakout price as determined by the Engineer/Architect.
- C. Identify each line item with number and title as listed in Table of Contents.
- D. Provide dollar values for each line item for labor, overhead, profit, material, and equipment components for each category of work if requested by the Engineer.
- E. List quantities of materials specified under unit price allowances.
- F. The Schedule of Values, after approval by the Engineer/Architect, shall be the basis for the Contractor's Application for Payment and shall be entered into Construction Management's chosen platform for the Contractor's Application of Payment.
- G. The first Application for Payment will not be reviewed prior to an approved breakdown.

1.04 PREPARATION OF SCHEDULE OF VALUES

- A. In addition to the above, provide a separate line item cost for each of the following items which shall be supported by proof where requested by Architect/Engineer:
 - 1. Performance and payment bonds.
 - 2. Insurance.
 - 3. Mobilization and Demobilization (Amounts shall be equal in value).
 - 4. Temporary facilities and measures as specified in Section 015000.
 - 5. Project Coordination Meetings as specified in Section 013100.
 - 6. Preparation of the Project Construction Schedule, and updates, as specified in Section 013300.
 - 7. Preparation of Monthly Schedules as specified in Section 013100

8. Rubbish removal and daily cleaning up. (Provide a total dollar amount and a daily rate for each calendar day during the contract period.)
 9. All Cash Allowance items as contained in Section 012100.
 10. On-site, full time superintendent starting on the date of the Notice To Proceed and ending on the date that all punch list items are completed, which for the purposes of the Schedule of Values, shall be the contract completion date.
 11. Surveyor used for layout, if necessary.
 12. A total dollar amount for furnishing all the Operations and Maintenance Manuals specified throughout the specifications.
 13. Record Drawing retainage amount specified in Section 017839.
 14. Final cleaning.
- B. Show total costs including overhead and profit.
- C. Provide additional details and data to substantiate the cost breakdown as requested by the Engineer.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Work of this Section includes:
 - 1. Requests for Interpretation or for information
 - 2. Administration of subcontracts
 - 3. Coordination of work with utility companies, Owner and the Engineer/Architect
 - 4. Communication and coordination requirements
- B. Site staffing requirements for the Contractor's superintendent is also specified herein, the costs for which shall be included in the Contract price.

1.02 FOR INTERPRETATION OR INFORMATION

- A. The Contractor shall contact the Engineer when the Contractor feels that additional information is needed to perform the work of the Contract. The request for information shall be entered in the Contract Management's chosen platform.
- B. The Engineer/Architect's verbal response(s) to the Contractor's formal requests, if provided, shall not constitute an official response and if acted upon by the Contractor are done so at the Contractor's own risk and liability and shall not be subject to claims for additional compensation.
- C. The Engineer/Architect will respond in writing to the request as soon as possible.

1.03 SUBCONTRACTOR ADMINISTRATION AND COORDINATION

- A. Terms and conditions of the Contract shall be binding upon each subcontractor.
- B. Provide at least one (1) copy of each approved shop drawing to each subcontractor whose work may depend upon the contents of the shop drawing submittal. The Owner reserves the right to stop all work, without claims for delay, until such time as appropriate subcontractors are furnished with appropriate shop drawings.
- C. Each Contractor shall sequence and schedule the work of subcontractors, coordinate construction and administration activities of subcontractors. Subcontractor and vendor questions and clarifications shall be directed to the Engineer by the Contractor.
- D. The Contractor's on-site project superintendent shall inspect all the work of all of his/her subcontractors, as it is being constructed. The Contractor's subcontractor shall not be permitted to do any work on the site without the Contractor's job site superintendent also being there to inspect the work as it is being performed.

1.04 UTILITY COORDINATION

- A. Comply with the requirements of 16 NYCRR Part 753 - Protection of Underground Facilities. Submit a letter stating the case number.
- B. Comply with the utility coordination requirements contained in the General Notes.

1.05 PUBLIC/PRIVATE UTILITIES

- A. Notify all public and private utilities in accordance with Article 20, Section 322-a of the New York State General Business Law for location and mark-out of existing utilities in the vicinity of the work.

- B. Repair all utilities damaged during the Work to the standards and approval of the respective utility at no cost to the Owner.

1.06 SPECIFIC COORDINATION REQUIREMENTS

- A. Sequence and schedule work so as not to interfere with the work by others. Coordinate the work of this Contract with the work by others. In case of conflicts due to improper coordination by the Contractor, the Owner/Engineer's resolution will be final. No compensation will be awarded for extra work required to resolve conflicts.
- B. Follow routing shown for pipes and conduit as closely as practicable. Place runs parallel with curb lines. Utilize spaces efficiently to maximize accessibility for other installations, maintenance, and to facilitate repairs.

1.07 CONTRACTOR'S JOB SITE SUPERINTENDENT

- A. Employ an on-site superintendent as specified herein below. He/She shall be a full-time employee of the Contractor.
- B. He/She shall have the authority to sequence and schedule the work, and to staff the project, so as not to interfere with the work by others and to complete the work daily within the time so required.
- C. Each Superintendent shall have a minimum of five (5) years of experience as a job site superintendent for projects of equal size and complexity.
- D. The Superintendent shall be qualified to perform the duties so required to successfully complete the work in accordance with the Contract Documents.
- E. The Superintendent shall speak English. If required by the Engineer, provide a resume for the proposed superintendent that shall be typed and shall list the qualifications of the superintendent. The Contractor shall employ a superintendent acceptable to the Owner.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Work of this Section includes the requirements for progress meetings.

1.02 PRE-CONSTRUCTION CONFERENCE

- A. The Contractor is required to attend the pre-construction conference at a location, date, and time selected by the Owner.
- B. The owner, a partner, or a corporate officer representing the Contractor shall attend the conference. The job site superintendent and office project manager for the Contractor shall also attend.
- C. The Engineer will prepare an agenda for the conference.

1.03 PROGRESS MEETINGS

- A. Progress meetings will be held approximately once every two (2) weeks during the project. The Owner may elect to hold meetings more or less frequently.
- B. The contractor shall submit a two week lookahead schedule, a minimum of 2 days prior to the biweekly progress meeting.
- C. At least seven (7) calendar days advance notice will be given by the Engineer or the date for the upcoming meeting will be set during the progress meeting.
- D. Attendance at progress meetings shall be mandatory for all Contractors. An amount of \$500 shall be deducted from the Contract Amount for each announced meeting not attended by the Contractor.
- E. The job site superintendent and/or office project manager for the Contractor shall attend.
- F. Subcontractors shall attend when requested by the Owner or Engineer at no cost to the Owner.
- G. Meetings will be conducted by Engineer at a location selected by the Owner, normally at or adjacent to the project site.
- H. The minimum agenda will cover:
 - 1. Review minutes of previous meetings.
 - 2. Identify present problems and resolve them.
 - 3. Plan work progress during next work period.
 - 4. Review the status of off-site fabrication and delivery schedule.
 - 5. Review shop drawings and submittal schedules.
 - 6. Review change order status.
 - 7. Review status of construction progress schedule.
 - 8. Coordinate access requirements.
 - 9. Other business related to the work.
- I. A monthly progress site walk through shall be occur with the Contractor, Construction Manager, Owner and Designer.

1.04 OTHER MEETINGS

- A. Attend special meetings which may be required or called for by federal, state or local authorities, utility companies, Owner, Engineer or any other firm, person, or organization related to the project.

1.05 CONDUCTING MEETINGS

- A. General - This paragraph covers Owner and/or Engineer meetings with Contractor and/or his subcontractors. Neither Owner nor Engineer wishes to meet solely with a subcontractor and requests for such meetings will be discouraged. If a meeting is deemed necessary, every effort will be made to have Contractor attend. If, for some reason, circumstances do not allow such, the meeting may be held, minutes of the meeting will be sent to Contractor and decisions on any major questions will be reserved until contractor has been consulted. Subcontractors may accompany Contractor to meetings provided contractor notifies Engineer in advance.
- B. Chairman - When Engineer or Engineer and Owner attend meetings, Engineer, or his duly authorized representative, will act as chairman. Should Owner-Contractor meetings be necessary, Owner will chair such meetings.
- C. Notices - Engineer or Owner will issue notices of meetings to all parties concerned and will note, thereof, who must attend and who may attend if they so desire. When Contractor desires a formal meeting, make a request through Engineer. Except when Engineer determines that a prompt meeting is essential, all notices will be issued at least one week in advance of the meeting date.
- D. Agenda - All parties shall inform Engineer of items desired to be discussed and Engineer will notify all parties of all items to be considered. This is to allow each party to fully prepare for the meeting. This shall not be construed to mean that other items cannot be brought up at the meetings.
- E. Time Limits - It is the intent to hold productive and efficient meetings and to keep them as short as is reasonably possible. The Chairman will be the sole judge as to whether or not further discussion on any matter is warranted and all discussions shall cease when he so orders.
- F. Minutes - Minutes of meetings will be kept, written and distributed by the Chairman or his duly authorized representative. Minutes of all meetings will be available upon request to the Chairman.
- G. Conduct - It is the intent to conduct all meetings in an orderly manner, to reasonably discuss all items and to hear and observe the rights and opinions of all parties. The Chairman will allow each party to speak, however, he reserves the right to order any individual to leave the meeting at any time for any reason.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section specifies the requirements for preparing construction schedules and for keeping them up to date.
- B. All schedules shall be submitted in accordance with the requirements contained herein in Section 013300.
- C. Refer to Section 013100 regarding the requirements for attendance at Project Coordination Meetings and additional requirements concerning the submission of other project coordination and sequencing information.

1.02 SCHEDULE PREPARATION MILESTONE DATES & REQUIREMENTS

- A. The Contractor shall prepare Draft #1 Construction Schedule for presentation and discussion during the Bid Phase submission.
 - 1. The Engineer/Architect will provide at least seven (7) calendar days written notice regarding the date of the first Project Coordination Meeting.
 - 2. At the Engineer/Architect's discretion, after Award, Project Coordination Meeting No. 1 may immediately take place on the same date and directly following the Pre-Construction Conference. The Notice To Proceed will contain information regarding the Pre-Construction Conference and Project Coordination Meeting No. 1 should it be so decided by the Engineer.
 - 3. Draft #1 Construction Schedule shall be prepared as specified hereinafter.
 - a. The schedule shall show all the major and subordinate tasks necessary to complete the project in the specified time and interim milestones.
 - b. It being understood that the Contractor's allotted time for others to perform their work is non-binding and does not relieve the Contractor from completing all the work in the specified contract completion time in accordance with the Contract Documents. It also being understood that this is the Contractor's realistic best estimate of the time needed for others to complete their related work.
 - c. The schedule shall also show the dependencies and time allocated for each task.
 - 4. The date, place, and time for Project Coordination Meeting No. 2 shall be established at the first meeting, but in no case be more than ten (10) calendar days from the date of the first meeting.
- B. As a result of the first meeting, a better understanding of the Contractor's time requirements will have been achieved. Within five (5) working days of the date of Project Coordination Meeting No. 1, the Contractor shall prepare Draft #2 Construction Schedule and submit it to the Engineer/Architect for review. The Contractor shall mail his/her schedule via Overnight Mail with a Return Receipt Requested.
 - 1. Project Coordination Meeting No. 2 shall focus on the time needed to complete each task and subordinate task and for establishing task dependencies.
 - 2. The Contractor shall deliver to the Engineer a hard copy of his/her Draft #2 Construction Schedule at the meeting.
- C. The Engineer/Architect's decision regarding the time allotted for a given task shall be final and each Contractor shall apply necessary resources to accomplish the work. Submission of a bid shall be intended to mean that the Contractor agrees that the determination is binding.
- D. Once revisions to the schedule have been made after Project Coordination Meeting No. 2, the agreed upon schedule shall become the Final Construction Schedule. The Contractor shall mail his/her Final Construction Schedule via Overnight Mail with a Return Receipt Requested.

1.03 PRIME CONTRACTORS SCHEDULE TYPES

- A. Gantt Chart Type: The Contractor shall prepare a Gantt Chart type schedule as specified hereinafter.

1.04 CONSTRUCTION SCHEDULE - GENERAL

- A. Coordinate the work and maintain the construction schedule. In the event actual progress begins to lag the schedule, promptly employ additional means and methods of construction to make up the lost time.
- B. Keep the construction schedule current and revise and resubmit as often as necessary to accurately reflect the conditions of the work, past progress and anticipated future progress.
- C. The construction schedule shall be completed, submitted, and deemed received by the Engineer prior to the first payment application.
- D. The schedule, when approved by the Engineer/Architect and the Owner, shall establish the dates for starting and completing work for the various portions of the Contract. It shall be the duty of the Contractor to conform to his/her own schedule and to perform the work within the time limits indicated. Failure to adhere to the approved schedule shall expose the Contractor to disputes, claims and additional costs incurred by others.
- E. Coordinate letting of subcontracts, material purchases, shop drawing submissions, delivery of materials, and sequence of operations, to conform to the schedule.
- F. Coordinate the construction schedule with the proposed schedules of the equipment suppliers and subcontractors.
- G. The schedule shall be plotted out in color and shall be 36-inch by 40-inch. It shall contain as many sheets as are necessary to show all rolled down tasks. Partially printed schedules will not be accepted.
- H. Prepare the schedule in a manner so that the actual progress of the work can be recorded and compared with the expected progress.
- I. The schedule shall be Gantt Chart and use the following convention:
 - 1. Tasks for the General Contractor in blue ink.
 - 2. Task links/task dependency in blue ink.
 - 3. Work by others in green ink.
 - 4. Milestone dates (zero duration) by a red diamond.
 - 5. The end date for each task and subtask at the end of a bar.
 - 6. The description of all major tasks within the bar. The bar shall be red.
 - 7. Critical path.
- J. The construction schedule shall also show the following:
 - 1. Critical sequence items where new units must come on-line before existing facilities go off-line, if applicable to the project.
 - 2. Lead time for major manufactured systems and equipment.
- K. Project scheduling software shall be the latest version of chosen Construction Management software.
- L. Construction schedule meeting shall be held on a monthly basis and be attended by contractor and contractor's scheduler.

- M. One licensed latest version of chosen Construction Management software shall be delivered to the Owner, which shall remain registered to the Owner after the project is completed.

1.05 REVISION OF PROJECT PROGRESS SCHEDULE

- A. The Contractor shall evaluate and provide updated construction schedules monthly in accordance with job requirements. Each update shall be submitted to the Engineer/Architect for information purposes and be provided by the last Friday of every month.
- B. From time to time, and at stages deemed appropriate by the Engineer/Architect, the Engineer/Architect may ask for updated schedules from the Contractor to reflect the project's status. The percent complete for each task may be shown for review by the Engineer/Architect.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Project record documents shall be prepared as specified herein.

1.02 QUALITY ASSURANCE

- A. The Contractor shall employ a land surveyor licensed in the State where the project is located. The surveyor shall be acceptable to the Architect/Engineer in terms of experience and qualifications.
 - 1. Submit evidence of the surveyor's errors and omissions (professional liability) insurance coverage in the form of an insurance certificate.
 - 2. The surveyor shall maintain a minimum coverage of \$1,000,000 for professional liability.
 - 3. The Owner, Architect/Engineer, and Contractor shall be named as insurance certificate holders.
 - 4. A thirty-day cancellation notice shall be provided.
 - 5. Physical work shall not be performed until the certificate is provided and approved by the Owner.
- B. All instruments used on the project shall be of professional quality and in first class condition.
 - 1. All instruments shall have been calibrated by a manufacturer's service station within the last twelve (12) months.

1.03 SUBMITTALS FOR REVIEW

- A. Submit name, address, and telephone number of Surveyor before starting survey work.
- B. Surveyor's professional liability insurance certificate.
- C. On request, submit documentation verifying accuracy of survey work.
- D. Submit a copy of the site drawing signed by the land surveyor showing locations of other benchmarks set by the surveyor, baseline location and offset hubs. If requested, the Architect/Engineer will provide a reproducible drawing or a drawing in digital format for use by the surveyor.

1.04 EXAMINATION

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Engineer/Architect of any discrepancies discovered.

1.05 SURVEY REFERENCE POINTS

- A. The Contractor's surveyor shall locate and protect survey control and reference points located throughout the project site.
- B. Control datum for survey is that indicated on the Drawings or will be provided by the Architect/Engineer.
- C. The Contractor shall protect survey control points prior to starting any site work. Preserve permanent reference points during construction.
- D. Promptly report to the Engineer/Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

1. The surveyor shall replace dislocated survey control points based on original survey control when directed by the Engineer/Architect.
 2. Make no changes without prior written notice to Engineer/Architect.
- E. The surveyor shall set control lath for rough and final grading purposes. Lath shall be placed at sufficient intervals to control grade or as directed by the Engineer/Architect.
- F. All new structures, pits, chambers, drainage pools, curbs, roads, swales, and other physical elements shall be located by survey control.
- G. Underground pipelines need not be located using survey control but shall be located using standard survey equipment operated by persons experienced in their operation.

1.06 SURVEY REQUIREMENTS

- A. The Engineer/Architect will provide one (1) benchmark.
- B. The Contractor shall, with his own forces, obtain working or construction lines or grades as needed subject to the check of the surveyor. The surveyor shall set offsets.
- C. Establish elevations, lines, offsets and levels. Locate and lay out by instrumentation and similar appropriate means:
1. Site improvements including pavements, stakes for grading, curbs, fill and topsoil placement, utility locations, slopes and invert elevations.
- D. The Contractor shall provide at least 48 hours notice and adequately protected access to all underground structures, valves, pipes, and utilities installed as work of this Contract to H2M prior to backfilling. Please contact H2M at least 48 hours in advance of backfilling. In the event the trench must be backfilled in less than 48 hours, the Contractor shall stake the junctions and termination points of the utility and note the depth to the top of the utility on the stake. Stakes must be protected for at least 48 hours until H2M survey can record the locations.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Pre-construction photographs.
- B. Periodic construction photographs.
- C. Final completion construction photographs.

1.02 SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Include same information as corresponding photographic documentation.
- B. Digital Photographs: Submit images files within five (5) days of taking photographs.
 - 1. Format: Provide images in JPG format, minimum 1600 x 1200 pixels, 400 dpi minimum, in unaltered original files, with same aspect ratio as sensor resolution, un-cropped, in a folder named by date of photograph, accompanied by key plan file.
 - 2. Quantities: Submit an average of twenty (20) photographs per week over the duration of the Project.
 - 3. Identification: Provide the following information with each submission:
 - a. Project name and number.
 - b. Name of Contractor who took the photographs.
 - c. Date and time picture was taken.
 - d. Location of picture relative to a specific location on the site, (for example, "10 ft. southeast of Operations Building").
 - 4. Frequency: Submit photographs weekly under the provisions of Section 013300 - Submittal Procedures.

1.03 CLOSEOUT SUBMITTALS

- A. Provide two (2) digital DVD discs containing all digital photographs, key plans and identifications for the entire construction duration, organized by folders named by date of photograph, under the provisions of Section 017800 - Closeout Submittals.

PART 2 - PRODUCTS

2.01 PHOTOGRAPHIC MEDIA

- A. Digital Camera: Minimum sensor resolution of 5 megapixels.

PART 3 - EXECUTION

3.01 CONSTRUCTION PHOTOGRAPHS

- A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location and direction.
 - 2. Use flash in low light levels or backlit conditions.
 - 3. Select vantage points to show status of construction and progress since last photographs were taken.

- B. Digital images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image editing software.
 - 1. Date and Time: include date and time in each file name for each image.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section specifies the requirements for making submissions for the project. Electronic submissions will be required unless expressly noted otherwise.

1.02 IDENTIFICATION OF SUBMITTALS

- A. Each and every submission shall be provided by the Contractor and shall be accompanied by a SUBMISSION TRANSMITTAL FORM. Identify each submittal and re-submittal using the form.

1.03 COORDINATION OF SUBMITTALS

- A. Prior to submitting to the Engineer/Architect, fully coordinate all interrelated work. As a minimum, do the following:
 - 1. Determine and verify all field dimensions and conditions by field measuring existing conditions and the installed work of this Contract and work by others.
 - 2. Coordinate with all trades, subcontractors, vendors, system and equipment suppliers and manufacturers, public agencies, and utility companies and secure all necessary approvals, in writing.
- B. Make submittals in groups containing all associated items that in some way depend upon each other.
 - 1. The Engineer/Architect may elect not to review partial or incomplete submissions, whereupon he will notify the Contractor of the additional submissions that are required before a review can be made.

1.04 TIMING OF SUBMITTALS

- A. Make submittals far enough in advance of scheduled dates of installation to provide time for reviews, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and securing delivery. The Engineer/Architect will review submittals within 15 business days.
- B. Submissions may be returned reviewed, unreviewed, rejected, returned conditioned upon submission of related items, or for other reasons set forth in the Contract Documents.
- C. Make submissions well in advance as the returning, rejecting or disapproval of submissions or other similar circumstances are possible and are deemed "avoidable delays". Costs for these delays or those attributed to Contractor's tardiness in making submittals shall be borne by the Contractor.
- D. Submittals requiring Engineer/Architect's review as required under the technical specifications of these documents shall be submitted prior to installation.
- E. If material or equipment is installed before it has been deemed to be in general compliance with the Contract Documents, as determined by the Engineer/Architect, the Contractor shall be liable for its removal and replacement at no extra charge and without an increase in contract time.

1.05 DESTINATION OF SUBMITTALS

- A. Submissions shall be sent to the Engineer/Architect's office to the attention of the Project Manager whom will be named in the Notice to Proceed or at the Construction Kick-Off meeting.

- B. All submittals shall be made via electronic format via e-mail or information exchange server. An information exchange server will be made available to each prime contractor by the Engineer.
- C. When submitting samples, the contractor shall arrange for the delivery of said samples to the office of the Engineer/Architect. Samples shall be clearly marked with name of the project and the Engineer/Architect's project manager.
- D. The Contractor is responsible for the pick-up of the sample from the Engineer/Architect's office following approval. In the event that a sample is not retrieved from the Engineer/Architect's office within thirty days of approval, it will be disposed of.

1.06 CLARITY OF SUBMITTALS

- A. All printed materials shall be neat, clean, professionally drafted by hand or by computer, clear, legible, and of such quality that they can be easily reproduced by normal photocopying or blueprinting machines.
- B. Information shall be separated into groups, subsystems, or similar equipment/function. Copies not conforming to this paragraph will be returned to the Contractor without the Engineer/Architect's review.

1.07 CONTRACTOR'S REPRESENTATION

- A. By making a submission, the Contractor represents that he has determined and verified all field measurements and dimensions, field construction criteria, site and building constraints in terms of limitations in moving equipment into an enclosed space, materials, catalog and model numbers and similar data and that he has checked and coordinated each submission with other work at or adjacent to the project site as required

1.08 ENGINEER/ARCHITECT'S REVIEW

- A. Engineer/Architect will review and comment on each submission conforming to the requirements of this Section.
 - 1. Engineer/Architect's review will be for conformance with the design concept of the project and will be confined to general arrangement and compliance with the Contract Documents only, and will not be for the purpose of checking dimensions, weights, clearances, fittings, laying lengths, tolerances, interference's, for coordinating the work by others or subcontractors.
 - 2. The Engineer/Architect's review of a separate item, or portion of a system, does not represent a review of an assembly or system in which the item functions.
- B. The Engineer/Architect will mark submittals as follows:
 - 1. **NO EXCEPTION TAKEN (A)** - No corrections, no marks. The content of this submittal has been reviewed by the Engineer/Architect and been found to be in general compliance with the Contract Documents. No further submission of this submittal is required and the information contained in the submittal may be built into the work in accordance with the Contract Documents.
 - 2. **MAKE CORRECTIONS NOTED (B)** - Minor amount of corrections. The content of this submittal has been reviewed by the Engineer/Architect and has been found in general to be in compliance with the Contract Documents. The notations made on the submittal by the Engineer/Architect shall be incorporated into the work in accordance with the terms and conditions of the Contract Documents. No further submission of this submittal is required.
 - 3. **AMEND AND RESUBMIT (C)** - The content of this submittal has been reviewed by the Engineer/Architect and this review has determined that additional data and/or modification

to the submitted data or other changes are required to bring the work represented in this submittal into compliance with the Contract Documents. This submittal shall be reviewed and revised in accordance with the Engineer/Architect's comments and resubmitted to the Engineer/Architect for review. The information contained on the resubmittal shall not be incorporated into the work until the submittal is returned to the Contractor marked "NO EXCEPTION TAKEN" or "MAKE CORRECTIONS NOTED".

4. REJECTED (D) - The content of this submittal has been reviewed by the Engineer/Architect and has been determined not to be in accordance with the requirements contained in the Contract Document and requires too many corrections or other justifiable reason. The submittal shall be corrected and resubmitted or a submittal of an alternate shall be provided. No items are to be fabricated under this mark.
 5. SUBMIT SPECIFIED ITEM (E)- The content of this submittal has been reviewed by the Engineer/Architect and this review has indicated that the work displayed in the submittal is not in compliance with the Contract Documents. The Contractor shall submit another submittal for this portion of the work, which complies with the Contract Documents.
 6. RECEIVED (R) - This submittal is accepted on the project and filed for record purposes only, in accordance with the terms and conditions of the Contract Documents. Documents marked "RECEIVED" will not be returned.
- C. No payment will be made on any item for which a submission is required if such submission:
1. has not been made,
 2. has been made but was not stamped "No Exceptions Taken" by Engineer/Architect,
 3. has been made and stamped "Make Corrections Noted", but contractor has not complied with Engineer/Architect's notes marked on the submittal,
 4. has been made and stamped "No Exceptions Taken", but item provided does not conform to the shop drawing nor to the Contract Documents.
- D. Submittals not required by these specifications will not be recognized or processed.
- E. Provide space for the Engineer/Architect's review stamp.

1.09 RESUBMISSIONS

- A. Prepare new and additional submissions, make required corrections, and resubmit corrected copies until found in compliance with the Contract Documents.
- B. On, or with, resubmittals, clearly describe revisions and changes made, other than the corrections requested by Engineer/Architect, which did not appear on the previous submissions.

1.10 CONTRACTOR'S RESPONSIBILITIES

- A. Engineer/Architect's review of submittals shall not relieve the Contractor of his/her responsibility for any deviation from the requirements of the Contract Documents nor relieve the Contractor from responsibility for errors or omissions in the submittals.
- B. No portion of the work requiring a submission shall be commenced until the Engineer/Architect has found the submission in general compliance with the Contract Documents.
- C. The Contractor shall provide notification of any specification or drawing deviation.

1.11 EXCESS COSTS FOR ENGINEERING/ARCHITECTURAL SERVICES

- A. The Owner will charge to the Contractor, and will deduct from the partial and final payments due the Contractor, all excess engineering and architectural expenses incurred by the Owner for extra services (work) conducted or undertaken by the Engineer/Architect as stipulated below:

1. Services and other similar charges because of the Contractor's errors, omissions, or failures to conform to the requirements of the Contract Documents as related to administrative charges associated with non-compliance with the requirements for making project submissions.
2. Services and other similar charges required to examine and evaluate any changes or alternates proposed by the Contractor and which may vary from the Contract Documents.
3. Services and other similar charges as a result of the Contractor's proposed substitution of materials, equipment or products which require a redesign of any portion of the project, as contained in the Contract Documents at the time of bid.
4. Services and other similar charges as a result of the Contractor's proposed substitution of products which require an engineering and/or architectural evaluation to determine if the substituted product is equal to that specified.
5. Services and other similar charges as a result of changes by the Contractor to dimensions, weights, sizes, voltages, phase, horsepower, materials of construction, and similar physical or operating characteristics of the product furnished which require redesign of the project in any way.
6. Services and other similar charges for the review of resubmissions of shop drawings that have been marked as "No Exceptions Taken" or "Make Corrections Noted".
7. Services and other similar charges for the review of shop drawings submitted more than two (2) times for the same product or portion of the work.

1.12 MISCELLANEOUS SUBMITTALS

- A. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.13 SUBCONTRACTOR LIST

- A. The Contractor shall submit within ten (10) calendar days after the date of the Notice to Proceed, a list of all subcontractors, including the names of the major subcontractors that were submitted at the time of the bid.

1.14 MATERIAL SAFETY DATA SHEETS (MSDS)

- A. Comply with "Right to Know" requirements of Chapter 551 of Laws of New York, 1980, concerning notification of the use of toxic substances.
- B. Any product or substance used by the Contractor or its subcontractors which is listed in Subpart Z of OSHA Part 1910 Title 29 of the Code of Federal Regulations entitled "Toxic and Hazardous Substances" shall be identified to the Owner/Engineer/Architect by the Contractor's submission of a standard Material Safety Data Sheet (MSDS) in accordance with "Right To Know" requirements.
- C. Products will not be permitted to be kept on site without a MSDS.

1.15 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Engineer/Architect.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation. Provide manufacturer's instructions with shop drawings.

1.16 CERTIFICATIONS

- A. Submit certifications of compliance indicated in the Contract Documents.
- B. Certifications shall be complete and exact, they shall be properly authenticated by the written signature, in ink, of an owner, officer or duly authorized representative of the person, firm or organization issuing such certification and they shall guarantee that the materials or equipment are in complete conformance with the requirements of these specifications.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Codes
- B. Governing agencies
- C. Permits

1.02 CODES

- A. Comply with the requirements of the various codes referred to in these Specifications. Such codes shall be the date of the latest revision in effect at the time of receiving bids.
- B. If there is a conflict between local, state, and/or Federal regulatory requirements, seek a consultation with the State Department of Labor. Resolve conflicts to the satisfaction of the State Department of Labor prior to commencing work.

1.03 GOVERNING AGENCIES

- A. All work shall conform to and be performed in strict accordance with all governing agencies such as, but not limited to:
 - 1. Occupational Safety and Health Act - OSHA
 - 2. New York City Codes, Rules, Laws, and Ordinances
 - 3. New York State Department of Health
 - 4. Brooklyn Navy Yard Development Corporation Codes, Rules, Laws and Ordinances
 - 5. New York City Department of Buildings Codes and Requirements

1.04 PERMITS AND INSPECTIONS

- A. Representatives of the Owner shall have access to the work for inspection purposes. The Contractor shall provide facilities suitable to the Owner to facilitate inspections of the installed work.
- B. The Contractor shall provide adequate time in the construction schedule for required permit inspections.
- C. A list of special permit inspections required on this project are attached to this project specification as Appendix A.
- D. Obtain and pay for all permits, fees, licenses, certificates, inspections and other use charges required in connection with the work.
- E. All road opening permit fees are the responsibility of the contractor. The contractor shall contact the New York Department of Transportation to assess the total fee charged.
- F. Obtain final approval including letter of completion from New York City Department of Buildings.

1.05 COORDINATION WITH GAS/ELECTRIC/TELEPHONE/CABLE UTILITY COMPANY

- A. Comply with the gas/electric/telephone/cable utility companies regarding excavation around or in the vicinity of existing facilities.

1.06 UTILITY WORK WITHIN RIGHT-OF-WAY

- A. Utility Work, either overhead or underground, within the boundaries of the NYC right-of-way, shall conform to procedures set forth by the applicable permits.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Work of this Section includes the requirements for pre-installation meetings.

1.02 PRE-INSTALLATION MEETINGS

- A. As required in individual specification sections, the Contractor shall convene a pre-installation meeting at the site prior to commencing work of the section.
- B. Pre-installation meetings are to be convened at least one week prior to commencing work on the section. The contractor shall arrange and require attendance of Owner/Architect/Engineer and parties directly affecting, or affected by, work of the specific section.
 - 1. At least seven (7) calendar days advance notice is to be given.
 - 2. The contractor shall prepare agenda and preside at meeting. At a minimum the following items are to be discussed:
 - 3. Review conditions of installation, preparation and installation procedures.
 - 4. Review coordination with related work.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Requirements for monitoring the quality of the constructed project.
- B. Work of this Section also includes services of an independent testing laboratory for quality assurance testing.

1.02 REFERENCES

- A. ASTM C1077 - Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
- B. ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- C. ASTM D4561 - Practice for Quality Control Systems for an Inspection and Testing Agency for Bituminous Paving Materials.
- D. ASTM E548 - Practice for Preparation of Criteria for Use in the Evaluation of Testing Laboratories and Inspection Bodies.
- E. ASTM E699 - Practice for Criteria for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating Building Components in Accordance with Test Methods Promulgated by ASTM Committee E6.

1.03 QUALITY ASSURANCE - CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with specified standards as a minimum quality for the work except when more stringent tolerances, codes, or specified requirements indicate higher standards or workmanship that is more precise.
- C. Perform work by persons qualified to produce workmanship of specified quality.
- D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.
- E. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

1.04 QUALITY ASSURANCE - TESTING LABORATORY

- A. In order to establish compliance with the Contract Documents, materials shall be tested, examined and evaluated before they are incorporated into the work. During and after installations, additional tests, examinations, and evaluations shall be made to determine continued compliance throughout the course of the work.
- B. Testing laboratory shall be a reputable, experienced firm that is capable of performing all of the required testing and authorized to operate in the state in which the project is located.
- C. Perform all sampling and testing in accordance with specified procedures and use the materials, instruments, apparatus, and equipment required by the codes, regulations and standards. Where specific testing requirements or procedures are not described, perform the

testing in accordance with all pertinent codes and regulations and with recognized standards for testing.

- D. In the event that samples and test specimens are not properly taken, handled, stored or delivered or if other requirements of this Section are not complied with, Engineer/Architect reserves the right to delegate any or all of this work to others, or to take whatever action deemed necessary to ensure that sampling and testing are properly accomplished, for which all costs shall be borne by Contractor.
- E. Engineer/Architect reserves the right to disapprove the use of a specific testing laboratory, even after prior approval, if the laboratory fails to meet or comply with the requirements of this Section. If this should occur, immediately discharge the testing laboratory and retain the services of a different laboratory acceptable to Engineer/Architect.
- F. The testing laboratory shall meet the following criteria:
 - 1. Be capable of performing all of the required tests.
 - 2. Be regularly engaged in performing the types of services required.
 - 3. Have adequate facilities, materials, equipment, and personnel to perform the services.
 - 4. Have an adequately trained, experienced and qualified staff.
 - 5. Have at least one registered professional engineer licensed in the state in which the project is located who shall be capable of performing field tests, supervising laboratory testing and interpreting test results. The professional engineer shall be thoroughly knowledgeable in materials, soils, asphalt paving and concrete.
 - 6. Shall be able to be on the Project site within two hours after being notified.
 - 7. Comply with the requirements of ASTM C1077, ASTM D3740, ASTM D4561, ASTM E548 and ASTM E699.
- G. Testing Equipment: Calibrated at reasonable intervals with devices of accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

1.05 REFERENCES

- A. Conform to reference standards by date that the project was last bid.
- B. Obtain copies of standards when required by Contract Documents.
- C. Should specified reference standards conflict with Contract Documents, request clarification from Engineer/Architect before proceeding.
- D. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.06 SUBMITTALS

- A. Within seven (7) calendar days from the date of the Notice to Proceed, submit documentation from testing laboratories that clearly indicates experience, location, qualifications of staff, and descriptions of any limitations or restrictions of the firm.
- B. Certified copies of each test report shall be mailed directly to the Engineer/Architect. The Contractor shall arrange with the laboratory to secure copies.
- C. Each report shall be in writing and shall include the testing method used, the test results, the specified results, the exact location of where the test specimens were taken, the date taken, Project identification, Contractor's name and other pertinent information required for a complete and meaningful test report.

- D. Each report shall be signed and certified by a responsible officer of the testing laboratory.
- E. Mail reports directly to Engineer/Architect within 24 hours after the sample is taken, except in those instances when tests cannot be immediately performed because of required curing, incubation periods, or lengthy testing procedures.
- F. The laboratory shall verbally communicate test results when requested by the Engineer/Architect. This does not eliminate nor replace the requirements for a written report.

1.07 SPECIAL INSPECTIONS

- A. Owner will employ services of a Special Inspection Agency to perform inspections and associated testing and sampling in accordance with ASTM E329 and required by the building code.
- B. It is the Contractor's responsibility to provide a current and updated schedule to allow for the special inspections to occur.

1.08 SCHEDULING - LABORATORY SERVICES

- A. Except where otherwise specified, the Engineer/Architect will determine the number of samples to be taken, the date and time samples will be taken and tests made, the number and type of tests to be performed, who will collect the samples, how they will be handled and stored and when laboratory personnel are required on site.
- B. Engineer/Architect will notify Contractor of his decision to take samples and/or have tests made and provide him with the pertinent information. Contractor is responsible for notifying the testing laboratory and for having the testing performed, on schedule.
- C. Contractor shall make his own arrangements for the sampling and testing of materials he proposes to incorporate into the work.
- D. Notify Engineer/Architect at least 72 hours in advance of the times at which scheduled samples or tests will be conducted.
- E. If samples and/or tests cannot be taken or performed when required, delay the work until such time that they can be accomplished. Where possible, any work that has been installed but has not been sampled or tested as required shall be tested by other means. Upon Engineer/Architect's request, uncover any work, which has been buried or covered, and perform special tests designated by Engineer/Architect. If the work cannot be tested by other means, Engineer/Architect may declare the work unacceptable. All costs associated with noncompliance and for special testing shall be borne by the Contractor.
- F. Should the testing laboratory be scheduled to take or collect samples or to perform tests, and finds that it is unable to do so as a result of delays in construction, inclement weather, or any other reason, reschedule the tasks for a date acceptable to Engineer/Architect. Costs associated with times testing laboratory is unable to perform scheduled services shall be borne by the Contractor and will not be paid for under the allowance.
- G. Plan all work and operations to allow for the taking and collection of samples and allow adequate time for the performance of tests. Delay the progress of questionable work until the receipt of the certified test reports.

1.09 TESTING REQUIREMENTS

- A. Compaction Testing - Soil:

1. Perform compaction testing in accordance with ASTM D2922, Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth) or ASTM D1556 Density and Unit Weight of Soil In Place by the Sand Cone Method.
 2. Perform tests and analysis of fill material in accordance with ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 55-lb. Rammer and 12-inch Drop.
- B. Compaction Testing - Asphaltic Concrete Pavement:
1. Perform asphaltic concrete compaction testing in accordance with ASTM D2950 - Standard Test Method of Density of Bituminous Concrete in Place by Nuclear Methods.
 2. Calibrate nuclear density measurement equipment based on theoretical maximum specific gravity of asphaltic concrete pavement material.
 3. Perform test to determine theoretical maximum specific gravity in accordance with ASTM D2041 Theoretical Maximum Specific Gravity of Bituminous Pavement Mixtures. Perform test on mix at plant prior to delivery. Collect sample at plant in accordance with ASTM D979 - Sampling Bituminous Paving Mixtures and perform test in approved laboratory if plant does not have necessary equipment.
- C. Asphalt Testing:
1. Collect samples at point of delivery in accordance with ASTM D979, Standard Practice for Sampling Bituminous Paving Mixtures.
 2. Perform extraction test in accordance with ASTM D2172, Standard Test Methods for Quantitative Extraction of Bitumen from Bituminous Paving Mixtures.
 3. Perform gradation test in accordance with ASTM C136, Method for Sieve Analysis of Fine and Coarse Aggregates.

1.10 TESTING SCHEDULE

- A. Compaction Testing of Soil:
1. Pipe Installation: 1 test per 100 linear feet per foot of backfill.
 2. Pavement Subgrade: 1 test per 50 square feet per lift.
- B. Asphalt Testing: 1 test per 50 square feet per course.
- C. Compaction Testing of Pavement: 1 test per 50 square feet per course.
- D. Concrete - Cast in place
- E. Structural steel - high strength bolting
- F. Mechanical systems

1.11 FIELD OBSERVATION OF CONTRACTOR'S WORK

- A. The Engineer/Architect will provide periodic observation of the Contractor's work.

1.12 SPECIAL INSPECTION OF CONTRACTOR'S WORK

- A. The Special Inspector will conduct the required permit inspections of the Contractor's work.
- B. Refer to contractor drawings for a list of all special inspections required on this project.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions. Verify that the existing substrate is capable of structural support or attachment of new Work being applied or attached. Examine and verify specific conditions described in individual specification sections. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance. Seal cracks or openings of substrate prior to applying next material or substance.
- B. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 FIELD QUALITY CONTROL

- A. Allow representatives of the testing laboratory access to the work at all time. Provide all equipment, labor, materials, and facilities required by the laboratory to properly perform its functions. Cooperate with and assist laboratory personnel during the performance of their work.
- B. Test specimens and samples shall be taken by the person(s) designated in other Sections, or as directed by Engineer/Architect. Conduct field sampling and testing in the presence of Engineer/Architect. Provide all materials, equipment, facilities and labor for securing samples and test specimens and for performing all field-testing.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Control of environmental pollution and damage that the Contractor must consider for air, water, and land resources in preparing a bid and while constructing the project. This Section includes management of site aesthetics, noise, solid and liquid waste and wastewater, and other pollutants that may be generated by the Contractor.
- B. Include all costs associated with environmental protection as specified herein and as specified in other Sections of these specifications in the total price bid.

1.02 DEFINITIONS

- A. Environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which:
 - 1. Adversely effect human health or welfare,
 - 2. Unfavorably alter ecological balances of importance to human life,
 - 3. Impact wetlands,
 - 4. Effect other species of importance to man, or;
 - 5. Degrade the utility of the environment for aesthetic, cultural, and historical purposes.
- B. Definitions of Pollutants:
 - 1. Sediment: Soil and other debris that has been eroded and transported by runoff water.
 - 2. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from industrial, commercial, and agricultural operations and from community activities.
 - 3. Rubbish: Combustible and noncombustible wastes such as paper, boxes, glass and crockery, metal and lumber scrap, tin cans, and bones.
 - 4. Debris: Combustible and noncombustible wastes, such as leaves, tree trimmings, ashes, and waste materials resulting from construction or maintenance and repair work.
 - 5. Chemical Waste: Petroleum products, bituminous materials, salts, acids, alkalies, herbicides, pesticides, organic chemicals, and inorganic wastes.
- C. Sanitary Wastes:
 - 1. Sewage: Domestic sanitary sewage and human and animal waste.
 - 2. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 PROTECTION OF ENVIRONMENTAL RESOURCES

- A. Protect environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire period of this Contract. Confine activities to areas defined by the Contract Documents.
- B. Protection of Land Resources: Prior to construction, identify all land resources to be preserved within the work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms without permission from the Engineer/Architect. Do not fasten or attach ropes, cables, or guys to trees for anchorage unless specifically authorized, or where special emergency use is permitted.

- C. Work Area Limits: Prior to any construction, mark the areas that require work to be performed under this Contract. Mark or fence isolated areas within the general work area that are to be saved and protected. Protect monuments, works of art, and markers before construction operations begin. Convey to all personnel the purpose of marking and protecting all necessary objects.
- D. Protection of Landscape: Protect trees, shrubs, vines, grasses, land forms, and other landscape features shown on the drawings to be preserved by marking, fencing, or using any other approved techniques.
 - 1. Immediately repair all damage to existing trees and shrubs by trimming, cleaning, and painting with antiseptic tree paint.
 - 2. Do not store building materials or perform construction activities closer to existing trees or shrubs than the farthest extension of their limbs.
- E. Contractor to submit an Excavation Work Plan in accordance with BNYDC standards.
- F. Reduction of Exposure of Unprotected Erodible Soils: Plan and conduct work to minimize the duration of exposure of unprotected soils. Excavate areas in reasonably sized increments only as needed to use.
 - 1. Manage and control excess material to limit spoil to areas immediately adjacent to excavation and prevent erosion of soil or sediment from entering nearby property, watercourses, drainage facilities or streets.
- G. Protection of Water Resources: Keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters and sewer systems. Implement management techniques to control water pollution by the listed construction activities that are included in this Contract.
- H. Control movement of materials and equipment during construction to prevent violation of water pollution control standards of the Federal, State, or local government.
- I. Monitor water areas affected by construction.
- J. Protection of Fish and Wildlife Resources:
 - 1. Keep construction activities under surveillance, management, and control to minimize interference with, disturbance of, or damage to fish and wildlife.
- K. Protection of Air Resources: Keep construction activities under surveillance, management, and control to minimize pollution of air resources.
 - 1. Burning is not permitted on the job site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State and Federal emission and performance laws and standards.
 - 2. Maintain ambient air quality standards set by the Environmental Protection Agency and State, for those construction operations and activities specified.
- L. Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials (such as from asphaltic batch plants) at all times, including weekends, holidays, and hours when work is not in progress.
- M. Particulates Control: Maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Sprinkle, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators, or other methods are permitted to control particulates in the work area.

- N. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.
- O. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.
- P. Reduction of Noise: Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the Engineer/Architect. Maintain noise-produced work at or below the decibel levels and within the time periods specified in accordance with OSHA and local ordinances, whichever is more restrictive.
 - 1. Perform construction activities involving repetitive, high-level impact noise only between 8:00 a.m. and 4:30 p.m. unless otherwise permitted by local ordinance or by the Engineer/Architect.
 - 2. Reduce repetitive impact noise on the property.
 - 3. Provide sound-deadening devices on equipment and take noise abatement measures that are necessary to comply with the requirements of this Contract, consisting of, but not limited to, the following:
 - 4. Use shields or other physical barriers to restrict noise transmission.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section supplements the General Conditions.
- B. The Work of this Section includes temporary facilities, utilities, and controls to be furnished by the Contractors for this project as it is specified herein.
- C. This Section is made a part of all Construction Contracts associated with the project. It contains specific references to the particular Contractor supplying said product or service. If no reference is provided then the requirement applies to all Prime Construction Contractors.

1.02 CARE AND PLACEMENT

- A. All temporary and permanent facilities and controls and all other elements on the project site shall meet all standards of the Occupational Safety and Health Act of 1970 and subsequent revisions. Each Contractor shall comply with all requirements of the Act.
- B. Contractor shall take every precaution and shall provide such equipment and facilities as are necessary or required for the safety of its employees and persons at the site.
- C. In the event of damage to existing and/or temporary facilities then immediately make all repairs and replacements to an equal condition prior to the event.

1.03 QUALITY PERFORMANCE

- A. Comply with and perform all work in accordance with the requirements of local authorities and utility companies having jurisdiction, and all applicable codes, regulations and ordinances.
- B. Secure approvals from the appropriate jurisdictions and utility companies on all repairs, relocations, connections, disconnections and the Work.
- C. All barricades, warning signs, lights, temporary signals and other protective devices shall conform with "Manual on Uniform Traffic Control Devices for Streets and Highways", US Government Printing Office.

1.04 SUBMITTALS

- A. Contractor shall provide a list of contact numbers as follows:
 - 1. Contractor's superintendent and office project manager (home, cellular, office, fax, trailer, and email address).
 - 2. All subcontractors.
 - 3. All utility companies.
 - 4. Emergency services such as fire department, police, and ambulance.
 - 5. Each Contractor shall also submit the following:
 - 6. Name and qualifications of person or persons who shall be available to render first aid.
 - 7. Names, addresses and telephone numbers of personnel who can be telephoned and act on behalf of Contractor in the event of emergencies or other problems requiring prompt attention during winter shutdown, holidays, nights and other periods when the Contractor's superintendent may be absent from the project site.
- B. The Contractor shall provide a sketch showing routing of temporary water service for construction purposes and for exfiltration tank testing. Provide cuts and plumber's certification for backflow device(s).

1.05 CONTRACTOR'S RESPONSIBILITY

- A. Each Contractor shall be responsible for the installation, performance, maintenance, and repair of all temporary facilities and controls specified herein this Section as originally provided.
- B. The Owner reserves the right to immediately correct a Contractor caused action, if in the opinion of the Owner, the situation may result in the immediate loss of life, property, and degradation of the environment. The costs for actions taken by the Owner shall be deducted from money due or to become due the Contractor. Amounts in excess shall be paid by the Contractor.
- C. If the Contractor caused situation is not deemed immediate, then the Contractor shall, within 24 hours of receipt of written and/or verbal notice, correct the defect or unsatisfactory condition.
- D. The Owner may repair, correct, replace, or install temporary facilities to correct the situation if the Contractor fails to perform within the allowed time. The costs to make the corrections shall be deducted from money due or to become due the Contractor. Amounts in excess shall be paid by the Contractor.

PART 2 - PRODUCTS

2.01 GENERAL

- A. The Owner may use temporary power lines, pipes, roadways or other facilities that each Contractor furnishes, installs, and maintains (then removes at the completion of the work), during the period of construction.
- B. The location of all temporary power lines, roadways, and other necessary temporary facilities shall be subject to the approval of the Engineer, and these shall be located and operated so as not to interfere with the operation of the facilities.

2.02 WATER FOR CONSTRUCTION PURPOSES

- A. Contractor shall obtain water from the nearest potable water source as designated by the Owner.
- B. The Owner will pay for water usage for general construction activities such as dust control and for sanitary purposes, like hand washing.
- C. Potable water, used for pipe exfiltration testing, process tank testing, storage tank testing, or elevated water storage tank testing, will not be paid for by the Owner. The Contractor shall include the costs for water for this purpose in the price as-bid.
- D. Contractor shall install his or her own backflow prevention device at the supply point where it is connected to the Owner's system.
 - 1. The water purveyor shall approve the device.
 - 2. The device shall be tested and certified as functioning properly.
 - 3. Post the certification in a location acceptable to the water purveyor.
- E. A water meter shall also be installed on any water service lines used to supply water for exfiltration testing.
- F. Contractor shall exercise measures to conserve water.

- G. Provide insulation and heat tracing to prevent freezing of temporary piping. Drain hoses at the end of each use.
- H. All Contractors, subcontractors, and personnel involved in the project shall be permitted to use water for construction purposes as provided under this paragraph.

2.03 SANITARY FACILITIES

- A. Contractor shall provide and maintain temporary toilet facilities for use by all contractors.
- B. These facilities shall be maintained in a strictly sanitary manner and be screened from the general public.
- C. All facilities shall be in accordance with the Occupational Safety and Health Act (OSHA) standards and all other applicable local codes.
- D. All applicable codes and regulations regarding the maintenance and method of waste disposal for these facilities will be strictly enforced. These facilities shall be of the portable type.
- E. The Owners sanitary facility will not be available for use by any contractor.
- F. Comply with the requirements also contained in Section 015719 - Environmental Protection.
- G. Contractor shall provide and pay for heating devices and fuel as required to maintain adequate heat for specific construction operations; i.e. painting, application of coatings, etc., where so specified elsewhere in these specifications.

2.04 VENTILATION

- A. Contractor shall ventilate enclosed areas to assist in the curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors or gases.
- B. The Contractor shall ventilate buildings to safely apply paint in accordance with Section 099100 requirements.

2.05 BARRIERS AND PROTECTION

- A. Contractor shall provide railings, barricades, signs, fences, posting of acquired permits, HASP (Health and safety plan), and other protective devices to prevent unauthorized entry to construction areas, to allow for the Owner's safe use of the site and to protect existing facilities and adjacent structures from damage from the work.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing buildings.
- C. Provide protection for plant life designated to remain.
- D. Protect vehicular traffic, stored materials, public utilities, site and structures from damage.
- E. Provide warning signs, detour signs and other traffic control devices to insure the safety of plant operators and to adequately direct traffic around the work. Illuminate barricades, obstructions, and warning signs from sunset to sunrise.

2.06 TEMPORARY FENCING

- A. The Contractor is responsible for performance compliance with OSHA standards.

- B. Contractor shall provide temporary safety fence around all open excavations or other dangerous conditions on the construction site.
 - 1. All temporary safety fencing shall be designed and erected in compliance with OSHA standards, but in no case less stringent than these specifications for fencing.
 - 2. Fence is to be bright orange in color, a minimum of 4 feet high, and properly secured using 1" diameter steel pipe at 4'-0" on-center as support posts.
 - 3. Stake each support post to a depth of 18" and tamp securely into place.
 - 4. Each post shall be plumb.
 - 5. Secure fencing to posts using heavy-duty 12" long cable ties or tie wire.
 - 6. The fence and supports shall remain the property of the Contractor and be promptly removed at the appropriate time.
 - 7. Post the following sign every 100-ft. along the perimeter of the fence: "RESTRICTED AREA KEEP OUT".
 - a. Each sign shall be commercially printed and be 18" x 36".
 - b. It shall be secured to the fence with heavy-duty tie wraps.

2.07 TEMPORARY HANDRAILS AND SCAFFOLDS

- A. All temporary handrailing and scaffolds shall be designed and erected in compliance with OSHA standards. Contractor is responsible for performance compliance with OSHA standards.
- B. Handrails shall be securely installed and maintained in accordance with OSHA regulations until the permanent railing or grating has been permanently installed and approved by the Engineer.
- C. All scaffolding and platforms shall be erected in a safe and substantial manner complying with OSHA requirements.
- D. All temporary handrails and scaffolds shall be designed by a professional engineer licensed in the state where the project is being constructed.
 - 1. The design drawings and details shall be stamped by the licensed engineer and submitted for record purposes.
 - 2. The Contractor's design engineer shall visit the site to certify that the handrailing and/or scaffolds have been erected pursuant to the stamped design.
- E. The Contractor shall protect all openings in building/structures of any type such as shafts, deck openings, and other building related chases.
- F. The Contractor shall also install two (2) separate temporary handrailing installations at two (2) separate stages of the construction for all structures where OSHA requires handrailing is to be provided.
 - 1. OSHA approved wooden railing shall be installed at the point where the deck platform formwork is proceeding and before reinforcement steel is placed.
 - a. Railing shall be installed using the bridge brackets used to construct the cantilevered platforms or other method as selected by the Contractor in compliance with OSHA.
 - b. Coordinate and advise the Prime Electrical Contractor of the date when the handrailing will be in place so that embedded conduit can be installed.
 - 2. The second installation of railing shall be fabricated of steel structural members with aircraft cable and turnbuckles installed immediately after the deck platform is constructed and the formwork is removed.

2.08 EROSION CONTROL

- A. Contractor shall provide measures to keep the ground surface well drained, but avoid erosion of embankments, excavations, the project site, and adjacent areas.

- B. Contractor shall comply with all local codes, rules, and regulations concerning soil erosion.
 - 1. Use hay bales or silt fences to control erosion to the satisfaction of the Engineer and regulatory agencies. Use hay bales or silt fences to stop silt and sediment from reaching surface waters, parking lots and roads.
 - 2. Leave erosion control methods in place until ground cover is established or until date of substantial completion.
- C. The Contractor shall install erosion control measures as shown on the Drawings.

2.09 DUST CONTROL

- A. Contractor shall provide measures to control dust resulting from the work.
- B. Control dust at locations and in such quantities and frequencies as required to prevent dust from becoming a nuisance to the surrounding area.
- C. In the event the Contractor does not adequately provide for dust control, or should insufficient quantities of dust control agents be placed and Contractor fails to place additional quantities within 4 hours after Engineer's direction, Owner will perform the required work by whatever means deemed expedient and all expenses incurred by Owner will be charged to and paid by Contractor.
- D. Take care in selecting and applying dust control agents so as not to make roadways or walkways slippery, muddy or hazardous. Dust control agents shall be acceptable to the Engineer.
- E. The Contractor shall provide all roadways with dust control.

2.10 RUBBISH REMOVAL

- A. The Contractor shall be responsible for overall rubbish removal.
- B. Burning of rubbish and trash will not be permitted.
- C. The Contractor shall clean up trash as specified in Section 011400 - Work Restrictions or more often if the trash interferes with the work of others, presents a hazard or if directed by the Engineer.
- D. Dispose of rubbish and waste materials in accordance with state regulations and local ordinances.
- E. The Contractor shall also place rubbish containers at locations selected by the Engineer.
 - 1. Furnish adequately sized rubbish containers from the date of initial mobilization to the date of final payment.
 - 2. As a minimum, the Contractor shall furnish ten (10) 55-gallon general trash containers. Secure the top of each container to the container.
 - 3. Secure the container itself so that it does not get blown about the site.
- F. The Contractor shall be responsible for maintaining the site free of trash.
- G. Contractor is responsible in maintaining the site free of trash and debris.
 - 1. It shall be the sole responsibility of the Contractor to prevent trash from being blown about the site.
 - 2. Provide a worker to police the site at least for 1 hour at the end of each day that work is being undertaken by the Contractor.

2.11 SNOW REMOVAL

- A. The Contractor shall be responsible for maintaining roads, walkways, sidewalks, and parking areas/lots free of snow. Provide snow plowing during and after each snow fall equal to or greater than 1.0 inch as reported by the local weather service.
- B. Any damage resulting from the Contractor's snow clearing operations shall be immediately repaired at no additional cost to the Owner.

2.12 ENCLOSURES

- A. Contractor shall provide and maintain temporary enclosures, sheds, or fenced-in areas to accommodate protection for products, material and equipment.
- B. Store equipment that cannot be exposed to outdoors in accordance with Section 016500 - Product Delivery, Storage and Handling.

2.13 SECURITY

- A. Contractor shall provide security and facilities to protect work from unauthorized entry, vandalism and theft.
- B. Coordinate with Owner's security program, if applicable.
- C. Contractor has full responsibility for the working area until final acceptance and payment.
- D. The Contractor shall maintain the perimeter fence that pre-existed prior to the start of construction. A temporary perimeter fence shall be required at all times during the construction and until the new perimeter fence is installed, or until the project is accepted by the Owner.
- E. It shall be the Contractor's responsibility to lock all gates to the site, and on the access road, at the end of each work day.
- F. All on-site employees shall bear, at all times, an identification badge, conspicuously worn, which shall include, at a minimum, a passport or similar size photograph, the name of the employee and the name of the company.
- G. Any employee working on site without a photo identification badge will be instructed to leave the site.
- H. All company vehicles shall be conspicuously identified, through sufficiently sized lettering on both the passenger and driver sides, with the company name, address and telephone number.
 - 1. All employee owned vehicles shall have an 8-1/2 inch by 11 inch sign with the company name, address and telephone number placed on the dashboard on the driver side.
 - 2. Vehicles may be subject to search by the Owner or owner's representatives.
 - 3. Any vehicle that does not have the company name, address and telephone number will not be permitted on the Owners' property.
- I. Submit to the Owner a complete listing of all employees that will or might be performing work at the project site.
 - 1. Furthermore, provide sufficient information as may be required for the Owner to conduct background checks, in accordance with the Fair Credit Reporting Act.
 - 2. Background checks may be performed at the discretion of the Owner due to the sensitive nature of the work and the extensive, and sometimes unsupervised, access to Owner property and buildings.

3. The Contractor shall be required, on request from the Owner, at any time prior to or during the work, to provide releases from its employees and officers to the Owner, H2M, and a background search firm, hired by either the Owner or H2M, to conduct background checks in accordance with the Fair Credit Reporting Act and applicable state law.

2.14 PARKING

- A. Do not allow heavy construction vehicle parking on existing pavement, if existing pavement is not scheduled for replacement or restoration.
- B. Provide and maintain access to fire hydrants, building entrances, process tanks, doors and the work in general.
- C. Contractor shall have his or her employees and subcontractors park in areas designated by the Owner/Engineer/Architect.
- D. If designated on the Contract Drawings, then only use those areas for parking.
- E. Where trades work from their trucks, then coordinate the parking of trucks with other prime contractors.
- F. If a Site Utilization Plan has been specified, then parking shall be as sited in the plan.
- G. Since the site is limited in space, special transportation may have to be furnished by the respective Contractor to have their employees bused to the site from off-site parking.

2.15 DAMAGES

- A. Contractor, with the prior approval of the Owner/Engineer/Architect, shall promptly repair any damage, directly or indirectly caused by the Contractor's operations.
- B. All repairs shall be to the complete satisfaction of the Owner and equal in quality to that which pre-existed.

2.16 FIRST AID FACILITIES & EMERGENCY TELEPHONE NUMBERS

- A. Each Contractor shall provide and maintain adequately equipped first aid facilities in a location or at locations that are readily accessible to workmen, Engineer and visitors to the site.
- B. Provide at least one on-site employee who is properly trained in first aid and who shall be available to render first aid whenever construction is in progress.
- C. Provide a list of emergency telephone numbers as specified above.
- D. Post the list of emergency telephone numbers as directed by the Engineer.

2.17 POLLUTION CONTROL

- A. Do not permit pollutants, such as chemicals, fuels, lubricants, calcium chloride, sewage, water containing sediments and other deleterious, poisonous, toxic or oxygen demanding substances to enter or leach into streams, lakes, wetlands, other surface waters, into groundwater, or into the air.
- B. In waters used for public water supply or used for trout, salmon or other game or forage fish spawning or nursery, control measures must be adequate to assure that turbidity in the receiving water will be increased not more than 10 standard turbidity units (s.t.u.) in the absence of other more restrictive locally established limitations, unless otherwise permitted by the State.

- C. In no case shall the classification for the surface water be violated, unless otherwise permitted by the State.
- D. In water used for other purposes, the turbidity shall not exceed State limits.

PART 3 - EXECUTION

3.01 PROTECTION OF EXISTING UTILITIES AND PUBLIC WORKS

- A. Maintain and protect existing utilities and public works including, but not limited to, conduits, sewers, water mains, electric and telephone conductors or conduits, and gas mains encountered during the construction.
- B. In the event that it is not possible to cross over, under, around or otherwise avoid the existing utility, the owner of the utility shall be notified that the utility must be altered or moved.
- C. In the event that damage shall result to any service pipe for water or gas, or any private or public sewer or conduit, the Contractor shall immediately, and at its own expense, repair same to the satisfaction of the Engineer/Architect.
- D. Any contents from the pipes, sewers or conduits shall be immediately removed and disposed in accordance with applicable laws.

3.02 REMOVAL OF UTILITIES, FACILITIES AND CONTROLS

- A. Remove temporary above grade or buried utilities, equipment, facilities and materials, immediately following substantial completion and prior to release of retainage.
- B. Remove underground installations to a minimum depth of 2 feet.
- C. Regrade site to restore to existing slope and elevation, and restore the surface.
- D. Clean and repair damage caused by installation or use of temporary work.
- E. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.
- F. Remove temporary parking and access roads.
- G. Regrade area to existing slope and elevation and restore the surface to its existing condition.
- H. Final payment will not be processed until all removals have been completed to the satisfaction of the Owner/Engineer/Architect.

3.03 PROTECTION OF EXISTING PROPERTY

- A. Protect existing structures and finishes during performance of the work.
- B. Protect existing trees and plants during performance of the work.
- C. Do not deposit excavated materials or store materials around trees or plants or attach guy wires to trees.

END OF SECTION

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Scope:
1. This Section includes requirements for CONTRACTOR-provided field office, with furnishings, equipment, and consumables, for use by Owner and Construction Manager.
 2. Contractor shall provide and maintain field office for Construction Manager's sole use. Provide field office at location shown on the Drawings and as approved by Construction Manager, in reasonable proximity to Contractor's field office.
 3. Field office shall be complete and fully functional within 30 days after date on which the Contract Times commence running.
 4. Obtain required permits for field offices.

1.02 SUBMITTALS

- A. Action Submittals: Obtain approval of the following prior to staging field office to the Site:
1. Field Office Submittal: Submit all of the following as one submittal which shall include:
 - a. Site plan indicating proposed location of field office, parking for field office, facilities related to the field office, and material of both field office parking and sidewalk or walkway to field office.
 - b. Information on proposed field office size, construction, exterior appearance, interior finishes, and field office security measures.
 - c. Proposed layout of field office exterior identifying sign, showing all text, font, colors, and graphics (if any).
 - d. Proposed type of Internet service; name of proposed Internet service provider; and product data and technical information on equipment (if any) required for Internet service.
 - e. Office Equipment: Product data and technical
 2. Health and Safety Plan (HASP)
 - a. Must be submitted by contractor. Shall include a dust control plan and waste management plan.

PART 2 – PRODUCTS

2.01 FIELD OFFICE CONSTRUCTION AND SITE REQUIREMENTS

- A. Field Office, Minimum Construction: Field office shall comply with the following:
1. Structurally sound foundation and superstructure.
 2. Size: Floor area of not less than 672 square feet. Provide "single-wide" trailer approximately 12 feet wide by 60 feet in length or equal adjacent office.
 3. Completely weather-tight and insulated, with insulation.
 4. Exterior finish to be submitted and approved in advance of mobilization.
 5. New interior finishes approved, including resilient floor covering in first-class condition.
 6. Field Office Ingress and Egress:
 - a. Two doors for ingress and egress for each field office unit, each with landing, stairs, and railing conforming to building codes in effect at the Site. A handicap accessible ramp shall be provided for access at one of the doors as approved.
 - b. Landing and stairs shall have slip-resistant walking surfaces, and be metal, fiberglass, or concrete.
 - c. Railing shall be metal or fiberglass.
 - d. Door Security:
 - 1) Doors shall be secure and lockable.
 - 2) Furnish each door with suitable, lockable security bar. Security bar shall be Master Lock 265DCCSEN Dual-Function Security Bar, or equal.

- (a) Windows:
 - (1) Window area equal to not less than ten percent of floor area.
 - (2) Windows shall each have insect screen and operable sash.
 - (3) Provide each window with lock and exterior security bars approved by Construction Manager.
 - (4) One lockable closet for storage.
 - (5) Keys:
 - (6) Furnish four identical sets of keys suitable for operating all keyed locks, including ingress/egress door locks, security bars for doors, window locks, closets, and office furnishings.
 - (7) Permanently label each key to indicate its associated lock.
 - (8) Exterior Sign:
 - (9) Field office identifying exterior sign, approved by Construction Manager. Sign shall be durable, weatherproof, suitable for long-term exposure to sunlight
 - (b) Field Office Optional Construction:
 - (1) Provide mobile office trailer in first-class condition approved by Construction Manager, specifically designed for use as construction field office and complying with requirements of this Section.
 - (2) Provide skirting around perimeter of each mobile field office trailer.
 - (3) Supplier: Provide field office by one of the following:
 - (4) Pac-Van, Inc.
 - (5) Modular Space Corporation (ModSpace).
 - (6) Williams Scotsman, Inc.
 - (7) Or equal.
7. FIELD OFFICE UTILITIES
- a. Comply with Section 015000, Temporary Construction Facilities and Controls.
 - b. Provide the following for the field office:
 - 1) Electrical System and Lighting:
 - (a) Electric service as required, including paying all costs.
 - (b) Interior lighting of not less than 50 foot-candles at desktop height.
 - (c) Minimum of eight 120-volt, wall-mounted, duplex convenience electrical receptacles.
 - (d) Exterior, wall-mounted lighting at each entrance to field office, not less than 250 watts each.
 - (1) Heating, Ventilating, and Air Conditioning System:
 - (2) Provide automatic heating to maintain indoor temperature in field office of not less than 65 degrees F in cold weather. Furnish all fuel and pay all utility costs.
 - (3) Automatic cooling to maintain indoor temperature in field office of not warmer than 75 degrees F in warm weather.
 - (4) Internet Access:
 - (5) Obtain and pay for Internet service until removal of the field office, with unlimited (untimed) Internet access, for Construction Manager's use.
 - (6) Set up system and appurtenances required and verify functionality in the field office.
 - (7) Internet service shall be one of the following, listed in order of preference; provide a lower type of access only when the next-higher level is unavailable:
 - (8) Fiber-optic or Cable Provider Service:
 - (9) Provide service via communication service provider via either cable or fiber-optic service at download speed of not less than 15 megabytes per second (Mbps) and upload speed of not less than 1 Mbps.
 - (10) Provide appropriate modem, cabling, and appurtenances.
 - (11) DSL:

- (12) Provide service via symmetrical digital subscriber line with download speed of not less than 1.5 Mbps and upload speed of not less than 384 kilobits per second (Kbps).
 - (13) Provide dedicated telephone line for Internet access.
 - (14) Provide DSL filters on each non-DSL outlet in the field office telephone system.
 - (15) Mobile Broadband Wireless:
 - (16) Provide mobile broadband wireless 4G network by AT&T, Verizon, Sprint, T-Mobile, or equal, with download speed of not less than 37 Mbps and upload speed of not less than 17 Mbps.
 - (17) Provide mobile broadband wireless router. Product and Manufacturer: Linksys Wireless-G Router for Mobile Broadband, or equal.
 - (18) Mobile broadband air-card for field office. Product and Manufacturer: Sierra Wireless 597E, Novatel Merlin EX720, or equal.
 - (19) Router and air-card will remain CONTRACTOR's property upon removal of field office from the Site.
 - (20) Satellite:
 - (21) Provide 4G network service with download speed of not less than 12 Mbps.
 - (22) Provide required equipment, including outdoor unit (dish) and indoor satellite modem equipment, together with required cabling provided.
 - (23) Provide telephone modem in computer, together with telephone line and service, for file uploading.
- (e) Should actions of utility companies delay the complete set up of field office, Contractor shall provide temporary electricity, heat, water supply, sanitary facilities, and telephone service as required at no additional cost to Construction Manager.
8. FURNISHINGS AND EQUIPMENT
- a. Provide the following furnishings and equipment:
- 1) Desks: minimum of three - 3-drawer desks for the trailer interior. Each desk shall be five feet long by 2.5 feet wide with not less than one file drawer per desk, suitable for storing 8.5-inch by 11-inch documents.
 - 2) Desk Chairs: One new or used (in good condition) five-point, high backed, cushioned swivel chair with seat-height adjustment, for each office area/work space indicated on the field office layout plan.
 - 3) Other Chairs: Four side chairs with arm rests and padded seats and backs, and eight metal folding chairs without arm rests.
 - 4) Provide adequate shelving in each office and in the common area.
 - 5) Four new or used (in good condition) folding tables each eight feet long by 2.5 feet wide.
 - 6) Two new or used (in good condition) folding tables each four feet long by 2.5 feet wide.
 - 7) Conference Table: One conference table equipped with 6 chairs and suitable to accommodate 6 people.
 - 8) Plan rack(s) and plan sticks to hold not less than eight sets of the Drawings.
 - 9) Two 4-drawer file cabinets.
 - 10) Two 2-door storage cabinet.
 - 11) Polyethylene waste baskets, each with capacity of not less than seven gallons. Furnish one in each office/work space indicated on the field office layout plan; one for the common area; and one for the restroom.
 - 12) Suitable doormat at each exterior ingress/egress door.
 - 13) Cork tack-board, 2.5 feet by three feet, with thumbtacks. Provide one for each office/work space shown on the field office layout plan and one in the common area.

- 14) One white board for use with dry markers, approximately six feet by four feet, with marker holding tray, installed by CONTRACTOR at location directed by Construction Manager in the field. Furnish supply of colored markers and eraser for the white board.
- 15) Safety Equipment: Provide the following:
 - (a) Fire extinguishers with associated signage.
 - (b) Smoke detectors with supply of batteries.
 - (c) Carbon monoxide detector with power supply.
 - (d) Provide in accordance with Laws and Regulations. For each field office structure, provide not less than two wall-mounted fire extinguishers, three battery operated ceiling-mounted smoke detector, and one carbon monoxide detector, each suitably located and installed in accordance with manufacturer's instructions.
 - (1) First-Aid Kit:
 - (2) In addition to first-aid stations otherwise required by the Contract Documents, provide for Construction Manager's sole use a first-aid kit in Construction Manager's field office.
 - (3) Product and Manufacturer: Zee Medical Service Co., Item 0152, "Medium Four-Shelf Plastic Cabinet", www.zeemedical.com; or equal.
 - (4) Temperature and Humidity Monitor:
 - (5) Sensor installed outdoors in shade, display installed inside field office. Unit shall display daily minimum and maximum temperature and current temperature, and be capable of displaying daily minimum and maximum relative humidity and current relative humidity, and have audible alarm and adjustable alarm setpoints.
 - (6) Manufacturer and Product: Provide Fisher Scientific "Traceable Remote Alarm RH/Temperature Monitor" Catalog No. 14-649-84; or equal.
 - (7) Provide batteries for unit as required.
 - (8) Personal Protective Equipment for Visitors. Furnish the following:
 - (9) Hardhats: Eight, each with full brim, of fiberglass or thermoplastic; each with ratchet suspension; white in color.
 - (10) Safety Glasses: Eight, each with clear lenses, polycarbonate, anti-fog and anti-scratch coating, two pair suitable to fit over personal eyewear.
 - (11) Reflective Safety Vest: Eight, each of polyester mesh or other material acceptable to Construction Manager, color to be high-visibility orange, with one-inch-wide reflective tape, one-size-fits-all design.
 - (12) Earplugs: Supply of foam, disposable earplugs. Promptly resupply when stock is depleted.
 - (13) Two electric clocks.
 - (14) One electric coffee maker, Keurig (single pod) with water reservoir.
 - (15) Bottled water with electric cooler dispenser for five-gallon bottles, with cup dispenser.
 - (16) Printer/Copier/Scanner:
 - (17) System Description: Provide one laser printer/copier/scanner with color printing capability.
 - (18) Manufacturer and Model: Provide one of the following:
 - (19) HP LaserJet Pro M476dw Color Multifunction Printer with sorter or equal.
 - (20) Sheet Size: Capable of printing 8.5-inch by 11-inch, 8.5-inch by 14-inch, and 11-inch by 17-inch sheets.
 - (21) Printing Speed: 20 pages per minute (black and white), 18 pages per minute (color).
 - (22) Scanning: Capable of scanning to PDF and JPG files, selectable by the user.

- (23) Toner Cartridges: Provide all cartridges required for full-color printing, and promptly replace cartridges as needed throughout the Project.
- (24) Wireless Router:
- (25) Provide two wireless routers (one active and one spare) to be configured by Construction Manager.
- (26) Router capacity shall be not less than 54 Bbps.
- (27) Manufacturer: Router shall be Linksys, or equal.
- (28) Multi-function Color Copier:
- (29) One new machine with the following functions: photocopying, network printing, scanning to produce PDF and JPG files, and e-mail.
- (30) Products and Manufacturers: Provide one of the following:
- (31) Xerox WorkCentre 7220.
- (32) Konica Minolta Bizhub C224e
- (33) Or equal.
- (34) Minimum Memory: 2 GB.
- (35) Ten-bin sort capacity, 8.5-inch by 11-inch, 8.5-inch by 14-inch, and 11-inch by 17-inch paper capacity, enlarging and reducing capabilities, stream-feed capability, bypass feeder, stapling capability, and double-sided copying capability. Copier shall produce not less than 20 copies per minute.
- (36) Provide necessary cables and appurtenances to enable all functions specified in this Section, including scan-and-email and printing from field office computers. Furnish services of manufacturer's representative to set up and service copier.
- (37) Dormitory Style Refrigerator
- (38) Provide one Dormitory Style Refrigerator 4.0 Cu.Ft.
- (39) Products and Manufacturer: Provide one of the following:
- (40) Haier or equal
- (41) Microwave Oven model OGZ.1104.1100 WATT or equal.
- (42) Toaster Oven. Black & Decker or equal.
- (43) Plan Table. Construct one 3' x 8' Plan table out of plywood, 2" x 4"s & Masonite. Locate in Common Area of Trailer.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install field office and related facilities in accordance with Laws and Regulations.
- B. Install materials and equipment, including prefabricated structures, in accordance with manufacturer's instructions.

3.02 CLEANING, MAINTENANCE, AND SUPPLIES

- A. Furnish the following maintenance services:
 - 1. Immediately repair malfunctioning, damaged, leaking, or defective field office structure, site improvements, systems, and equipment.
 - 2. Provide computer supplies and pay for maintenance on Contractor-furnished computer system and copier.
 - 3. Promptly provide snow and ice removal for CONSTRUCTION MANAGER' field office, including parking area, walkways, and stairs and landings.
 - 4. Provide daily maintenance and janitorial service of field office and sanitary facilities. Clean field office not less than once per week, sweep or vacuum field office not less than every other day when site conditions are such that dirt or mud are frequently tracked into field office.

5. Waste Disposal:
 - a. Properly dispose of trash and waste as needed, not less than twice per week.
 - b. Properly handle and dispose of recyclables. Do not dispose of recyclables as trash. Provide Containers strictly for Recyclables.
 - c. Dispose of other waste, if any, as required, to avoid creation of nuisances and adverse environmental effects. Properly dispose of electronic waste, when necessary, at proper waste receiving facility.
 - 1) Strip and wax all floor surfaces in the field office not less than once per year.
 - (a) Consumables: Provide the following consumables as needed:
 - (1) Toner and ink cartridges for printers and copier, as required.
 - (2) Paper supplies for printer and copier. Always maintain in field office not less than one ream of each size of paper for which printer and copier are capable.
 - (3) Dry markers in six colors and white board eraser set. Replace markers when exhausted or lost.
 - (4) Bottled water suitable for water dispenser and disposable cups.
 - (5) Coffee supplies, including coffee, filters, cups, sugar, creamer, and stir-sticks.
 - (6) Hand-soap, paper towels, toilet paper, cleansers, and janitorial implements, including broom.
 - (7) Batteries for smoke detector and other battery-powered items furnished by Contractor.
 - (8) Replace fire extinguishers upon expiration.
 - (9) Not less-often than monthly, inspect first-aid kit and inventory items consumed or used and remove items that are at or near their expiration date. Promptly replace and restock consumed and expired items.

3.03 REMOVAL

- A. Remove field office when directed by Construction Manager, prior to inspection for final completion. Upon removal of the field office structure, the field office will be Contractor's responsibility for disposition.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary field offices for use by the Contractor, Construction Manager and Architect/Engineer with furnishings, equipment and consumables.
- B. Temporary field offices for use of Contractor.

1.02 SUBMITTALS

- A. Action Submittals: Obtain approval of the following prior to staging field office on the site:
 - 1. Field Office Submittal - Submit all of the following as one submittal which shall include the following:
 - a. Site plan indicating proposed location of field office, parking for field office, facilities related to the field office, and material of both field office parking and sidewalk or walkway to field office.
 - b. Information on proposed field office size, construction, exterior appearance, interior finishes, and field office security measures.
 - c. Proposed type of Internet service; name of proposed Internet service provider; and product data and technical information on equipment (if any) required for Internet service.
 - d. Office Equipment: Product data and technical information for copier, telephones, and other office equipment.

PART 2 PRODUCTS

2.01 MATERIALS, EQUIPMENT, FURNISHINGS

- A. Field Minimum Requirements:
 - 1. Structurally sound foundation and superstructure.
 - 2. Size: Floor area of not less than 672 square feet. Provide "single-wide" trailer approximately 12 feet wide by 60 feet in length or equal adjacent office.
 - 3. Completely weather-tight and insulated, with insulation.
 - 4. Exterior finish to be submitted and approved in advance of mobilization.
 - 5. New interior finishes approved, including resilient floor covering in first-class condition.
 - 6. Field Office Ingress and Egress:
 - a. Two doors for ingress and egress for each field office unit, each with landing, stairs, and railing conforming to building codes in effect at the Site. A handicap accessible ramp shall be provided for access at one of the doors as approved.
 - b. Landing and stairs shall have slip-resistant walking surfaces, and be metal, fiberglass, or concrete.
 - c. Railing shall be metal or fiberglass.
 - d. Door Security:
 - 1) Doors shall be secure and lockable.
 - 2) Furnish each door with suitable, lockable security bar. Security bar shall be Master Lock 265DCCSEN Dual-Function Security Bar, or equal.
 - 7. Windows:
 - a. Window area equal to not less than ten percent of floor area.
 - b. Windows shall each have insect screen and operable sash.
 - c. Provide each window with lock and exterior security bars approved by Construction Manager.
 - 8. One lockable closet for storage.
 - 9. Keys:

- a. Furnish four identical sets of keys suitable for operating all keyed locks, including ingress/egress door locks, security bars for doors, window locks, closets, and office furnishings.
 - b. Permanently label each key to indicate its associated lock.
10. Field office identifying exterior sign, approved by Construction Manager. Sign shall be durable, weatherproof, suitable for long-term exposure to sunlight.

2.02 FIELD OFFICE UTILITIES

- A. Comply with Section 015000 Temporary Facilities and Controls.
- B. Provide the following for the field office:
1. Electrical System and Lighting:
 - a. Electric service as required, including paying all costs.
 - b. Interior lighting of not less than 50 foot-candles at desktop height.
 - c. Minimum of eight 120-volt, wall-mounted, duplex convenience electrical receptacles.
 - d. Exterior, wall-mounted lighting at each entrance to field office, not less than 250 watts each.
 2. Heating, Ventilating, and Air Conditioning System:
 - a. Provide automatic heating to maintain indoor temperature in field office of not less than 65 degrees F in cold weather. Furnish all fuel and pay all utility costs.
 - b. Automatic cooling to maintain indoor temperature in field office of not warmer than 75 degrees F in warm weather.
 3. Internet Access:
 - a. Obtain and pay for Internet service until removal of the field office,
 - b. Set up system and appurtenances required and verify functionality in the field office.

2.03 CONTRACTOR FURNISHINGS AND EQUIPMENT

- A. Provide the following furnishings and equipment:
1. Desks: minimum of three (3) - 3-drawer desks for the trailer interior.
 2. Desk Chairs: One new or used (in good condition).
 3. Provide adequate shelving in each office and in the common area.
 4. Four new or used (in good condition) folding tables each eight feet long by 2.5 feet wide.
 5. Conference Table: One conference table equipped with 6 chairs.
 6. Plan rack(s) and plan sticks to hold not less than eight sets of the Drawings.
 7. Two 4-drawer file cabinets.
 8. Two 2-door storage cabinet.
 9. Suitable doormat at each exterior ingress/egress door.
 10. One white board for use with dry markers, approximately six feet by four feet, with markers and marker holding tray.
 11. Safety Equipment: Provide the following:
 - a. Fire extinguishers with associated signage.
 - b. Smoke detectors with supply of batteries
 - c. Carbon monoxide detector with power supply.
 - d. Any other items in accordance with Laws and Regulations.
 12. First-Aid Kit

PART 3 EXECUTION

3.01 INSTALLATION

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Control of environmental pollution and damage that the Contractor must consider for air, water, and land resources in preparing a bid and while constructing the project. This Section includes management of site aesthetics, noise, solid and liquid waste and wastewater, and other pollutants that may be generated by the Contractor.
- B. Include all costs associated with environmental protection as specified herein and as specified in other Sections of these specifications in the total price bid.

1.02 DEFINITIONS

- A. Environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which:
 - 1. Adversely effect human health or welfare,
 - 2. Unfavorably alter ecological balances of importance to human life,
 - 3. Impact wetlands,
 - 4. Effect other species of importance to man, or;
 - 5. Degrade the utility of the environment for aesthetic, cultural, and historical purposes.
- B. Definitions of Pollutants:
 - 1. Sediment: Soil and other debris that has been eroded and transported by runoff water.
 - 2. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from industrial, commercial, and agricultural operations and from community activities.
 - 3. Rubbish: Combustible and noncombustible wastes such as paper, boxes, glass and crockery, metal and lumber scrap, tin cans, and bones.
 - 4. Debris: Combustible and noncombustible wastes, such as leaves, tree trimmings, ashes, and waste materials resulting from construction or maintenance and repair work.
 - 5. Chemical Waste: Petroleum products, bituminous materials, salts, acids, alkalies, herbicides, pesticides, organic chemicals, and inorganic wastes.
- C. Sanitary Wastes:
 - 1. Sewage: Domestic sanitary sewage and human and animal waste.
 - 2. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

1.03 SUBMITTALS

- A. Submit the following under provisions of Section 013300:
 - 1. Environmental Protection Plan / Erosion Control Plan: After the Contract is awarded and prior to the commencement of the work, meet with the Engineer to discuss the proposed Environmental Protection Plan and to develop mutual understanding relative to details of environmental protection. Not more than twenty (20) days after the meeting, prepare and submit to the Engineer for approval, a written and/or graphic Environmental Protection Plan including, but not limited to, the following:
 - a. Methods for protection of features to be preserved within authorized work areas including trees, shrubs, vines, grasses, ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, and archeological and cultural resources.
 - b. Permits, licenses, and the location of the solid waste disposal area(s).
 - c. Drawings showing locations of any proposed temporary excavations or embankments for haul roads, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials.

2. Prepare an Erosion Control Plan describing and showing methods for erosion control that shall be employed by the Contractor to protect adjoining wetlands.
3. Prepare a Work Area Plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan shall include measures for marking the limits of use areas. This plan may be incorporated within the Erosion Control Plan.
4. Approval of the Contractor's Environmental Protection Plan / Erosion Control Plan will not relieve the Contractor of responsibility for adequate and continued control of pollutants and other environmental protection measures.
5. Prepare Health and Safety Plan, which once approved shall be displayed on site.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 PROTECTION OF ENVIRONMENTAL RESOURCES

- A. Protect environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire period of this Contract. Confine activities to areas defined by the Contract Documents.
- B. Protection of Land Resources: Prior to construction, identify all land resources to be preserved within the work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms without permission from the Engineer. Do not fasten or attach ropes, cables, or guys to trees for anchorage unless specifically authorized, or where special emergency use is permitted.
- C. Work Area Limits: Prior to any construction, mark the areas that require work to be performed under this Contract. Mark or fence isolated areas within the general work area that are to be saved and protected. Protect monuments, works of art, and markers before construction operations begin. Convey to all personnel the purpose of marking and protecting all necessary objects.
- D. Protection of Landscape: Protect trees, shrubs, vines, grasses, land forms, and other landscape features shown on the drawings to be preserved by marking, fencing, or using any other approved techniques.
 1. Box and protect from damage existing trees and shrubs to remain on the construction site.
 2. Immediately repair all damage to existing trees and shrubs by trimming, cleaning, and painting with antiseptic tree paint.
 3. Do not store building materials or perform construction activities closer to existing trees or shrubs than the farthest extension of their limbs.
- E. Reduction of Exposure of Unprotected Erodible Soils: Plan and conduct earthwork to minimize the duration of exposure of unprotected soils. Clear areas in reasonably sized increments only as needed to use. Form earthwork to final grade as shown. Immediately protect side slopes and back slopes upon completion of rough grading.
 1. Temporary Protection of Disturbed Areas: Construct diversion ditches and berms to retard and divert runoff from the construction site to protected wetlands areas as defined in the Clean Water Act and federal, state and local regulations.
 2. Erosion and Sedimentation Control Devices:
 - a. Construct or install all temporary and permanent erosion and sedimentation control features as shown or specified in the Contract Documents and as required by the Owner pursuant to direction of the regulatory authority.
 - b. Maintain temporary erosion and sediment control measures such as berms, dikes, drains, hay bales, erosion control fencing, sedimentation basins, grassing, and

- mulching, until permanent drainage and erosion control facilities are completed and operative.
3. Manage borrow areas on and off Owner property to minimize erosion and to prevent sediment from entering nearby property, watercourses and local streets.
 4. Manage and control spoil areas on and off Owner property to limit spoil to areas shown on the Environmental Protection Plan and prevent erosion of soil or sediment from entering nearby property, watercourses or streets.
 5. Protect adjacent areas from degradation by temporary excavations and embankments.
- F. Handle and dispose of solid wastes in such a manner that will prevent contamination of the environment.
1. Place solid wastes (excluding clearing debris) in containers that are emptied on a regular schedule.
 2. Transport all solid waste off Owners' property and dispose of waste in compliance with Federal, State, and local requirements.
 3. Store chemical waste away from the work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.
 4. Handle discarded materials other than those included in the solid waste category as directed by the Engineer.
- G. Protection of Water Resources: Keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters and sewer systems. Implement management techniques to control water pollution by the listed construction activities that are included in this Contract.
- H. Washing and Curing Water: Do not allow wastewater directly derived from construction activities to enter water areas. Collect and place wastewater in retention ponds allowing the suspended material to settle, the pollutants to separate, or the water to evaporate.
- I. Control movement of materials and equipment during construction to prevent violation of water pollution control standards of the Federal, State, or local government.
- J. Monitor water areas affected by construction.
- K. Protection of Fish and Wildlife Resources:
1. Keep construction activities under surveillance, management, and control to minimize interference with, disturbance of, or damage to fish and wildlife.
 2. Prior to beginning construction operations, list species that require specific attention along with measures for their protection.
- L. Protection of Air Resources: Keep construction activities under surveillance, management, and control to minimize pollution of air resources.
1. Burning is not permitted on the job site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State and Federal emission and performance laws and standards.
 2. Maintain ambient air quality standards set by the Environmental Protection Agency and State, for those construction operations and activities specified.
- M. Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials (such as from asphaltic batch plants) at all times, including weekends, holidays, and hours when work is not in progress.
- N. Particulates Control: Maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Sprinkle, chemical treatment of an approved type, light bituminous treatment, baghouse,

scrubbers, electrostatic precipitators, or other methods are permitted to control particulates in the work area.

- O. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.
- P. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.
- Q. Reduction of Noise: Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the Engineer. Maintain noise-produced work at or below the decibel levels and within the time periods specified in accordance with OSHA and local ordinances, whichever is more restrictive.
 - 1. Perform construction activities involving repetitive, high-level impact noise only between 8:00 a.m. and 5:00 p.m unless otherwise permitted by local ordinance or by the Engineer.
 - 2. Repetitive impact noise on the property shall not exceed the following dB limitations:
 - 3. Provide sound-deadening devices on equipment and take noise abatement measures that are necessary to comply with the requirements of this Contract, consisting of, but not limited to, the following:
 - a. Use shields or other physical barriers to restrict noise transmission.
 - b. Provide soundproof housings or enclosures for noise-producing machinery.
 - c. Use efficient silencers on equipment air intakes.
 - d. Use and maintain efficient intake and exhaust mufflers on internal combustion engines.
 - e. Line hoppers and storage bins with sound deadening material.
 - f. Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum.
- R. Contractor shall have a copy of the approved Health and Safety Plan (HASP) on display within the Construction Field Office.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section includes the general requirements for products that are to be furnished, installed, or otherwise incorporated into the project.

1.02 QUALITY ASSURANCE APPLIES TO ALL PRODUCTS

- A. In addition to the Contractor's warranties and guarantees on materials and equipment required under the General Conditions of the Contract and the Technical Specifications contained hereinafter, the Contractor shall also be responsible for all materials, equipment, and products that have or is planned to be incorporated into the work.
 - 1. The Contractor shall be responsible for the finished work and that it accurately and completely complies with these Contract Documents.
 - 2. The Contractor shall be responsible for work performed by subcontractors, equipment suppliers, and material vendors.
 - 3. The Contractor shall be satisfied as to the product's performance before it is ordered for installation. At the Contractor's option, he/she shall have tested each product to determine compliance with these specifications.
- B. The Engineer/Architect may check all or any portion of the work and the Contractor shall afford all necessary assistance to the Engineer/Architect in carrying out such checks.
 - 1. Such checking by the Engineer/Architect shall not relieve the Contractor of any responsibilities for the accuracy or completeness of the work.
 - 2. Such checking is a courtesy service being provided by the Owner and does not relieve the Contractor of his/her responsibilities under this Construction Contract.
- C. Should a dispute arise as to the quality of workmanship, equipment or material performance, then the final decision regarding acceptability with these Contract Documents shall be that of the Owner.
- D. At the request of the Engineer/Architect, the Contractor shall promptly provide the services of a competent representative of the manufacturer at the project site, fully equipped and prepared to answer questions, perform tests, make adjustments and to prove compliance with the Contract Documents free of all additional charges. Proof of compliance shall be the responsibility of the Contractor.

1.03 QUALITY ASSURANCE - EQUIPMENT

- A. All material furnished shall be new, and guaranteed free from defects in workmanship, installation, and design.
- B. Equipment shall be products of manufacturers who produce evidence of their ability to promptly furnish any and all interchangeable replacement parts as may be needed at any time within the expected life of the equipment.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. The Owner reserves the right to reject any material or equipment manufacturer who, although he appears to be qualified and meets the technical requirements, does not provide satisfactory evidence indicating adequate and prompt post-installation repair and maintenance service, as required to suit the operational requirements of the Owner.

- B. Whenever it is required that the Contractor furnish materials or manufactured articles or shall do work for which no detailed specifications are set forth, the materials or manufactured articles shall be of the best grade in quality and workmanship obtainable on the market from firms of established good reputation, or, if not ordinarily carried in stock, shall conform to the usual standards for first-class materials or articles of the kind required.
- C. Perform work in full conformity and harmony with the intent to secure the best standard of construction and equipment of the work as a whole or in part.
- D. Items of any one type of material or equipment shall be the product of a single manufacturer.
 - 1. For ease of the Owner in maintaining and obtaining service for equipment and for obtaining spare parts from as few places as possible, to the maximum extent possible, use equipment of a single manufacturer.
 - 2. The Engineer/Architect reserves the right to reject any equipment from various manufacturers if suitable equipment can be secured from fewer manufacturers and to require that source of materials be unified to the maximum extent possible.
- E. Substitute equipment shall not be fabricated nor installed until after written decision to accept request is received from the Engineer/Architect.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Prior to work under any Section, carefully inspect the work of all other prime trades and verify that all such work is in conformance with the Contract Documents and is complete to the point where the work under that Section may properly commence.
- B. Verify that all work can be installed in strict accordance with the drawings and the approved shop drawings. Immediately report discrepancies to Engineer/Architect.
- C. Do not proceed with the work under any Section until these conditions are obtained.

3.02 INSTALLATION

- A. Furnish and install materials and equipment in accordance with the instructions of the applicable manufacturer, fabricator or processors, except as otherwise provided in the Contract Documents.
- B. All work shall be done in a workmanlike manner and set to proper lines and grades. The work shall be square, plumb and/or level as the case may be.
- C. Where performance criteria are specified, do all work necessary to attain the required end results.

3.03 FIELD QUALITY CONTROL

- A. Neither observations by Engineer/Architect nor inspections, tests or approvals by other persons shall relieve the Contractor from his obligations to perform the work in accordance with the requirements of the Contract Documents.
- B. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any work to specifically be inspected, tested or approved by some public body, the Contractor shall assume full responsibility therefore, pay all costs in connection

therewith, and furnish the Engineer/Architect with the required certificates of inspection, testing or approval.

3.04 UNCOVERING WORK

- A. Unless otherwise specified or directed by Engineer/Architect, no work shall be covered until it has been observed, tested, photographed, measured, and authorized to be covered by Engineer/Architect.
- B. Tie distances to above ground physical structures as reference points to all underground utilities, conduits, pits, manholes, valves, and pipelines shall be obtained by the Contractor prior to covering the work. Immediately comply with the Engineer/Architect's direction to uncover the work if tie distances were not obtained.
- C. If any work has been covered with Engineer/Architect's consent and Engineer/Architect considers it necessary or advisable that covered work be observed or tested, the Contractor, at Engineer/Architect's request, shall uncover, expose or otherwise make available for observation, or testing as Engineer/Architect may require, that portion of the work in question, furnishing all necessary labor, material and equipment.
 - 1. If it is found that such work is defective, the Contractor shall bear all the expenses of such uncovering, exposure, observation, and testing of satisfactory reconstruction, including compensation for additional engineering and architectural services and an appropriate deductive change order shall be issued.

3.05 DEFECTIVE WORK

- A. The repair, removal, replacement and correction of defective work is a part of this Contract and shall be promptly performed in accordance with the requirements set forth in the General Conditions or other portions of the Contract Documents. All costs in connection with the correction of defective work shall be borne by the Contractor.
- B. Products that fail to maintain the performance or other salient requirements of the Contract Documents, shows undue wear, or other deleterious effects during the maintenance period shall be considered defective.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The Section includes the transportation, handling, storage and protection of products that are to be incorporated into the work.
- B. The procedures for turning equipment over to the Owner for installation by others is also included herein.

1.02 GENERAL

- A. Items shall be delivered as complete assemblies direct from the manufacturer with all internal components intact except where partial disassembly is required by transportation regulations, protection of components, or where physical constraints may exist or be created for the setting of the item.
- B. Coordinate the disassembly and reassembly requirements with the manufacturer. Determine the need and extent of reassembly prior to bid.
 - 1. All labor, material and equipment costs associated with the disassembly and reassembly of the product shall be included in the Contract Price.
 - 2. Where reassembly of equipment is necessary, then the manufacturer shall provide reassembly instruction at the project site.
 - 3. A technician shall be present during the entire reassembly procedure and the manufacturer shall certify, in writing, that the unit was reassembled properly in accordance with instructions provided by the manufacturer and that all as-specified warranties remain in effect.
 - 4. The manufacturer's reassembly inspection time shall be in addition to the field service time specified and shall be included in the Contract Price. This time shall not be eligible for payment under any cash allowance item.
- C. In the case where equipment is to be installed by others, then the supplying contractor shall be responsible for its reassembly. If reassembly is necessary and the unit(s) are to be set inside an enclosure or building, reassemble the equipment inside said enclosure. The equipment once reassembled shall be turned over to the installing contractor as specified below.

1.03 PACKING

- A. Transport products in containers, crates, boxes or similar means such that the products are protected against damage that may occur during transportation.
- B. All parts shall be packaged separately or in container where parts of similar systems are grouped.
- C. Part numbers shall be indicated on the individual part. Use indelible ink to mark part numbers.
- D. All equipment shipments shall be included with a parts list showing a description (name) of the part and the manufacturer's part number.
 - 1. The parts list shall be shipped in a plastic zippered envelope with the words "Parts List" lettered on it in indelible ink.
 - 2. The parts list shall be placed inside the shipping container so that it is on the top of the contents.
- E. Equipment shall be shipped with storage, handling and installation instructions.

1. The Engineer reserves the right to withhold payment for equipment delivered to the site until such time as the storage, handling and installation instructions are supplied by the manufacturer.
 2. In the case where operation and maintenance manuals have been provided by the manufacturer, which includes the installation instructions, then the installation instructions shall also be included with the equipment shipment.
- F. All control panels shall be wood crated.
1. All sides of the control panel shall be covered with 3/4" plywood.
 2. The control panel number or name shall be printed on all sides of the crate in 1' high black lettering.
 3. The manufacturer's name, Contractor's name and project name shall also be printed on the front of the crate.
 4. All control panels and centers shall be packaged with three (3) copies of the approved wiring diagram inside the control panel enclosure in a separate plan holder attached to the inside door. The words "APPROVED FOR CONSTRUCTION" shall be indicated on each page of the wiring diagram.
- G. Delicate instruments and devices, reagents, chemicals, and glassware shall be shipped in packaging normally provided by the manufacturer.
- H. The Contractor shall require the manufacturer to be responsible for the proper packing of all products.

1.04 SHIPPING AND DELIVERY

- A. Product deliveries shall be accompanied with a bill of lading indicating the place of origination and the Contractor's purchase order number.
- B. Inspect shipments immediately upon delivery, to assure compliance with requirements of the Contract Documents and those products are undamaged.
- C. Promptly remove damaged material and unsuitable items from the job site.
- D. Provide equipment and personnel to handle products by methods to prevent soiling; disfigurement or damage.

1.05 STORAGE

- A. Store sensitive products and all spare parts in weather tight, climate controlled enclosures in an environment favorable to product.
- B. Store and protect products in accordance with the manufacturer's instructions.
- C. All other products that are to be installed underground or products such as pipe, valves, and fittings shall be stored outdoors but shall be blocked off the ground and covered with impervious sheet coverings.
- D. Store fabricated products above the ground on blocking or skids.
- E. Store loose granular materials in well-drained areas on solid surfaces to prevent mixing with foreign matter.
- F. Provide adequate ventilation to avoid condensation.

- G. In accordance with manufacturer's instructions protect bearings, couplings, shafts, rotating components, and assemblies. Protection of said equipment shall be continuous until the time the equipment is placed into permanent service.
- H. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration.
- I. Do not store volatile liquids in any building on site.
- J. Storage of products shall be the responsibility of the supplying contractor. The installing contractor shall take all necessary precautions to protect the equipment being furnished by others.
- K. Store with seals and labels intact and legible.

1.06 EQUIPMENT INSTALLED BY OTHERS

- A. All products, except products noted on the Drawings or specified, shall be furnished and installed under this Contract.
 - 1. Only noted or specified products shall be furnished under this Contract for installation by others.
 - 2. If it is not noted on the Drawings or specified, then the product shall be furnished and installed under the Contract.
- B. The Contractor shall furnish these products to the Owner. These products shall be stored as specified above.
- C. The Owner will then advise the installing contractor that the product(s) are ready for installation.
 - 1. In the case where the product is stored in a proper enclosure, but not stored inside the building to be constructed under this project, then the installing contractor shall move the product into the building to a location adjacent to the final location shown on the Drawings.
 - 2. In all cases, the installing contractor shall be responsible for moving from storage, uncrating, anchoring, mounting and installing the product as required by the Contract Documents.
- D. The Contractor and installing contractor(s) shall be present at the time the equipment is turned over to the Owner. Immediately thereafter, the Owner will turn the product over to the installing contractor for installation.
- E. The Owner, Contractor, Engineer/Architect and the installing contractor shall inspect the condition of the product at this time.
 - 1. Any defects in the product will be noted and the Contractor will be advised to make all repairs immediately.
 - 2. The installing contractor shall still be required to install the product if the damage is deemed cosmetic by the Engineer/Architect.
 - 3. The manufacturer's installation instructions or wiring diagram shall be turned over to the installing contractor at this time by the Contractor.
 - 4. Any damage occurring to the product during moving, setting and mounting the unit(s) shall be the responsibility of the installing contractor.
 - 5. The Contractor is advised to take photographs to document the condition prior to it being turned over to the installing contractor.
 - 6. The installing contractor is advised to take photographs to document the condition prior to its acceptance.

- F. The supplied unit(s) remain the property of the Contractor until final acceptance of the work.
- G. Any damage caused to the unit(s) due to improper installation, workmanship, and non-compliance with the manufacturer's written installation instructions shall be the responsibility of the contractor who caused said damage. The burden of proof shall rest with the supplying Contractor.
- H. In the event the Contractor discovers misuse, abuse or improper installation of the unit(s) by the installing contractor, then he shall immediately notify the Engineer/Architect in writing. The Engineer/Architect will investigate the accusations and make a determination. The Engineer's determination shall be binding and agreed to by both parties.
- I. If the Engineer's determination substantiates the accusations of the Contractor, then the Contractor shall install the unit(s), the costs for which will be paid for as extra work. All costs associated with the extra work change order, including engineering and attorney fees of the Owner and Contractor will be deducted from money due the installing contractor.

1.07 PROTECTION OF WORK

- A. The Contractor shall protect the installed work. All costs for protection shall be borne by the Contractor. Provide coverings as necessary to protect installed products from damage, from traffic and subsequent construction operations. Remove when no longer needed.
- B. Cover and protect equipment from dust, moisture or physical damage. Protect finished floor surfaces prior to allowing equipment or materials to be moved over such surfaces. Maintain finished surfaces clean, unmarred and suitably protected until accepted by the Owner.
- C. Additional time required to secure replacements and to make repairs will not be considered by the Engineer/Architect to justify any extension in the Contract Time of Completion. In the event of the damage, promptly make replacement and repairs to the approval of the Engineer at no additional costs.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 GENERAL

- A. The intent of this Section is to have Contractor perform his Work in such a manner that continuous, uninterrupted treatment of the electrical service and all essential building systems and facilities are maintained operational throughout the construction period.
- B. Except for the scheduled shutdowns specified in this Section and in other Contracts, the existing building will be maintained in continuous operation by the Brooklyn Navy Yard (BNY) and any other Contractors working within or in the immediate area of the building during the entire construction period under all Contracts. Work under this Contract shall be so scheduled and conducted by Contractor such that it will not impede the operation of any building system or create potential hazards to operating equipment, building personnel, or any other Contractors working on this or other Contract Work. In performing the Work shown and specified, Contractor shall plan and schedule Work to meet both constraints outlined in this Section and building operating requirements.
- C. The work covered in the following paragraphs may not be all inclusive of all work which may affect building operations. All operations which involve the demolitions, isolation or tie in to existing building equipment and/or systems will be submitted for approval.
- D. Contractor has the option of providing additional temporary facilities that can eliminate a constraint, provided it is done without additional cost to the County, and provided that it does not require any other Contractor to perform additional work, and provided that all requirements of these Specifications are fulfilled.
- E. The Contractor shall not shut off or disconnect any operating system of the Building. All Building equipment operation and equipment shutdowns shall be executed by the BNY. The Contractor shall put in place a Lock Out Tag Out (LOTO) system for the safety of their workers in conjunction with the BNY's LOTO.
- F. This Section of the Specifications contains several references to equipment, piping, ductwork, conduit, cable, material and appurtenances to be removed or reinstalled. The Contractor shall also refer to the Drawings and other applicable Sections for definition of the equipment, piping, ductwork, conduit, cable, material and appurtenances to be removed and turned over to the County and stored on site, or to become the property of the Contractor and removed from the site.

1.02 GENERAL CONSTRAINTS

- A. Paragraph 1.05 of this Section specifies the sequence and shutdown duration (where applicable) for Building units which are to be taken out of service. The operational status of new or existing "units", "utility systems", etc. other than the designated "units", "utility systems", etc. shall not be interrupted by the Contractor during the specified time periods. New "units", "utility systems", etc. may only be used after the specified testing and acceptance of the "units", "utility systems", etc.
- B. The following constraints shall be applied to all equipment and appurtenant utility systems on the Building site.
 - 1. Load limits on Access Roads: Existing and new underground facilities such as electrical duct banks, pipelines, etc., in, under and crossing BNY roads have been designed for a maximum wheel load of AASHTO H-20. The Contractor shall not exceed this weight limit.
 - 2. Access to Site: An unobstructed traffic route through all BNY gates must be maintained at all times.

3. Internal Roads Access: Vehicular access to all buildings and facilities must be maintained at all times.
4. Personnel Access: BNY Personnel and other Contractors must have access to all areas that remain in operation throughout the construction period.
5. Potable Water System: The existing potable water system shall be kept in operation at all times.
6. Plumbing Facilities: Sanitary facilities in the existing structures shall be operational at all times for BNY operating personnel and employees. All other building plumbing systems such as roof and floor drains, pumping, etc. shall be maintained for all structures.
7. Storm Drainage: Storm drainage on the site shall be operational at all times.
8. Building Heating and Ventilating: In the Contractor's work areas and areas affected by the Contractor's operations, building heating and ventilating shall be both provided and maintained by the Contractor. Temperatures to be maintained in any area occupied by BNY Personnel or other Contractors such as offices, toilet rooms, etc., shall be at least 65°F. Temperatures to be maintained in all other interior Building areas, whether new, existing or temporary, shall be maintained at a minimum of 55°F.
9. Power, Light and Communication Systems: Electric power, lighting service and communication systems shall be maintained in uninterrupted operation in all areas unless otherwise shown or specified.
10. Pipes:
 - a. Unless otherwise specified, the contents of pipes undergoing modifications shall be transferred to the Plant drain sewer system using hoses, piping, or pumps (if hydraulic conditions so require them) by the Contractor whose Work requires the draining. Exception: if contents of pipe not permitted to be discharged to normal drain, Contractor is responsible to contain, collect, and dispose of in a manner acceptable to the local authority having jurisdiction.
 - b. If a drain is not available on the pipe to be drained, then a wet tap shall be made by the Contractor using an approved tapping saddle and valve. No uncontrolled spillage of a pipe's contents shall be allowed.
 - c. All spillage shall be immediately washed down by the Contractor to the floor drains.
11. Dead End Valves or Pipe: The Contractor shall provide blind flanges on all valves or pipe that dead-end a line on a temporary or permanent basis.
12. Dead End Conduit:
 - a. Empty conduit stubbing up from floor shall be cut flush with floor and patched.
 - b. Empty conduit (spare or not) above finished floor shall be provided with cap, removable for future use.

1.03 SHUTDOWNS

A. General:

1. Shutdown shall be defined to indicate that a portion of the normal operation of a Building system has to be suspended or taken out of service in order to perform the specified work. For each shutdown, the Contractor shall compile an inventory of its labor and materials required to perform the tasks, an estimate of the time required and a written description of steps required to complete the tasks. The inventory, the estimate and written procedure shall be submitted to the Owner and Owner's Representative for review 30 calendar days prior to the proposed start date of the shutdown. The Contractor shall also request in writing, from the BNY, approval for each shutdown a minimum of fourteen calendar days prior to the proposed date. No shutdown shall be initiated until the list of materials and labor is verified on site at least one week prior to the proposed start date.
2. Work required which will interrupt the normal Building operations shall be accomplished at such times that will be convenient to the BNY and other Contractors on site.
3. The Contractor shall provide 7-day advance notice of needed shutdowns to all BNY Personnel.
4. The Contractor shall also have on hand, located in close proximity to the Work area, all tools, equipment and materials, both temporary and permanent, necessary to complete

each work category, without interruption. Adequate numbers of personnel shall be scheduled for each shutdown, so that the work may be accomplished within the specified time frame. Prefabrication of all piping, ductwork and other assemblies shall be completed to greatest degree possible, prior to any shutdowns. The BNY shall be satisfied that the Contractor has complied with these requirements, to the fullest extent possible, before shutdowns will be authorized.

- B. Shutdowns of Mechanical and Electrical Systems: The Contractor and the BNY shall each lock out and tag circuit breakers and switches operated by the BNY, and shall check cables and wires to be sure that they are deenergized to ground potential before Work begins and that all mechanical isolation devices are functional. Upon completion of the Work, the Contractor shall remove the locks and tags and advise the BNY that the facilities are available for use. The County will then remove their locks and place facilities back into use.

1.04 OVERTIME

- A. Overtime Work by the Contractor necessary to conform to the requirements of this Section and related Sections shall be performed by the Contractor, and the Contractor shall make no claims for extra compensation as a result thereof.

1.05 MAINTENANCE OF BUILDING OPERATIONS (MOBO) AND SEQUENCE OF CONSTRUCTION

- A. In order to maintain continuous Building operation during construction, a MOBO Description Section is included after this Section. The category order and item order within each category are not intended as an exact sequence of work or a listing of priorities. However, within each item procedural steps, time constraints and milestone dates may be outlined and are intended to recommend a sequence and timing in order to maintain the continuous operation of the Plant.
- B. The Contractor shall note that all necessary shutdowns may not be included in the MOBO Descriptions. As the need for additional shutdowns becomes evident, the Contractor shall notify the Engineer, who with assistance and approval of the BNY, will arrange for necessary shutdowns.
- C. Contractor is advised that work in multiple areas of the Building performed simultaneously may be required in order to complete the entire scope of the Contract within the allotted time.

REFER TO FOLLOWING "DETAILED MOBO DESCRIPTIONS".

Section 017001

Detailed MOBO Descriptions

Index to MOBO Items

Item Nos.:	Description:	Page:
1	Demolish Existing 2 nd Floor	
2	Construct New 2 nd Floor	
2a	Construction of New Substation G on new 2 nd Floor	
3	Provide and Install Interior Conduit, Exterior Below Grade Conduit Duct Banks, and Manholes	
4	Demolition of Existing Transformer T1	
5	Construct Exterior Platform Side 1	
6	Install New Medium Voltage Transformer T1 on Elevated Platform	
7	Install New Medium Voltage Primary Manhole, Cable, Conduit, and Duct Bank for Feeder XE2T	
8	Install New Medium Voltage Secondary Cable and Conduit to new Medium Voltage Switchgear Side A	
9	Energize New Substation G on 2 nd Floor	
10	Splice and Extend all Existing Low Voltage Feeders Indicated to Remain to new Low Voltage Equipment	
11	Demolition of Existing Transformers T2	
12	Construct Exterior Platform Side 2	
13	Install New Medium Voltage Transformer T1 on Elevated Platform	
14	Install New Medium Voltage Primary Manhole, Cable, Conduit, and Duct Bank for Feeder XE2T	
15	Install New Medium Voltage Secondary Cable and Conduit to new Medium Voltage Switchgear Side BA	
16	Demolition of Existing Substation G	

MAINTENANCE OF BUILDING OPERATIONS

Item Number:	Item Description:	Time Constraints:	Equipment Out of Service:	Procedure:
1	Demolish Existing 2 nd Floor	<p>Must be performed prior to any installation of new equipment and demolition of the existing 1st floor electrical equipment.</p> <p>All new electrical equipment must be ordered as soon as possible.</p>	<p>Any devices/equipment that resides on the second floor.</p> <p>All 1st floor equipment shall remain in service.</p>	<p>Identify and disconnect all 2nd floor feeders that originate from the 1st floor substation. Remove and dispose of all second floor in its entirety. Only the existing exterior walls, roof, and rafters shall remain intact.</p>
2	Construct New 2 nd Floor	<p>Install new 2nd floor slab.</p> <p>All new electrical equipment must be ordered as soon as possible.</p>	None.	<p>Install new 2nd floor slab while existing 1st floor substation remains fully operational.</p>

2a	Construction of New Substation G on new 2 nd Floor	Installed as soon as the 2 nd floor is constructed.	None.	Install new low voltage and medium voltage 'Substation G' equipment.
3	Installation of conduits, duct banks, and manholes.	<p>Interior Conduit: Installed as soon as the 2nd floor is constructed.</p> <p>Exterior Concrete Duct Bank: Install as soon as possible.</p> <p>Exterior Manholes: As soon as possible.</p>	None.	Install new conduits, duct banks, and manholes.

4	Demolition of Existing Transformer T1	Transformer T1 shall not occur until an appropriate delivery date of new equipment is confirmed. Additionally, Substation G must be solely powered Transformer T2 prior to demolition.	Existing Substation G within Building 386 cannot be deenergized in its entirety for any length of time. Contractor permitted to deenergize the Transformer T1 side for the duration needed to open the main circuit breaker for the respective side and close the tie breaker so that entire substation is energized from the Transformer T2 side which remains active.	Verify existing transformers T2 is energized. Open the existing substation G medium voltage switchgear main circuit breaker fed from existing Transformer T1. Close the medium voltage switchgear tie breaker. Open main circuit breaker for primary feeder XE2T at substation C in building 542. Disconnect and pull back existing primary feeder XE2T from existing transformer T1 to the existing electrical manhole.
5	Construct Exterior Platform Side 1	Transformer T1 must be demolished.	Existing Substation G within Building 386 cannot be deenergized in its entirety for any length of time.	Construct Side 1 of the transformer elevated platform above the footprint of the existing Transformer T1.

6	Install New Medium Voltage Transformer T1 on Elevated Platform	Must be installed, tested, and approved prior to connection of new substation equipment on site.	Existing Substation G within Building 386 cannot be deenergized in its entirety for any length of time.	
7	Install new Medium Voltage Primary Manhole, Cable, Conduit, and Duct Bank for Feeder XE2T	Must be installed tested and improved prior to connection of new substation equipment on site.	Existing Substation G within Building 386 cannot be deenergized in its entirety for any length of time.	Install new electrical manhole on beneath new platform, intercepting existing XE2T concrete duct bank. Install new primary feeder conduit (XE2T, XE2TA) duct bank from new manhole to new transformer T1. Splice new primary feeder XE2T with existing primary feeder in existing manhole. Pull new primary feeders from
8	Install new Medium Voltage Secondary Cable and Conduit to new Medium Voltage Switcher Side A	Must be installed and operational, as outlined in sequence of construction to minimize interruption to building.	Existing Substation G within Building 386 cannot be deenergized in its entirety for any length of time.	Install new medium voltage cable and conduit from new transformer T1 and terminate to new medium voltage switchgear side A main circuit breaker.

Item Number:	Item Description:	Time Constraints:	Equipment Out of Service:	Procedure:
9	Energize New Substation G on 2 nd Floor	Must be installed and operational, as outlined in sequence of construction to minimize interruption to building.	Existing Substation G within Building 386 cannot be deenergized in its entirety for any length of time.	Close main circuit breaker for primary feeder XE2T at substation C in building 542. Close new medium voltage substation side A main circuit breaker. Close medium voltage tie circuit breaker. Close medium voltage feeder circuit breakers to transformers T3 through T6.
10	Splice and Extend all Existing Low Voltage Feeders Indicated to Remain to new Low Voltage Equipment	Must be installed and operational, as outlined in sequence of construction to minimize interruption to building.	Individual equipment (Low Voltage Equipment) to be temporarily deenergized during swap over from existing low voltage switchgear to the new low voltage switchgear.	Must be phased to minimize downtime of each piece of equipment during its respective swap over from existing low voltage switchgear to new low voltage switchgear. Refer to Sequence of Construction for New Low Voltage Switchgear below for detail.
11	Demolition of Existing Transformer T2	Must be performed after confirming no remaining loads are connected to the existing Substation G.	New Substation G within Building 386 cannot be deenergized in its entirety for any length of time.	Verify new transformers T1 is energized. Open the existing substation G medium voltage switchgear main circuit breaker fed from existing Transformer T2. Open main circuit breaker for primary feeder XE2T at substation C in building 542. Disconnect and pull back existing primary feeder XE2T from existing transformer T2 to the existing electrical

Item Number:	Item Description:	Time Constraints:	Equipment Out of Service:	Procedure:
12	Construct Exterior Platform Side 2	Transformer T2 must be demolished.	Existing Substation G within Building 386 cannot be deenergized in its entirety for any length of time.	Construct Side 2 of the transformer elevated platform above the footprint of the existing Transformer T2.
13	Install New Medium Voltage Transformer T2 on Elevated Platform	Must be installed, tested, and approved.	New Substation G within Building 386 cannot be deenergized in its entirety for any length of time.	
14	Install new Medium Voltage Primary Manhole, Cable, Conduit, and Duct Bank for Feeder XPG	Must be installed tested and improved prior to arrival of new substation equipment on site.	Existing Substation G within Building 386 cannot be deenergized in its entirety for any length of time.	Install new electrical manhole on beneath new platform, intercepting existing XE2T concrete duct bank. Install new primary feeder conduit (XPG, XPGA) duct bank from new manhole to new transformer T2. Splice new primary feeder XPG with existing primary feeder in existing manhole. Pull new primary feeders from existing manhole to new transformer T2. XPG shall remain deenergized at substation C until new transformer T2 is delivered, installed, and ready for energization.

16	Install new Medium Voltage Secondary Cable and Conduit to new Medium Voltage Switcher Side B	Must be installed and operational, as outlined in sequence of construction to minimize interruption to building.	Existing Substation G within Building 386 cannot be deenergized in its entirety for any length of time.	Install new medium voltage cable and conduit from new transformer T2 and terminate to new medium voltage switchgear side B main circuit breaker.
17	Demolition of Existing Substation G	Must be performed as outlined in sequence of construction to minimize interruption to building.	None.	Existing substation shall not be demolished until new substation is online, tested, and approved.

SEQUENCE OF CONSTRUCTION FOR SUBSTATION G (BUILDING 386)

Install the new substation and complete system testing. Upon successful completion of system testing, the substation will be ready for energization. Substation G Medium Voltage Bus 'A' will be energized first. Following a 48-hour period for demonstrating the proper functioning of Substation G Medium Voltage Bus 'A', energization of Low Voltage Switchgear Side 'A' shall proceed. Following an additional 48-hour period for demonstrating the proper function of Low Voltage Switchgear Side 'A', energization of Low Voltage Switchgear Side 'B' shall proceed. Prior to beginning the work described in the following sequence and making any terminations, the Contractor shall hi-pot test the existing feeders noted in sequence A through G. If the feeders pass the hi-pot test, then the Contractor may proceed as sequence A through G indicates. Should any feeders fail the hi-pot test, that feeder shall be replaced in kind. Contractor shall note that sequence below includes work in and around area of live feeders and/or electrical equipment, and that Contractor is responsible to ensure that all appropriate safety measures and personal protective equipment (PPE) are utilized.

Preliminary Work:

1. All existing 2nd floor structural modifications, including but not limited to replacement of concrete, rebar, structural steel, etc., shall be completed, tested, approved, and accepted by Engineer and Owner prior to installation of electrical substation equipment.
 2. All protective walls and barriers required to isolate the existing substation room and to assure uninterrupted operation throughout the construction activities shall be installed prior to any structural modifications of the 2nd floor and the installation of electrical substation equipment. All protective walls and barriers shall remain intact until installation of electrical substation is complete including delivery, rigging, installation, assembly, connection terminations, testing, and acceptance.
 3. Prior to arrival of electrical substation equipment on site Contractor shall install all associated feeder conduit and cable, and all additional preliminary work possible to minimize downtime of electrical systems during subsequent swap over to new electrical substation.
- A. Transfer all existing building loads to the existing Transformer 'T2'. NOTE: the time to conduct the required steps (from opening the medium voltage switchgear main circuit breaker fed from transformer 'T1' and close the medium voltage switchgear tie breaker), shall be limited to no more than one hour:
1. Open, rack-out, and lock-out existing Substation G Medium Voltage Bus A Main breaker.
 2. Open and lock-out existing Transformer T1 medium voltage switch.
 3. Open, rack-out, and lock-out existing Substation C feeder breaker for Substation G Transformer T1.
 4. Close Existing Substation G Medium Voltage Tie Breaker.

B. Connect new Substation G to existing Transformer T1 13.8kV power.

1. Pull new 15kV feeders from existing electrical manhole 'EM-1' to new Substation G Medium Voltage Transformer T1 on elevated platform via new electrical manhole 'EM-7'.
2. Connect new 15kV feeders to existing 15kV feeders serving existing Substation G Medium Voltage Transformer T1 with an indefinite water submergence splice in existing electrical manhole.
3. Perform cable testing and splice testing in accordance with the specifications.
4. Upon successful testing, terminate feeders at new Substation G Medium Voltage Transformer T1 medium voltage switch, remove lock, rack-in, and close existing Substation C feeder breaker for new Substation G Medium Voltage Transformer T1.
5. Terminate new fire alarm panel bus tap feeders at new medium bus tap section, ahead of new medium voltage switchgear main circuit breaker switch for Substation G Medium Voltage Bus A.
6. Close new Substation G Medium Voltage Transformer T1 medium voltage switch.
7. Remove lock, and close new Substation G Medium Voltage Switchgear Bus A main circuit breaker.
8. Remove lock, rack-in, and close new Substation G Medium Voltage Switchgear Tie breaker.
9. New Substation G Medium Voltage Bus B Main breaker shall remain open, racked-out, and locked-out.
10. Remove lock, rack-in, and close new Substation G Medium Voltage Switchgear Transformer T3 circuit breaker.
11. Remove lock, rack-in, and close new Substation G Low Voltage Switchgear Side A Bus A main circuit breaker.
12. Remove lock, rack-in, and close new Substation G Medium Voltage Switchgear Transformer T4 circuit breaker.
13. Remove lock, rack-in, and close new Substation G Low Voltage Switchgear Side A Bus B main circuit breaker.
14. New Substation G Low Voltage Switchgear Side A Tie breaker shall remain open, racked-out, and locked-out.
15. Remove lock, rack-in, and close new Substation G Medium Voltage Switchgear Transformer T5 circuit breaker.
16. Remove lock, rack-in, and close new Substation G Low Voltage Switchgear Side B Bus A main circuit breaker.
17. Remove lock, rack-in, and close new Substation G Medium Voltage Switchgear Transformer T6 circuit breaker.
18. Remove lock, rack-in, and close new Substation G Low Voltage Switchgear Side B Bus B main circuit breaker.
19. New Substation G Low Voltage Switchgear Tie breaker shall remain open, racked-out, and locked-out.

C. Swap over existing Substation G Low Voltage Switchgear feeders to new Substation G Low Voltage Switchgear one at a time to minimize downtime of each:

1. Rect. Crane 309 & (1) Y. Box
2. DD-6 South, C-S-12 Transformer No. 7, CS-5 A&B
3. South Side DD #6, 6-S2A-B-C-D
4. DD-6 North
5. Flood Light Tower 8

6. Shore Power DD #6 Top Pier
7. N-Side Capstans, Main Gate, Trailers
8. Shore Power DD #6 Top Pier S. Side, Feeder Breaker 600A N. Side Pump Room
9. Head, Capstan DD #6, Caisson #6 Crane
10. Fire Pump
11. Pump Room Line 1, Machine Shop, Electrical Shop
12. Fire Pump No. 1
13. Emergency Bus Tie, S.B. 5&6, For Emergency Gen. Caisson 5
14. Machine Shop Trailer, Machine Shop
15. Yellow Box No. 5
16. Chem. Pioneer, No. Side DD #5, Yellow Box No. 2
17. No. Side DD #5, 5S2-A-B-C
18. Yellow Box No. 1, Bus Bar & Plate, Shop-Caisson No. 5, Yellow Front Electric Shop No. Side
19. Plate Shop
20. Compressor Room, Capstan So. Side DD #5
21. Machine Shop Arturo
22. Pump Well Line No. 2 Pump Room 5

FOR EACH EQUIPMENT LISTED ABOVE, PERFORM THE FOLLOWING SEQUENCE.

1. Pull new 600V feeders from New Substation G Low Voltage Switchgear to the existing Low Voltage Switchgear Enclosure via cable trays.
2. Perform cable testing in accordance with the specifications.
3. Upon successful testing, splice new 600V feeders to existing feeders, remove lock, rack-in, and close new Substation G Low Voltage Switchgear feeder breaker for existing equipment.

D. Connect new Substation G to existing Transformer T2 13.8kV power.

1. Pull new 15kV feeders from existing electrical manhole 'EM-1' to new Substation G Medium Voltage Transformer T2 on elevated platform via new electrical manhole 'EM-8'.
2. Connect new 15kV feeders to existing 15kV feeders serving existing Substation G Medium Voltage Transformer T2 with an indefinite water submergence splice in existing electrical manhole.
3. Perform cable testing and splice testing in accordance with the specifications.
4. Upon successful testing, terminate feeders at new Substation G Medium Voltage Transformer T2 medium voltage switch, remove lock, rack-in, and close existing Substation C feeder breaker for new Substation G Medium Voltage Transformer T2.
5. Terminate new fire alarm panel bus tap feeders at new medium bus tap section, ahead of new medium voltage

- switchgear main circuit breaker switch for Substation G Medium Voltage Bus B.
6. Close new Substation G Medium Voltage Transformer T2 medium voltage switch.
 7. Remove lock, rack-out, and open new Substation G Medium Voltage Switchgear Tie breaker.
 8. Remove lock, and close new Substation G Medium Voltage Switchgear Bus B main circuit breaker.
 9. New Substation G Medium Voltage Tie breaker shall remain open, racked-out, and locked-out.

E. Once the new Substation G is fully operational for a minimum of 48 continuous hours, remove and dispose of existing Substation G.

01700-10

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Cleaning during the progress of the work
- B. Cleaning prior to final payment

1.02 SCHEDULING

- A. Perform final cleaning at least five (5) days before the date set for ceremonies to dedicate the new facility wherein the Owner will provide tours to the general public and/or dignitaries. The site shall be clean, organized, and totally free of construction debris, tools, and equipment.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cleaning materials shall be appropriate to the surface and materials being cleaned.
- B. Provide pads to protect finished surfaces from cleaning materials.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Post signs to advise building occupants if wet and/or slippery floor conditions exist during cleaning operations.

3.02 PROGRESS CLEANING

- A. Keep all buildings, enclosures, and confined areas where work is being performed under the Contract free from unattended combustible materials.
- B. Remove rust spots as they develop.

3.03 FINAL CLEANING

- A. Remove dust, dirt, grease, stains, paint drips and runs, plastic, labels, tape, glue, rope, and other foreign materials from visible interior and exterior surfaces.
- B. Do not move dust from spot to spot. Remove directly from the surface on which it lies by the most effective mean such as appropriately treated dusting cloths or vacuum tools. When doing high cleaning, do not allow dust to fall from high areas onto furniture and equipment below.
- C. Dismantle and remove all temporary structures, scaffolding, fencing, and equipment. Remove waste materials, rubbish, lumber, block, tools, machinery, and surplus materials.
- D. Perform the following prior to final payment:
 - 1. Broom clean all exterior concrete surfaces and vacuum clean all interior concrete surfaces.
 - 2. Dust and spot clean painted and vinyl covered walls.
 - 3. Clean and polish all unpainted metal on doors such as trim, hardware, kickplates and doorknobs.
 - 4. Repair, patch, and touch-up marred surfaces to specified finish and to match adjacent surfaces.

5. Remove foreign material from exterior masonry.
6. Clean and polish all stainless steel surfaces, including control panels supplied under this Contract.
7. Remove all rust spots and stains from new and pre-existing concrete, painted surfaces, and all other surfaces.
8. Inspect interior and exterior surfaces, and all work areas, to verify that the entire work is clean and ready for use by the Owner. The project will not be considered substantially complete until all final cleaning has been performed.
9. Vacuum the inside of all control panels provided under this Contract after the panel has been wired.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Work of this Section includes the following:
 - 1. Starting systems
 - 2. Testing, adjusting, and balancing
 - 3. Updating of manufacturer's operations and maintenance manuals and wiring diagrams
- B. Work of this Section also includes stipulated man-hours that shall be provided by the **Prime Electrical Construction Contractor** for startup participation of equipment and systems.

1.02 STARTING SYSTEMS

- A. The Contractor shall coordinate, schedule, and sequence the start-up of various equipment and systems.
- B. Where the start-up of a system or piece of equipment is dependent upon the start-up of other system(s) or equipment, then the Contractor shall schedule and sequence the start-ups to coincide.
- C. Notify the Architect/Engineer at least 14 calendar days prior to the start-up of each item or system so that he can schedule the startup with the Owner and utilities.
- D. Where applicable, verify that each piece of equipment or system has been checked for proper:
 - 1. lubrication,
 - 2. drive rotation,
 - 3. belt tension,
 - 4. motor starter heater size,
 - 5. fuse size,
 - 6. water pressures,
 - 7. terminal connections,
 - 8. control sequence,
 - 9. for conditions which may cause damage or delay the start-up procedure.
- E. Verify that the equipment has been installed in accordance with the manufacturer's requirements.
- F. Complete all pre-startup checklists that may be required by the system vendor.
 - 1. In the event that start-up activities are delayed as a result of the Contractor's failure to properly check the completed installation and a manufacturer's representative is on the job site waiting for corrections to be made, then the Architect/Engineer may, at his/her sole discretion, postpone start-up until such time as the corrections have been made without any extra costs.
 - 2. The Owner may deduct from money due the Contractor the excess cost of engineering associated with having the Architect/Engineer present during the start-up.
 - 3. The deduction shall be equal to the Architect/Engineer's effective billing rate times the total number of hours delayed during the start-up activities.
- G. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- H. Verify that wiring and support components for equipment are complete and tested.
- I. Execute start-up under supervision of applicable Contractor's personnel in accordance with manufacturer's instructions.

- J. The Contractor shall have the job site superintendent present during all start-up activities.
- K. Provide manufacturer's authorized technician at the site when specified and in accordance with the requirements contained in Section 014500 - Quality Control.
- L. Submit manufacturer's start-up reports (MSR's) in accordance with Section 013300.

1.03 STIPULATED STARTUP PARTICIPATION FOR PRIME ELECTRICAL CONSTRUCTION CONTRACTOR

- A. The **Electrical Construction Contractor** shall provide the services of the job site foreman or superintendent who shall participate in the startup of equipment or systems that were furnished by others so as to achieve proper and sustained service.
- B. The Electrical Construction Contractor shall include in the Contract price **TWO HUNDRED FORTY (240)** man-hours of participation service exclusively dedicated for providing startup services for equipment furnished.
 - 1. The Owner reserves the right to receive a credit for each unused hour at the prevailing wage in effect at the time, said amount not being less than **Seventy Five Dollars (\$75)** per hour in any case.
 - 2. This service shall be provided when directed by the Architect/Engineer. Sufficient advance notice will be provided.
- C. The **Contractor** shall provide a separate line item in the Schedule of Values for this service.
 - 1. Provide with each requisition for payment, concerning this stipulated amount, a field report documenting the equipment item or system, date(s) of service, name of Contractor's worker(s), hour(s) worked, brief description of work performed during startup, and the prevailing wage rate paid them.
 - 2. The field report shall be signed by the Architect/Engineer's field representative.
- D. Requisitions for payment out of this stipulated amount will not be processed without an executed field report unless proof of manhours expended can be proved otherwise.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SUBMITTALS

- A. Submit the following items to the Engineer/Architect with the final application for payment:
 - 1. Approved change orders.
 - 2. Maintenance Bond (period beginning date to match the date of final payment) prepared in accordance with the Contract,
 - 3. Utility company signoffs and inspection approvals, if applicable.
 - 4. Federal, state, county, town and local signoffs and inspection approvals, where applicable.
 - 5. Certified Payroll records with affidavits of labor.

- B. All documents shall be complete, signed, dated, and notarized (where applicable) and be subject to the Engineer/Architect's acknowledgment of receipt or approval.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SUBMITTALS

- A. Submit the following items to the Engineer/Architect with the final application for payment:
 - 1. Approved change orders.
 - 2. Maintenance Bond (period beginning date to match the date of final payment) prepared in accordance with the Contract,
 - 3. Utility company signoffs and inspection approvals, if applicable.
 - 4. Federal, state, county, town and local signoffs and inspection approvals, where applicable.
 - 5. Certified Payroll records with affidavits of labor.

- B. All documents shall be complete, signed, dated, and notarized (where applicable) and be subject to the Engineer/Architect's acknowledgment of receipt or approval.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section specifies the requirements for Operations and Maintenance Manuals required to be prepared by system suppliers and equipment manufacturers.
- B. The Contractor shall submit Operations and Maintenance Manuals for all equipment.
- C. Where the technical specifications call for the submission of manuals, said manuals shall be prepared in accordance with the requirements contained herein. It being understood that manuals shall be submitted for all equipment even if it is not specifically called out in the specifications.

1.02 MANUAL CONTENTS AND FORMAT

- A. All Operations and Maintenance Manuals shall be as specified hereinafter.
- B. The binder shall be 8 1/2" x 11", metal hinge, vinyl, large capacity by National or Equal. It shall show the name of the manufacturer or supplier and project name on the spine of the binder.
- C. A cover shall be provided showing the names of the Owner, Engineer/Architect, Contractor, and Manufacturer.
 - 1. It shall show the Contractor's order number and manufacturer's project number.
 - 2. The address of the manufacturer, service station telephone number, project title, contract number, and year shall also be shown.
- D. Provide tabbed color dividers for each separate product and system.
 - 1. The name of the product shall be typed on the tab.
 - 2. A separate tab shall also be provided for information such as troubleshooting instructions, spare parts list, etc.
- E. An index shall be provided in the back of the binder, with a separate tab, providing a quick way for the operator to find key and important topics contained in the manual.
- F. A separate listing for all charts, graphs, tables, figures and shop drawings shall be provided directly following the table of contents.
- G. Each manual shall contain one (1) copy of all shop drawings deemed in compliance with the Contract Documents by the Engineer submitted for the equipment or system for which the manual is prepared.
 - 1. Only these shop drawings shall be included in the manual.
 - 2. All shop drawings larger than 8 1/2" x 11" shall be folded and placed in a heavy duty, top loading plastic sheet protector with the title of the drawing showing; one (1) drawing per protector page.
- H. For systems being furnished with control panels, each manual shall contain a catalog cut for every electrical device installed inside the control panel or motor control center.
- I. Where emergency generator(s) are included as work of this Contract, the manufacturer's standard manual will be allowed if the manual clearly shows the instructions for the particular model of generator. Cross out chapters and paragraphs that do not apply to the Owner's generator.

- J. Where manuals are prepared for treatment systems for water or wastewater, a process chapter, written in plain language for the operators, shall be prepared by the manufacturer providing the following:
1. A general discussion regarding the theory of the process.
 2. A specific discussion relating the theory to the project as designed and constructed. Provide capacities, sizes, loading rates, application criteria, design values, and design assumptions.
 3. Provide model numbers for equipment comprising the system.
 4. Provide figures, tables, and graphs to assist the operator in understanding the operation of the treatment system.
 5. Where operator interfaces are provided, provide step-by-step instructions for changing a process control variable such as set points.
 - a. The instructions shall be numbered and written such as "press", "hold" "scroll", etc.
 - b. Each operator interface instruction sheet shall be laminated and placed in the binder.
 - c. Another laminated sheet shall be provided and placed inside the control panel.
- K. Each manual shall contain the following as a minimum:
1. Table of contents
 2. Final version of the warranty statement approved by the Engineer/Architect
 3. Nameplate data of each component, year of installation, contract number and specification number
 4. Name, address and telephone number of the manufacturer and the manufacturer's local representative(s)
 5. Installation instructions
 6. Operation instructions including adjustments, the interrelation of components and the control sequence describing break-in, start-up, operation and shutdown
 7. Emergency operating instructions and capabilities
 8. Maintenance requirements include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair and reassembly instructions; and alignment, adjusting, balancing, and checking instructions
 9. Troubleshooting guide and corrective maintenance (repair) procedures for all electrical and mechanical equipment. These guides shall list the most frequent and common problems, together with the symptoms, possible causes of the trouble, and remedies
 10. Drawings (pictures or exploded views) which clearly depict and identify each part, suitable for assembly and disassembly of entire system and each component
 11. Wiring and control diagrams, if applicable
 12. Panelboard circuit directories including electrical service characteristics, if applicable
 13. Part list with current prices; ordering information; and recommended quantities of spare parts to be maintained in storage
 14. Charts of valve tag numbers, with location and function of each valve, keyed to the process and instrumentation diagram prepared as part of the Contract Documents
 15. Name, address, and telephone number of nearest parts supply house and nearest authorized repair service center.
 16. List of recommended spare parts and the recommended number of each per unit and per group of units.
 17. Approved shop drawings, submittals and product data.
- L. Submit two (2) copies of a preliminary draft manual at least fourteen (14) calendar days prior to the date set for start-up.
1. The Engineer/Architect will review the manual for content and compliance with these specifications.
 2. Written comments will be provided, but the manual will not be returned.
 3. One (1) manual will be used at start-up, to record changes that should be made to the final manual.

4. This copy of the manual will be retained on the site until such time as the final, updated manual is provided.
- M. Two (2) weeks after the date the unit was placed into service and the Owner has gained beneficial use, submit two (2) paper and two (2) electronic copies of the final updated Operations and Maintenance Manual. Refer to Section 017500 - Starting and Adjusting for requirements related to updating the manual(s).
- N. Where installation instructions are not included with the manual, they shall be shipped at least ten (10) days prior to the date the equipment is scheduled for installation.

1.03 RETAINAGE

- A. The Engineer will retain from payment due the Contractor, for failure to submit manuals as specified, an amount equal to 5% of the scheduled value for the equipment or system for which the manual applies. This Contract requirement only applies when a manual is specified to be provided in the Technical Specifications for a particular system or piece of equipment.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section includes:
 - 1. Maintenance of documents
 - 2. Recording of record information
 - 3. Submission of record documents
- B. Work of this section also includes the furnishing of underground pipeline documentation.

1.02 PLANS AND SPECIFICATIONS FURNISHED TO THE CONTRACTOR

- A. Two (2) complete sets of Contract Documents (plans, specifications and addenda) will be furnished to the Contractor upon request.
- B. Additional sets will be furnished to the Contractor at \$300 per set.

1.03 MAINTENANCE OF DOCUMENTS

- A. The Contractor shall maintain at the site one (1) set of the following: drawings, specifications, addenda, change orders, approved shop drawings, test reports, operations and maintenance manuals, and shop drawing log.
- B. The Contractor shall make these documents available for use by the Owner, Engineer/Architect, regulatory agencies and other parties designated by the Owner.
- C. Provide a drawing rack for storage of plans.
- D. Maintain these documents in a clean, dry, legible condition throughout the entire contract period.
- E. This field set of documents shall returned to the Engineer/Architect for scanning.

1.04 RECORDING OF RECORD INFORMATION

- A. The Contractor shall include a lump sum amount in the bid amount for preparation of record drawings.
 - 1. Stipulated amount in the bid item will be released when the record drawings have been accepted by the Engineer.
 - 2. Satisfactory evidence shall be provided by the Contractor demonstrating compliance with these specifications and said drawings have been delivered and deemed in compliance with the specifications by the Engineer/Architect.
 - 3. Progress payments will be allowed against the line item in the Schedule of Values only if record documents are considered accurate and up-to-date by the Engineer.
- B. The contractor shall be required to keep accurate record drawings, in hard copy format, as well as Autocad 2020 or newer digital format, of the work actually performed which is in accordance with the contract documents and that which deviates from them.
- C. As work progresses, the contractor shall maintain an on the field set of hard copy drawings, a complete and accurate set of field notes clearly delineating all work as it is actually installed. This set of drawings shall be available at all times for the Engineer/Architect to review and shall be examined at all jobsite meetings.
- D. Do not permanently conceal any work until required information has been recorded.

- E. Final record drawings shall be hard copy format and AutoCad 2020 or newer digital format, 24" x 36", completed by a competent draftsman or CAD operator with the following information as a minimum:
 - 1. A dimensioned drawing of all equipment installed.
 - 2. Field changes of dimension and detail.
 - 3. Changes made by Change Order.
 - 4. Clarification plans not on original contract.
- F. At final contract closeout Engineer/Architect will review preliminary set of final record drawings. After approval of this submission, the contractor will be required to submit one (1) set of hard copy, 24" x 36" drawings and one (1) digital DVD disc including all as-built drawings in AutoCad 2020 or newer format as detailed above. No portion of the line item bid amount in the proposal for the record drawings will be released until final record drawings have been submitted and approved. No exceptions.

1.05 SUBMITTAL OF RECORD DOCUMENTS

- A. At completion of project prior to the final project close-out meeting, deliver marked-up record documents to the Engineer.
- B. Accompany submittal with transmittal letter, containing:
 - 1. Date.
 - 2. Project title and number.
 - 3. Contractor's name and address.
 - 4. Title and number of each record document.
 - 5. Certification that each document as submitted is complete and accurate.
 - 6. Signature of Contractor or its authorized repre-sentative.
- C. Upon completion of the work, Contractor shall prepare and furnish the Engineer/Architect a set of marked up prints of the as-built drawings for review, with all changes conspicuously circled or otherwise emphasized.
- D. Prior to final payment, Contractor shall conform the drawings to the comments made by the Engineer/Architect and then provide the Owner a complete reproducible set of as-built drawings on 24" x 36" paper and a set in digital CD-ROM AutoCad 2020 or newer format.
- E. As-built drawings shall be the same size as the contract drawings, with 1/2 inch margins space on three sides and a 2 inch margin on the left side for binding. Each drawing shall bear the legend "AS-BUILT" and the name of the Contractor in heavy black lettering 1/2 inch high and be certified as complete and accurate.
- F. As a convenience, Engineer/Architect will make available to the Contractor electronic media of the contract drawings for the sole purpose of the Contractor preparing as-built drawings. Electronic media made available is without guarantee of compatibility with the Contractor's software or hardware. If the Contractor wishes to take advantage of this offer, the Contractor will be required to execute an indemnification and hold harmless agreement with the Engineer/Architect and pay the Engineer/Architect \$150.00 per contract set to cover the cost of providing electronic media. Payment shall be by check, payable to H2M architects +engineers, in advance of picking up the requested materials. Electronic media shall be returned to the Engineer/Architect upon acceptance of the as-built drawings by the Owner.

1.06 RELATED DOCUMENTS

- A. Provide certificate of release of liens if requested by the Engineer.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The Section includes the requirements for delivering spare parts specified to be furnished under the provisions of the Contract Documents.

1.02 QUALITY ASSURANCE

- A. Spare parts shall be delivered as complete assemblies direct from the manufacturer such that the part is fully functional and ready to be installed.

1.03 DELIVERY, STORAGE AND HANDLING OF SPARE PARTS

- A. Comply with the requirements of Section 016500 for packing, delivery, storage and handling requirements for all parts delivered to the site of the work.
- B. All spare parts required to be furnished under a Section of the Specifications shall be packaged in one separate box, crate or container with the words "SPARE PARTS" lettered on all sides of the container.
- C. The equipment name or system name for which the spare parts are being provided shall also be lettered on the container.
- D. A separate packing list for the spare parts shall be included in the container.
- E. The Contractor shall store all spare parts indoors immediately upon delivery of the spare parts to the site. Spare parts will not be accepted by the Owner/Architect/Engineer if the spare parts have been stored outdoors for more than 8 hours upon delivery to the site.
- F. The storage location shall be secure.

1.04 TURN OVER OF SPARE PARTS

- A. Spare parts shall be turned over to the Owner/Engineer approximately two (2) weeks prior to the Architect/Engineer's preparation of the Final Punch List.
 - 1. The Certificate of Substantial Completion will not be issued until all spare parts are delivered.
- B. The following procedure shall be followed:
 - 1. The Contractor shall provide a formal letter of transmittal listing the name or description of the part, part number, model number, manufacturer (or supplier), and system component name and the Section where it was specified to be provided.
 - 2. Two (2) counterparts of the letter shall be provided.
 - 3. The Contractor shall turn each part individually over to the Owner/Architect/Engineer.
 - 4. The Owner/Architect/Engineer will initial next to the part description on each counterpart of the transmittal letter.
 - 5. The initials represent that the part was received.
 - 6. One transmittal counterpart will be returned to the Contractor.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Work of this Section includes the requirements for demonstrating and training of installed systems, equipment, and products.
- B. Manufacturer field services and the credit for unused service time is also included herein.

1.02 MANUFACTURER'S FIELD SERVICES

- A. When specified in individual specification sections require field services to be provided, said services shall be provided by qualified, authorized and factory trained representative(s) of the manufacturer (supplier).
- B. Field services shall generally consist of:
 - 1. installation supervision,
 - 2. verify terms of the manufacturer's warranty,
 - 3. equipment and system calibration,
 - 4. startup supervision,
 - 5. and operation and maintenance instructions to the Owner's employees.
- C. Such services do not include service time to correct a factory fault, correct problems resulting from a factory wiring or control logic error, or errors caused by poor or improper installation by the Contractor.
- D. Sale representatives are not acceptable.
- E. The time specified to be provided under the specification sections shall be exclusive of travel time to and from the facility or site. For the purposes of this Contract, one (1) day shall be defined as eight (8) hours exclusive of breaks or mealtime.
- F. The times specified to be provided by the manufacturer does not relieve the manufacturer from providing sufficient service time to place the equipment or systems into satisfactory operation and to obtain the specified performance. The manufacturer shall provide, as a minimum, the times specified in the Specification Sections.
- G. If for any reason, the specified service days are not used, then the Owner shall receive a credit equal to **[\$500.00 (FIVE Hundred Dollars and Zero Cents)]** for each unused field service day specified. The Contractor shall include, as a minimum, **[\$20,000 (twenty thousand dollars and zero cents)]** in the amount bid for manufacturer supplied field service for equipment furnished and installed under Contract G. Said amount of **[\$20,000]** being equal to **[40]** days of service at **[\$500]** each day.
- H. A change order to the Contract reducing the Contract Price, by the dollar amount equivalent to the unused field service days, will be issued.
- I. Submit manufacturers' startup reports (MSR's) in accordance with the requirements contained in Section 013300 - Submittals.

1.03 SUBMITTALS

- A. The Contractor shall prepare a list of all manufacturer specified field time required by the technical specifications. Compile this summary listing and submit it to the Engineer for review in accordance with the requirements contained in Section 013300.

B. Manufacturer's Startup Reports

1.04 QUALITY CONTROL

- A. The Contractor shall adhere to all instructions provided by the manufacturer's authorized representative.
- B. All verbal instructions necessary to satisfy performance of the equipment or the system shall be immediately provided by the Contractor. The manufacturer shall document all verbal orders in writing at a time suitable to the Contractor.
- C. All written instructions provided in operation, maintenance, and installation guides and manuals, provided by the manufacturer of such equipment and or system, shall be complied with by the Contractor.
- D. The Contractor shall comply with all manufacturer requirements such that written or implied warranties remain in full force during the time period so specified elsewhere in the technical specifications.
- E. Should manufacturer's instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- F. Actions and/or non performance by the Contractor that may void manufacturer warranties shall not constitute a release of the specified warranty, and all warranty claims made by the Owner shall be paid for by the Contractor as if the manufacturer's warranty was still in effect.

1.05 SCHEDULING - FIELD SERVICES

- A. The Contractor shall arrange field service on dates acceptable to the Owner and Architect/Engineer.
- B. The service visits shall be scheduled at least 2 weeks in advance so that the Owner and Architect/Engineer can adequately staff the date.
- C. Operator training will not be allowed until such time as the Manufacturer's Operation and Maintenance Manuals have been supplied and approved by the Architect/Engineer.
 - 1. The field service technician shall review the contents of the manual with designated employees of the Owner.
 - 2. Field services will not be deemed provided until the MSR is provided.

1.06 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of products to Owner's personnel prior to date of Substantial Completion.
- B. Utilize manufacturer's and vendor's Operation and Maintenance Manuals as basis for instruction. Review contents of the manual with the Owner's personnel in detail to explain all aspects of operation and maintenance.
- C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of the equipment or of the system.
- D. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

- E. The Contractor shall arrange to have the manufacturer's Operation and Maintenance Manuals updated with information that has been added during start-up activities.
- F. The final manual shall contain the most recent information and reflect all operational and maintenance aspects of the final installed and functioning system or equipment component of the system.
- G. Any changes to control panel wiring diagrams or interconnection wiring schematics shall be made and new prints provided as an update to previously approved manuals.
- H. Manufacturer field time shall be as specified in individual Sections of the Technical Specifications.
- I. For control panels, explain the control sequence, timing structure, and safety precautions when working inside the panel, terminal wiring system, PLC program, if applicable, operator interface(s) and control logic.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

PART 1 GENERAL

PRESUME HISTORICAL CONTAMINATION 100 YDS³ SOILS REMOVAL NECESSARY AS HAZARDOUS OR CONTAMINATED PCB. PLEASE REFER TO SITE MANAGEMENT PLAN APPROVED BY NYSDEC AND REVISED ON 10/18/22 FOR EXCAVATION. GUIDANCE NYSDEC SITE NO. V00120.

CONTRACTOR TO PROVIDE COSTS FOR CONTAMINATED SOILS REMOVAL COST IN THEIR BID. CONTRACTOR SHALL PROVIDE HAZARDOUS SOILS COST AS AN ALTERNATE.

4.01 SECTION INCLUDES

- A. Requirements for furnishing all labor, materials, tools, and equipment and performing all operations necessary for sampling and analysis of site materials and stockpiles.
- B. Requirements for furnishing all labor, materials, tools and equipment, and performing all operations necessary for sampling and analysis of groundwater.
- C. Recommended stockpile classifications and number of stockpile samples.
- D. Suggested stockpile analytical parameters and/or as directed by the Engineer-approved disposal facility and/or as directed by the Engineer and Owner.

4.02 REFERENCED SECTIONS

- A. Division 01 - General Requirements.
- B. Division 02 - Transportation and Disposal of Hazardous Materials
- C. Section 026100 - REMOVAL, TRANSPORT AND DISPOSAL OF CONTAMINATED SOIL.
- D. Section 026120 - STAGING, HANDLING, TRANSPORTATION AND DISPOSAL OF NON-HAZARDOUS AND PETROLEUM CONTAMINATED MATERIALS

4.03 NOTED RESTRICTIONS

- A. Verify that soil, rock and groundwater analytical results are consistent with applicable regulatory standards and permit restrictions.
- B. All laboratory testing and sampling equipment and material shall be state certified in New York.
- C. Due to site constraints, the Contractor may be required to stockpile materials off-site or perform in-situ characterization of soil and groundwater.

4.04 QUALITY CONTROL

- A. Regulatory Requirements:
 - 1. NYCDEP:
 - a. 15 RCNY Chapter 19 - Use of Public Sewers
 - b. Limitations for Effluent to Sanitary or Combined Sewers, May 1, 2005
 - 2. New York State Regulations:
 - a. 6 NYCRR Part 360 - Solid Waste Management Facilities
 - b. 6 NYCRR Part 371 - Identification and Listing of Hazardous Waste

- c. New York State Department of Health Environmental Laboratory Accreditation Program (NYSDOH ELAP)
 - d. 6 NYCRR Part 375-6, Environmental Remediation Programs, Remedial Program Soil Cleanup Objectives.
 3. New York State Department of Environmental Conservation (NYSDEC):
 - a. Spill Technology and Remediation Series (STARS) Memo No. 1 - Petroleum Contaminated Soil Guidance Policy, Division of Construction Management, Bureau of Spill Prevention and Response, August 1992.
 - b. Technical and Operational Guidance Series (TOGS) 1.1.1., Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, June 1998.
 - c. Well Permit Conditions.
 - d. Draft DER-10, Technical Guidance for Site Investigation and Remediation
 4. Code of Federal Regulations (CFR):
 - a. 29 CFR 1910 - Occupational Safety and Health Standards (OSHA).
 - b. 29 CFR 1910.120 - Hazardous Waste Operations and Emergency Response.
 - c. 40 CFR 261 - Identification and Listing of Hazardous Waste.
 - d. 40 CFR 761 - Polychlorinated biphenyls (PCBs) - Toxic Substances Control Act (TSCA).
 5. United States Environmental Protection Agency (EPA):
 - a. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) 42 U.S.C. s/s 9601 et seq.
 - b. Resource Conservation and Recovery Act (RCRA) 42 U.S.C. s/s 321 et seq.
 - c. Superfund Amendment and Authorization Act of 1986 (SARA) Title III, Emergency Planning and Community-Right-To-Know.
 6. Before material excavation and stockpiling, verify that soil and other Work Site material analytical results are consistent with applicable regulatory limits specified herein including 40 CFR 261, 40 CFR 761, 6 NYCRR 371, and 6 NYCRR 375-6.
 7. Verify that the Construction Manager and Owner have approved all proposed treatment or disposal facilities and verify the facilities have approved the sampling and analytical methods and procedures contained in this Section.
 8. Verify that soil, rock and other sampling activities are completed in accordance with applicable protocols and cited standards and regulations specified herein, including CERCLA, RCRA, and NYSDEC Sampling Guidelines and Protocols.
 9. Verify Laboratory provided results and documents include all requested analytical parameters prior to submission to the Construction Manager.
 10. Contractor is responsible for assuring compliance with all applicable federal and state regulations and policies in place at the time of construction. This includes, but is not limited to, any state or federal modifications to sampling or analytical methods, standards or policies specified herein.
 11. Verify the stockpile construction including liner, berm cover, and erosion control is in compliance with Division 31.

4.05 SUBMITTALS FOR REVIEW

- A. Sampling Procedures, Testing Requirements and List of Disposal Facilities: sampling and analysis plan and a list of proposed disposal facilities at least 30 days before implementing sampling activities on the Work Site in accordance with the regulatory requirements specified herein. The Engineer shall approve the Contractor's submitted sampling procedures, testing requirements and disposal facilities.
- B. Contractor's site-specific Construction Safety and Health Plan (CSHP) and Safe Work Plan (SWP) in accordance with Division 01. Documents shall address proposed chemical sampling and handling of potentially hazardous and/or petroleum-contaminated materials in this Section and in accordance with applicable OSHA standards including 29 CFR 1910.120(b).

- C. Laboratory Qualifications: Submit analytical laboratory qualifications to provide certification under the NYSDOH ELAP for all chemical analyses conducted.

4.06 SUBMITTALS FOR INFORMATION

- A. Laboratory Results: laboratory results and documents within 21 days (unless otherwise specified) of the sampling event in accordance with this Section for the exclusive use of the laboratory results shall be accompanied by a drawing that depicts the sampling locations, which correspond to the appropriate laboratory data.
- B. Provide laboratory data requirements that comply with NYSDEC regulations and NYCDEP Sewer Discharge Authorization requirements. Category B QA/QC Data Package Deliverables shall be required.

4.07 PERFORMANCE/DESIGN REQUIREMENTS

- A. The Specifications herein below are minimum requirements. However, the Contractor shall prepare and submit his/her own Specifications for review and approval by the Construction Manager.
- B. Products:
1. General:
 - a. All reusable sample collection devices, such as shovels or hand trowels, shall be stainless steel. All devices shall be decontaminated before and after collection of each sample. All methods necessary to decontaminate the sampling equipment shall be used, including steam cleaning and methanol solutions as necessary. Contractor shall be responsible for proper handling and disposal of all decontamination materials and fluids.
 - b. All disposable sampling devices, such as bailers or tubing, shall be constructed of inert materials such as polyethylene, silicon, or Teflon. All disposable sampling devices shall be used only once and properly disposed of.
- C. Execution:
1. Stockpiling Guidelines
 - a. Classify and segregate excavated material into stockpiles for sampling as follows:

Stockpile	Defined as:
Hazardous Material	Excavated material from areas where analytical results from environmental investigations exceed RCRA and/or TSCA hazardous waste regulatory levels for at least one target compound, as defined by 40 CFR Part 261, 40 CFR 761, and 6 NYCRR Part 371.
Non-Hazardous, Non-Petroleum Contaminated Material	Excavated material from areas where analytical results from environmental investigations are less than NYSDEC 6 NYCRR 375 unrestricted use soil cleanup objectives and does not exhibit a hazardous characteristic per 40 CFR Part 261 and 6 NYCRR Part 371.
Petroleum-Contaminated Material	Excavated material from areas where analytical results from environmental investigations exceed NYSDEC CP-51 soil cleanup levels.

- b. Excavation, on-site storage, off-site storage, handling, transportation and disposal procedures are specified in Division 31.

D. Sampling Protocol for Soils and Rock:

1. Collect soil and rock samples from the stockpiles or in-situ for waste characterization/classification purposes in accordance with the Owner-approved disposal facility permit requirements.
2. Suggested analytical parameters and methods for waste characterization/classification purposes include the following:

Analytical Parameters	EPA Method
TCLP VOCs	8260C
TCLP SVOCs	8270C
TCLP Metals	1311/6010/7471
PCBs	8082
TCLP Pesticides	1311/8081
TCLP Herbicides	1311/8151
Ignitibility	1020
Corrosivity	9045
Reactivity	SW-86, Ch.7.3

a. Notes:

- 1) VOCs - Volatile Organic Compounds
 - 2) SVOCs - Semi-Volatile Organic Compounds
 - 3) TCLP - Toxicity Characteristic Leaching Procedure
3. Submit stockpile samples and/or in-situ samples to the Laboratory for analysis by the analytical parameters suggested above or as directed by the Owner-approved facility. Samples shall be submitted in Laboratory-provided containers and within prescribed holding times and conditions.
 4. Endpoint samples for Petroleum-Contaminated Materials shall require the following analyses: PCBs, TCLP Target Compound List (TCL) VOCs, TCLP TCL SVOCs and Total Target Analyte List (TAL) metals.
 5. Furnish laboratory analytical results and copies of chain-of-custody forms to the Construction Manager within 21 days (unless otherwise specified) of the sampling event.
 6. No extra payment shall be made for additional sampling and analysis for waste characterization as required by the Owner-approved facility.

E. Sampling for Groundwater:

1. Collect groundwater samples from monitoring wells, piezometers and discharge location(s) in accordance with the conditions set forth in all applicable permits and relevant regulations including NYSDEC's TOGS, and NYCDEP's 15 RCNY Chapter 19.
2. Submit samples to laboratory and analyze for parameters as specified in all applicable permits and relevant regulations including NYSDEC's TOGS, and NYCDEP's 15 RCNY Chapter 19 - Use of Public Sewers.
3. Furnish laboratory analytical results and copies of chain-of-custody forms to the Construction Manager within 21 days of the sampling event (unless otherwise specified).
4. Samples shall be collected for laboratory analysis and shall include a minimum of the following parameters:

Analytical Parameters	EPA Method
TCL VOCs	624/8260B
TCL SVOCs	625/8270B
TCL PCBs	8082
TAL Metals Unfiltered	6010
TAL Metals Filtered	6010
Temperature	Standard Method (in situ)
pH	9045C
Total Suspended Solids	160.2

Flash Point 1010

F. Groundwater Corrosivity Testing:

1. Corrosivity of the groundwater shall be measured with a probe at the face of the excavation. The groundwater parameters to be measured are Dissolved Oxygen, pH, Specific Conductance, Hydrogen Sulfide, Total Dissolved Solids, Alkalinity (Total), Sulfate, Hardness as CaCO₃ and Chloride.
2. Submit samples to the laboratory and analyze for parameters as specified.
3. Samples shall be collected for laboratory analysis and shall include a minimum of the following parameters:

Analytical Parameters	EPA Method
Dissolved Oxygen	In-Situ
pH	In-Situ
Specific Conductance	In-Situ
Hydrogen Sulfide	In-Situ
Total Dissolved Solids	160.1
Alkalinity, Total	300
Sulfate	300
Hardness as CaCO ₃	6010
Chloride	300

PART 2 PRODUCTS

5.01 NOT USED

PART 3 EXECUTION

6.01 NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Asbestos, Lead, PCB, and Universal Survey performed by H2M architects + engineers dated 09/28/2023 consisting of 83 pages This Section includes the following:
- B. Related Sections include the following:
 - 1. Section 028200 - Asbestos Remediation.
 - 2. Section 028304 - Handling of Lead Containing Materials.
 - 3. Section 028400 - Polychlorinated Biphenyl (PCB) Remediation
 - 4. Section 028400.11 - Management of Polychlorinated Biphenyl (PCB) Equipment.
 - 5. Section 028600 - Disposal of Hazardous Waste
 - 6. Section 028700 - Removal and Disposal of Universal Waste and Fluorescent Lamps
 - 7. Section 026100 - Removal, Transport and Disposal of Contaminated Soil

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

PART 1- GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 1. Demolition and removal of buildings and and site improvements.
 2. Removing below-grade construction.
 3. Disconnecting, capping or sealing, and removing site utilities.

1.03 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.

1.04 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified refrigerant recovery technician.
- B. Proposed Protection Measures: Submit informational report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and for noise control. Indicate proposed locations and construction of barriers.
- C. Schedule of Building Demolition Activities: Indicate the following:
 1. Detailed sequence of demolition work, with starting and ending dates for each activity.
 2. Temporary interruption of utility services.
 3. Shutoff and capping of utility services for subsequent removal.
- D. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
- E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.06 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.
- D. Pre-demolition Conference: Conduct conference at Project Site.
 - 1. Inspect and discuss condition of construction to be demolished.
 - 2. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review procedures for noise control and dust control.

1.07 PROJECT CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.
- B. Owner assumes no responsibility for buildings and structures to be demolished.
 - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of the Work.
- D. On-site storage or sale of removed items or materials is not permitted.

PART 2 - PRODUCTS

NOT USED

2.01 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements under Division 312000 - EARTH MOVING.

PART 3 - EXECUTION

3.01 DEMOLITION CONTRACTOR

- A. Demolition Contractor:
 - 1. Demolition Contractor shall have a minimum of Five (5) years experience on projects of similar size and complexity involving similar scope of regulatory controls and requirements. Contractor shall supply references for the representative projects including Project Name, Project Demolition Scope / Cost and Owner's Representative contact information including telephone, fax and email information.

3.02 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.
- B. Review Project Record Documents and Plot Drawing showing of existing construction/structure locations. These drawings are general in nature and do not provide detailed project information

provided by Owner. The Owner does not guarantee that existing conditions are same as those indicated nor are they fully documented in Project Record on this drawing.

- C. The Contractors are advised to conduct their own thorough site visits / inspections in order to ascertain existing field conditions and materials including Hazardous Materials which are to be removed / remediated as part of this contract.

3.03 PREPARATION

- A. Refrigerant: Remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction before starting demolition.
- B. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
 - 1. Arrange to shut off indicated utilities with utility companies.
 - 2. Cut off pipe or conduit a minimum of 24 inches (610 mm) below grade unless the utility is located within 5' of the footprint of the proposed structure. In this case, the utility will be removed back to a point outside this distance for capping and future connection. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
- C. Existing Utilities: See plumbing and electrical Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.04 PROTECTION

- A. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.
 - 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
 - 2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
 - a. Provide at least 72 hours notice to occupants of affected buildings if shutdown of service is required during changeover.
- B. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 - TEMPORARY FACILITIES AND CONTROLS.
 - 1. Protect existing site improvements, appurtenances, and landscaping to remain.
 - 2. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 - 3. Provide a 6 foot high Chain Link construction fence and temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
- C. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.05 DEMOLITION, GENERAL

- A. General: Demolish indicated buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.

2. Maintain fire watch during and for at least 2 hours after flame cutting operations.
 3. Maintain adequate ventilation when using cutting torches.
 4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- C. Explosives: Use of explosives is not permitted.

3.06 DEMOLITION BY MECHANICAL MEANS

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.
- B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.
- C. Below-Grade Construction: Demolish foundation walls and other below-grade construction.
1. Remove below-grade construction, including basements, foundation walls, and footing, completely.
- D. Existing Utilities: Demolish existing utilities and below-grade utility structures that are within the entire site outside footprint indicated for new construction.
- E. Fill abandoned utility structures with satisfactory soil materials according to backfill requirements under Division 312000 - EARTH MOVING.
1. Piping: Disconnect piping at unions, flanges, valves, or fittings.
 2. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.
- F. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.
1. Piping: Disconnect piping at unions, flanges, valves, or fittings.
 2. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.

3.07 SITE RESTORATION

- A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.
- B. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with Controlled Fill as required by the Structural Construction Documents, according to backfill requirements under Division 312000 - EARTH MOVING.
- C. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.08 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and legally dispose of off-site..
Contractors shall make every effort to re-cycle construction debris on-site.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

- B. Do not burn demolished materials.

3.09 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.
 - 1. Clean roadways of debris caused by debris transport.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 1. Demolition and removal of selected portions of building or structure.
 2. Demolition and removal of selected site elements.
 3. Salvage of existing items to be reused or recycled.

1.03 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.04 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition shall remain the property of Owner.
 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.05 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
 1. Inspect and discuss condition of construction to be selectively demolished.
 2. Review structural load limitations of existing structure.
 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 5. Review areas where existing construction is to remain and requires protection.
 6. Review procedures for turning over salvaged materials to the Owner and protected off-site storage of materials to be reused in the work of the project.

1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.

- B. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting the public, pedestrian access and circulation areas and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- C. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of elevator and stairs.
 - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- D. Inventory: Submit a list of items to be removed, salvaged and delivered to Owner prior to start of demolition.
- E. Photographs or Video: Submit before Work begins.
- F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- G. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.07 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.
- B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.08 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.09 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: Hazardous materials are present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use and is included in this Division of the specifications. Examine report and / or the appropriate specification section to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
 3. Owner will provide material safety data sheets for suspected hazardous materials that are known to be present in buildings and structures to be selectively demolished because of building operations or processes performed there.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
1. Maintain fire-protection facilities in service during selective demolition operations.
 2. Provide a Fire Watch or other method acceptable to the authority having jurisdiction should the existing fire protection facilities have to be shut down during the work.
 3. Do not disable or disrupt building fire or life safety systems without five (5) days prior written notice to Architect.

1.10 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties. Notify warrantor before proceeding.
- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.
- C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned

collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
- F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
1. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.
 2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.02 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
1. Comply with requirements for existing services/systems interruptions specified in Section 011000 "Summary."
- B. Existing Services/Systems to be removed, relocated, or abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
1. Arrange to shut off indicated utilities with utility companies. Provide 5 days notice to the Architect prior to any utility shut-downs.
 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap, plug or reconnect remaining piping with same or compatible piping material.
 - b. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - c. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug or reconnect remaining ducts with same or compatible ductwork material.
- C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.03 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building. Maintain existing required widths of egress pathways throughout.
 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.

3.04 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
 5. Maintain adequate ventilation when using cutting torches.
 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 9. Dispose of demolished items and materials promptly.
 10. Interior demolition work using other than handheld equipment is subject to periodic Special Inspections per 2022 NYCDOB BC, Section 1704.20.4.
- B. Removed and Salvaged Items:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designated by Owner or as indicated on Drawings.
 5. Protect items from damage during transport and storage.
- C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.05 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 1 inch (25 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

3.06 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.07 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.08 SELECTIVE DEMOLITION SCHEDULE

- A. Remove, store, relocate, salvage and protect the following materials and equipment:
 - 1. Existing Items to Be Removed: Items indicated on contract drawings and items listed in technical specifications sections.
 - 2. Existing Items to Be Removed, relocated and/or Salvaged: Items required to be removed, relocated salvaged and/or stored to complete the work as indicated or called for in these construction documents.
- B. Existing Items to Remain: to complete and conform to the work of the project shall be as indicated on the contract drawings and items listed in the technical specification sections.

END OF SECTION

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This Project will include the excavation, handling, stockpiling, temporary on-site storage, transportation and disposal of soils generated during construction activities that will not be reused on-site at Per Onsite "Site Management Plan" at the Brooklyn Navy Yard approved and revised by NYSDEC 10-18-22. Soils eligible for reuse at the Site are discussed under Section 1.02 Special Job Conditions.
1. The work shall include but not be limited to the removal of the materials indicated on the Contract Documents.
 2. Preliminary waste characterization sampling was completed by To Be Determined. See Appendix A. A brief description of soil boring locations and sampling scheme is provided below.
 - a. None - Scheduled Contingency on 30 yds³ Contaminated/Haz PCB historic soils for incidental removal while removing Exterior Transformers.. If these soils are tested and found to be non contaminated or non hazardous then the Owner shall receive a credit for this disposal item.
 - b. The results of the laboratory analyses were compared to [6 NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives (SCOs), Residential Use SCOs, Restricted Residential Use SCOs, Commercial Use SCOs and Industrial Use SCOs] or current guidance. A summary of the contaminants and levels exceeding any of the SCOs listed above in section 1.01 B. is presented below in section 1.01 C. 3. To Be Determined complete Soil Report is provided in Appendix A of this Section.
 - c. Soil sample results of contaminants and levels exceeding any of the SCOs: To Be Determined. Contractor shall refer back to lab report.
 3. The Contractor shall be aware of all conditions of the Project and is responsible for verifying quantities and locations of all Work to be performed. Failure to do so shall not relieve the Contractor of their obligation to furnish all labor and materials necessary to perform the Work.
 4. All Work shall be performed in strict accordance with the Project Documents and all governing codes, rules, and regulations. Where conflicts occur between the Project Documents and applicable codes, rules, and regulations, the more stringent shall apply.
 5. Working hours shall be as required and approved by the Owner. Soil excavation activities including, but not limited to, pre-work area preparation, excavation activities, stockpiling, waste removal, etc. may need to be performed during 'off-hours' (including nights and weekends). In addition, multiple mobilizations may be required to perform the work identified in this Project. The Contractor shall coordinate and schedule all Work with the facility and Owner's representative.
 6. The Contractor shall provide labor, materials, equipment and incidentals required for the excavation, transportation and disposal of materials generated during construction activities that are deemed unsuitable for reuse.

1.02 SPECIAL JOB CONDITIONS

- A. Any special job conditions are described below.
1. REFER TO ONSITE "SITE MANAGEMENT PLAN" for the Brooklyn Navy Yard revised and approved by NYS DEC 10/18/22

1.03 STANDARDS AND REFERENCES

- A. The Contractor shall comply with the following codes and standards, except where more stringent requirements are shown or specified:
1. Federal Regulations:
 - a. 42 USC §6901 et. Seq.
 - b. 15 USC §2601

- c. 29 CFR 1910.1200, "Hazard Communication" (OSHA)
 - d. 29 CFR 1926, "Construction Industry" (OSHA)
 - e. 29 CFR 1926 Subpart P "Excavations"
 - f. 29 CFR 1926.500 "Guardrails, Handrails and Covers" (OSHA)
 - g. 49 CFR 171-172, Transportation Standards (DOT)
 - h. 29 CFR 1910.146 Confined Space
 - i. 29 CFR 1926.21 Safety Training and Education
2. New York State Regulations:
 - a. 6 NYCRR, Parts 360, 364, Disposal and Transportation (NYSDEC)
 - b. 6 NYCRR Parts 370-374
 - c. 6 NYCRR Parts 610-614
 3. Latest version of the New York State Uniform Fire Prevention and Building Code.
 4. Latest version of American Society for Testing and Materials (ASTM) standards.
 5. ACI-318 latest edition-Building Code Requirements. (NYC ONLY)
 - a. All work shall comply with requirements of the New York City Building Code (NYCBC), requirements of the New York State Department of Labor, requirements of United States Department of Labor Occupational Safety and Health Administration (OSHA), requirements of New York State Department of Health (NYSDOH), requirements of the New York State Department of Environmental Conservation (NYSDEC), requirements of the New York City Department of Environmental Protection (NYCDEP), requirements of the New York State Department of Transportation (NYSDOT), requirements of New York City Department of Transportation (NYCDOT), the requirements of the New York City Transit Authority (NYCTA), the requirements of United States Environmental Protection Agency (USEPA), requirements under the Resource Conservation and Recovery Act (RCRA), applicable requirements under 6 NYCRR Parts 360, 364, and 370 through 375 and with applicable requirements of all other authorities having jurisdiction.

1.04 PERMITS AND COMPLIANCE

- A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and Local laws, rules, and regulations pertaining to Work practices, protection of Workers, authorized visitors to the Site, persons, and property adjacent to the Work.
- B. Obtain all required permits and notifications for removals (excavation/dewatering), on-site storage, transportation and disposal of contaminated wastes, including sanitary sewer discharge.
- C. Perform contaminated soil excavation related Work in accordance with NYS DEC Division of Environmental Remediation (DER)-10 Technical Guidance for Site Investigation and Remediation. Where more stringent requirements are specified, adhere to the more stringent requirements. See Section 1.01 E.
- D. The Contractor shall comply with all applicable regulations of the OSHA in performance of the work and take all required precautions to ensure the safety and health of personnel. The Contractor has been provided with information on current Site conditions for the Contractor to prepare a Site Health and Safety Plan (HASP) for the execution of the work.
- E. The Contractor shall be responsible for compliance with The New York State Uniform Fire Prevention and Building Code, or its successor during all Work at the Site.
- F. Contractor shall be responsible for notification to the Environmental Consultant for the collection and sampling of wastewater (for permit compliance or disposal facility requirements). Contractor is responsible for treatment (if necessary), and disposal of generated waste water. Waste water disposal may be permitted for sanitary sewer discharge or taken off-site for disposal at a licensed facility.

1.05 SUBMITTALS

- A. Pre-Work Submittals: Within seven (7) days prior to the pre-construction conference, the Contractor shall submit an electronic copy of the documents listed below to the Environmental Consultant and Owner's Construction Representative for review and approval prior to the commencement of removal/excavation activities:
1. The Contractor shall submit a schedule, arranged in chronological order, by dates required by the construction schedule.
 2. The Contractor shall prepare and submit to the Owner a Health and Safety Plan (HASP) for work associated with any potential contaminated soils at the Site, as defined in Section 1.07. This plan shall address all of the activities which the Contractor will perform in fulfillment of the contract, and shall comply in all aspects with OSHA regulations for solid and hazardous waste operations (29 CFR 1910.120). The Contractor shall make the HASP available to authorized personnel who require access to any contaminated area or exclusion zone. The health and safety of the Contractor's employees remains solely the responsibility of the Contractor.
 3. The Contractor shall perform excavation markouts and contact Dig Safely New York (DSNY) as required by law. Contractor shall provide valid DSNY ticket number along with associated documentation.
 4. An Excavated Soils Management Plan including re-use and disposal options prepared in accordance with Section 4.01 B. of this Specification.
 - a. Work Plan requirements should include a site plan showing stock pile locations and protection methods, soil grid, equipment decon locations, excavation methods, dewatering, wastewater storage, and traffic direction at the site for trucks.
 5. The Contractor shall prepare and maintain all material shipment records required by applicable Federal, State, and Local laws and regulations. These records shall include but not be limited to: scale tickets, bill of lading, and manifests. The Contractor shall provide copies of all documentation to the Owner/Owner's Representative. Drafts of the following documents (as applicable) related to waste soil transport shall be submitted for prior review and approval:
 - a. A draft shipping document.
 - b. NYSDEC waste tracking document.
 - c. NYSDEC Notification of Fill Material Reuse form.
 - d. NYSDEC Use of Predetermined Beneficial Use Determination form.

NOTE: Copies of these forms are provided in Appendix B.
 6. Transfer Facility Permit (if applicable) and letter of acknowledgement from the Transfer Facility stating they intend to accept the material.
 7. Treatment Facility Permit (if applicable) and letter of acknowledgement from the Treatment Facility stating they intend to accept the material.
 8. Disposal Facility Permit for material disposed of at an off-site facility (if applicable) and letter of acknowledgement from the Disposal Facility stating they intend to accept the material.
 9. Copy of a valid NYSDEC Waste Transporter Permit and permits for any other State(s) the material will travel through to reach the disposal facility.
 10. Valid US DOT permit for hauler, if applicable.
- B. On-Site Submittals: The following documentation shall be maintained on-site by the Contractor during site activities at a location approved by the Project Manager.
1. Copy of the Approved Pre-Work Submittal, as described in Section 1.05 A.
 2. Health and Safety Plan (HASP) for work associated with any potential contaminated soils at the Site. This plan shall address all of the activities which the Contractor will perform in fulfillment of the contract and shall comply with all aspects of applicable OSHA regulations for solid and hazardous waste operations (29 CFR 1910.120).
 3. Copy of DSNY ticket documentation.

4. Proof of worker training in accordance with OSHA 29 CFR 1910.120 for all workers with the potential to come in contact with contaminated soils and hazardous materials.
 5. Soil Management Plan (SMP). This plan should include, at a minimum: equipment specifications; methods of excavation, waste water management plan for dewatering, waste water storage, on-site drainage, and decontamination of equipment; procedures for management of soil designated for off-site disposal; methods for documenting tracking of contaminated soil/material from the origin to disposal; methods for removal, loading and transport of the contaminated soil; certification of clean fill in accordance with NYSDEC if applicable; contractor health and safety procedures including personnel certifications; and identification of licensed transporter(s) and disposal facility or facilities to be used by the Contractor.
- C. Close-Out Submittals
1. Within two (2) business days of receipt from the facility, the Contractor shall submit copies of all receipts and other paperwork from disposal/treatment facilities which indicate the actual quantity of waste received.
 2. Within 30 days of the completion of the project, the Contractor shall submit 1 electronic copy of the documents listed below to DASNY and the Environmental Consultant for review and approval prior to Contractor's final payment. Once DASNY Code Compliance approves the electronic close-out submittal, the Contractor shall provide 3 hard copy sets of the approved close-out documents (double-sided and bound) to DASNY Project Management, including 1 set to be distributed to the facility.
 - a. All Waste Shipment Records, Forms, and Waste Shipment Record Logs.
 - b. Completed waste tracking documents, as applicable.
 - c. Daily progress log.
 - d. Transfer/Treatment/Disposal Site/Landfill Permits from applicable regulatory agency.
 - e. Copy of NYSDEC Waste Transporter Permit and permits for any other State(s) the material traveled through to reach the disposal facility.

1.06 PRE-CONSTRUCTION CONFERENCE

- A. Prior to start of preparatory Work under this Contract, the Contractor shall attend a pre-construction conference attended by the Owner, Facility Personnel, and Environmental Consultant.
- B. Agenda for this conference shall include but not necessarily be limited to:
1. Contractor's scope of Work, Work plan, and schedule.
 2. Contractor's safety and health precautions including protective clothing, equipment, and decontamination procedures.
 3. OSHA excavation and trenching requirements if applicable (> 4 feet and > 5 feet in depth, respectively)
 4. Environmental Consultant's duties, functions, and authority.
 5. Contractor's Work procedures including:
 - a. Methods of job site preparation and removal methods.
 - b. Contacting Dig Safely New York for Utility Clearance (if necessary).
 - c. Equipment and process of initial clearing of vegetation (if necessary).
 - d. Process of clearing the construction areas, excavation pathways for subgrade materials, stockpiling soil, separating waste from earthen materials, etc.
 - e. Truck loading procedure near active roadway/traffic controls/safety.
 - f. Disposal procedures.
 - g. Cleanup procedures.
 - h. Emergency procedures.
 6. Contractor's required pre-work and on-site submittals, and documentation.
 7. Contractor's plan for 24-hour Project security both for prevention of theft and for barring entry of unauthorized personnel into work areas.

8. Waste disposal requirements and procedures.
- C. In conjunction with the conference, the Contractor shall accompany the Owner and Environmental Consultant on a pre-construction walk-through documenting work to be completed at the Site.

1.07 DEFINITIONS

- A. Wherever the word “excavating”, “excavate”, “excavation”, “carried down”, or “remove” are used, they shall be understood to include the removal of all existing work, including brick work, rubble work, former foundation remnants, rubbish, and earth as well as rock, boulders, steel grillages, concrete and all other materials and obstructions encountered. They shall also be understood to include all sheet piling, bracing, pumping, operations and items needed for the proper execution of the work. Excavation is considered unclassified.
- B. Rough grading consists of cutting or filling to the elevation established on the Contract Drawings.
- C. Material Definitions
 1. Non-Hazardous Excavated Contaminated Soil:
 - a. Soil that may include or contain mixtures of the following: soil (including, but not limited to, natural undisturbed soil), Clean (below SCOs), and Contaminated (above SCOs). This material includes material that will exceed 6 NYCRR 375-6 Restricted Residential Use Soil Cleanup Objectives and NYSDEC CP-51: Soil Cleanup Guidance Supplemental Soil Cleanup Objectives.
 2. Non-Hazardous Excavated Soil (Clean Fill):
 - a. Soil that is at or below the SCOs for unrestricted use. This material includes material defined in Title 6 NYCRR 375-6.3 and does not exceed NYSDEC CP-51: Soil Cleanup Guidance Supplemental Soil Cleanup Objectives.
 3. Petroleum-Contaminated Soil:
 - a. Material (soil, concrete, sediment, UST contents, fill, debris, etc.) that meets the NYSDEC STARS Memo #1 definition of petroleum-contaminated material from known source areas. Petroleum-contaminated material shall be evidenced by the following observations and be from a known source area: producing higher than background responses on a portable vapor meter such as a photo ionization detector or flame ionization detector, petroleum-like odor, visual impacts (e.g., staining or discoloration), proximity to known releases from existing or historic petroleum storage tanks or systems, and exceed the soil cleanup levels for gasoline and/or fuel oil contaminated soil provided in the NYSDEC CP-51: Soil Cleanup Guidance. The determination as to whether the excavated material is petroleum-contaminated or is non-petroleum contaminated material will be made by analytical testing of representative material samples. The Environmental Consultant shall perform all required testing. The Environmental Consultant shall make the final determination as to whether or not the material is petroleum-contaminated and the appropriate disposal.
 4. Hazardous Waste:
 - a. Material meeting the definition of a Resource Conservation and Recovery Act (RCRA) hazardous waste as defined in 40 CFR Part 261, New York State ECL Section 27-09 or 6 NYCRR Part 371.

1.08 PROJECT CONDITIONS

- A. Preliminary waste characterization sampling was completed (see Appendix A). Any additional waste characterization sampling required to complete the excavation and disposal of material generated during the project will be directed by the Contractor and, upon concurrence with the Architect/Owner, will be performed by DASNY’s on-site Environmental Consultant.

- B. The Contractor, by careful examination, shall inform themselves as to the nature and location of the work; the conformation of the ground; the nature of the subsurface conditions; the locations of the groundwater table; the character, quality and quantity of the materials to be encountered; the character of the equipment and facilities needed preliminary to and during the execution of the work; and all other matters which can in any way affect the work.
- C. The Contractor shall have visited the site and familiarized themselves with the existing conditions of adjoining properties, utilities and buildings.
- D. The Contractor shall investigate the conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to, ingress and egress of the site of the work. The Contractor shall conform to all Federal, State and Local regulations in regard to the transportation of materials to and from and at the job site and shall secure in advance such permits as may be required.
- E. Existing Utilities: The Contractor shall locate existing underground utilities in and beyond the areas of work. This shall include, at a minimum, notification to Dig Safely New York (DSNY) as required by law. The Contractor shall mark out the project areas and allot 3 business days for the ticket request to be completed; such off-set time shall be included in the proposed schedule. The DSNY ticket number shall be recorded for inclusion in project record documentation. If utilities are indicated to remain in place, provide adequate means of support and protection during the work.
 - 1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, immediately cease excavation activities and consult with the utility owner for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner or compensate repair of same at Contractor's cost.
 - 2. Do not interrupt existing utilities serving facilities occupied by Owner or others, during occupied hours, except when permitted in writing by the Construction Manager and then only after acceptable temporary utility services have been provided. Provide minimum of 48-hour notice to the Construction Manager, and receive written notice to proceed before interrupting any utility.
- F. The Contractor shall examine drawings to determine sequence of operations, and relation to work of other trades. Start of work will signify acceptance of field conditions and will acknowledge coordination with other trades.
- G. The Contractor shall comply with the Work Plan and associated documentation in the Approved Pre-Work Submittal, all Federal, State and Local environmental regulations, and health and safety regulations, including but not limited to OSHA.

1.09 PROTECTION

- A. The work shall be executed so that no damage or injury will occur to the existing public and adjoining or adjacent structures, streets, paving, sewers, gas, water, electric or any other pipes. Should any damage or injury be caused by the Contractor, or anyone in the Contractor's employ, or by the work under this Contract occur, the Contractor shall repair such damage and shall assume all responsibility for such injury and costs.
- B. The above shall also include the protection of all existing utilities (including but not limited to sewers, water lines, electrical lines and telecommunication lines) to remain in use within and adjacent to the area affected by the work of this project.

- C. Monuments, bench marks and other reference features on streets bounding this project, shall be protected. Should these be disturbed in any manner, the Contractor shall have them replaced.
- D. Excavation sides of any pits within the site and adjacent structure foundations shall be protected by means of adequate bracing, shoring and anchoring at all times in accordance with applicable OSHA regulations. No site excavation shall proceed until adequate support for excavation sides is provided. The Contractor is solely responsible for the stability, safety and protection of excavation sides.
- E. The Contractor shall provide barricades, warning lights, and barriers to prevent accidents, and to prevent all hazards to protect the public and property at all times, including Saturdays, Sundays, and Holidays.
- F. It is the Contractor's responsibility to ensure that contaminated materials will not be spilled, placed, or otherwise discharged into areas other than those specified in the Contract Documents. Any unauthorized placement, spill, or discharge of contaminated material by the Contractor will be completely and properly removed by the Contractor at their own expense.
- G. It is the Contractor's responsibility to ensure that adequate erosion control and stockpile protection measures are put in place and maintained at the Site.
- H. Any unauthorized placement, spill, or discharge of contaminated material by the Contractor must be reported immediately to DASNY, the Construction Manager, and the Owner's Engineer.
- I. All costs associated with repairing any damage will be the Contractor's sole responsibility, and such repairs will be made to the satisfaction of the respective Owner(s).

1.10 ERRORS IN DEPTH

- A. In the event that any part of the excavation is carried, through error, beyond the depth and the dimensions indicated on the drawings or called for in the specifications, then the Contractor, at his own expense, shall furnish and install certified clean fill, gravel, stone, or structural concrete with which to backfill to the required level at all locations, subject to approval of the Owner and Geotechnical Engineer.

1.11 SUBSURFACE STRUCTURES AND UTILITIES

- A. The Contractor shall become acquainted with the existence and location of all surface and subsurface structures and utilities within the project area and beneath the surrounding streets. The Contractor shall not damage any of those utilities that are to remain and shall leave them accessible and make the necessary provision by sheeting, hanging, supporting or other means necessary to obtain this result, subject to the approval of the New York City Building Department (NYC only), the New York State Department of Transportation, and the utility companies involved.

1.12 PROJECT SUPERVISOR

- A. The Contractor shall designate a full-time Project Supervisor who shall meet the following qualifications:
 - 1. If excavated soils are determined by sample analysis to be contaminated, the Project Supervisor shall be an OSHA competent person for excavation. The OSHA Construction Standard defines a competent person as someone who is: capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary,

- hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.
2. The Project Supervisor shall have a minimum of one year experience as a supervisor.
 3. The Project Supervisor must be able to read and write English fluently, as well as communicate in the primary language of the Workers.
- B. If the Project Supervisor is not on-site at any time whatsoever, all Work shall be stopped. The Project Supervisor shall remain on-site until the Project is complete. The Project Supervisor cannot be removed from the Project without the written consent of the Owner and the Environmental Consultant. The Project Supervisor shall be removed from the Project if so requested by the Owner or DASNY.
- C. The Project Supervisor shall maintain a bound Daily Project Log that includes a Waste Shipment Record Log included in Appendix C.
- D. The Project Supervisor shall be responsible for the performance of the Work and shall represent the Contractor in all respects at the Project site. The Supervisor shall be the Contractor primary point of contact for the Environmental Consultant.
- E. As required by applicable regulations, prior to assignment of work, instruct each employee with regard to the hazards of the generated waste, safety and health precautions, and the use and requirements of protective clothing and equipment, as well as the Contractor's HASP.

PART 2 EXECUTION

2.01 PREPARATION OF PROJECT SITE

- A. Obtain all necessary permits to perform the work from the appropriate authorities and agencies prior to start of such work. Obey all applicable Federal, State, and Local work safety rules and regulations. Ensure DSNY markings indicative of utilities are maintained and visible in areas not impacted by the work.
- B. Install all necessary protection equipment and structures such as fences, signs, scaffolding, etc. prior to start of work.
- C. Remove all existing structures, utilities, and pavement in accordance with the Contract Documents.
- D. Protect all utility lines, which are not to be disturbed or abandoned. Contractor shall be solely responsible for any damage to utilities that may occur.
- E. Protective Clothing.
1. Provide personnel utilized during the Project with disposable protective whole body clothing, head coverings, and foot coverings. Provide appropriate disposable gloves suitable to protect hands and prevent skin contact.
 2. Eye protection and hard hats shall be provided and made available for all personnel entering any Work Area.
 3. Authorized visitors shall be provided with suitable protective clothing, headgear, eye protection, and footwear whenever they enter the Area, if necessary.
 4. Provide ladders as required by the Environmental Consultant for the purposes of performing required inspections.

2.02 DAILY PROJECT LOG

- A. Provide a Daily Project Log. The log shall contain on the title page the DASNY Project name and number; the name, address and phone number of the Owner; the name, address and

phone number of the Environmental Consultant; the name, address and phone number of the Contractor; and emergency numbers including, but not limited to, local Fire/Rescue department. The log shall also include the DSNY Ticket number along with a summary of the utilities in the vicinity of the work.

- B. All entries into the log shall be made in non-washable, permanent ink and such pen shall be strung to or otherwise attached to the log to prevent removal from the log-in area. Under no circumstances shall pencil entries be permitted.
- C. The Project Supervisor shall document all Work performed daily and note all inspections.

2.03 GENERAL EXCAVATION

A. General

1. Contractor shall perform all excavation required to complete the Work as shown and specified. All material excavated shall be non-classified. It shall include all materials such as but not limited to earth, sand, clay, gravel, hardpan, boulders, organic materials, rock, miscellaneous fill and debris.
2. Excavations shall be open type, sheeted, shored and braced or sloped where necessary to prevent injury to workmen and to new and existing structures or pipelines.
3. All excavations shall be made in dry material.
4. All equipment shall be decontaminated and free from debris, caked soil, contamination, and any other foreign materials prior to mobilization to the site. Equipment utilized during the excavating of contaminated materials shall be decontaminated in accordance with project decontamination requirements.
5. The bottom of excavations shall be leveled off and graded to receive foundations, slabs, pits, trenches and grade beams.
6. All excavation work must also adhere to the Construction Health and Safety Plan.

PART 3 HANDLING AND MANAGEMENT OF CONTAMINATED MATERIALS

3.01 GENERAL INSTRUCTIONS

- A. This Section is a description of responsibilities for proper handling and management of contaminated materials on Site. The requirements of the Contract Documents, including Scope of Work, will apply to the Work in this Section.
- B. The Contractor will be required to handle environmentally contaminated materials at the Site in compliance with all Federal, State and Local regulations. Contractor's Work will include handling of these contaminated materials.
 1. For the purpose of this Specification, contaminant levels shall be compared to NYSDEC USCOs and RSCOs (NYSDEC Regulation 6 NYCRR Subpart 375-6) and the approved disposal facility acceptance criteria.
- C. The Environmental Consultant shall create and implement a Community Air Monitoring Plan (CAMP), if required by DASNY Project Management, to manage real-time monitoring for particulates at the upwind and downwind perimeters and adjacent to the nearest structure within the work area when particulate-generating activities are in progress at the Site. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on-site may generate fugitive dust from exposed waste or contaminated soil.
- D. Engineering Inspections and Observations:
 1. The Owner's Engineer will inspect the movement and handling of all contaminated materials. Contractor will notify Construction Manager and Owner's Engineer a minimum of 72 hours prior to start of Work involving handling of contaminated materials.

2. Owner's Engineer will observe the contaminated material removal procedures and methods and will notify the Contractor, Construction Manager, and Owner of any part of the Work of this Section not in compliance with these specifications. Such notification will not relieve the Contractor from the responsibility of properly implementing, performing, and maintaining contaminated material removal as specified herein and as required by the Work.
3. Contractor will cooperate with the Construction Manager and Owner's Engineer to facilitate the progress of the Work.
4. Contractor will provide at least one supervisory person who must be present at all times during execution of the Work and who is thoroughly familiar with the type of work being performed and its best methods for completion. This person will have the authority to act on behalf of Contractor.

PART 4 SOIL CHARACTERIZATION, MANAGEMENT AND DISPOSAL

4.01 SOIL CHARACTERIZATION

A. Soil Characterization

1. The Contractor shall confirm with the disposal facility that a sufficient quantity of soil samples was obtained to fully characterize the site soils scheduled for disposal prior to removing any soils from the site. The contractor shall notify the DASNY on-site representative if additional waste characterization samples are needed to satisfy targeted disposal facility requirements. Any additional samples that are required will be collected by DASNY's on-site Environmental Consultant. The results of all waste characterization analyses shall be submitted to DASNY Code Compliance prior to removal of soils from Site.
2. In-situ soil characterization should be completed in accordance with the sampling procedures in the Soil Management Plan (SMP), described in Section 4.02 B. of this Specification. Sampling should be biased to soil encountered that exhibits staining, free product and/or elevated photo-ionization detector (PID) readings.
3. Soils proposed for reuse on-Site will be managed as directed by the Environmental Consultant.

- B. Uncontaminated, non-hazardous soil (i.e. soil meeting NYSDEC's Unrestricted Use Soil Cleanup Objectives cited in 6 NYCRR Part 375-6.3) is not subject to approval from NYSDEC's Division of Hazardous Materials Management. If the material is stockpiled on-Site, it must follow the stockpiling procedures set forth in the SMP.

- C. The Contractor shall protect and maintain excavation areas until completion of the work and acceptance by the Environmental Consultant. Excavated contaminated soil designated for off-site management may be containerized in roll-off containers at designated area(s), as directed by the Environmental Consultant.

4.02 TRANSPORTATION AND DISPOSAL OF EXCAVATED MATERIAL

A. Description of Work

1. Non-Hazardous Excavated Material, as defined in Section 1.07, that has been excavated as part of the construction project and slated for disposal shall be transported to an off-site disposal facility meeting the requirements of 6 NYCRR Part 360, or equivalent out-of-state facility, approved by the appropriate regulatory agency of that State with a permit to receive non-hazardous excavated material. This facility shall be identified and approved in the Pre-Work Submittal referenced in Section 1.05 A. prior to the start of work.
2. Clean Fill for reuse, as defined by NYSDEC under 6 NYCRR Part 360 Article 12 Beneficial Use as material that is not considered Solid Waste when a Pre-determined Beneficial Use or a Case-specific Beneficial Use is determined for the excavated material.

3. All petroleum-contaminated material, as defined in 6 NYCRR Part 360 Article 1.5, if discovered, shall be transported to an off-site disposal facility permitted to receive petroleum-contaminated material from known source areas. All hazardous waste, as defined in Article 1.5, if discovered, shall be transported to an off-site disposal facility meeting the requirements of 40 CFR Part 265 and 6 NYCRR Part 373, or equivalent out-of-state facility, approved by the appropriate regulatory agency of that State with a permit to receive hazardous waste. This facility shall be identified and approved in the Pre-Work Submittal referenced in Section 1.05 A. prior to the start of work.
 4. Soils may be reused on-site, if the criteria are met for pre-determined (SCO).
 5. The Contractor must inform the Owner a minimum of one week prior to the start of excavation activities. Excavation and disposal activities must be supervised by the Owner or Owner's representative.
- B. Excavated Soil Management Plan
1. An Excavated Soil Management Plan (SMP) shall be prepared by the Contractor and approved by the Owner for non-hazardous excavated material a minimum of 7 days prior to the start of excavation. A separate Excavated Material Disposal Plan for any additional categories of material (petroleum-contaminated or hazardous), as defined in Section 1.07 C. 3. and 1.07 C. 4., if encountered during excavation, shall be prepared by the Contractor and approved by the Owner prior to removing the material off-site. Soil may be re-used on-site in accordance with NYSDEC Beneficial Use Determination (BUD) regulation. There are 28 predetermined BUDs listed in 6 NYCRR Part 360.12(c). Refer to Section 1.04 for submittal requirements. In the Excavated Soil Management Plan, the Contractor shall, at a minimum:
 - a. Indicate how buried utilities (e.g. electric, gas, water, sewers, telephone, etc.) will be located and provide copies of the resulting information to the Owner.
 - b. Provide a to-scale figure indicating the excavation areas, the estimated depths of excavation, and estimated quantities of excavated material.
 - c. Provide a listing, including company name, name of owner contact, phone number, and address of facility, of the off-site disposal facility(ies) meeting the requirements listed in Item A above, for each specific material to be disposed and a copy of each facility's permit (NYSDEC or equivalent out of state).
 - d. Provide a listing, including company contact name, phone number and address, of proposed waste haulers. Provide a copy of the valid 6 NYCRR 364 Waste Transporter Permit for each proposed waste hauler.
 - e. Provide a certification from the proposed waste disposal facility(ies) that material from the site is acceptable for disposal. This letter must be on the disposal facility letterhead and must be received prior to removal of excavation material from the site.
 - f. Provide a plan for re-use of uncontaminated soil on-site, dependent upon the appropriate SCO determination, prior to excavation.
- C. All excess material, including earth, rock, and fill, shall be removed from site and legally disposed of by the Contractor.
- D. All lumber, forms and metal work shall be removed immediately after completion of local areas. The Contractor shall be responsible for removal of all debris produced by work to this section from the site.
- E. Sidewalk and streets adjoining the property shall be broom cleaned and free of debris, rubbish, trash and obstructions of any kind caused by the work of this Section by the Contractor.
- F. The Contractor must confirm characterizing for disposal has been performed on all material prior to removing material from the Site. DASNY's on-site Environmental Consultant will collect additional waste characterization samples, if needed, to satisfy targeted disposal facility requirements. The results of all waste characterization analyses shall be submitted to the Owner prior to removal of waste from the Site.

- G. The Contractor shall be responsible for handling and transporting contaminated materials removed from the Site to a permitted disposal/treatment facility licensed to accept such waste soil. Materials removed from the Site shall only be transported to facilities which have received prior approval of the Owner and which have provided written approvals indicating they are permitted to accept such materials.
- H. No materials shall be added to or removed from transport vehicles between their time of departure from the Site and their time of arrival at the approved facility for their disposal.
- I. The Contractor shall use only properly permitted Owner-approved waste transporters. All vehicles and drivers shall be permitted and licensed in accordance with all applicable Federal, State and Local laws and regulations including the laws and regulations of governing agencies which have jurisdiction over areas through which the waste will be transported.
- J. Vehicles shall be designed, equipped, operated and maintained to prevent leakage, spillage or airborne emissions of waste during transport. Appropriate controls shall be used to contain odors during loading and shipping of waste. Only safe, suitable and well-maintained vehicles, which are properly labeled/placarded, manned, permitted and registered to perform the required transportation services shall be used. All vehicles shall be decontaminated as necessary, including truck tires and undercarriages, prior to leaving the Site. The Contractor shall be responsible for supplying all labor, materials, equipment and supplies for decontaminating the vehicles used and shall be responsible for the off-site disposal of wastes resulting from any decontamination.
- K. Certified weight scale tickets showing the weight of the vehicle at the time of arrival and departure from the disposal facility shall be provided for all waste material transported off-site. The weight tickets shall be signed and dated by a representative of the Contractor certifying the accuracy of all measurements, the date and time of arrival and departure of each vehicle, the disposal location and the vehicle identification number.
- L. The Contractor shall continuously monitor the regulatory compliance status of all waste transporters and disposal facilities used and proposed for use. If, at any time, the Contractor becomes aware of a potential or actual change in the regulatory compliance status of any waste transporters or disposal facilities used or proposed for use, the Contractor shall immediately notify the Architect, Owner or Owner's Representative of such potential or actual change and, in consultation with the Owner, make arrangements to divert waste to alternate approved transporters and disposal facilities.
- M. The Contractor shall complete all required manifest forms and bills of lading as required by applicable laws and regulations for transportation and disposal of materials off-site. The Contractor shall provide completed copies of all required manifests and bills of lading to the Owner along with all requested backup documentation. DASNY's on-site Environmental Consultant shall sign manifests and bills of lading. The Contractor shall be responsible for assuring that all notifications, labeling, documentation, sampling, analysis, transportation and disposal requirements of the disposal facility, and Federal, State and Local governments are complied with and properly documented.
- N. The Contractor's Hauler and Disposal Site shall be approved by the Owner.
- O. The Contractor shall give 24-hour notification prior to removing any waste from the site. Waste shall be removed from the site only during normal working hours unless otherwise specified. No waste may be taken from the site unless the Contractor and Environmental Consultant are present and the Environmental Consultant authorizes the release of the waste as described herein.

- P. The Environmental Consultant shall verify the landfill to be used for waste disposal with the waste transporter (driver) and Contractor prior to the waste storage trailer/dumpster leaving the site. The Environmental Consultant shall confirm the waste transporter firm and landfill are listed on the regulatory notifications for the Project and the waste transport vehicle license number is listed on the current NYS DEC Waste Transporter permit.
- Q. Payment for disposal of contaminated soils will not be made until a signed copy of all required manifests and bills of lading from the treatment or disposal facility certifying the amount of contaminated soils delivered is returned for each load removed from the site. This original manifest and bill of lading documentation as well as the waste disposal log originals must be provided to the Owner or appropriate state if applicable, and copies provided to DASNY Code compliance.

END OF SECTION

PART 1- GENERAL

1.01 SECTION INCLUDES

- A. Requirements for furnishing labor, materials, tools, and equipment, and performing operations necessary for staging, handling, treatment, and disposal of non-hazardous and petroleum contaminated materials.

1.02 CITED STANDARDS

- A. None Cited

1.03 NOTED RESTRICTIONS

- A. Do not move any contaminated soil and other materials from their original Work Site to any other site without written permission from the Construction Manager.
- B. All equipment, vehicles, and dump trucks/trailers in contact with contaminated soil shall not leave the site until the equipment and vehicles have been decontaminated on the wash pad using steam cleaning procedures. Rinse water is allowed to percolate into the underlying soil. Contractor shall have all necessary measures in place to prevent rinse water from migrating off the site. Any rinse water that migrates off the site or any sediment that is tracked onto public right of ways shall be cleaned up by the Contractor.
- C. Contractor shall maintain the decontamination pad to minimize dust and mud accumulation.
- D. Prior to leaving the site, all equipment and material decontamination procedures shall be carried out on the decontamination pad only.
- E. All soil erosion and sediment control measures at the decontamination and stockpile areas shall be in-place throughout the entire duration of cleaning and decontamination activities.
- F. Prevent water from entering excavated areas.
- G. Contact New York One-Call Center (800-272-4480 or 811) at least 48 hours prior to starting any excavation.
- H. Protect structures, utilities, utility poles and supports, pavements, and other facilities from damage including damage caused by heave, settlement, lateral movement, undermining, washout, and other hazards created by excavation. All means and methods of protection are subject to the review by the Construction Manager.

1.04 QUALITY CONTROL

- A. Regulatory Requirements:
 - 1. Code of Federal Regulations (CFR):
 - a. 29 CFR 1910 - Occupational Safety and Health Administration (OSHA)
 - b. 49 CFR 397 - Federal Motor Carrier Safety Administration, Department of Transportation
 - 2. New York Codes, Rules and Regulations (NYCRR):
 - a. 6 NYCRR 360 - Solid Waste Management Facilities
 - b. 6 NYCRR 364 - Waste Transporter Permits
 - c. 6 NYCRR 375 - Environmental Remediation Programs
 - 3. New York State DEC Guidance Documents:
 - a. NYSDEC STARS (Spill Technology and Remediation Series) Memo #1
 - b. DER-10 -Technical Guidance for Site Investigation and Remediation

- B. Verify that soil and other material analytical results comply with applicable standards referenced in Article 1.05A and classified in accordance with Section 022423. Verify compliance with standards and regulations.
- C. Verify that sampling activities and analytical methods are in accordance with applicable regulatory protocols, referenced standards, and regulations specified herein and Section 022423.
- D. If at any time during the course of construction Contractor deems any soil to be contaminated other than what has been identified, immediately notify the Construction Manager. The Construction Manager will take the appropriate action to identify the soil as contaminated", either by field examination for possible contamination (i.e., soil discoloration, odors, etc.), or by taking representative composite samples for laboratory analysis. Upon determination by the Construction Manager that the suspect soil is contaminated, the Construction Manager will authorize Contractor to handle the material as referenced herein.
- E. Comply with all requirements of the USEP and NYSDEC, except where directed by the Engineer.
- F. All off-site solid waste management methods, facilities and transporters, which Contractor intends to use to treat, dispose or transport soils and other materials shall be reviewed by the Construction Manager before any materials excavation under this Contract.
- G. Should any problem arise regarding an approved facility or transporter that would require the return of materials to Contractor or should such facility or transporter have violated any regulation which would result in any regulatory enforcement action, immediately notify the Construction Manager in writing of such situations. Make provisions for the lawful storage of the soils and other materials, at no additional expense to the Client, until an alternate facility or transporter can be arranged by Contractor and reviewed by the Construction Manager.
- H. All on-site solid waste management methods that Contractor intends to use to handle or treat soils and other materials shall be reviewed by the Construction Manager before any materials excavation under this Contract.
- I. Should any problem arise regarding an approved treatment method, immediately notify the Construction Manager in writing of such situations. Make provisions for the lawful storage of the soils and other materials, at no additional expense to the Client, until an alternate method, facility, and/or transporter can be arranged by Contractor and reviewed by the Construction Manager.

1.05 SUBMITTALS FOR REVIEW

- A. Written description of excavation and handling procedures (including solid waste management methods or facilities), list of tasks, and statement of qualifications for Non-Hazardous Waste Materials Management including names, addresses, and telephone numbers of responsible individuals.
- B. Evidence of current valid permits, licenses, and certifications including, as a minimum, the following:
 - 1. Off-site transportation entity permits and licenses including a copy of the Spill Prevention and Contaminant Containment (SPCC) Plan.
 - 2. Written verification by a Certified Industrial Hygienist (CIH) of approval of Contractor's site-specific Construction Health and Safety Plan (CHSP) and Safe Work Plan (SWP) documents, and a copy of the reports.
 - 3. Name, location, telephone number, and all required permits of all handling facilities.

- C. Provide any other documentation requested for review by the Construction Manager to conform or comply with all applicable laws, codes, ordinances, and regulation.

1.06 SUBMITTALS FOR INFORMATION

- A. Within 90 days of completion of work, provide documentation including as a minimum, the following:
 - 1. Summary of sampling efforts and results of Laboratory analysis for all soils and materials sampled
 - 2. Executed waste manifest or bills of lading for each load of respective material removed and transported from the Work
 - 3. Executed waste manifest or bills of lading signed by a responsible party of the solid waste management facility
 - 4. Certificates of final disposition for each manifest
- B. Submit site-specific CHSP and SWP documents as required in Section 01570, 3.01 G. Documents shall conform to the requirements of 29 CFR 1910 including, but not limited to, the following:
 - 1. The CHSP and SWP documents signed by all affected personnel verifying that they have read these documents
 - 2. List of key personnel responsible for Work Site safety, including the name and qualifications of Contractor's Safety Supervisor/Representative
 - 3. Levels of Personal Protection Equipment (PPE) to be employed during Work, specific criteria for choices of protective clothing and equipment

1.07 PERFORMANCE REQUIREMENTS

- A. Execution:
 - 1. Coordination:
 - a. Make requests for waste disposal clearances, and permits through the Construction Manager.
 - 2. Work Area Conditions:
 - a. Display or have available at the Work Site a copy of the accepted CHSP and SWP documents.
 - 3. Staging, Handling, Transportation, and Disposal of Non-Hazardous, Petroleum Contaminated Materials:
 - a. Stockpiles shall be of manageable size and designed to protect the soil from precipitation, runoff, and erosion, as shown in the Contract Drawings. Access to the area shall be restricted to authorized personnel only.
 - b. Design storage areas to prevent leakage from the stockpiled materials from entering surrounding surface soils or waters. Line and cover, at the end of each work day, stockpiled areas with impervious plastic sheeting. The plastic sheeting shall be weighted down with sand bags. The perimeter of the stockpile shall be surrounded with appropriate soil erosion and sediment controls (i.e., haybales).
 - c. Provide appropriate berms, sumps, or ditches around the storage area to prevent surface water runoff from contacting the stockpiles and to prevent infiltrating water from discharging off the stockpile area.
 - d. Collect (soil and other material) samples from the stockpiles for waste characterization purposes. Proposed analytical parameters and appropriate methods are presented in Section 02 24 23.
 - e. Confirm all analytical parameters that may be required by solid waste management facilities prior to their acceptance of materials. No extra payment shall be made for additional sampling and analysis for waste characterization purposes.

- f. Surplus non-hazardous and petroleum contaminated material shall be properly transported following the Construction Manager's receipt and written notice of sampling, analysis and characterization.
 - g. No excavated materials shall be removed from the Work Site unless reviewed by the Construction Manager. Transportation shall comply with USEPA, USDOT, NYSDOT, NYSDEC and NYCDOT regulations. On the day of off-site shipment, the Construction Manager shall sign the waste manifest or bill of lading and retain one copy.
 - h. All vehicles used to transport material to off-site facilities shall be covered to prevent loss of soil during transport to the disposal facility.
 - i. Disposition of contaminated material at an off-site facility shall include all time incurred for queuing, weighing, and tipping at the facility.
 - j. Deliver all scale tickets to the Construction Manager for confirmation of quantities.
 - k. Submit executed waste manifests and/or bill-of-lading for each load of material removed from the Work Site.
 - l. Contractor to provide copies of all paperwork (shipping documents) that accompany a waste shipment, including a description of the material and the on-site source, to the Construction Manager within two days of the shipment.
 - m. Provide final weight tickets and waste/shipping documents from the receiving facility and transporter within seven days of shipment from the Work Site.
4. Dust Control:
- a. Ensure that dust generated during all Work is controlled in accordance with Federal, State, and local regulations. Implement OSHA requirements for suppression of contaminated dust.
5. Work Completion:
- a. Remove all waste materials and restore all temporary storage and stockpile areas and corridors.
 - b. At the completion of the Work, temporary storage and stockpile areas, as well as the decontamination pad area, shall have a neat appearance and shall be graded to drain to accepted drainage to prevent erosion. Perform grading in accordance with Section 022423.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

PART 4- MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Excavation, staging, handling, transportation and disposal of non-hazardous and petroleum contaminated materials will not be measured separately for payment.

4.02 PAYMENT

- A. All costs associated with the work for excavation staging, handling, transportation and disposal of non-hazardous and petroleum contaminated materials at site, complete, as specified in this Section shall be included in the cost.

4.03 PAY ITEMS

ITEM NO.	DESCRIPTION	UNIT
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SECTION 026120 - STAGING, HANDLING, TRANSPORTATION AND DISPOSAL OF
NON-HAZARDOUS AND PETROLEUM CONTAMINATED MATERIALS

H2M

	EXCAVATION, STAGING, HANDLING TRANSPORTATION AND DISPOSAL OF NON-HAZARDOUS AND PETROLEUM CONTAMINATED MATERIALS	TON
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END OF SECTION

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Broad Scope: Asbestos containing materials (ACM) have been identified at the project site. Samples of various suspect materials have been collected and analyzed; additional samples may be required as existing materials are removed or revealed during the course of work. The scope of work and procedures outlined herein shall be followed by a New York State Department of Labor (NYS DOL) certified asbestos abatement contractor.
- B. Related Sections:
1. 022600 – Hazardous Material Assessment
- C. SCOPE OF WORK
1. Removal of the following items described in the asbestos survey as positive for asbestos, in accordance with NYSDOL Industrial Code Rule (ICR) 56 and NYC DEP Title 15 Chapter 1:
 - a. Refer to H-101 and H-102 construction drawings.
 2. Asbestos Containing materials must be removed only by a New York State Department of Labor (NYS DOL) licensed asbestos abatement contractor (herein referred to as the "Contractor").
 3. The Contractor shall be aware of all conditions of the Project and is responsible for field verifying quantities and locations of all ACM to be removed from the building prior to submission of any bid. Failure to do so shall not relieve the Contractor of its obligation to furnish all labor and materials necessary to perform the Work. The quantities presented in this Specification are approximate and should not be used solely as the basis for any bid. In the event that suspect materials not included in this Specification are encountered while the work is in progress, such material shall be tested for asbestos content or assumed positive for asbestos content, and removed in accordance with the procedures herein. Any discovery of new ACM shall not delay the progress of the Work. Payment for any additional work shall be considered on a case-by-case basis by the Engineer and Owner.
 4. All Work shall be performed in strict accordance with the Contract Documents and all applicable codes, rules, and regulations. Where conflicts occur between the Contract Documents and applicable codes, rules, and regulations, the more stringent shall apply.
 5. The Contractor's industrial hygiene practices during asbestos abatement will be monitored by the Owner's representative. The Contractor shall be responsible for monitoring his own construction safety work practices for compliance with the OSHA regulations.
 6. Contractor to provide an itemized bid cost for all asbestos removals PER Removal item, in their bid.
 - a. The owner shall receive a credit if assumed/presumed ACM is either found to be:
 - 1) not existing, or
 - 2) existing and tested/analyzed by 3rd party/owner as Non-ACM.
 - 3) The contractor must schedule assumed asbestos testing with the Navy Yard and its environmental consultant to verify and test assumed materials. Access must be provided by the contractor for testing.

1.02 SPECIAL JOB CONDITIONS

- A. Any special job conditions, including variances to be obtained by the Contractor, are described herein.
1. The contractor shall be responsible for any necessary permits and NYCDEP filing.
 2. The contractor shall be responsible for obtaining any site specific variances and
 3. Fire Watch shall be required during the asbestos abatement.
 4. Any asbestos pipe insulation removal shall be accomplished where the whole pipes are wrapped and also cut and removed intact as asbestos. See H drawings for details.

5. The contractor shall be responsible for obtaining any necessary NYC DEP/DOB building Work Place Safety Plan (WPSP) and ATRU Permit, and affiliated ATR-1 inspections to close out the permit.

1.03 CODES, PERMITS AND COMPLIANCE

- A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local laws, rules, and regulations pertaining to Work practices, protection of workers, authorized visitors to the site, persons, and property adjacent to the Work.
- B. Perform asbestos related Work in accordance with NYCDEP Title 15 Chapter 1, New York State Industrial Code Rule 56, 40 CFR 61, and 29 CFR 1926, as specified herein. Where more stringent requirements are specified, adhere to the more stringent requirements.
- C. State Licenses: The Contractor must maintain current licenses pursuant to New York State Department of Labor and Department of Environmental Conservation for all Work related to this Project, including the removal, handling, transport, and disposal of asbestos containing materials.
 1. The Contractor must have and submit proof upon request that any persons employed by the Contractor to engage in, or supervise Work on any asbestos Project have a valid NYS asbestos handling certificate pursuant to Industrial Code Rule 56.
 2. The Contractor shall comply fully with the variances secured from regulatory agencies in the performance of the Work. The Contractor shall also be responsible for paying and complying with any additional variances. Should the Contractor choose to apply for any variance, approval from the Engineer is first required. In the event that the Contractor chooses to use more than one NYS Applicable Variance in the same Work Area simultaneously, the Contractor is responsible for complying with all conditions of each variance and any NYS DOL interpretations concerning the use of these variances together.
- D. Agency Notifications: The Contractor shall prepare written notification to EPA Region 2, and to the NYSDOL at least 10 days prior to commencement of Work, when applicable. The Contractor shall be responsible for use and payment of any notifications required for performance of the Work. This includes ACP7 filing and DEP notice.
- E. It is the sole responsibility of the Contractor to determine what, if any patents are applicable to the Project. The Contractor shall pay all royalties and/or license fees. He/She shall defend all suits or claims for infringement of any patent rights and save the Owner, Architect, Engineer, and Construction Manager harmless from loss, including attorney's fees, on account thereof.
- F. Before commencement of Work, the Contractor shall review and adhere to the Contract Documents. Failure to adhere to the Contract Documents shall constitute a breach of the Contract and the Owner shall have the right to and may terminate the Contract provided, however, the failure of the Owner to so terminate shall not relieve the Contractor from future compliance.

1.04 APPLICABLE STANDARDS AND REGULATIONS

- A. The Contractor shall comply with the following codes and standards, except where more stringent requirements are shown or specified:
- B. Federal Regulations:
 1. 29 CFR 1910.1001, "Asbestos" (OSHA)
 2. 29 CFR 1910.1200, "Hazard Communication" (OSHA)
 3. 29 CFR 1910.134, "Respiratory Protection" (OSHA)
 4. 29 CFR 1910.145, "Specification for Accident Prevention Signs and Tags" (OSHA)

5. 29 CFR 1926, "Construction Industry" (OSHA)
 6. 29 CFR 1926.1101, "Asbestos, Tremolite, Anthophyllite, and Actinolite" (OSHA)
 7. 29 CFR 1926.2, "Variances from safety and health standards" (OSHA)
 8. 29 CFR 1926.500 "Guardrails, Handrails and Covers" (OSHA)
 9. 40 CFR 61, Subpart A, "General Provisions" (EPA)
 10. 40 CFR 61, Subpart M, "National Emission Standard for Asbestos" (EPA)
 11. 49 CFR 171-172, Transportation Standards (DOT)
 12. 40 CFR Part 763, "Asbestos Hazard Emergency Response Act" (AHERA)
- C. New York State Regulations:
1. 12 NYCRR, Part 56, "Asbestos", Industrial Code Rule 56 (DOL)
 2. NYC DEP Title 15 Chapter 1, of the Rules of New York City (DEP)
 3. 6 NYCRR, Parts 360, 364, Disposal and Transportation (DEC)
 4. 10 NYCRR, Part 73, "Asbestos Safety Program Requirements" (DOH)
 5. New York State Department of Health (NYSDOH) Training Requirements
- D. Standards and Guidance Documents:
1. American National Standard Institute (ANSI) Z88.2-80, Practices for Respiratory Protection
 2. ANSI Z9.2-79, Fundamentals Governing the Design and Operation of Local Exhaust Systems
 3. EPA 560/585-024, Guidance for Controlling Asbestos Containing Materials in Buildings (Purple Book)
 4. EPA 530-SW-85-007, Asbestos Waste Management Guidance

1.05 AUTHORITY TO STOP WORK

- A. The Owner shall have the authority to stop the abatement work at any time a determination is made that conditions are not within Specification and applicable regulations. The stoppage of work shall continue until conditions have been corrected to the satisfaction of the Owner. Standby time to resolve the problems shall be at the contractor's expense.

1.06 SUBMITTALS

- A. Pre-contract Submittals. After bids are opened, the apparent low bidder shall submit the following documentation, in accordance with the project deadlines outlined in the Contract Documents. Failure to submit all required documentation truthfully or in a timely manner may be cause for rejection of the bid.
1. Contractor license issued by New York State Department of Labor.
 2. A list of Projects performed within the past two (2) years and include the dollar value of all Projects. Provide Project references to include Owner, consultant, and air monitoring firm's name, contact persons, address, and phone number.
 3. A standard operating procedures manual describing Work practices and procedures, equipment, type of decontamination facilities, respiratory program, special removal techniques, etc.
 4. Citations/Violations/Legal Proceedings: Submit a notarized statement describing:
 - a. Any citations, violations, criminal charges, or legal proceedings undertaken or issued by any law enforcement, regulatory agency, or consultant concerning performance on previous abatement contracts. Briefly describe the circumstances citing the Project and involved persons and agencies as well as the outcome of any actions.
 - b. Any litigation or arbitration proceedings arising out of performance on past Projects.
 - c. Any liquidated damages assessed within the last 2 years.
 5. Preliminary Schedule: Provide an estimate of manpower to be utilized and the time required for completion of each major Work Area. Include estimated size and number of crews and work shifts.

- B. Pre-Work Submittals. The Contractor shall submit 3 copies of the documents listed below, in accordance with the project deadlines outlined in the Contract Documents:
1. Progress Schedule:
 - a. Show the complete sequence of abatement activities and the sequencing of Work within each building or building section.
 - b. Show the dates for the beginning and completion of each major element of Work including substantial completion dates for each Work Area, building, or phase.
 2. Notifications: As required by Federal, State and local regulatory agencies together with proof of transmittal (i.e. certified mail return receipt).
 3. Permits: As required by State and local regulations, including arrangements for storage, transportation, and disposal of contaminated material.
 4. Abatement Work Plan: Provide plans which clearly indicate the following:
 - a. All Work Areas/containments numbered sequentially.
 - b. Locations and types of all decontamination enclosures.
 - c. Entrances and exits to the Work Areas/containments.
 - d. Type of abatement activity/technique for each Work Area/containment.
 - e. Number and location of negative air units and exhaust.
 - f. Proposed location and construction of storage facilities and field office.
 - g. Location of water and electrical connections to building services.
 5. Subcontractor List: List of all subcontractors to be used on the Project (i.e. Waste Hauler).
 6. Material Safety Data Sheets (MSDS): Copies of MSDS for each chemical or material used for the Project (encapsulant, surfactant, mastic remover, etc.).
 7. Laboratory: Submit the NYS Department of Health ELAP certification for the laboratory that will be analyzing the OSHA personnel air samples.
- C. Project Close-out Submittal. Submit the following at the closeout of the Project:
1. Copies of all waste disposal manifests, seals, and disposal logs.
 2. OSHA compliance air monitoring records conducted during the Work.
 3. Daily progress log.
 4. Entry and exit log.
 5. A list of each Worker used in the performance of the Project, including name, social security number, and NYS DOL certification number.

1.07 HEALTH & SAFETY

- A. Worker Protection: The Contractor shall comply with OSHA and provide and maintain all safety measures necessary to properly protect all individuals that enter the work area. The contractor must be performing OSHA personal air monitoring during the abatement work for his/her workers.
- B. Emergency Actions: In an emergency affecting the safety of life, the work, or adjoining property, the Contractor shall immediately act in such a manner to prevent such threatened loss or injury.
- C. Fire Protection, And Emergency Egress: The Contractor shall be responsible to the security and safeguarding of all areas turned over by the Owner to the Contractor. The Contractor shall designate to his workers and other building occupants the means of egress in case of emergency.
- D. The Contractor shall establish emergency and fire exits from the work area. First aid kit, two (2) full sets of protective clothing and respirators shall be provided for use by qualified emergency personnel in the clean room of the decontamination facility.
- E. Contractor shall provide fire watch and logbook throughout the entire term of the project, to protect against fire and unauthorized entry into and around the work area. Any intrusion or incident shall be documented in the logbook. Fire watch personnel shall be present during

off-hours shift such as night shift, weekends and holidays when abatement work is not in progress. Fire watch shall be a certified asbestos handler by NYSDOL.

1.08 PRE-CONSTRUCTION CONFERENCE

- A. Prior to start of preparatory Work under this Contract, and in accordance with the deadlines outlined in the Contract Documents, the Contractor shall attend a pre-construction conference attended by Owner, Facility Personnel, and Engineer, if requested.
- B. Agenda for this conference shall include but not necessarily be limited to:
 - 1. Contractor's scope of Work, Work plan, and schedule to include number of Workers and shifts.
 - 2. Contractor's safety and health precautions including protective clothing and equipment and decontamination procedures.
 - 3. Owner & Engineer's duties, functions, and authority.
 - 4. Contractor's Work procedures including:
 - a. Methods of job site preparation and removal methods.
 - b. Respiratory protection.
 - c. Disposal procedures.
 - d. Cleanup procedures.
 - e. Fire exits and emergency procedures.
 - 5. Contractor's plan for twenty-four (24) hour project security both for prevention of theft and for barring entry of unauthorized personnel into Work Areas.
 - 6. Temporary utilities.
 - 7. Handling of furniture and other moveable objects.
 - 8. Storage of removed asbestos containing materials.
 - 9. Waste disposal requirements and procedures.
- C. In conjunction with the conference, if requested, the Contractor shall accompany the Owner and/or Engineer on a pre-construction walk-through documenting existing condition of finishes and furnishings, reviewing overall Work plan, location of fire exits, fire protection equipment, water supply and temporary electric tie-in.

1.09 PROJECT MONITORING, AIR SAMPLING, AND INSPECTIONS

- A. The Owner shall engage the services of an Environmental Consultant (the Consultant) or Engineer who shall serve as the Owner's Representative in regard to the performance of the asbestos abatement Project and provide direction as required throughout the entire abatement period.
- B. The Contractor is required to ensure cooperation of its personnel with the Consultant/Engineer for the air sampling and project monitoring functions described below. The Contractor shall comply with all direction given by the Consultant/Engineer during the course of the Project.
- C. The Consultant/Engineer shall provide the following administrative services:
 - 1. Review and approve or disapprove all submittals, shop drawings, schedules, and samples.
 - 2. Assure that all notifications to governmental agencies by the Contractor are submitted in a timely manner and are correct in content.
 - 3. Review and approve the Contractor's OSHA compliance testing laboratory.
- D. The Consultant/Engineer shall staff the Project with a NYSDOL-trained and certified Project Monitor to act on the Owner's behalf at the job site. This individual shall be designated as the Abatement Project Monitor (APM).
 - 1. The APM shall be on-site at all times the Contractor is on-site. The Contractor shall not be permitted to conduct any Work unless the APM is on-site.

2. The APM has the authority to direct the actions of the Contractor verbally and in writing if the Contractor is not performing in compliance with the Project Documents and all regulations. Such authority does not in any way diminish the Contractor's sole responsibility to perform all Work in accordance with the Contract Documents and regulations. However, only the Owner shall have the authority to Stop Work when gross work practice deficiencies or unsafe practices are reported by the APM or when ambient fiber concentrations outside the removal area exceed 0.01 f/cc or background level, whichever is greater.
 - a. Such Stop Work order shall be effective immediately and remain in effect until corrective measures have been taken and the situation has been corrected.
 - b. Standby time required to resolve the situation shall be at the Contractor's expense.
 3. The APM shall provide the following services:
 - a. Inspection of the Contractor's Work, practices, and procedures, including temporary protection requirements, for compliance with all regulations and Project specifications.
 - b. Provide abatement Project air sampling as required by applicable regulations (NYS, AHERA). Sampling will include pre-abatement (backgrounds), work area preparation, during abatement and clearance sampling.
 - c. Verify daily that all Workers used in the performance of the Project are certified by the appropriate regulatory agency.
 - d. Monitor the progress of the Contractor's Work, and report any deviations from the schedule to the Owner.
 - e. Monitor, verify, and document all waste load-out operations.
 - f. Verify that the Contractor is performing personal air monitoring daily, and that results are being returned and posted at the site as required.
 4. Inspections shall be conducted at various milestones as Work progresses by the APM. Additional inspections shall be conducted as required by Project conditions. Progression from one phase of work to the next by the Contractor shall be permitted only after visual inspection and verbal approval by the APM.
- E. The Consultant/Engineer shall provide abatement project air sampling and analysis as required by applicable regulations (New York State and/or AHERA). Sampling will include background, pre-abatement, during-abatement and clearance sampling.
1. Unless otherwise required by applicable regulations, the Consultant shall have samples analyzed by Phase Contrast Microscopy (PCM) using NIOSH Method 7400. Results shall be available within 24 hours of completion of sampling.
 2. If the air sampling during abatement reveals airborne fiber levels at or above 0.01 fibers/cc or the background level (whichever is greater) outside the Work Area, then the Owner shall issue an immediate Stop Work order. The Contractor shall then inspect the barriers for leakage and HEPA vacuum and/or wet clean the surface outside the Work Area. The Contractor shall bear the burden of any and all costs incurred by this delay.
 3. Final air clearance sampling will be conducted by Transmission Electron Microscopy (TEM) in accordance with 40 CFR Part 763 (AHERA), as applicable.

1.10 CONTRACTOR AIR SAMPLING

- A. In addition to the requirements of OSHA 1926.1101, the Contractor shall be required to perform personal air monitoring every Work shift in each Work Area during which abatement activities occur in order to determine that appropriate respiratory protection is being utilized (OSHA Monitoring).
- B. The Contractor shall conduct air sampling that is representative of both the 8-hour time weighted average and 30-minute short-term exposures to indicate compliance with the permissible exposure and excursion limits.
- C. The Contractor's laboratory analysis of air samples shall be conducted by an NYS DOH ELAP approved laboratory.

1.11 WORK SUPERVISION

- A. The Contractor shall designate a full-time Project Supervisor who shall meet the following qualifications:
 - 1. The Project Supervisor shall hold New York State certification as an Asbestos Supervisor.
 - 2. The Project Supervisor shall meet the requirements of a "Competent Person" as defined by OSHA 1926.1101 and shall have a minimum of one year experience as a supervisor.
 - 3. The Project Supervisor must be able to read and write English fluently, as well as communicate in the primary language of the Workers.
- B. If the Project Supervisor is not on-site, all Work shall be stopped. The Project Supervisor shall remain on-site whenever asbestos removal is being performed. The Project Supervisor cannot be removed from the Project without the written consent of the Owner and the Engineer.
- C. The Project Supervisor shall maintain the Project Log Book required by New York State Department of Labor and section 2.03 of the specifications and the Waste Disposal Log required by section 4.04 of the specifications.
- D. The Project Supervisor shall be responsible for the performance of the Work and shall represent the Contractor in all respects at the Project site. The Supervisor shall be the primary point of contact for the Asbestos Project Monitor.

1.12 DELIVERY AND STORAGE

- A. Deliver non-contaminated materials to the job site in original packages with containers bearing manufacturer's name and label.
- B. Store all materials at the job site in a suitable and designated area.
 - 1. Store materials subject to deterioration or damage away from wet or damp surfaces and under cover.
 - 2. Protect materials from unintended contamination.
- C. Remove damaged or deteriorated materials from the job site. Materials contaminated with asbestos shall be disposed of as asbestos debris as herein specified.

1.13 TEMPORARY UTILITIES

- A. Shut down and lock out all electrical power to the asbestos Work Areas.
- B. Provide temporary 120-208 volt, single phase, three wire, 100 amp electric service with Ground Fault Circuit Interrupters (GFCI) for all electric requirements within the asbestos Work Area.
 - 1. Where available, obtain from Owner's existing electrical system. Otherwise provide power from other sources (i.e. generator).
 - 2. Provide temporary wiring and "weatherproof" receptacles in sufficient quantity and location to serve all HEPA equipment and tools.
 - 3. Provide adequate "weatherproof" receptacles, to incorporate use by the APM for air sampling equipment.
 - 4. All power to the Work Area shall be brought in from outside the area through GFCI's at the source.
- C. Provide temporary lighting with "weatherproof" fixtures for all Work Areas including decontamination chambers.
 - 1. The entire Work Area shall be kept illuminated at all times work is in progress.
 - 2. Provide lighting adequate for the purposes of performing required inspections.

- D. All temporary devices and wiring used in the Work Area shall be capable of decontamination procedures including HEPA vacuuming and wet-wiping.
- E. Utilize domestic water service, if available, from Owner's existing system. Provide hot water heaters with sufficient capacity to meet Project demands.

PART 2 - PRODUCTS

2.01 PROTECTIVE CLOTHING

- A. Provide personnel utilized during the Project with disposable protective whole body clothing, head coverings, gloves and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber for comfort, but shall not be used alone. Make sleeves secure at the wrists and make foot coverings secure at the ankles by the use of tape, or provide disposable coverings with elastic wrists or tops.
- B. Provide sufficient quantities of protective clothing to assure a minimum of four (4) complete disposable outfits per day for each individual performing abatement Work.

2.02 DISPOSAL BAGS, DRUMS, AND CONTAINERS

- A. Provide 6 mil polyethylene disposal bags printed with asbestos caution labels. Bags shall be imprinted with U.S. Department of Transportation required markings.
- B. If the asbestos waste has the potential to damage or puncture the disposal bags, burlap sacks shall be utilized as a liner inside the polyethylene disposal bags to prevent puncture or damage to the disposal bags. In addition, 30 or 55 gallon capacity fiber or metal drums capable of being sealed air and water tight may also be used. Affix asbestos caution labels on lids and at one-third points around drum circumference to assure ready identification.
- C. Containers and bags must be labeled with the names of the waste generator and the location at which the waste was generated in accordance with 40 CFR Part 61 NESHAPS.
- D. Labeled ACM waste containers or bags shall not be used for non-ACM waste or trash. Any material placed in labeled containers or bags, whether turned inside out or not shall be handled and disposed of as ACM waste.

2.03 HEPA VACUUM EQUIPMENT

- A. All dry vacuuming performed under this contract shall be performed with High Efficiency Particulate Absolute (HEPA) filter equipped industrial vacuums conforming to ANSI Z9.2.
- B. Provide tools and specialized equipment including scraping nozzles with integral vacuum hoods connected to a HEPA vacuum with flexible hose.

2.04 POWER TOOLS

- A. Any power tools used to drill, cut into, or otherwise disturb asbestos material shall be equipped with HEPA filtered local exhaust ventilation.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Should the area beyond the Work Area(s) become contaminated with asbestos containing materials or elevated fiber levels, immediately stop Work and institute emergency procedures. Contaminated non-Work Areas shall be isolated and decontaminated in accordance with procedures established for asbestos removal. All costs incurred in decontaminating such non-Work Areas and the contents thereof shall be borne by the Contractor, at no additional cost to the Owner.
- B. NYS DOL certificates shall be on site prior to admittance of any Contractor's employees to the asbestos Work Area.
- C. Perform all asbestos removal Work using wet removal procedures. Dry removal procedures are not permitted.
- D. The following documents shall be posted at the site at an easily accessible location:
 - 1. Company Asbestos Abatement license.
 - 2. Worker's asbestos handling certificates (copies are acceptable provided Workers have original certificates in their possession).
 - 3. Project specifications.
 - 4. Project drawings.
 - 5. Notifications and variances.
 - 6. Applicable regulations.
 - 7. Material Safety Data Sheets.
 - 8. Abatement Work plan.
 - 9. List of emergency telephone numbers.
 - 10. Waste Disposal Log.
- E. The Work Area must be vacated by building occupants prior to decontamination enclosure construction and Work Area preparation.

3.02 PERSONNEL DECONTAMINATION ENCLOSURE

- A. Full (five room) Decontamination Facility: The Contractor shall provide a full decontamination enclosure system for large asbestos projects in accordance with OSHA Standard 29 CFR 1926.1101 and 12NYCRR Part 56 (ICR 56).
- B. Remote Decontamination Facility: The Contractor shall provide a remote personnel decontamination enclosure system for small asbestos projects, asbestos projects that utilize multiple tents, and exterior asbestos roof projects in accordance with OSHA Standard 29 CFR 1926.1101 and 12NYCRR Part 56 (ICR 56).
- C. Decontamination Enclosure System Utilities: Lighting, heat, and electricity shall be provided as necessary by the Contractor.

3.03 WASTE DECONTAMINATION ENCLOSURE

- A. Waste/Equipment Decontamination Enclosure System: This system is located adjacent to the work area and personnel decontamination system. If the decontamination chamber is accessible to the public it shall be fully framed and sheathed to prevent unauthorized entry. A remote decontamination unit may be used that complies with subpart 56-9 of NYS Industrial Code Rule 56 of Title 12, section 30 of the Labor Law. This remote enclosure system must be on the property and stationary, within 50 feet of the building.

- B. Where only one egress from the Work Area exists, the holding area of the waste decontamination enclosure system may branch off from the personnel decontamination enclosure equipment room, which then serves as the waste wash room.
- C. The waste wash room water shall be drained, collected, and filtered as specified in ICR 56.
- D. In small asbestos projects where only one egress from the Work Area exists, the shower room may be used as a waste washroom. In this instance, the clean room shall not be used for waste storage, but shall be used for waste transfer to carts, which shall immediately be removed from this enclosure.

3.04 WORK AREA ENTRY AND EXIT PROCEDURES

- A. Personnel Entrance and Decontamination Procedures for Gross Removal Operations utilizing full decontamination facility, the following entry/exit procedures shall be used for gross removal using full containment:
 - 1. All workers and authorized visitors shall enter the work area through the worker decontamination enclosure system.
 - 2. All individuals who enter the work area shall sign the entry log, located in the clean room, upon each entry and exit. The log shall be permanently bound and shall identify fully the facility, agents, contractor(s), the project, each work area and worker respiratory protection employed. The site supervisor shall be responsible for the maintenance of the log during the abatement activity.
 - 3. Each worker or authorized visitor shall, upon entering the job site, remove street clothes in the clean room and put on a clean respirator (with new filters, if appropriate) and clean protective clothing before entering the work area through the shower room and equipment room.
 - 4. Each worker or authorized visitor shall, each time he/she leaves the work area: remove gross contamination from clothing before leaving the work area; proceed to the equipment room and remove all clothing except the respirator; still wearing the respirator, proceed to the shower room; clean the outside of the respirator with soap and water while showering; remove filters, wet them, and dispose of them in the container provided for that purpose; wash and rinse the inside of the respirator; and thoroughly shampoo and wash himself/herself.
 - 5. Following showering and drying off, each worker or authorized visitor shall proceed directly to the clean room, dress in street clothes, and exit the decontamination enclosure system immediately. Disposable clothing of the type worn inside the work area is not permitted outside the work area.
- B. Personnel Entrance and Decontamination Procedures for Removal Operations utilizing remote decontamination facility: The following entry/exit procedures shall be used for removal work areas.
 - 1. All individuals who enter the Work Area shall sign the entry log, located in the clean room, upon each entry and exit. The log shall be permanently bound and shall identify fully the facility, agents, contractor(s), the project, each Work Area, and worker respiratory protection employed. The job supervisor shall be responsible for the maintenance of the log during the abatement activity.
 - 2. Each worker shall remove street clothes in the clean room; wear two disposable suits, including gloves, hoods and non-skid footwear; and put on a clean respirator (with new filters) before entering the work area.
 - 3. Each worker shall, before leaving the work area or tent, shall clean the outside of the respirators and outer protective clothing by wet cleaning and/or HEPA vacuuming. The outer disposable suit shall be removed in the work area and the worker shall then proceed to the shower room. The inner disposable suit and respirator shall be wet wiped and HEPA vacuumed thoroughly before removing and prior to aggressive shower.

4. Following showering and drying off, each worker or authorized visitor shall proceed directly to the clean room, dress in street clothes, and exit the decontamination enclosure system immediately.

3.05 WORK AREA PREPARATION

- A. Work Area preparation shall be performed in accordance with ICR 56, the Contract Documents and the approved Asbestos Work Plan.
- B. Temporary lighting within the work area and decontamination system shall be provided as required to achieve minimum illumination levels.
- C. Unless otherwise specified for removal, the Contractor shall either protect all fiberglass insulation on piping, ductwork, tanks, etc. in the Work Area using two layers of six mil polyethylene or remove the insulation as asbestos containing waste. If the Contractor elects to remove the fiberglass insulation, he/she shall be responsible for reinsulation, if reinsulation of removed ACM is part of the Contract or Project.
- D. Emergency exits. Emergency exits and routes shall be established and clearly marked with florescent paint or other effective designations to permit easy location from anywhere within the work area. Emergency exits shall be secured to prevent access from uncontaminated areas and yet permit emergency exiting. Exits shall be checked daily against exterior blockage or impediments to exiting.
- E. Remove all items attached to or in contact with ACM only after the Work Area enclosure is in place. HEPA vacuum and wet wipe with amended water all removed items prior to their removal from the Work Area and before the start of asbestos removal operations.
- F. If, required, suspended ceiling tiles shall only be removed after Work Area preparation is complete. Non-contaminated ceiling tiles shall be HEPA vacuumed and removed from the Work Area before asbestos removals begin. Contaminated ceiling tiles shall be disposed of as asbestos waste.
- G. For tent enclosures: the Contractor shall use negative pressure ventilation equipment to continuously exhaust the enclosed area. A minimum of two (2) volume changes per hour is required. All required air monitoring must be successfully completed before the tent/barrier is collapsed.

3.06 NEGATIVE AIR PRESSURE FILTRATION SYSTEM

- A. Provide a portable asbestos filtration system that develops a minimum pressure differential of negative 0.02 in. of water column within all full enclosure areas relative to adjacent unsealed areas and that provides a minimum of 4 air changes per hour in the Work Area during abatement.
- B. The system shall include a series of pre-filters and filters to provide High Efficiency Particulate Air (HEPA) filtration of particles down to 0.3 microns at 100% efficiency and below 0.3 microns at 99.9% efficiency. Provide sufficient replacement filters to replace pre-filters every 2 hours, secondary pre-filters every 24 hours, and primary HEPA filters every 600 hours of operation.
- C. At no time will the unit exhaust indoors, within 50 feet of a receptor, including but not limited to windows and doors, or adversely affect the air intake of the building.
- D. The Contractor shall provide either a manometer or a photohelic style negative air pressure gauge with chart recorder to measure and record negative pressure differential across the Work Area barriers without interruption 24 hours per day as directed by the Environmental Consultant.

- E. There shall be at least a 12-hour settling period after the Work Area is fully prepared and the negative filtration units have been started to ensure integrity of the barriers. Unless otherwise specified in the variance(s) utilized by the contractor.

3.07 REMOVAL OF ASBESTOS CONTAINING MATERIALS - FULL CONTAINMENT AND TENT PROCEDURES

- A. Asbestos-containing materials shall be removed in accordance with ICR 56 and NYC DEP Title 15 Chapter 1, the Contract Documents and the approved Asbestos Work Plan.
- B. Sufficiently wet asbestos materials with a low pressure, airless fine spray of surfactant to ensure full penetration prior to material removal. Re-wet material that does not display evidence of saturation.
- C. One Worker shall continuously apply amended water while ACM is being removed.
- D. Perform cutting, drilling, abrading, or any penetration or disturbance of asbestos containing material in a manner to minimize the dispersal of asbestos fibers into the air. Use equipment and methods specifically designed to limit generation of airborne asbestos particles. All power operated tools used shall be provided with HEPA equipped filtered local exhaust ventilation.
- E. Power or pressure washers will not be allowed to be used for asbestos removal or clean-up procedures.

3.08 ACM WASTE CONTAINERIZING, DECONTAMINATION AND LOAD OUT PROCEDURES

- A. Packaging of ACM shall conform to OSHA Standard 29 CFR 1926.1101, DOT 49 CFR 171, 172, and 173, and EPA Standard 40 CFR Part 61 and the requirements as herein specified. Materials to be transported through a non-Work area building space shall be placed in hard wall shipping containers for handling.
- B. The cleaned containers of asbestos material and equipment shall be placed in water tight carts with doors or tops that shall be closed and secured. These carts shall be held in the holding area pending removal. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.
- C. The exit from the decontamination enclosure system shall be secured to prevent unauthorized entry.
- D. Where the waste removal enclosure is part of the personnel decontamination enclosure, waste removal shall not occur during shift changes or when otherwise occupied. Precautions shall be taken to prevent short circuiting and cycling of air outward through the shower and clean room.

3.09 WORK AREA CLEANING PROCEDURES

- A. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, decontamination procedures shall be followed as specified in ICR 56, unless otherwise stated in the variance(s) utilized by the Contractor.
- B. Following each decontamination procedure (i.e., first, second, and third cleanings) the APM shall inspect the Work Area for effectiveness of the cleanings. If necessary, additional cleaning shall be performed by the Contractor as directed by the APM.
- C. As a result of any air sampling results that indicate high fiber levels, the Contractor will clean or reclean the affected areas at no additional expense to the Owner.

3.10 TENT ENCLOSURES

- A. Tent enclosures may only be used in areas specifically permitted by NYS Department of Labor Code Rule 56 or a Project specific variance issued by the NYS Department of Labor.
- B. The Contractor shall restrict access to the immediate area where tent removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.
- C. Remote personnel and waste decontamination enclosures shall be constructed. Configuration shall be as required by Project size.
- D. During removal activity, a HEPA vacuum or small capacity negative pressure filtration unit shall be used to provide a negative air pressure inside the tent. A minimum of six air changes per hour is required.
- E. Workers shall wear two disposable suits for all phases of Work. Workers exiting the tent shall HEPA vacuum the outer suit, enter the airlock, remove the outer suit and then place it back into the Work Area. A clean second suit shall be donned before exiting the airlock and proceeding to the decontamination enclosure or another tent.
- F. ACM removal shall follow procedures defined in Section 3.07.
- G. Waste material shall be placed in properly labeled 6 mil plastic bags or other appropriate containers. The outside of the bags or containers shall be wet wiped and/or HEPA vacuumed before being passed into the airlock for double- bagging. The bags or containers shall then be transported to the decontamination enclosure and then bagged for a third time and transported to the waste storage container. All transportation of waste bags and containers outside the Work Area shall be in watertight carts.
- H. The APM shall conduct a visual inspection of the Work Area for cleanliness and completion of abatement.

3.11 GLOVEBAG REMOVAL IN TENT

- A. Glovebag removals may only be used as specifically permitted by NYS Department of Labor Code Rule 56, Applicable Variance 108 (AV 108) Glovebag Operations, or a Project specific variance issued by the NYS Department of Labor. Glovebags may only be used on piping.
- B. As specified in applicable regulations and variances, glovebag removals are only permitted to be conducted within tent enclosures complying with these specifications. Removal and disposals must also be conducted in conformance with all Project variance conditions.
- C. The Contractor shall restrict access to the immediate area where tent/glovebag removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.
- D. Remote personnel and waste decontamination enclosures shall be constructed. Configuration shall be as required by Project size.
- E. The glovebags shall be smoke tested by the APM before removal operations commence. Glovebags that do not pass the smoke test shall be resealed and then retested.
- F. After glovebag removals are complete, tent decontamination procedures shall be followed.

3.12 RESTORATION OF UTILITIES, FIRESTOPPING, AND FINISHES

- A. After final clearance, remove locks and restore electrical and HVAC systems. All temporary power shall be disconnected, power lockouts removed and power restored. All temporary plumbing shall be removed.
- B. Finishes damaged by asbestos abatement activities including, but not limited to, plaster/paint damage due to duct tape and spray adhesives, and floor tile lifted due to wet or humid conditions, shall be restored prior to final payment, unless the damaged surfaces are to be replaced during renovation activities.
 - 1. Finishes unable to be restored shall be replaced under this Contract.
 - 2. All foam and expandable foam products and materials used to seal Work Area openings shall be completely removed upon completion of abatement activities.
- C. All penetrations (including, but not limited to, pipes, ducts, etc.) through fire rated construction shall be firestopped using materials and systems tested in accordance with ASTM E814 on Projects where re-insulation is part of the required work.

3.13 ASBESTOS WASTE

- A. Applicable Regulations: All asbestos waste shall be stored, transported and disposed of in accordance with the following regulations as a minimum:
 - 1. NYS DEC 6 NYCRRNYRCC part 360 and 364.
 - 2. US EPA NESHAPS 40 CFR 61.
 - 3. US EPA Asbestos Waste Management Guidance EPA/530-SW85.
- B. Waste Storage Containers.
 - 1. As work progresses, remove sealed and labeled bags of ACM from the Work area and place in a lockable trailer, dumpster, or other container approved for storage or transport of asbestos waste. Open containers will not be permitted on-site (i.e. open dumpster with canvas cover, etc.).
 - 2. The container interior shall be plasticized and sealed with a minimum of two (2) layers of 6 mil polyethylene.
 - 3. While on-site, the container shall be labeled with EPA Danger signage:

**DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD**

- 4. The danger sign legend, text size, style and arrangement shall conform to the requirements of EPA Standard 40 CFR Part 61.149 (d) (1).
- 5. The New York State Department of Environmental Conservation Asbestos Hauler's Permit number shall be stenciled on both sides and back of the container.
- 6. Once the container is loaded at the site, the door(s) will be locked at all times.
- 7. Before the container is removed from the Project Site for transportation to the Disposal Site, the door(s) shall be locked. The locks shall be removed at the Disposal Site by the operator of the Disposal Facility.
- 8. The Owner may initiate random checks at the Disposal Site to insure that the procedures outlined herein are complied with.

3.14 DISPOSAL AND TRANSPORTATION OF ASBESTOS-CONTAMINATED WASTES

- A. Sealed and labeled disposal bags or waste wrapped in two layers of plastic sheeting sealed airtight shall be used to transport asbestos-contaminated waste to the landfill. Procedures for

hauling and disposal shall comply with 40 CFR, Part 61, 49 CFR, Part 171 and 172, and other applicable state, regional, and local government regulations.

1. An asbestos waste shipment record or waste manifest shall accompany asbestos waste, which is transported to a disposal site.
2. The waste manifest shall be completed by the Contractor.
3. The waste manifest shall have the appropriate signatures of the APM, the Contractor, and the Hauler representatives prior to any waste being removed from the site.
4. Copies of the completed waste manifest shall be retained by APM and the Contractor and shall remain on site for inspection. The Contractor shall forward originals of the waste manifest, which include final sign-off by the disposal facility, to Consultant/Engineer within 14 days of the waste container being removed from the site. Failure to do so may result in payment being withheld from the Contractor.

3.15 DISPOSAL SITE

- A. The Contractor's Hauler and Disposal Site shall be approved by the Owner.
- B. The Contractor shall have the Hauler provide the estimated date and time of arrival at the Disposal Site.
- C. Unless specifically approved by the Owner, the Contractor shall not permit any off-site transfers of the waste or allow the waste to be transported or combined with any other off-site asbestos material. The Hauler must travel directly to the disposal site without unauthorized stops.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section specifies the requirements for the detection and prevention of lead dust contamination of lead dust control work areas and areas adjacent to them, protection of workers, post-work cleaning, pre-disposal testing and appropriate disposal of removed material.

1.02 RELATED SECTIONS

- A. Section 011100 - SUMMARY OF WORK.
- B. Section 028200 - ASBESTOS REMEDIATION.

1.03 REFERENCES

- A. New York State Department of Environmental Conservation (DEC) 6NYCRR:
- B. Part 360 Solid Waste Management Facilities.
- C. Part 364 Waste Transporter Permits.
- D. Part 370 Hazardous Waste Management System-General.
- E. Part 371 Identification and Listing of Hazardous Wastes.
- F. Part 372 Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities.
- G. Part 373 Hazardous Waste Management Facilities.
- H. New York State Department of Transportation (DOT): Follow all regulations of 49CFR Part 100 through 199.
- I. Occupational Safety and Health Administration (OSHA): Lead Exposure in Construction: Interim Final Rule 29 CFR 1926.62.
- J. U.S. Department of Housing and Urban Development (HUD): Guidelines for evaluation and control of Lead based paint hazards: Title Ten of Housing and Community Act of 1992.
- K. U.S. Environmental Protection Agency (EPA): Resource Conservation and Recovery Act (RCRA) Section 3004 Hazardous and Solid Waste Amendments.
- L. U.S. Environmental Protection Agency (EPA): Toxicity Characteristics Leaching Procedure EPA Method 1311.

1.04 DEFINITIONS

- A. Authorized Personnel: Facility or the Director's Representative, and all other personnel who are authorized officials of any regulating agency, be it State, Local, Federal or Private entity who possess legal authority for enforcement or inspection of the work.
- B. Containment: The enclosure within the building which establishes a contaminated area and surrounds the location where lead remediation is taking place and establishes a Lead Control Work Area.

- C. Clearance Criteria: Shall be determined and established by an independent testing lab hired by the Director's Representative, conforming to all standards set forth by all authorities having jurisdiction, mentioned in the references, and issue the certification of cleaning. At a minimum no single sample shall have reading levels greater than the levels established by pre-work sampling and testing. Levels shall be recorded in mg/ft².
- D. Fixed Object: Mechanical equipment, electrical equipment, fire detection systems, alarms, and all other fixed equipment, furniture, fixtures or other items which cannot be removed from the work area.
- E. HEPA: High Efficiency Particulate Absolute filtration efficiency of 99.97 percent down to 0.3 microns. Filtration provided on specialized vacuums and air filtration devices to trap particles.
- F. Lead Based Paint (LBP): Paints or other surface coatings that contain lead equal to or greater than 1.0 milligrams per square centimeter or 0.5 percent of lead by weight.
- G. Lead Dust Control Work Area: A cordoned off area with drop clothes or an enclosed area or structure with containment to prevent the spread of lead dust, paint chips, or debris from lead-containing paint disturbance operations.
- H. PPE: Personal Protective Equipment.

1.05 ABBREVIATIONS

- A. ASTM: American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103
- B. CFR: Code of Federal Regulations, Government Printing Office, Washington, DC 20402
- C. DOT: Department of Transportation, Main Office, 50 Wolf Road, Albany, NY 12232
- D. NIOSH: National Institute for Occupational Safety and Health, Building J, N.E. Room 3007, Atlanta, Georgia 30333
- E. OSHA: Occupational Safety and Health Administration, 200 Constitution Avenue, Washington, DC 20210
- F. USEPA: United States Environmental Protection Agency, 401 M Street SW, Washington, DC 20460.

1.06 SUBMITTALS

- A. Quality Control Submittals:
 - 1. Worker' Qualifications: The persons removing lead containing/coated material and their Supervisors shall be personally experienced in this type of work and shall have been employed by a company with a minimum of one year experience in this type of work. Submit a copy of documentation of completion of current valid lead awareness certifications.
 - 2. Work Plan: Submit one copy of the work plan required under Quality Assurance Article.
 - 3. Waste Transporter Permit: One copy of transporter's current waste transporter permit.
- B. Operation and Maintenance Data: Submit air filtration unit operation and maintenance data and manufacturer's catalog sheets for the HEPA filter.
 - 1. Provide an affidavit stating that the HEPA filters to be used for this project are new and unused.

- C. Contract Closeout Submittals:
 - 1. Assessment Report compiled by a testing lab certifying that the work area has lead concentrations below the levels specified under the cleaning criteria.
 - 2. Disposal Site Receipts: Copy of waste shipment record and disposal site receipt showing that the lead-containing materials have been properly disposed.

1.07 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with the referenced standards.
- B. Pre-Work Conference: Before the Work of this Section is scheduled to commence, a conference will be held by the Director's Representative at the Site with the contractor and the lead handling subcontractor (if any) for the purpose of reviewing the Contract Documents, discussing requirements for the Work, and reviewing the Work procedures.
- C. Lead-Containing Material Removal Work Plan: Before the physical Work begins, prepare a detailed lead-containing material removal work plan.
 - 1. The work plan shall include, but not be limited to, the location, size, and details of lead dust control work areas, sequencing of lead containing material handling, work procedures, types of equipment, crew size, and emergency procedures for fire and medical emergencies.

1.08 PROJECT CONDITIONS

- A. Shut-down of Air Handling System: Complete the Work of this Section within the time limitation allowed for shutdown of the air handling system serving the work area.
 - 1. The air handling system will not be restarted until approval of the post-work dust-wipe testing following the last cleaning.
- B. Cover and seal all fin-tube radiator covers, diffusers, duplex outlets, speakers, smoke and heat detectors, etc.
 - 1. Prevent lead containing dust from entering hard to clean areas within the duct containment area.
 - 2. Items judged to be too difficult to protect may be disconnected, removed and replaced at contractor's option.
- C. Remove or encase all movable equipment in the work area with two layers of six mil fire retardant polyethylene sheeting.

1.09 HEALTH AND SAFETY

- A. Where in the performance of the work, workers, supervisory personnel or sub-contractors may encounter, disturb, or otherwise function in the immediate vicinity of contaminated items and materials, all personnel shall take appropriate continuous measures as necessary to protect all ancillary building occupants from the potential lead exposure.
 - 1. Such measures shall include the procedures and methods described herein and shall be in compliance with all applicable regulations of Federal, State and Local agencies.

1.10 FIRE PROTECTION, EMERGENCY EGRESS AND SECURITY

- A. Establish emergency and fire exits from the lead dust control work area containment. Provide first aid kits and two full sets of protective clothing and respirators for use by qualified emergency personnel outside of the work area.

- B. Provide a logbook throughout the entire term of the project. All persons who enter the regulated lead dust control work area or containment shall sign the logbook. Document any intrusion or incident in the log book.

1.11 PERSONAL PROTECTIVE CLOTHING AND EQUIPMENT

- A. Workers must wear protective suits, protective gloves, eye protection and a minimum of half-face respirator with HEPA filter cartridge for all projects. Respiratory protection shall be in accordance with OSHA regulation 29 CFR 1910.134 and ANSI Z88.2.
- B. Workers must be trained, have medical clearance and must have recently received pulmonary function test (PFT) and respirator fit tested by a trained professional.
 - 1. A personal air sampling program shall be in place as required by OSHA.
 - 2. The use of respirators must also follow a complete respiratory protection program as specified by OSHA.

PART 2 - PRODUCTS

2.01 RESPIRATORS

- A. Type: Approved by the Mine Safety and Health Administration (MSHA), Department of Labor, or the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.

2.02 VACUUM CLEANERS

- A. Type: Vacuums equipped with HEPA filters.

2.03 PLASTIC SHEETS

- A. Type: Minimum 6 mil., clear, fire retardant polyethylene sheets.
- B. Floor Protective Layer: Minimum 10 mil., reinforced polyethylene sheets.

2.04 DISPOSAL BAGS

- A. Type: Minimum 6 mil thick, clear polyethylene bags with preprinted Caution Label.

2.05 EQUIPMENT

- A. Temporary lighting, heating, hot water heating units, ground fault interrupters, and all other equipment on site shall be UL listed and shall be safe, proper, and sufficient for the purpose intended.
- B. All electrical equipment shall be in compliance with the National Electric Code, Article 305 - Temporary Wiring.

PART 3 - EXECUTION

3.01 PRE-WORK TESTING

- A. Testing: The Director's Representative will employ the services of an independent testing laboratory to perform the pre-work testing within the lead dust control work area and the areas adjacent to the lead dust control work area.

1. The testing lab will be New York State Department of Health, Environmental Laboratory Accreditation Program (NYS ELAP).

3.02 EMPLOYEE PROTECTION

- A. Comply with all applicable Occupational Safety and Health Administration (OSHA) Requirements.

3.03 LEAD-CONTAINING/COATED MATERIAL HANDLING AND DISPOSAL

- A. Handle and dispose of lead-containing materials in accordance with OSHA 1926.62 and the approved lead-containing material work plan. Use procedures and equipment required to limit occupational and environmental exposure to lead when material containing or coated with lead containing paint is handled and disposed of in accordance with referenced standards.

3.04 POST-WORK TESTING

- A. Testing: The Director will employ the services of an independent testing laboratory to perform the post-work testing within the lead dust control work area and the areas adjacent to the lead dust control work area.
 1. The testing lab will be New York State Department of Health, Environmental Laboratory Accreditation Program (NYS ELAP).

3.05 MULTIPLE WORK LOCATIONS

- A. The first two locations encountered shall be utilized to develop a method for an acceptable baseline approach for the lead dust control area, pre work wipe samples, employee protection, work method, post work wipe samples, cleaning criteria and disposal.
 1. Once an acceptable method is developed and verified by the independent testing lab employed by the Director, subsequent testing shall not be required.
 2. Do not change the methodology of the verified work plan during the course of the entire project.

3.06 CLEANING CRITERIA DWELLINGS & TARGET SPACES

- A. Cleaning criteria is separated into two categories; areas within the lead dust control work area, and areas adjacent to the lead dust control work area:
 1. Surfaces within the Lead Dust Control Work Area: In each area where the lead containing/coated materials have been disturbed, compare the sample results with the criteria listed below. Any other surfaces inside the lead dust control work area that is not listed below shall be cleaned to the pre-work levels. If any of the results exceed the following values, clean again and schedule retesting until the lead dust levels are equal to or lower than the following values:
 - a. Floors: 10 micrograms of lead per square foot.
 - b. Window Sills: 100 micrograms of lead per square foot.
 - c. Window Troughs: 400 micrograms of lead per square foot.
 - d. Soil: 400 ppm in play areas and 1,200 ppm in bare soil in the remainder of the yard.
 2. Areas Adjacent to the Lead Dust Control Work Area: If the post-work test results indicate an increase in the lead level as compared to the pre-work samples, the area has been contaminated by the work and cleaning is mandatory.
 - a. Clean all affected surfaces and schedule retesting. If results still exceed pre-abatement levels, clean again and schedule retesting until the following criteria is met or until the lead dust levels are equal to or lower than the pre-work wipe sample results. Any affected surfaces that are not listed below shall be cleaned to pre-work levels.
 - 1) Floors: 10 micrograms of lead per square foot.

- 2) Window Sills: 100 micrograms of lead per square foot.
- 3) Window Troughs: 400 micrograms of lead per square foot.
- 4) Soil: 400 ppm in play areas and 1,200 ppm in bare soil in the remainder of the yard.

3.07 CERTIFICATION OF CLEANING IF NECESSARY

- A. Schedule dust wipe testing with the Director's Representative at the site, when work area is ready for clearance testing.
- B. Director's Representative will employ the services of an independent testing lab to perform clearance testing.
 1. Prior to removal of any isolation barrier, the Director's Representative will obtain a written affidavit and a final assessment report from the lab stating that the tests conform to all standards set forth by all authorities having jurisdiction, mentioned in the references.
 2. Schedule a walk-through inspection with the Director's Representative and obtain his written approval.
- C. The Director's Representative shall have final determination of an acceptable clearance level.

3.08 PRE-DISPOSAL TESTING

- A. Prior to disposal, test the removed materials for toxicity in accordance with EPA Method 1311, Toxicity Characteristic Leaching Procedure (TCLP).
 1. Test results indicating a value greater than 5 ppm lead classifies the removed material as Hazardous Waste.

3.09 DISPOSAL OF LEAD-CONTAINING/COATED MATERIAL AND RELATED DEBRIS

- A. Transport and dispose of lead-containing material classified as Hazardous Waste in accordance with the standards referenced in Part 1 of this Section.
- B. Transport and dispose of lead-containing material classified as Non- Hazardous Waste in accordance with the standards referenced in Part 1 of this Section.

3.10 RESTORATION

- A. Remove temporary decontamination facilities and restore area designated for these facilities to its original condition or better.
- B. Where existing construction is damaged or contaminated during the course of performing this project, restore area to its condition or better.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Furnish labor, materials, services, and equipment necessary for complete removal and disposal of the following demolition debris in accordance with federal, state, and local regulations:
 - 1. PCB-containing electrical equipment, including transformers, capacitors, and switches.
 - 2. PCB- and DEHP-containing lighting ballasts.
 - 3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.
- B. Perform PCB removal and disposal work in accordance with 40 CFR 761 and the requirements specified herein.

1.02 RELATED REQUIREMENTS

- A. Section 017419 - Construction Waste Management and Disposal: Disposal of normal demolition debris.

1.03 DEFINITIONS

- A. Toxic Substances: PCBs, mercury, and other substances regulated under the U.S. Federal Toxic Substances Control Act (TSCA); substances covered by this specification are identified under SECTION INCLUDES.
- B. Leak: Leak or leaking means any instance of a toxic substance present on any portion of the external surface of an item of equipment or container.
- C. PCBs: PCBs as used in this specification shall mean the same as PCBs, PCB Article, PCB Article Container, PCB Container, PCB Equipment, PCB Item, PCB Transformer, PCB-Contaminated Electrical Equipment, as defined in 40 CFR 761, Section 3, Definitions.
- D. Spill: Spill means both intentional and unintentional spills, leaks, and other uncontrolled discharges when the release results in any quantity of toxic substances running off or about to run off the external surface of an item of equipment or other source, as well as the contamination resulting from those releases.
- E. Universal Waste: Any of the following hazardous wastes that are managed under the universal waste requirements of 40 CFR 273:
 - 1. Batteries as described in Sec. 273.2 of that chapter.
 - 2. Thermostats as described in Sec. 273.4 of that chapter.
 - 3. Lamps as described in Sec. 273.5 of that chapter.

1.04 REFERENCE STANDARDS

- A. 29 CFR 1910.132-138 - Personal Protective Equipment; Current Edition.
- B. 29 CFR 1910.145 - Accident Prevention Signs and Tags; Current Edition.
- C. 29 CFR 1910.1000 - Air Contaminants; Current Edition.
- D. 40 CFR 273 - Standards For Universal Waste Management; current edition.
- E. 40 CFR 761 - Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution In Commerce, And Use Prohibitions; current edition.

- F. 49 CFR 178 - Specifications for Packaging; current edition.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures, except that all submittals are to be made to Owner, not to Architect/Engineer.
- B. Qualifications of Certified Industrial Hygienist: Submit name, address, and telephone number and documentation of certification, including certification number and date of certification or recertification.
- C. Toxic Substances Removal Work Plan.
- D. Disposal Plan.
- E. Worker Training Certification: Submit certificates, prior to the start of work but after the main abatement submittals, signed and dated by the Certified Industrial Hygienist and by each employee stating that the employee has received training; organize by individual worker not by type of certificates.
- F. Notification of start of removal work.
- G. Spill notification and documentation:
 - 1. Certification of Decontamination for PCB Spill.
 - 2. Post-cleanup sampling data, if required.
- H. Transporter and disposal documentation.

1.06 QUALITY ASSURANCE

- A. Notification: Notify Owner 20 days prior to the start of toxic substance removal work.
- B. Reference Documents: At all times maintain one copy each of 29 CFR 1910.1000, 40 CFR 761, and Contractor work practices for removal, storage and disposal of toxic substances, at field office and one copy each in view at project site.
- C. Removal Contractor Qualifications: Must Be Approved by Owner.
- D. Certified Industrial Hygienist (CIH): Obtain services of an industrial hygienist certified by American Board of Industrial Hygiene to review and approve Toxic Substances Removal Plan, including determination of the need for personnel protective equipment (PPE) in performing toxic substance removal work, and to certify training.
- E. Training: Instruct employees on dangers of exposure to toxic substances present and on respirator use, decontamination, and applicable regulations.
- F. Surveillance Personnel: Surveillance personnel may enter Control Areas for brief periods of time provided they wear disposable polyethylene gloves and disposal polyethylene foot covers, as a minimum. Additional protective equipment may be required if respiratory hazard is involved or if skin contact with PCB is involved.
- G. Toxic Substances Removal Work Plan: Submit a detailed job-specific plan of the work procedures to be used in the removal and containment of toxic substance-containing materials, not to be combined with other hazardous abatement plans.

1. Select removal procedures to minimize contamination of work areas with toxic substances or contaminated debris or waste.
 2. Include a sketch showing the location, size, and details of Control Areas.
 3. Include location and details of decontamination rooms, change rooms, shower facilities, and mechanical ventilation system.
 4. Include eating, drinking, smoking and restroom procedures, interface of trades, sequencing of related work, Disposal Plan, respirators, protective equipment, and a detailed description of the method of containment of the operation to ensure that toxic substances are not spread or carried outside of the control area unless properly containerized or controlled.
 5. Include provisions to ensure that airborne PCB concentrations of 3.10 E-08 pound per cubic foot (0.50 milligrams per cubic meter) of air are not exceeded outside of Control Area; include air sampling, training and strategy, sampling methodology, frequency, duration of sampling, and qualifications of air monitoring.
 6. Obtain approval of plan prior to the start of removal work.
- H. Disposal Plan: Within 45 calendar days after award of contract submit a Disposal Plan that complies with applicable requirements of federal, state, and local waste regulations.
1. Do not proceed without Owner's approval of plan.
 2. Do not proceed without Architect/Engineer's approval of plan.
 3. Include in Plan:
 - a. Identification of wastes associated with the work.
 - b. Estimated quantities of wastes to be generated and disposed of.
 - c. Names and qualifications of each contractor that will be transporting, storing, treating, and disposing of the wastes.
 - d. Disposal facility location and 24-hour point of contact; furnish two copies of facility's EPA waste permit applications and EPA Identification numbers.
 - e. Names and qualifications (experience and training) of personnel who will be working on-site with toxic substances.
 - f. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.
 - g. Spill prevention, containment, and cleanup contingency measures to be implemented.

PART 2 PRODUCTS

2.01 EQUIPMENT

- A. Special Clothing (PPE): Work clothes shall consist of personal protective equipment (PPE) as required by 29 CFR 1910.132-138; including, but not limited to, the following:
1. Disposable coveralls.
 2. Gloves (Disposable rubber gloves may be worn under these).
 3. Disposable foot covers (polyethylene).
 4. Chemical safety goggles.
 5. Half mask cartridge respirator.
- B. Special Clothing for Owner's Personnel Required to Enter Control Areas: Provide PPE same as specified for workers.
- C. PCB Spill Kit: Include the following items, in at least the quantity indicated:
1. Disposable Gloves (Polyethylene): 6 Pairs.
 2. Gloves With A High Degree Of Impermeability To PCB: 6 Pairs
 3. Disposable Coveralls With Permeation Resistance To PCB: 4 Each.
 4. Chemical Safety Goggles: 2 Each.
 5. Disposable Foot Covers (Polyethylene): 6 Pairs.
 6. PCB Caution Sign: "PCB Spill--Authorized Personnel Only": 2 Each.

7. Banner Guard Or Equivalent Banner Material: 100 feet (30 m).
 8. Absorbent Material.
 9. Blue Polyethylene Waste Bags: 5 Bags.
 10. Cloth Backed Tape: 5 Each.
 11. Area Access Logs, Blank: 1 Roll.
 12. Brattice Cloth 6 by 6 feet (2 by 2 m): 10 Each.
 13. Rags: 1 Piece.
 14. Ball Point Pens: 20 Each.
 15. Herculite, 4 by 4 feet (1.5 by 1.5 m): 2 Each.
 16. Herculite, 8 by 8 feet (3 by 3 m): 1 Each.
 17. Blank Metal Signs And Grease Pencils.
 18. Waste Containers: 55 gallon (208 Liters): 2 Each.
 19. Drum (May Be Used As Container For Kit): 1 Each.
- D. PCB Caution Labels: Comply with 40 CFR 761, Subpart C.
1. Affix labels to PCB waste containers and PCB-contaminated items not stored in containers.
 2. Provide label with sufficient print size to be clearly legible, with bold print on contrasting background, displaying the following: "CAUTION: Contains PCBs (Polychlorinated Biphenyls)."
- E. Caution Signs: Comply with 29 CFR 1910.145.
1. Provide signs at approaches to Control Areas.
 2. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the control area.
- F. Storage Containers for PCBs: Comply with 49 CFR 178.
1. Liquid PCBs: Department of Transportation (DOT) Specification 17E containers.
 2. Non-Liquid PCB Mixtures, Articles, and Equipment: DOT Specification 5, 5B, or 17C containers with removable heads.
- G. Storage Containers for Mercury-Containing Lamps: Appropriate DOT containers (original transport boxes or equivalent).

PART 3 EXECUTION

3.01 PREPARATION

- A. Control Area: Isolate Control Area by physical boundaries to prevent unauthorized entry of personnel; do not permit food, drink, or smoking materials in areas where toxic substances are handled or stored.
- B. Construct a Decontamination Room, Shower Facilities, and Clean Room arranged so that workers exiting the Control Area remove contaminated PPE in the decontamination room, proceed to showers, and exit through the clean room.
1. Provide rooms with doors and attach to the exitways of Control Areas.
 2. Make rooms of sufficient size to accommodate Contractor's operation within.
 3. Existing facilities with water closets, urinals, wash basins and showers may be used if available to Contractor.
 4. Provide toilet and shower facilities; locate shower facilities between the clean room and decontamination room.
 5. Provide separate clothing lockers or containers in each room to prevent contamination of street and work clothes.
 6. Hot water, towels, soap, and hygienic conditions are the responsibility of Contractor.

3.02 WORK PROCEDURE - PCBS

- A. Permissible Exposure Limits (PEL): PEL for PCBs is 3.1 E-08 pounds per cubic foot (0.5 mg/cu m) on an 8-hour time weighted average basis.
- B. Work Operations: Ensure that work operations and processes involving PCB or PCB-contaminated materials are conducted in accordance with 40 CFR 761 and the applicable requirements of this section, including but not limited to:
 - 1. Obtaining advance approval of PCB storage sites.
 - 2. Notifying Owner prior to commencing the operation.
 - 3. Reporting leaks and spills to Owner.
 - 4. Cleaning up spills.
 - 5. Maintaining access log of employees working in Control Area and providing copy to Owner upon completion of the operation.
 - 6. Inspecting PCB and PCB-contaminated items and waste containers for leaks and forwarding copies of inspection reports to Owner.
 - 7. Maintaining the specified spill kit.
 - 8. Maintaining inspection, inventory and spill records.
- C. Perform PCB removal as described in PCB Removal Work Plan; handle PCBs so that no skin contact occurs.
- D. Personnel Protection: Require workers to wear and use PPE, as recommended by the Industrial Hygienist, upon entering PCB control area. If PPE is not required by the CIH, so state in PCB Removal Work Plan.
- E. Footwear: Keep work footwear inside work area until completion of removal operations.
- F. Hazards:
 - 1. Do not expose PCBs to open flames or other high temperature sources since toxic decomposition by-products may be produced.
 - 2. Do not heat or handle PCBs to temperatures of 135 degrees F (55 degrees C) or higher without Owner's concurrence.
- G. Package, mark, transport, and dispose of PCBs as required by regulations.
- H. Control Area: Allow only personnel certified as having received specified training into the control area.
- I. No Smoking: Smoking is not permitted within 50 feet (15 m) of control area; provide "No Smoking" signs as directed by Owner.
- J. Confined Spaces: Wherever feasible, do not carry out PCB handling operations in confined spaces having limited means of egress and inadequate cross ventilation.
- K. Exhaust Ventilation: If used, discharge exhaust ventilation for PCB operations to outside and away from personnel.
- L. Solvent Cleaning: Clean contaminated tools, containers, etc., after use by rinsing three times with appropriate solvent or by wiping down three times with solvent wetted rag; suggested solvents are Stoddard solvent and hexane.
- M. Drip Pans: Place drip pans under portable PCB transformers and rectifiers in use or stored for use; provide pans with containment volume of at least one and one-half times internal volume of PCBs that would drain into pan.

- N. Evacuation Procedures: Establish written procedures for evacuation of injured workers; do not delay aid for a seriously injured worker for reasons of decontamination.

3.03 PCB-CONTAINING EQUIPMENT EXCEPT BALLASTS

- A. Draining of Liquid PCB: Drain equipment items of free flowing liquid prior to transportation.
1. Place the drained liquids in specified containers, filled with not more than 50 gallons (190 liters) of oil.
 2. Do not mix different concentrations in the same container.
 3. Containers must have a 2 inch (50 mm) ullage space from the top of the container.
 4. After draining add absorbent material to absorb oil residue remaining.
- B. If equipment cannot be drained, place it in storage container of the type specified.
- C. Markings: Apply specified PCB Caution Labels to containers and drained PCB-contaminated electrical equipment.
1. Apply date drained to transformer using stencil or grease pencil.
 2. Containers: Stencil on the following:
 - a. PCB content in parts per million (ppm).
 - b. Date container filled.
 - c. Serial number of transformer liquid came from.
 - d. National Stock Number:
 - 1) "9999-00-OIL" for less than 50 ppm.
 - 2) "9999-00-CONPCB" for 50 to 499 ppm.
 - 3) "9999-00-PCBOIL" for greater than 500 ppm.
- D. Laboratory Analysis: All transformers shall have a laboratory analysis for turn-in. DRMO-Hawaii prefers a gas chromatograph test.
1. The only two exceptions to this rule are:
 - a. The transformer is hermetically sealed using solder or fusion, with no access ports or openings.
 - b. The name plate states that the transformer contains Pyranol, Interteen, Aroclor, or other known PCB-containing substances.
 2. Attach copy of lab analysis to both the DD 1348-1 and transformer itself.

3.04 BALLASTS

- A. As ballasts are removed from lighting fixtures, inspect label on ballast.
1. Ballasts Without "No PCB" Label: Assume to contain PCBs; containerize and dispose of as specified.
 2. Ballasts With "No PCB" Label: If there are less than 1600 total to be removed from project, dispose of them as normal demolition debris.
- B. More Than 1600 "No PCB" Labeled Ballasts: Determine whether the "No PCB" labeled ballasts contain diethylhexyl phthalate (DEHP) either by testing or by checking with ballast manufacturer indicated on the label.
1. Submit testing results and/or written confirmation from manufacturer to Owner.
 2. If the ballasts do not contain DEHP, dispose of them as normal demolition debris.
 3. If they do contain DEHP, dispose of them as as specified for PCBs.
 4. As basis of contract assume ballasts with "No PCB" labels do not contain DEHP.
 5. If 1600 or more DEHP ballasts are disposed of in a 24 hour period, notify the National Response Team at 800-424-8802.

3.05 MERCURY-CONTAINING LIGHTING LAMPS

- A. Lighting Lamps: Remove lighting tubes/lamps from lighting fixtures and carefully place, unbroken, into containers.
 - 1. In the event a lighting tube/lamp breaks, sweep up pieces and contents and place waste in double plastic taped bags and dispose of as Universal Waste as specified in 40 CFR 273.
- B. Deliver unbroken, boxed, lamps to Owner at location directed.

3.06 PCB SPILL CLEANUP REQUIREMENTS

- A. Immediately report to Owner all PCB spills on the ground or in the water, PCB spills in drip pans, and PCB leaks.
- B. Control Area: Rope off area around edges of PCB leaks and spills and post "PCB Spill Authorized Personnel Only" caution sign. Immediately transfer leaking items to drip pan or other container.
- C. Cleanup: Comply with 40 CFR 761, Subpart G.
 - 1. Initiate cleanup of spills as soon as possible, but no later than 48 hours of its discovery.
 - 2. Require personnel to wear specified PPE, unless determined not required by CIH.
 - 3. If misting, elevated temperatures, or open flames are present, or if spill is situated in a confined space, notify Owner.
 - 4. Mop up liquid with rags or other conventional absorbent.
 - 5. Treat spent absorbent as solid PCB waste.
- D. Records and Certification: Document cleanup with records of decontamination in accordance with 40 CFR 761, Section 125, Requirements for PCB Spill Cleanup; provide certification of decontamination.
- E. Sampling: Perform post cleanup sampling as required by 40 CFR 761, Section 130, Sampling Requirements.
- F. Do not remove boundaries of PCB control area until site is determined satisfactorily clean by Owner.

3.07 TEMPORARY STORAGE PRIOR TO DISPOSAL

- A. Storage Site: Obtain Owner's approval in advance of areas, spaces, rooms, and buildings used to store toxic substances prior to disposal off-site; storage sites must comply with the following criteria without exception:
 - 1. Adequate roof and walls to prevent rainwater from reaching stored toxic substances.
 - 2. Adequate floor that has continuous curbing with minimum 6 inch (50 mm) high curb, with containment volume equal to at least two times internal volume of largest toxic substance article or container stored therein or 25 percent of total internal volume of all toxic substance containing equipment or containers stored therein, whichever is greater.
 - 3. No drain valves, floor drains, expansion joints, sewer lines, or other openings that would permit liquids to flow from curbed area.
 - 4. Floors and curbing constructed of continuous smooth and impervious materials, such as Portland cement, concrete, or steel, to prevent or minimize penetrations of toxic substances.
 - 5. Not located at a site that is below the 100-year flood water elevation.
 - 6. Posted with specified Caution Sign.
- B. Store PCBs, PCB articles, and PCB-contaminated items in specified containers.

1. Label waste containers with the following:
 - a. "Solid (or Liquid) Waste Polychlorinated Biphenyls."
 - b. Specified PCB Caution Label.
 - c. Date item was placed in storage and name of generator.
 2. Label PCB articles and PCB-contaminated items with the following:
 - a. Specified PCB Caution Label.
 - b. Date item was placed in storage and name of generator.
- C. Label mercury-containing lamp waste in accordance with 40 CFR 273. Affix labels to all lighting waste containers.

3.08 CLEANING

- A. Clean up and containerize wastes daily.
- B. Maintain surfaces of Control Areas free of accumulations of toxic substances. Restrict spread of dust and debris; keep waste from being distributed over work area.
- C. Do not remove Control Area boundaries or warning signs prior to Owner's approval.
- D. Reclean areas showing residual toxic substances.

3.09 DISPOSAL BY CONTRACTOR

- A. Comply with disposal requirements and procedures specified in 40 CFR 761 and _____; deliver toxic substance waste to a disposal facility having required permits.
 1. Do not accept toxic substance waste unless it is accompanied by a manifest signed by Owner.
 2. Before transporting toxic substance waste, sign and date manifest acknowledging acceptance of the waste from Owner.
 3. Return a signed copy to Owner before leaving project site.
 4. Ensure that manifest accompanies waste at all times.
 5. Submit transporter certification of notification to EPA of their toxic substance waste activities.
- B. Payment will not be made until Certificate of Disposal has been furnished to Owner.
- C. Certificate of Disposal: Submit to Owner within 30 days of date that disposal of waste identified on manifest was completed; include on the certificate:
 1. The identity of disposal facility, by name, address, and EPA identification number.
 2. The identity of waste affected by Certificate of Disposal including reference to manifest number for the shipment.
 3. Statement certifying the fact of disposal of the identified waste, including date(s) of disposal, and identifying disposal process used.
 4. Certification as defined in 40 CFR 761, Section 3.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Furnish labor, materials, services, and equipment necessary for complete management, handling and disposal of the following PCB containing electrical equipment demolition related debris:
 - 1. PCB-containing transformers,
 - 2. PCB capacitors, rectifiers, insulators, switches, and other related equipment,
 - 3. PCB containing lighting ballasts.
- B. Perform PCB removal, handling and disposal work in accordance with all applicable federal, state and local regulations and the requirements specified herein. When applicable regulations, standards, protocols or requirements differ, the most stringent shall be followed.
- C. Contractor is to provide an itemized bid cost for all and each transformer removals per unit item, in their bid.
 - 1. The Owner shall receive a credit, If assumed/presumed PCB Dielectric and contained equipments are either found to be:
 - a. not existing, or
 - b. existing and tested/analyzed by 3rd party/owner as Non-Haz PCB (< 50ppm), or
 - c. If assumed PCB lighting ballasts read "NONPCB" then said items shall be disposed as E-Waste.

1.02 DEFINITIONS

- A. EPA refers to the United States Environmental Protection Agency.
- B. EPA identification number means the 12-digit number assigned to a facility by EPA upon notification of PCB waste activity under 40 CFR 761.205.
- C. Generator of PCB waste means any person whose act or process produces PCBs that are regulated for disposal or whose act first causes PCBs or PCB items to become subject to the disposal requirements or who has physical control over the PCBs when a decision is made that the use of the PCBs has been terminated and therefore is subject to the disposal requirements.
- D. Leak: Leak or leaking means any instance of a toxic substance present on any portion of the external surface of an item of equipment or container.
- E. Non-PCB Transformer means any transformer that contains dielectric fluid with a PCB concentration less than 50 ppm PCBs; except that any transformer that has been converted from a PCB Transformer or PCB-Contaminated Transformer cannot be classified as a non-PCB Transformer until reclassification has occurred in accordance with the requirements of 40 CFR 761.30(a)(2)(v).
- F. PCB Article means any manufactured article, other than a PCB Container, that contains PCBs and whose surface(s) has been in direct contact with PCBs. "PCB Article" includes capacitors, transformers, electric motors, pumps, pipes and any other manufactured item.
- G. PCB Capacitor means any capacitor that contains greater than or equal to 500 ppm PCB. Concentration assumptions applicable to capacitors is defined in 40 CFR 761.2.
- H. PCB Container means any package, can, bottle, bag, barrel, drum, tank, or other device used to contain PCB Articles or PCB Equipment, and whose surface(s) has not been in direct contact with PCBs.

- I. PCB Transformer means any transformer that contains greater than or equal to 500 ppm PCBs. PCB contaminated transformer means any transformer that contains PCBs at a concentration greater than or equal to 50 ppm but less than 500 ppm.
- J. PCB and PCBs means any chemical substance that is limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances which contains such substance. Refer to 40 CFR 761.1(b) for applicable concentrations of PCBs. PCB and PCBs as contained in PCB items are defined in 40 CFR 761.3.
- K. PCB-Contaminated Electrical Equipment means any electrical equipment including, but not limited to, transformers (including those used in railway locomotives and self-propelled cars), capacitors, circuit breakers, reclosers, voltage regulators, switches (including sectionalizers and motor starters), electromagnets, and cable, that contains PCBs at concentrations of greater than or equal to 50 ppm and less than 500 ppm in the contaminating fluid. In the absence of liquids, electrical equipment is PCB-Contaminated if it has PCBs at greater than 10 µg/100 cm² and less than 100 µg/100 cm² as measured by a standard wipe test (as defined in 40 CFR 761.123) of a non-porous surface.
- L. PCB-Contaminated means a non-liquid material containing PCBs at concentrations greater than or equal to 50 ppm but less than 500 ppm; a liquid material containing PCBs at concentrations greater than or equal to 50 ppm but less than 500 ppm or where insufficient liquid material is available for analysis, a non-porous surface having a surface concentration greater than 10 µg/100 cm² but less than 100 µg/100 cm², measured by a standard wipe test as defined in 40 CFR 761.
- M. PCBs: PCBs as used in this specification shall mean the same as PCBs, PCB Article, PCB Article Container, PCB Container, PCB Equipment, PCB Item, PCB Transformer, PCB-Contaminated Electrical Equipment, as defined in 40 CFR 761, Section 3, Definitions.
- N. Spill or Release means both intentional and unintentional spills, leaks, and other uncontrolled discharges where the release results in any quantity of PCBs running off or about to run off the external surface of the equipment or other PCB source, as well as the contamination resulting from those releases. This policy applies to spills of greater than or equal to 50 ppm PCBs. The concentration of PCBs spilled is determined by the PCB concentration in the material spilled as opposed to the concentration of PCBs in the material onto which the PCBs were spilled. Where a spill of untested mineral oil occurs, the oil is presumed to contain greater than or equal to 50 ppm, but less than 500 ppm PCBs and is subject to the relevant requirements of this policy.
- O. TSCA means the Toxic Substances Control Act (15 U.S.C. 2601 et seq.).

1.03 REFERENCE STANDARDS

- A. 29 CFR 1910.132-138 - Personal Protective Equipment; Current Edition.
- B. 29 CFR 1910.145 - Accident Prevention Signs and Tags; Current Edition.
- C. 40 CFR 761 - Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution In Commerce, And Use Prohibitions; current edition.
- D. 49 CFR 178 - Specifications for Packaging; current edition.
- E. 49 CFR Part 172 – Hazardous Materials.
- F. 49 CFR Part 172 – Transportation of Hazardous Materials.
- G. 6 NYCRR Part 370 - 374 – NYS Hazardous Waste Regulations.

1.04 SUBMITTALS

- A. See Section 013300 - SUBMITTALS, for submittal procedures, except that all submittals are to be made to Owner, not to Architect/Engineer.
- B. Waste Management Plan.
- C. Disposal Facility Qualifications and Permits.
- D. Proof of arrangements with, and acceptance by, waste disposal facilities.
- E. Contingency Plan including owner arrangements with emergency spill response contractor.
- F. Worker Training Certification: Submit certificates for proof of HAZWOPER training, with up-to-date annual refreshers, for all workers who will be handling PCBs or PCB contaminated materials.
- G. Notification of start of removal work.
- H. Spill notification and documentation: Any and all spillage of PCB liquid materials require owner notification and/or notification to NYS Spill Hotline 1-800-457-7362.
- I. Transporter and disposal documentation – all shipment/transportation for disposal of PCB electrical equipment shall be accompanied by a hazardous waste manifest and a Land Disposal Restriction (LDR) form completed by a qualified environmental consultant.

1.05 QUALITY ASSURANCE

- A. Notification: Notify the Owner at least twenty (20) days prior to the start of toxic substance removal work.
- B. Reference Documents: At all times maintain one copy each of Contractor site specific Health & Safety Plan, Emergency Environmental Spill Contractor contact numbers (Contingency Plan), and Contractor work practices for removal, storage and disposal of toxic substances, at field office and one copy each in view at project site.
- C. Provide copies of Removal Contractor Qualifications, licenses, permits, insurances or other credentials, as appropriate.
- D. Professional Engineer licensed in the State of New York: Obtain services of a licensed P.E. for oversight and sign off on required plans and oversight of qualified individual for signing and management of shipping documentation.
- E. Training: Instruct employees on dangers of exposure to toxic substances present and on respirator use, decontamination, and applicable regulations. Such training shall include 40-hour HAZWOPER Training. In addition, workers may be required to have hazard awareness training, OSHA 30-hour contractor safety training and proof of training for signing manifest documentation.
- F. Surveillance Personnel: Surveillance personnel may enter Control Areas for brief periods of time provided they wear standard Level D worker PPE including gloves, hardhat, eye protection, and appropriate foot gear. Additional protective equipment may be required if respiratory hazard is involved or if skin contact with PCB is involved as determined by the Environmental Consultant.

- G. PCB Equipment and Substances: A Waste Management Work Plan shall be developed which shall include a detailed job-specific plan of the work procedures to be used in the removal and containment of PCB substance-containing materials, not to be combined with other hazardous abatement plans. The Plan shall:
1. Identify Qualified personnel to sample, handle, manage and oversee all work in connection with PCB equipment management.
 2. Select removal procedures to minimize contamination of work areas with toxic substances or contaminated debris or waste.
 3. Include a sketch showing the location, size, and details, including PCB measured concentrations, of each transformer or PCB equipment including nameplate information for each piece of equipment.
 4. As necessary, provide a Pick Plan for lifting, staging, and loading for each transformer or PCB equipment.
 5. Include general safety requirements for eating, drinking, smoking and restroom procedures, interface of trades, sequencing of related work, PPE to be employed, protective equipment, and a detailed description of the method of containment of the operation to ensure that toxic substances are not spread or carried outside of the control area unless properly containerized or controlled.
 6. Include Contingency Plan provisions to be executed in the case of a spill or accident identifying qualified environmental response contractors, spill response equipment, notification procedures, and appropriate response actions.
 7. Identification of all disposal facilities to be employed and transportation methods to be employed.
 8. Obtain approval of plan by the owner prior to the start of removal work.
- H. PCB Transport and Disposal (per Waste Management Work Plan): Within fifteen (15) calendar days after award of contract submit a PCB Transport and Disposal Plan that complies with applicable requirements of federal, state, and local waste regulations.
1. Do not proceed without Owner's approval of plan.
 2. Do not proceed without Architect/Engineer's approval of plan.
 3. Include in Plan:
 - a. Identification of all wastes associated with the work.
 - b. Generating facility EPA Waste ID number.
 - c. Estimated quantities of wastes to be generated and disposed of.
 - d. Names and qualifications of each contractor that will be transporting, storing, treating, and disposing of the wastes.
 - e. Disposal facility location and 24-hour point of contact; furnish two copies of facility's EPA waste permit applications and EPA Identification numbers.
 - f. Names and qualifications (experience and training) of personnel who will be working on-site with toxic substances.
 - g. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.
 - h. Spill prevention, containment, and cleanup contingency measures to be implemented.
 - i. Proof of waste acceptance by the disposal facility for each type of waste.

PART 2 PRODUCTS

2.01 EQUIPMENT

- A. Special Clothing (PPE): Work clothes shall consist of personal protective equipment (PPE) as required by 29 CFR 1910.132-138; including, but not limited to, the following:
1. Disposable coveralls.
 2. Gloves (Disposable rubber/latex gloves may be worn under these).
 3. Disposable foot covers (polyethylene) as appropriate.

SECTION 028400.11 - MANAGEMENT OF POLYCHLORINATED BIPHENYL (PCB) EQUIPMENT **H2M**

4. Eye protection such as chemical safety goggles.
 5. Half mask cartridge respirator (as required)
- B. Special Clothing for Owner's Personnel Required to Enter Control Areas: Provide PPE same as specified for workers.
- C. PCB Spill Kit: Include the following items, in at least the quantity indicated:
1. Disposable Gloves (Polyethylene): 6 Pairs.
 2. Gloves With A High Degree Of Impermeability To PCB: 6 Pairs
 3. Disposable Coveralls With Permeation Resistance To PCB: 4 Each.
 4. Chemical Safety Goggles: 2 Each
 5. Disposable Foot Covers (Polyethylene): 6 Pairs.
 6. PCB Caution Sign: "PCB Spill--Authorized Personnel Only": 2 Each.
 7. Banner Guard Or Equivalent Banner Material: 100 feet.
 8. Absorbent Material (aka speedy dry): Minimum two bags.
 9. Waste Bags: 1 box, heavy duty 55 gallon capacity size.
 10. Duct Tape: 5 rolls each.
 11. Drum wrenches.
 12. Package of absorbent pads (100 count).
 13. Broom and shovel.
 14. Permanent markers (e.g., Sharpie pens).
 15. PCB and Hazardous Waste Drum Labels. as required
 16. Waste Containers: 55 gallon open top drums: 2 Each.
- D. Labels:
1. Yellow PCB Labels that Comply with 40 CFR 761, Subpart C.
 2. Hazardous Waste Labels (Yellow with red lettering).
 3. Non-Hazardous Waste Labels (white with green lettering).
 4. Labeling
 - a. Affix labels to PCB waste containers and PCB-contaminated items.
 - b. Affix drum labels to upper 1/3rd of 55-gallon drums.
 - c. All labels are typically 4-inch square, with sufficient print size to be clearly legible, with bold print on contrasting background.
 - d. Print all required information clearly with a "Sharpie" or other permanent marking pen.
- E. Caution Signs: (Comply with 29 CFR 1910.145).
1. Provide signs at approaches to Control Areas.
 2. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the control area.
- F. Storage Containers for PCBs: (Comply with 40 CFR 761).
1. Liquid PCBs: Department of Transportation (DOT) Specification 17E containers.
 2. Non-Liquid PCB Mixtures, Articles, and Equipment: DOT Specification 17C containers with removable heads.

PART 3 EXECUTION

3.01 PREPARATION

- A. Control Area: Isolate Control Area as necessary by physical boundaries to prevent unauthorized entry of personnel; do not permit food, drink, or smoking materials in areas where toxic substances are handled or stored and identify all PCB transformer and equipment locations and determine who is equipment owner.

SECTION 028400.11 - MANAGEMENT OF POLYCHLORINATED BIPHENYL (PCB) EQUIPMENT **H2M**

- B. Document equipment nameplate information, photograph units and note if any PCB or Non-PCB stickers have been affixed to equipment.
- C. Confirm that all transformers or electrical equipment have been de-energized, isolated, and grounded.
- D. Inspect all areas around unit for leaks, former spill staining, general unit condition, accessibility, surrounding dangers or impediments.
- E. Unless previously documented, obtain a sample of the dielectric oil in each transformer or piece of equipment for laboratory analysis by a NYS ELAP certified laboratory. If sample cannot be obtained then the transformer or piece of equipment must be considered PCB. Ensure that any and all sample access ports, valves or other locations are resealed and secure.
- F. Obtain a wipe sample of the transformer/equipment pad, enclosure, or surrounding base in accordance with 40 CFR 761.123.

3.02 WORK PROCEDURE - PCBS

- A. OSHA Permissible Exposure Limits (PEL) for PCBs is dependent on the percent PCB Aroclor used in the dielectric oil. For Aroclor 1242, PEL is TWA 1.0 mg/m³. For Aroclor 1254, PEL is TWA 0.5 mg/m³. Avoid direct skin contact.
- B. Work Operations - general: Ensure that work operations and processes involving PCB or PCB-contaminated materials are conducted in accordance with 40 CFR 761 and the applicable NYS hazardous waste requirements of this section, including but not limited to:
 - 1. Obtain advance approval from owner of PCB Equipment of all Plans and work to be conducted.
 - 2. Determine if a Process Safety Analysis and/or Job Safety Analysis needs to be performed.
 - 3. Obtain advance approval of PCB storage and staging locations, planned access and equipment and vehicle parking.
 - 4. Notify Owner prior to commencing the operation.
 - 5. Report leaks and spills to Owner and NYS Spill Hotline.
 - 6. Implement Contingency Plan for cleaning up spills.
 - 7. Maintain access log of employees working in Control Area and providing copy to Owner upon completion of the operation.
 - 8. Inspect PCB and PCB-contaminated items and waste containers for leaks, suitable containment, proper labeling and signage, and forward copies of inspection reports to Owner.
 - 9. Maintain the specified spill kit at an appropriate location.
 - 10. Maintain inspection, inventory and spill records.
 - 11. Maintain onsite the Site-Specific Health & Safety Plan
 - 12. Maintain copies of all shipping papers, manifests, BOLs, etc.
- C. Ensure all equipment identified for removal has been thoroughly de-energized, grounded, and isolated.
- D. Laboratory Analysis: All transformer or equipment oils shall be sampled and analyzed by a NYS certified (ELAP) laboratory. If the transformer is hermetically sealed using solder or fusion, with no access ports or openings then it must be assumed to be PCB unless other information or nameplate indicates otherwise. If the name plate states that the transformer contains Pyranol, Interteen, Aroclor, it is assumed to be PCB-containing equipment.
- E. As appropriate for PCB concentrations in equipment to be removed, access and pump out all possible dielectric oil, place into appropriate containers for ultimate transport and disposal at an

approved facility by a licensed PCB hauling contractor. Have all contingency plans and support in-place.

- F. Perform PCB equipment removal as described in Waste Management Work Plan (including implementation of Pick Plan); handle PCBs so that no spills or skin contact occurs.
- G. Personnel Protection: Require workers to wear and use PPE, as specified in the site-specific Health & Safety Plan and Job Safety Analysis. .
- H. Hazards:
 - 1. Do not expose PCBs to open flames or other high temperature sources since toxic decomposition by-products may be produced.
 - 2. Do not heat or handle PCBs to temperatures of 135 degrees F or higher without Owner's concurrence.
 - 3. If any cutting or welding is involved, obtain Hot Work permit
- I. Package, mark, transport, and dispose of PCBs as required by regulations. Completion of a Hazardous Waste Manifest by a qualified person is required for all PCB items shipped off-site.
- J. Control Area: Allow only personnel certified as having received specified training into the control area.
- K. No Smoking: Smoking is not permitted within 50 feet of control area; provide "No Smoking" signs as directed by Owner.
- L. Confined Spaces: Wherever feasible, do not carry out PCB handling operations in confined spaces having limited means of egress and inadequate cross ventilation. If used, discharge exhaust ventilation for PCB operations to outside and away from personnel.
- M. Drip Pans: Place drip pans under PCB transformers and equipment when staged or stored for removal; provide pans with containment volume of at least one and one-half times internal volume of PCBs that would drain into pan.
- N. Evacuation Procedures: Establish written procedures for evacuation of injured workers; do not delay aid for a seriously injured worker for reasons of decontamination.

3.03 PCB-CONTAINING EQUIPMENT EXCEPT BALLASTS

- A. Removal of Liquid PCB:
 - 1. Pump equipment items of free-flowing liquid prior to transportation.
 - 2. Place the drained liquids in specified containers or directly into transport vehicles.
 - 3. All drained equipment must be transported inside suitable containment trays.
 - 4. Do not mix different non-hazardous PCB liquids with hazardous concentrations in the same container.
 - 5. Containers must have a minimum of 2 inch ullage space from the top of the container.
 - 6. After draining use absorbent rags or material to absorb any dripped or spilled residue remaining at the removal point.
- B. If equipment cannot be drained or pumped empty, place it in storage or overpack container of the type specified. Assumed such equipment is PCB contaminated.
- C. Labeling:
 - 1. Apply specified PCB Labels to containers and drained PCB-contaminated electrical equipment.
 - 2. Apply Hazardous Waste Labels to drums of contaminated materials. Apply date drained to transformer using stencil or grease pencil.

3.04 BALLASTS

- A. As ballasts are removed from lighting fixtures, inspect label on ballast.
 - 1. Ballasts Without " PCB" Label: Assume to contain PCBs; containerize in drums and dispose of as PCB article.
 - 2. Ballasts that do not have a "No PCB" Label" or there is no indication on nameplate, the following applies:
 - a. If manufactured through 1979 and not labeled "No PCBs" assume it contains PCBs.
 - b. If manufactured through 1979 and labeled "No PCBs" assume it is non-PCB.
 - c. If manufactured after 1979 and through 1989, it should be labeled "No PCBs" and may be assumed to be non-PCB.
 - d. If manufactured after 1989 it should be non-PCB but may not be labeled "No PCBs".
 - e. If manufactured after 1979 through 1991 it may contain DEHP but can be disposed of as a non-hazardous waste.

3.05 PCB SPILL CLEANUP REQUIREMENTS

- A. Immediately report to Owner all PCB spills on the ground or into the water. PCB spills contained in drip pans, and PCB leaks into drip pans should immediately be addressed. The NYS DEC Spill Hotline must also be notified if a spill occurs.
- B. Implement Contingency Plan and notify emergency spill response contractor if spill or leak occurs.
- C. Control Area: Rope off area around edges of PCB leaks and spills and post "PCB Spill Authorized Personnel Only" caution sign. Immediately transfer leaking items to drip pan or other container if possible. Otherwise construct a dike or berms of speedy dry or equivalent around leak area; protect any floor drains or other means of conveyance.
- D. Cleanup: Comply with 440 CFR 761, Subpart G and applicable hazardous regulations.
 - 1. Initiate cleanup of spills as soon as possible, but no later than 24 hours of its discovery.
 - 2. Cleanup should be performed only by qualified and trained personnel.
 - 3. Require response personnel to wear specified PPE, unless determined otherwise by a CIH or the Safety Manager.
 - 4. If misting, elevated temperatures, or open flames are present, or if spill is situated in a confined space, evacuate and notify Owner.
 - 5. Clean up liquid with absorbent rags, pads or other conventional absorbent medium.
 - 6. Treat spent absorbent as solid PCB remediation waste.
- E. Records and Certification: Document cleanup with records of decontamination in accordance with 40 CFR 761, Section 125, Requirements for PCB Spill Cleanup; provide certification of decontamination. Collect all associated paperwork associated with removal and disposal.
- F. Sampling: Perform post cleanup sampling as required by 40 CFR 761, Section 130, Sampling Requirements.
- G. Do not remove boundaries of PCB control area until site is determined satisfactorily clean by Owner.

3.06 TEMPORARY STORAGE PRIOR TO DISPOSAL

- A. Storage Site: Obtain Owner's approval in advance of areas, spaces, rooms, and buildings used to store or stage toxic substances prior to transport for disposal off-site; storage sites must comply with the following criteria without exception:
 - 1. Adequate roof and walls to prevent rainwater from reaching stored toxic substances.

2. Adequate floor that has continuous curbing with minimum 6 inch high curb, with containment volume equal to at least two times internal volume of largest toxic substance article or container stored therein or 25 percent of total internal volume of all toxic substance containing equipment or containers stored therein, whichever is greater.
 3. No drain valves, floor drains, expansion joints, sewer lines, or other openings that would permit liquids to flow from curbed area.
 4. Floors and curbing constructed of continuous smooth and impervious materials, such as Portland cement, concrete, or steel, to prevent or minimize penetrations of toxic substances.
 5. Not located at a site that is below the 100-year flood water elevation.
 6. Posted with specified Caution Sign.
- B. Store PCBs, PCB articles, and PCB-contaminated items in specified containers.
1. Label waste containers with the following as appropriate:
 - a. Specified Hazardous Waste Label
 - b. Specified PCB Label.
 - c. Date item was placed in storage and name of generator.
 2. Label PCB articles and PCB-contaminated items with the following:
 - a. Specified PCB label.
 - b. Date item was placed in storage and name of generator.

3.07 CLEANING

- A. Implement clean up by a qualified environmental contractor and containerize wastes daily.
- B. Maintain surfaces of Control Areas free of accumulations of toxic substances. Restrict spread of dust and debris; keep waste from being distributed over work area.
- C. Do not remove Control Area boundaries or warning signs prior to Owner's approval.
- D. Reclean areas showing residual toxic substances.

3.08 DISPOSAL BY CONTRACTOR

- A. Comply with disposal requirements and procedures specified in 40 CFR 761 and NYS Hazardous Waste Regulations:
 1. Ensure delivery of all toxic substances and waste to a disposal facility having required permits and licenses.
 2. Ensure that all transportation of wastes is performed with trucks having appropriate transport permits, including Part 364 permit for NY.
 3. Do not accept toxic substance waste unless it is accompanied by a manifest signed by Owner or owner's authorized representative. Specialized training is required for completion of a hazardous waste manifest.
 4. Before transporting toxic substance waste, sign and date manifest acknowledging acceptance of the waste from Owner.
 5. Distribute copies of the manifest as required by regulation, i.e., 6NYCRR Part 371.
 6. Ensure that manifest accompanies waste at all times and that transport vehicles are properly placarded.
- B. Payment will not be made until Certificate of Disposal has been furnished to Owner.
- C. Certificate of Disposal: Submit to Owner within thirty (30) days of date that disposal of waste identified on manifest was completed; include on the certificate:
 1. The identity of disposal facility, by name, address, and EPA identification number.
 2. The identity of waste affected by Certificate of Disposal including reference to manifest number for the shipment.

SECTION 028400.11 - MANAGEMENT OF POLYCHLORINATED BIPHENYL (PCB) EQUIPMENT **H2M**

3. Statement certifying the fact of disposal of the identified waste, including date(s) of disposal, and identifying disposal process used.
4. Certification as defined in 40 CFR 761, Section 3.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This specification covers the identification and disposal of hazardous waste, and related hazardous materials. Products shall be as follows or as directed by the Owner and or their representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- B. Special Wastes:
 - 1. Asbestos-Containing Materials (ACM): ACM is regulated by EPA TSCA Rules, NY Code Rule 56 and OSHA standards, and is not Hazardous Waste.
 - 2. PCB Bulk Waste and non-liquid PCB materials (NLPCB): Window caulk and other caulk may contain NLPCB; if so, when disposed these materials are EPA-regulated PCB Bulk Waste under TSCA, and are NYS hazardous waste. PCB light ballasts are also to be disposed of as NYS Hazardous Waste. See Section 028400 for work involving PCB Containing Materials.
- C. Scope of Work: Please see H-100 Drawings For Tables and Summary

1.02 DEFINITIONS

- A. Hazardous waste shall be any materials to be disposed that possess at least one of four characteristics, ignitibility, corrosivity, reactivity or toxicity, as defined and regulated by the Resource Conservation and Recovery Act (RCRA) and applicable state and federal regulations, or a material specifically identified as hazardous waste by applicable Federal or State lists, in 40 CFR 261 or 6 NYCRR 371.
- B. A Conditionally Exempt Small Quantity Generator (CESQG) of hazardous waste shall be a waste handler who generates no more than 100 kilograms per month of listed and/or characteristic hazardous waste, generates no more than 1 kilogram of acute hazardous waste in any calendar month, and stores no more than 1000 kilograms of listed and/or characteristic hazardous waste or more than 1 kilogram of acutely hazardous waste.
- C. A Small Quantity Generator (SQG) of hazardous waste shall be a waste handler who generates no more than 1000 kilograms per month of listed and/or characteristic hazardous waste, generates no more than 1 kilogram of acute hazardous waste per month, and stores no more than 6000 kilograms of listed and/or characteristic hazardous waste or more than 1 kilogram of acutely hazardous waste.
- D. Large Quantity Generator (LQG) of hazardous waste shall be a waste handler who generates more than 1000 kilograms per month of listed and/or characteristic hazardous waste, generates more than 1 kilogram of acute hazardous waste per month, or stores more than 6000 kilograms of hazardous waste or 1 kilogram of acutely hazardous waste.
- E. The Owner's Consultant: The Owner shall provide a third-party consultant to provide pre-work assessments, project monitoring assessments for the construction procedures for the work area and surrounding areas and final clearance assessments. The Contractor shall be responsible for the worker protection requirements.

1.03 SUBMITTALS

- A. Before start of work: At the pre-construction meeting, the Contractor shall submit the following to the Owner's Representative for review:
 - 1. Copy of State or local license for hazardous waste hauler.

2. Certificate of at least one on-site supervisor which has satisfactorily completed the OSHA 40 hour Health and Safety course for handling hazardous waste and spills.*
 3. Certificates of workers, which have successfully completed the OSHA 40-Hour Health and Safety Course for Hazardous Waste and spills.*
 4. List of the employees scheduled to perform this work.
 5. Schedule of start and finish times and dates for this work.
 6. The name, address and EPA ID No. of the disposal facility where these waste materials are to be received. Include contact person, a copy of the facility permit and telephone number.
 7. The facility permit must identify the waste material(s) to be received, and must be accompanied by a statement that the facility has the capacity and authority to accept the waste. Land Disposal Restriction (LDR) forms must also be provided.
 8. Material Safety Data Sheet (MSDS) for all materials to be removed.
 9. If the Contractor introduces any chemical into the work environment, a MSDS for that chemical must be presented to the Owner's Representative prior to use.
 10. Transporter must have notified the EPA and/or other appropriate local government agency in advance of its intentions to transport hazardous materials and, if applicable, receive an identification number. The transporter shall submit a copy of the NYS DEC Part 364 Permit, for review.
 11. Health and Safety/Contingency Plan for material handling and emergency procedures.
 12. Certification for medical examinations.
 13. Respiratory protection program.
 14. Project Plan: Provide a description of the methods, procedures and materials to be used in performing the work and handling all hazardous wastes. Also provide a schedule identifying specific work areas and duration. The schedules will be utilized to schedule facility and third party consultant requirements.
 15. Waste Sampling Plan: Provide a sampling plan that describes all samples to be taken and the parameters to be analyzed, as well as the laboratory providing the services; or provide another basis for identification of the waste, such as an MSDS.
- B. Do not start work until submittals are returned with the Owner's Representative stamp indicating that the submittal is returned for unrestricted use.

1.04 REGULATORY REQUIREMENTS

- A. All activities related to the work shall be conducted in compliance with all applicable laws, regulations, and requirements which may include, but not be limited to, the United States Environmental Protection Agency (US EPA), United States Department of Transportation (US DOT), Resource Conservation and Recovery Act (RCRA), Toxic Substances Control Act (TSCA), Occupational Safety and Health Administration (OSHA), New York State Department of Environmental Conservation (NYS DEC), and Local AHJ.
- B. The Contractor is required to secure and maintain all required regulatory permits necessary to perform all aspects of the work.
- C. The Contractor shall containerize and store waste in accordance with all applicable regulations. All containers are to be appropriately marked/labeled.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Drums: Recovery or salvage drums acceptable for disposal of hazardous waste. Prior approval of drums is required. Drums or containers must meet the required OSHA, EPA (40 CFR Parts 260-264 and 300), and DOT Regulations (49 CFR Parts 171-178). Use of damaged containers shall not be allowed.

- B. Labels: As required by the EPA and OSHA for handling, transportation, and disposal of hazardous waste.
- C. Absorbent Material: Clay, soil or any commercially available absorbent used for the purpose of absorbing hazardous or potentially hazardous materials.

PART 3 EXECUTION

3.01 EXECUTION

- A. All waste shall be stored, handled, transported and disposed of in accordance with all federal, state and local guidelines and regulations. The Contractor is to obtain all permits, licenses, etc., which are necessary for the storing, transporting and disposing of hazardous waste. The Contractor shall develop all applicable manifests, Profile Sheets, Land Ban Forms and any other documentation and co-ordinate with the Owner regarding proper signatures. The Contractor may be required to notify the EPA of the hazardous waste activities, and obtain an EPA identification number specifically for the project, if one is not available.
- B. The Contractor shall identify and classify the hazardous waste generated through the performance of the work as per the governing regulations, and in accordance with the Waste Sampling Plan submittal from Section 1.1 above. The Contractor shall conduct the required sampling and chemical analysis for handling, storing, transporting and disposing of the hazardous waste.
- C. The Contractor is responsible for securing appropriate treatment or disposal for the waste streams at a permitted TSD, in compliance with all requirements, and for obtaining a copy of the waste manifest as executed by the TSD. If the manifest is not returned within the required time, the contractor shall notify the Owner and the NYS DEC, and initiate an investigation as required.
- D. Transporters shall maintain waste manifest and shipment record forms. All transporters are required to obtain and maintain NYS DEC Part 364 Waste Transporter permit and, if applicable, a NYC Fire Department permit for transporting flammables. The Part 364 Permit shall have the license plate number of the vehicle, the expiration date of the permit, the type of waste the hauler can take and the treatment, storage and disposal (TSD) facility to which the hauler can take the waste. The transporter must also have all applicable, current waste transportation permits for states where proposed disposal facility is located.
- E. The Contractor shall supply all required placard and labeling, and shall have an appropriately trained individual to prepare and sign the hazardous waste manifest, as the DOT shipper.
- F. The Contractor shall furnish all certified copies of manifests (interim storage and final disposal) within regulatory requirements. Within 30 days from the acceptance of the waste by the disposal facility, the Contractor shall provide the Owner with Certificate of Disposal documents, as a requirement for final payment.
- G. Unless directed otherwise, the Contractor shall file the annual report and fee report if applicable for the hazardous waste shipped, and provide closure notification to EPA and DEC immediately upon completion of the work.

*HAZWOPER Training is not required if the waste is PCB Bulk waste alone, but OSHA HAZCOM and TSCA training are still required

END OF SECTION

SECTION 028700 - REMOVAL AND DISPOSAL OF UNIVERSAL WASTE AND FLUORESCENT LAMPS
H2M

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. This specification covers the removal and disposal of Universal waste, including fluorescent lamps, high-intensity discharge (HID) lamps, mercury thermostats and switches, batteries and pesticides (not PCB lighting ballasts). Removed or replaced mercury thermostats shall be recycled as per current NYS DEC regulations, instead of disposal as Universal Waste. Demolition and removal of materials shall be as required to support the work.
- B. Scope: Please refer to Environmental & Hazardous Materials Assessment Report by H2M architects + engineers, at Building 386 dated January 5, 2023

1.02 SUBMITTALS

- A. Before Start of Work: Submit the following to the Owner's Representative for review. Do not start work until these submittals are returned with Owner's Representative's approval.
 - 1. Copy of State or local license for hazardous waste hauler;
 - 2. Certification of at least one on-site supervisor which has satisfactorily completed the OSHA 40 Hour Health and Safety Course for Handling Hazardous Materials;
 - 3. Certificates of workers which have successfully completed at least the OSHA 40-Hour Health and Safety Course for Hazardous Materials;
 - 4. Certificates of workers which have successfully completed the required employee training for universal waste or appropriate type of training to the type of wastes being managed;
 - 5. Schedule of start and finish times and dates for this work;
 - 6. Name and address of the universal waste handler or a destination facility where the waste materials is to be treated, deposited or recycled in accordance with all regulatory requirements (include contact person and telephone numbers), if the universal waste meets the definition of hazardous waste, the name and address of the hazardous waste treatment, storage and disposal (TSD) facility, the name and address of the mercury thermostat recycling collection site;
 - 7. Material Safety Data Sheets for all materials requiring removal;
 - 8. If Contractor introduces any chemical into the work environmental, a MSDS for that chemical is required before use;
 - 9. Contingency Plan for handling emergency spills or leaks;
 - 10. Provide a copy of the NYS DEC Part 364 Waste Transporter permit for Universal Waste Transporters that transport more than 500 pounds of universal waste in a single shipment since they must be a permitted waste transporter;
 - 11. Large Quantity Handlers of universal waste must provide documentation of notification to the EPA and/or the appropriate local government agency in advance of its intentions to transport the waste and receive from the facility or provide an EPA identification number prior to exceeding 5,000 kilograms of waste on-site;
 - 12. Provide a record of all universal waste shipments received and sent offsite from the project.

1.03 DEFINITIONS

- A. Large Quantity Handler (LQH) of Universal Waste shall be a waste handler who accumulates 5,000 kilograms or more of universal waste (batteries, pesticides, thermostats, or lamps, calculated collectively) at any time. This designation as a large quantity handler of universal waste is retained through the end of the calendar year in which 5,000 kilograms (11,000 pounds) or more total of universal waste is accumulated. The LQH shall notify the EPA, acquire or co-ordinate with a facility regarding an EPA identification number, and provide records for each shipment. The LQH shall ensure all employees are thoroughly familiar with proper waste handling and emergency procedures, relative to their responsibilities during normal facility operations and emergencies.

SECTION 028700 - REMOVAL AND DISPOSAL OF UNIVERSAL WASTE AND FLUORESCENT LAMPS
H2M

- B. Small Quantity Handler of Universal Waste (SQH) shall be a waste handler who does not accumulate 5,000 kilograms (11,000 pounds) or more of total universal waste (batteries, pesticides, thermostats, or lamps, calculated collectively) at any time.
- C. Destination Facility shall be a facility that legitimately and can legally accept universal waste from offsite so that the universal waste can be treated, disposed, or recycled in accordance with the regulatory requirements.
- D. Universal Waste Transporter shall be anyone who transports universal waste. In New York, universal waste transporters that transport greater than 500 pounds of universal waste in a single shipment must be a permitted hazardous waste transporter pursuant to Federal and State regulations. Proper notification with the receiving handler agreeing to receive the shipment is required by the Universal Waste Transporter.
- E. Universal Waste consists of the following discarded materials, as identified in 6 NYCRR 374-3: Fluorescent light bulbs high-intensity discharge (HID) lamps, mercury thermostats and switches, batteries, and pesticides. Removed or replaced mercury thermostats must be delivered to a designated mercury thermostat collection site as per current NYC DEC regulations. Disposal of mercury thermostats in a solid waste management facility is prohibited. PCB ballasts/capacitors from light fixtures shall not be treated as universal waste, they shall be handled and disposed of as hazardous waste. See the Hazardous Waste Disposal Specification for these wastes.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Polyethylene Sheet: A single polyethylene film in the largest sheet size possible to minimize seams, 6.0 mil thick, clear, frosted, or black.
- B. Duct Tape: Provide duct tape in 3" widths, with an adhesive which is formulated to stick aggressively to sheet polyethylene.
- C. Spray Cement: Provide spray adhesive in aerosol cans which is specifically formulated to stick tenaciously to sheet polyethylene.
- D. Disposal Bags: Provide 6 mil thick leak-tight polyethylene bags.
- E. Labels: As required by the EPA and OSHA for handling, transportation, and disposal of hazardous waste.
- F. Drums: Recovery or salvage drums acceptable for disposal of hazardous waste. Prior approval of drums is required. Drums or containers must meet the required OSHA EPA (40 CFR Parts 264-265 and 300), and DOT regulations (49 CFR Parts 171-178). Use of damaged drums will not be allowed.

PART 3 EXECUTION

3.01 UNIVERSAL WASTE

- A. Employee training shall ensure that all employees are thoroughly familiar with proper waste handling and emergency procedures, relative to their responsibilities during normal operations and emergencies and to the type of waste they are handling.
- B. Mercury thermostats shall be segregated from other Universal Wastes to allow for required recycling.

SECTION 028700 - REMOVAL AND DISPOSAL OF UNIVERSAL WASTE AND FLUORESCENT LAMPS
H2M

- C. Once the properly labeled containers holding the universal waste have been filled and sealed, they shall be stored in designated accumulation areas as agreed upon by the Owners Representative and Contractor. They shall not be allowed to store in transportation vehicles, or onsite for more than one year from when the waste has been generated.
- D. Documentation when a universal waste in storage was first accumulated shall be provided. This is to be done by dating and labeling the waste with the date of the earliest accumulation that can document the length of time the universal waste has been accumulated.
- E. Maintenance of an inventory system on-site that identifies the earliest date that any universal waste in a group of universal waste items or a group of containers of universal waste became a waste was received.
- F. Any waste developed from the work that exhibits one or more characteristics of hazardous waste, that are not specifically identified by EPA and DEC as Universal Waste, must be handled accordingly and not as a universal waste. See the Hazardous Waste Disposal Specification for those wastes.

3.02 OFF-SITE SHIPMENT OF UNIVERSAL WASTE

- A. Off-Site shipments shall meet the requirements for offsite shipments and is prohibited from sending or taking universal waste to a place other than a designated universal waste handler or a universal waste destination facility.
- B. LQH's of universal waste must notify EPA in writing and develop an EPA identification number or co-ordinate with the facility regarding use of their EPA identification number, prior to exceeding 5,000 kilograms of universal waste onsite.
- C. SQH's do not need to notify EPA, receive an EPA identification number or keep records of shipments of universal waste.
- D. LQH's must keep a record of all universal waste shipments received or sent offsite, and must retain those records for at least three years from the date of receipt or shipment. Records may include invoices, manifests, logs, bills or lading, or other shipping documents.
- E. The Contractor shall provide certified copies of all receipts obtained from designated mercury thermostat recycling collection sites within 30 days of thermostat acceptance by collection site.
- F. The Contractor shall furnish all certified copies of manifests (interim storage and final disposal) within regulatory requirements. Within 30 days from acceptance of the waste by the disposal facility, the Contractor shall provide the Owner with Certificate of Disposal documents, as a requirement for final payment.

END OF SECTION



Email: cstabile@bnydc.org

September 28, 2023

Mr. Carmine A. Stabile
Senior Vice President, Operations & Infrastructure
Brooklyn Navy Yard Development Corporation
63 Flushing Avenue, Unit 300
Brooklyn, NY 11205

**Re: Environmental Hazardous Materials Survey Report
Restoration of Substation at Building 386
Brooklyn Navy Yard
63 Flushing Avenue, Brooklyn, NY
H2M Job No. BNYD1905**

Dear Mr. Stabile:

H2M architects + engineers (H2M) conducted a limited hazardous materials survey, including asbestos (ACM), lead based paint (LBP), universal waste and polychlorinated biphenyls (PCBs) in sealant, of Building 386 at the Brooklyn Navy Yard Development located at 63 Flushing Avenue, Brooklyn, NY 11205. This report is based on 100% Drawings by H2M titled Restoration of Substation at Building 386. Provided herein are the results of our survey findings.

Asbestos Sampling

On July 24th of 2020, January 11, 2021 and November 19, 2022, H2M collected limited bulk samples of suspect asbestos containing materials (ACM) that were located at the above-mentioned building and are scheduled to be disturbed during the upcoming project. The materials sampled included various surfacing, miscellaneous materials, and thermal system insulation. Bulk samples were collected and submitted by New York State Department of Labor (NYSDOL) certified inspector Mr. Kyle P. Vander Schuyt (NYSDOL Cert. No. 12-11293). Mr. Vander Schuyt is also certified as an asbestos investigator by the New York City Department of Environmental Protection (NYCDEP Cert. No. 149351) and was assisted by Mr. Douglas B. Milne (NYSDOL Cert No. 13-14307) and Mr. Frank J. Acciarito (NYSDOL Cert. No. 18-63276). Also performing a design phase inspection was Mr. Anthony Spantidakis (NYSDOL Cert. No. 98-16544 and NYCDEP Cert. No. 117708).

Asbestos Results

According to the federal Asbestos Hazard Emergency Response Act (AHERA), the Occupational Safety and Health Administration (OSHA 1926.1101) and the NYSDOL (12 NYCRR Part 56); asbestos containing material (ACM) is defined as any material or product which contains greater than one percent (1%) of asbestos.



TABLE 1: ASBESTOS BULK SAMPLE SUMMARY RESULTS BUILDING 386 63 FLUSHING AVENUE, BROOKLYN, NY 11205			
LOCATION	MATERIAL DESCRIPTION/ SAMPLE HA #	RESULT FINDINGS	APPROXIMATE QUANTITY OF ACM
North Side Storage Room	Fire Door Insulation	Assumed ACM	1 Door 21 Sq. Ft.
	Tar on Brick	Assumed ACM	2 Sq. Ft.
Throughout	Brick	Non-ACM	--
	Brick Mortar	Non-ACM	--
	Glazed Block Mortar	Non-ACM	--
	Glazed Block Mud	Non-ACM	--
Exterior 1 st Floor	Window Glazing	Non-ACM	--
	Door Frame and Rolling Door Frame Caulk	ACM	3 Sq. Ft.
	Window Caulk	ACM	N/A **
	Metal Louver Caulk	ACM	N/A **
Interior, 1 st floor	Large Diameter Pipe Insulation Wrap	ACM	80 Ln. Ft.
	Large Diameter Pipe Insulation Rope	ACM Contaminated	
	Large Diameter Pipe Insulation Miscellaneous Fill	ACM Contaminated	
	Smooth Wire	Non-ACM	--
	Ribbed Wire	Non-ACM	--
	Pipe Insulation Jacket Mud Fill/Lagging and Associated Elbows	ACM	1,000 Ln. Ft.
	Pipe Insulation Elbow to Fiberglass and Contaminated Fiberglass Pipe Insulation	ACM	
2 nd Floor, South Office	Wall Gypsum Board	Non-ACM	--
	Blue 12"x12" Floor Tile	Non-ACM	--
	Blue 12"x12" Floor Tile Mastic	Non-ACM	--
2 nd Floor, South Office Kitchen & Bathroom	White 12"x12" Floor Tile	Non-ACM	--
	White 12"x12" Floor Tile Mastic	Non-ACM	--
	Black Cove Base	Non-ACM	--
2 nd Floor, South Office Kitchen & Bathroom	Black Cove Base Mastic	Non-ACM	--
2 nd Floor, South Office Hallway and Attic	Pipe Insulation and Mud Joint Packing	ACM	850 Ln. Ft.
2 nd Floor, Exterior	Window Caulk (Gray)	Non-ACM/ Trace	--
	Wall Gypsum Board	Non-ACM	--



TABLE 1: ASBESTOS BULK SAMPLE SUMMARY RESULTS BUILDING 386 63 FLUSHING AVENUE, BROOKLYN, NY 11205			
LOCATION	MATERIAL DESCRIPTION/ SAMPLE HA #	RESULT FINDINGS	APPROXIMATE QUANTITY OF ACM
2 nd Floor, North Office	Wall Joint Compound	Non-ACM	--
	Ceiling Gypsum Board	Non-ACM	--
	Ceiling Joint Compound	Non-ACM	--
	12"x12" Grey Floor Tile	Non-ACM	--
	12"x12" Grey Floor Tile Mastic	Non-ACM	--
	Blue Cove Base	Non-ACM	--
	Blue Cove Base Mastic	Non-ACM	--
2 nd Floor, South Office	Ceiling Gypsum Board	Non-ACM	--
	Ceiling Joint Compound	Non-ACM	--
	Wall Joint Compound	Non-ACM	--
2nd Floor, South Office	Ceramic Wall Tile Backing	Assumed ACM	50 Sq. Ft.
Attic	Pipe Insulation and Mud Joint Packing	ACM	150 Ln. Ft.
Interior 1st Floor	Electric Panel Black Ebony Backing Boards – SW Panel	Assumed ACM	10 Sq. Ft.
Interior 1st Floor	Electric Panel Black Ebony Backing Boards – South Caged Electric Hub	Assumed ACM	50 Sq. Ft.
Interior 1st Floor	Arc Tape on Braided Wires Caged Electric Hub	Assumed ACM	10 Sq. Ft.
Interior 1st Floor	Firestop Compound on Floor of Power Panels at Conduit	Assumed ACM	5 Sq. Ft.
Interior 1st Floor	Large Diameter Braided Wire Insulation – South Caged Electric Hub	Assumed ACM	125 Ln. Ft.
Interior 1st Floor	Small Diameter Braided Wire Insulation – South Caged Electric Hub	Assumed ACM	200 Ln. Ft.
Interior 1st Floor (South Side)	Fire Door Insulation	Assumed ACM	84 Sq. Ft. (4 Doors)
Table Notes: 1. ACM = Asbestos Containing Material, contains more than 1% by weight in Bold. 2. Non-ACM = Contains ≤1% or no asbestos detected in material samples. 3. Section A = Smaller Side of Building/Courtyard 4. ** - Not To Be Impacted by SOW All quantities should be verified on site by the contractor prior to submitting a cost estimate or abatement notification/filings. H2M should be notified if there is a change in quantities or work scope. Licensed abatement contractor must remove in accordance with NYCDEP TITLE 15 CHAPTER 1 of the Rules of the City of New York.			



Lead Based Paint Sampling

On July 24th of 2020 and January 11, 2021, H2M collected paint chip samples of suspect lead-based paint from painted surfaces of Building 386. Sampling was performed by a US EPA Certified Lead Based Paint Inspector, Mr. Kyle P. Vander Schuyt (LBP-I-1173781-2). Paint Chip samples were submitted to EMSL Analytical, Inc. (EMSL) of Carle Place, New York. EMSL is certified by the New York State Department of Health (NYSDOH), Environmental Laboratory Approval Program (ELAP), No. 11469 and EPA 7000B, AAS.

Lead Based Paint Results

According to the U.S. Environmental Protection Agency (US EPA) lead based paint is defined as paint containing equal to or more than 0.5% lead by weight in paint chip samples.

TABLE 2: LEAD PAINT BULK SAMPLE SUMMARY RESULTS BUILDING 386 63 FLUSHING AVENUE, BROOKLYN, NY 11205					
Location / Sample #	Room/Component	Substrate	Color	% by Weight	Interpretation
386A/ 1	Panel Box	Metal	Black	1.5 %	LBP *
386A/ 2	Floor Paint	Concrete	Grey	0.55 %	LBP *
386A/ 3	Switch Gear Leg	Metal	Red	14 %	LBP *
386A/ 4	Louver	Metal	Red/Grey	20 %	LBP *
386A/ 5	Louver	Metal	Black	16 %	LBP *
386A/ 6	Switch Gear Leg Top	Metal	Grey	0.35 %	LBP *
386A/ 7	Switch Gear	Metal	Grey	0.25 %	LBP *
386B/ 8	Transformer	Metal	Grey	0.032 %	LCM *
386B/ 9	Switch Gear	Metal	Blue	0.12 %	LCM *
386B/ 10	Wall Panel	Metal	Grey Composite	0.93 %	LBP *
386/ 11	Divider Gate	Metal	Grey	1.9 %	LBP *
386/ 12	Window	Wood	Grey	6.8 %	LBP *
386B/ 13	Floor	Concrete	Red	0.36 %	LBP *
386/ 001	2 nd Floor, North Office Wall	Gypsum	Off-White	0.0086 %	Non-LBP
386/ 002	2 nd Floor, North Office Wall	Gypsum	Blue	<0.0080 %	Non-LBP
386/ 003	2 nd Floor, South Office Ceiling	Gypsum	White	<0.0080 %	Non-LBP
386/ 004	2 nd Floor, South Office, Woman's Bathroom Wall	Gypsum	White	<0.0080 %	Non-LBP
386/ 005	2 nd Floor, South Office, Kitchen Wall	Gypsum	Beige	<0.0080 %	Non-LBP



TABLE 2: LEAD PAINT BULK SAMPLE SUMMARY RESULTS BUILDING 386 63 FLUSHING AVENUE, BROOKLYN, NY 11205					
Location / Sample #	Room/Component	Substrate	Color	% by Weight	Interpretation
386/ 006	Stairs Exterior	Metal	White	<0.0080 %	Non-LBP
386/ 007	Stairs Exterior	Metal	Blue	2.9 %	LBP *
386/ 008	1 st Floor, Exterior Door	Metal	Blue	0.12%	LCM *
386/ 009	Stairs Exterior	Metal	Red	<0.0080 %	Non-LBP
386/ 010	Stairs Exterior	Metal	Yellow	1.5 %	LBP *
386/ 011	2 nd Floor, North Office	Gypsum	White	0.011 %	LCM *
386/ 012	2nd Floor, Attic, Roof Girders	Metal	White	0.29 %	LBP *

Table Notes:

1. Lead Based Paint (LBP) in Bold = EPA defined LBP or lead concentration equal to or above 0.5% by weight, NYC Local Law 66 lowers the threshold to 0.25% by weight.
2. Lead Containing Material (LCM) = OSHA recognizes any detectable lead in paint as a Lead Containing Material.
3. Lab detection reporting limit is 0.008%
4. 00 = 2nd Site Visit Sampling

* - Lead sample concentration above lab detection limit, refer to OSHA 29 CFR 1926.62 for training and handling guidance of Lead Containing Materials (LCM) or incidentally impacted Lead Based Paint (LBP) during construction. Contractor must hold awareness training and reference OSHA 29 CFR 1926.62 and 29 CFR 1910 in working with LCM including proper housekeeping and PPE and disposal and waste characterization requirements.

Polychlorinated Biphenyls (PCB) Sampling

On July 24th of 2020 and January 11, 2021, H2M collected samples of suspect polychlorinated biphenyls (PCBs) laden sealants, caulks and putty from surfaces of the windows, doors, brick, etc. Sampling was performed by Mr. Douglas B. Milne & Frank J. Acciarito, as referenced above.

Bulk samples were submitted to EMSL Analytical, Inc. (EMSL) of Carle Place, New York. EMSL is certified by the New York State Department of Health (NYSDOH), Environmental Laboratory Approval Program (ELAP), No. 11469 and EPA SW 846 3540C/8082A.



Polychlorinated Biphenyls (PCB) Results & Recommendations

According to the U.S. Environmental Protection Agency (USEPA) EPA TSCA 40 CFR Part 761, samples of suspect PCB is defined as “hazardous” when a sample contains equal to or more than 50 parts per million (PPM) total PCB compound concentration. Proper handling, transportation and disposal methods are required when a material contains PCB compound concentration of equal to or more than 50 PPM.

Universal Waste, E-waste and light fixtures potentially containing PCB ballasts, and thermostats and bulbs that may contain mercury shall be properly disposed of in accordance with local and state regulations.

TABLE 3: SUSPECT POLYCHLORINATED BIPHENYLS (PCB) BULK SAMPLE SUMMARY RESULTS BUILDING 386 63 FLUSHING AVENUE, BROOKLYN, NY 11205					
Location / Sample #	Room/Component	Substrate	Color	Total PCB (PPM)	Interpretation
Exterior 1 st Floor / 1	Window Caulk	Brick	Black	1.9	NONPCB
Exterior / 2	Window Glazing	Brick	White	7.2	NONPCB
Exterior / 3	Louvre Caulk	Metal	Brown	2.6	NONPCB
Exterior 2 nd Floor / 001	Window Caulk	Brick	Grey	ND	NONPCB
<p><u>Notes:</u></p> <p>1. Hazardous PCB = ≥ 50 PPM, as defined by EPA NONPCB = Below hazardous PCB level ND = Not Detected above laboratory reporting limits 00 = 2nd Site Visit</p>					

Universal Waste in Light Fixtures

The federal universal waste regulations are found in Title 40 of the Code of Federal Regulations (CFR) in part 273 and apply to (4) four types of universal waste:

These are:

- Batteries, such as lead/acid, lead, nickel-cadmium, silver, lithium or mercury (Information on the Rechargeable Battery Recycling Act).
- Certain Pesticides, that would otherwise be a hazardous Waste
- Thermostats and other Mercury-Containing Equipment (MCE), (Additional information on thermostat management). MCE is included as Universal Waste by the NYC DEC Commissioners Policy 39, approved in 2006.
- Lamps, (except LED lamps which fall under a different category of e-waste) Fluorescent, Halogen, Incandescent and other lamps may be laden with a mercury coating.

In NYS, the NYSDEC references the “Universal Waste Rule” (UWR), 6 NYCRR Part 374-3, as an alternate way of managing certain types of hazardous wastes, otherwise they would be subject to all applicable requirements of Parts 370 through 374 and 376. Handlers may choose to manage eligible wastes under the UWR, or under ordinary hazardous waste regulations. A Universal Waste handler falls under one or more of the following: generates, receives, stores, accumulates, and/or sends universal waste. A universal



waste Transporter is involved in the transportation of Universal waste with all the accreditations required by the DOT and DEC, in the state of New York.

Universal Waste, E-waste and light fixtures potentially hazardous containing PCB ballasts, and thermostats and bulbs that may contain mercury; shall be properly disposed of in accordance with local and state regulations.

On March 25, 2023 - the Navy Yard and TCI, of NY Inc. entered into an agreement to collect samples of Transformers at the buildings scheduled for demolition. The data is attached and presented in the following table 4.

(See TCI field Log and Transformer Description in Appendix)



TABLE 4: UNIVERSAL WASTE SUMMARY BUILDING 386 63 FLUSHING AVENUE, BROOKLYN, NY 11205					
Building Wing	Light Fixtures (Assumed Haz PCB Ballast)	Light Bulbs (Assumed Mercury)	Thermostats (Assumed Mercury)	Smoke Detectors	Emergency Lights
2 nd Floor	16	30	1	1	2
1 st Floor	35	44	0	0	2
Other					
Interior 1 st Floor	Serial # 6583144 – 35 ppm PCBs (Silicone)	Haz PCB Dielectric Oil in (2) Transformers Two (2) GE Pyranol Transformers 100KVA Stickers indicate used to have 50 to 500 ppm PCB Oil but have been drained (Unison) and recertified <50 ppm PCB Oil at 55 gallons each Overall, Weight with Oil = unknown No staining was observed on the platforms.			
	Serial # 6583145 – 45 ppm PCBs (Silicone)				
	Serial # 6909934 – 1,000ppm PCBs (Silicone)	Haz PCB Dielectric Oil in (2) Transformers Two (2) GE Pyranol Transformers 450KVA (Blue Color) Stickers indicate used to have 50 to 500 ppm PCB Oil but have been drained (Unison) and recertified <50 ppm PCB Oil at 262 gallons each Overall, Weight with Oil = 10,100 pounds No staining was observed on the platforms.			
	Serial # 6909935 – 13,700ppm PCBs (Silicone)				
	Serial # 7085375 – 79ppm PCBs (Silicone)	Haz PCB Dielectric Oil in (4) Transformers Four (4) GE Pyranol Transformers 2000KVA (Grey Color) Stickers indicate used to have 50 to 500 ppm PCB Oil but have been drained (Unison) and recertified <50 ppm PCB Oil at 482 gallons each Overall, Weight with Oil = 19,900 pounds No staining was observed on the platforms.			
	Serial # 7085372 – 415ppm PCBs (Silicone)				
	Serial # 7085377 – 804ppm PCBs (Silicone)				
	Serial # 7085371 – 210ppm PCBs (Silicone)				



Exterior	Serial # 7104499 – Main Reservoir 215ppm PCBs Oil Circuit Breaker in Cabinet 7ppm PCBs	Haz PCB Dielectric Oil in (2) Transformers Two (2) GE Unit Sub Transformers 4500KVA Assumed 50 to 500 ppm PCB Oil Oil at 1,620 gallons each Overall, Weight with Oil = 39,500 pounds Some Staining observed inn photos unclear if rainwater or dielectric oil. Presume historical contamination 30 yds ³ soils removal necessary as Hazardous PCB
	Serial #7081468 – Main Reservoir 278ppm PCBS Oil Circuit Breaker in Cabinet 5ppm PCBS	
<p><u>Notes:</u></p> <ul style="list-style-type: none"> - Lights and Ballasts could not be opened and inspected, unless the existing ballast indicate “Non-PCB” on them they will be considered to contain PCB Dielectric fluid in Hazardous Waste levels. - Incandescent and fluorescent bulbs are assumed to contain mercury and are to be recycled in accordance with EPA, Local waste disposal facility requirements and DOT transporting requirements. - Haz = Hazardous levels PCB > 50 PPM 		

Laboratory analytical data sheets and chain of custody forms are provided in **Attachment 1**. Copies of H2M's licenses and certifications are provided in **Attachment 2**. Copies of EMSL's certifications are provided in **Attachment 3**. Photographic documentation Asbestos Sample locations are provided in **Attachment 4**.

H2M surveyed visible and accessible materials during this survey without destructive exploratory means. It is possible that concealed materials such as, but not limited to, tar within façade brick wythes and foundations, and tar on concealed spandrels and relieving angles may exist.

H2M certifies that the information contained herein is based on the physical data and visual inspections conducted by H2M and lab data collected during the inspection survey. All findings stated in this report are based upon facts and circumstances as they existed at the time of inspection and at the time that this report was prepared. A change in any of the site conditions, facts or circumstances upon which this report is based may affect the findings expressed in this report.



] If you have any questions, please do not hesitate to contact the undersigned at (631) 756-8000 extension 1621.

Very truly yours,

H2M architects + engineers

A handwritten signature in blue ink that reads "Douglas B. Milne".

Douglas B. Milne – Industrial Hygienist

A handwritten signature in black ink that reads "Anthony Spantidakis".

Anthony Spantidakis – Senior Environmental Scientist

cc: Kyle P. Vander Schuyt – Sr. Project Scientist
Richard J. Schmitz – Sr. Discipline Engineer



ATTACHMENT 1

LABORATORY ANALYSIS
&
CHAIN OF CUSTODY FORM



EMSL Analytical, Inc.

200 Route 130 North, Cinnaminson, NJ 08077

Phone: (856) 303-2500 Fax: (856) 858-4571 Email: EnvChemistry2@emsl.com

Attn: **Kyle Vanderschuyt**
H2M Architects and Engineers
538 Broad Hollow Road
4th Floor East
Melville, NY 11747

8/4/2020

Phone: (631) 756-8000

Fax:

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 7/28/2020. The results are tabulated on the attached data pages for the following client designated project:

Brooklyn Navy Yard, Whole Building

The reference number for these samples is EMSL Order #012007800. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Approved By:

Phillip Worby, Environmental Chemistry
Laboratory Director



The test results contained within this report meet the requirements of NELAP and/or the specific certification program that is applicable, unless otherwise noted.
NELAP Certifications: NJ 03036, NY 10872, PA 68-00367, CA ELAP 1877

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the NELAP, unless specifically indicated. All results for soil samples are reported on a dry weight basis, unless otherwise noted. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

**EMSL Analytical, Inc.**

200 Route 130 North, Cinnaminson, NJ 08077
 Phone/Fax: (856) 303-2500 / (856) 858-4571
<http://www.EMSL.com> EnvChemistry2@emsl.com

EMSL Order: 012007800
 CustomerID: H2ML50
 CustomerPO: BNYD1905
 ProjectID:

Attn: **Kyle Vanderschuyt**
H2M Architects and Engineers
538 Broad Hollow Road
4th Floor East
Melville, NY 11747

Phone: (631) 756-8000
 Fax:
 Received: 07/28/20 10:20 AM

Project: **Brooklyn Navy Yard, Whole Building**

Analytical Results

Client Sample Description 1 Exterior, Window Caulk **Collected:** 7/24/2020 **Lab ID:** 012007800-0001

Method	Parameter	Result	RL Units	Prep Date & Analyst	Analysis Date & Analyst
GC-SVOA					
3540C/8082A	Aroclor-1016	ND D	0.89 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1221	ND D	0.89 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1232	ND D	0.89 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1242	ND D	0.89 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1248	ND D	0.89 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1254	ND D	0.89 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1260	1.9 D	0.89 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1262	ND D	0.89 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1268	ND D	0.89 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH

Client Sample Description 2 Exterior, Window Glazing **Collected:** 7/24/2020 **Lab ID:** 012007800-0002

Method	Parameter	Result	RL Units	Prep Date & Analyst	Analysis Date & Analyst
GC-SVOA					
3540C/8082A	Aroclor-1016	ND D	0.96 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1221	ND D	0.96 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1232	ND D	0.96 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1242	ND D	0.96 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1248	ND D	0.96 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1254	ND D	0.96 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1260	7.2 D	0.96 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1262	ND D	0.96 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1268	ND D	0.96 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH

Client Sample Description 3 Exterior, Louvre Caulk (Metal) **Collected:** 7/24/2020 **Lab ID:** 012007800-0003

Method	Parameter	Result	RL Units	Prep Date & Analyst	Analysis Date & Analyst
GC-SVOA					
3540C/8082A	Aroclor-1016	ND D	0.87 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1221	ND D	0.87 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1232	ND D	0.87 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1242	ND D	0.87 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1248	ND D	0.87 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH

**EMSL Analytical, Inc.**

200 Route 130 North, Cinnaminson, NJ 08077
 Phone/Fax: (856) 303-2500 / (856) 858-4571
<http://www.EMSL.com> EnvChemistry2@emsl.com

EMSL Order: 012007800
 CustomerID: H2ML50
 CustomerPO: BNYD1905
 ProjectID:

Attn: **Kyle Vanderschuyt**
H2M Architects and Engineers
538 Broad Hollow Road
4th Floor East
Melville, NY 11747

Phone: (631) 756-8000
 Fax:
 Received: 07/28/20 10:20 AM

Project: **Brooklyn Navy Yard, Whole Building**

Analytical Results

Client Sample Description 3 **Collected:** 7/24/2020 **Lab ID:** 012007800-0003
 Exterior, Louvre Caulk (Metal)

Method	Parameter	Result	RL Units	Prep Date & Analyst	Analysis Date & Analyst
GC-SVOA					
3540C/8082A	Aroclor-1254	ND D	0.87 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1260	2.6 D	0.87 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1262	ND D	0.87 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH
3540C/8082A	Aroclor-1268	ND D	0.87 mg/Kg	7/28/2020 RS	07/29/20 0:00 EH

Definitions:

- MDL - method detection limit
- J - Result was below the reporting limit, but at or above the MDL
- ND - indicates that the analyte was not detected at the reporting limit
- RL - Reporting Limit (Analytical)
- D - Dilution Sample required a dilution which was used to calculate final results



EMSL Analytical, Inc.

200 Route 130 North, Cinnaminson, NJ 08077

Phone: (856) 303-2500 Fax: (856) 858-4571 Email: EnvChemistry2@emsl.com

Attn:

**Doug Milne
H2M Architects and Engineers
538 Broad Hollow Road
4th Floor East
Melville, NY 11747**

1/19/2021

Phone: (631) 756-8000

Fax:

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 1/12/2021. The results are tabulated on the attached data pages for the following client designated project:

BNYD Building 386

The reference number for these samples is EMSL Order #012100288. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Approved By:

Phillip Worby, Environmental Chemistry
Laboratory Director



The test results contained within this report meet the requirements of NELAP and/or the specific certification program that is applicable, unless otherwise noted.
NELAP Certifications: NJ 03036, NY 10872, PA 68-00367, CA ELAP 1877

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the NELAP, unless specifically indicated. All results for soil samples are reported on a dry weight basis, unless otherwise noted. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

**EMSL Analytical, Inc.**

200 Route 130 North, Cinnaminson, NJ 08077

Phone/Fax: (856) 303-2500 / (856) 858-4571

<http://www.EMSL.com>EnvChemistry2@emsl.com

EMSL Order: 012100288

CustomerID: H2ML50

CustomerPO:

ProjectID:

Attn: **Doug Milne**
H2M Architects and Engineers
538 Broad Hollow Road
4th Floor East
Melville, NY 11747

Phone: (631) 756-8000

Fax:

Received: 01/12/21 9:50 AM

Project: BNYD Building 386

Analytical Results

Client Sample Description 1 **Collected:** 1/11/2021 **Lab ID:** 012100288-0001
 2nd Floor Exterior

Method	Parameter	Result	RL Units	Prep Date & Analyst	Analysis Date & Analyst
GC-SVOA					
3540C/8082A	Aroclor-1016	ND D	0.90 mg/Kg	1/12/2021 RS	01/13/21 0:00 EH
3540C/8082A	Aroclor-1221	ND D	0.90 mg/Kg	1/12/2021 RS	01/13/21 0:00 EH
3540C/8082A	Aroclor-1232	ND D	0.90 mg/Kg	1/12/2021 RS	01/13/21 0:00 EH
3540C/8082A	Aroclor-1242	ND D	0.90 mg/Kg	1/12/2021 RS	01/13/21 0:00 EH
3540C/8082A	Aroclor-1248	ND D	0.90 mg/Kg	1/12/2021 RS	01/13/21 0:00 EH
3540C/8082A	Aroclor-1254	ND D	0.90 mg/Kg	1/12/2021 RS	01/13/21 0:00 EH
3540C/8082A	Aroclor-1260	ND D	0.90 mg/Kg	1/12/2021 RS	01/13/21 0:00 EH
3540C/8082A	Aroclor-1262	ND D	0.90 mg/Kg	1/12/2021 RS	01/13/21 0:00 EH
3540C/8082A	Aroclor-1268	ND D	0.90 mg/Kg	1/12/2021 RS	01/13/21 0:00 EH

Definitions:

MDL - method detection limit

J - Result was below the reporting limit, but at or above the MDL

ND - indicates that the analyte was not detected at the reporting limit

RL - Reporting Limit (Analytical)

D - Dilution Sample required a dilution which was used to calculate final results



EMSL Analytical, Inc.

528 Mineola Avenue Carle Place, NY 11514
Tel/Fax: (516) 997-7251 / (516) 997-7528
<http://www.EMSL.com / carleplacelab@emsl.com>

EMSL Order: 062013374
Customer ID: H2ML50
Customer PO: BNYD1905
Project ID:

Attention: Kyle Vanderschuyt
H2M Architects and Engineers
538 Broad Hollow Road
4th Floor East
Melville, NY 11747
Project: Brooklyn Navy Yard - Bldg. 386, Electrical Rm.

Phone: (631) 756-8000
Fax:
Received Date: 07/27/2020 9:20 AM
Analysis Date: 07/29/2020 - 07/31/2020
Collected Date: 07/24/2020

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 1-1 062013374-0001			Description Throughout - Brick Homogeneity Homogeneous		
PLM NYS 198.1 Friable	07/29/2020	Red		30.00% Ca Carbonate 14.00% Non-fibrous (other) 56.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1-2 062013374-0002			Description Throughout - Brick Homogeneity Homogeneous		
PLM NYS 198.1 Friable	07/29/2020	Red		33.00% Ca Carbonate 9.00% Non-fibrous (other) 58.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 2-1 062013374-0003			Description Throughout - Brick Mortar Homogeneity Homogeneous		
PLM NYS 198.1 Friable	07/29/2020	Gray		30.00% Ca Carbonate 8.00% Non-fibrous (other) 62.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 2-2 062013374-0004			Description Throughout - Brick Mortar Homogeneity Homogeneous		
PLM NYS 198.1 Friable	07/29/2020	Gray	2.00% Cellulose	34.00% Ca Carbonate 10.00% Non-fibrous (other) 54.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

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EMSL Order: 062013374
Customer ID: H2ML50
Customer PO: BNYD1905
Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 3-1 062013374-0005			Description Throughout - Glazed Block Mortar		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable	07/29/2020	Gray		56.00% Ca Carbonate 9.00% Non-fibrous (other) 35.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 3-2 062013374-0006			Description Throughout - Glazed Block Mortar		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable	07/29/2020	Gray		70.00% Ca Carbonate 5.00% Non-fibrous (other) 25.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 4-1 062013374-0007			Description Throughout - Glazed Block Mud		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable	07/29/2020	Gray		60.00% Ca Carbonate 17.00% Non-fibrous (other) 23.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 4-2 062013374-0008			Description Throughout - Glazed Block Mud		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable	07/29/2020	Gray		58.00% Ca Carbonate 12.00% Non-fibrous (other) 30.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 5-1 062013374-0009			Description Exterior - Window Glazing		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	07/30/2020	Gray/ White	<1.00% Wollastonite	100.00% Other	Inconclusive : <1% Anthophyllite
TEM NYS 198.4 NOB	07/31/2020	Gray/ White		100.00% Other	None Detected
Sample ID 5-2 062013374-0010			Description Exterior - Window Glazing		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	07/30/2020	Gray/ White	None	100.00% Other	Inconclusive : <1% Anthophyllite
TEM NYS 198.4 NOB	07/31/2020	Gray/ White		100.00% Other	None Detected

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528 Mineola Avenue Carle Place, NY 11514
Tel/Fax: (516) 997-7251 / (516) 997-7528
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EMSL Order: 062013374
Customer ID: H2ML50
Customer PO: BNYD1905
Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 6-1 062013374-0011			Description Exterior - Window Caulk Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	07/30/2020	Gray/ White	1.90% Wollastonite	95.80% Other	<1% Anthophyllite 1.90% Chrysotile 2.3% Total
TEM NYS 198.4 NOB	07/31/2020				Not Analyzed
Sample ID 6-2 062013374-0012			Description Exterior - Window Caulk Homogeneity		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	07/30/2020				Positive Stop (Not Analyzed)
TEM NYS 198.4 NOB	07/31/2020				Not Analyzed
Sample ID 7-1 062013374-0013			Description Exterior - Metal Louvre Caulk Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	07/30/2020	Tan/ White	None	97.50% Other	2.50% Chrysotile
TEM NYS 198.4 NOB	07/31/2020				Not Analyzed
Sample ID 7-2 062013374-0014			Description Exterior - Metal Louvre Caulk Homogeneity		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	07/30/2020				Positive Stop (Not Analyzed)
TEM NYS 198.4 NOB	07/31/2020				Not Analyzed
Sample ID 8-1 062013374-0015			Description 386B - L. Diameter Pipe Insulation - Wrap Homogeneity Heterogeneous		
PLM NYS 198.1 Friable	07/29/2020	White	15.00% Cellulose	18.00% Non-fibrous (other)	67.00% Chrysotile
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 8-2 062013374-0016			Description 386B - L. Diameter Pipe Insulation - Wrap Homogeneity		
PLM NYS 198.1 Friable	07/29/2020				Positive Stop (Not Analyzed)
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

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Tel/Fax: (516) 997-7251 / (516) 997-7528
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EMSL Order: 062013374
Customer ID: H2ML50
Customer PO: BNYD1905
Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 8-3 <i>062013374-0017</i>			Description 386B - L. Diameter Pipe Insulation - Wrap		
			Homogeneity		
PLM NYS 198.1 Friable	07/29/2020				Positive Stop (Not Analyzed)
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 9-1 <i>062013374-0018</i>			Description 386B - L. Diameter Pipe Insulation - Pipe		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable	07/29/2020	Brown	99.00% Cellulose	1.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 9-2 <i>062013374-0019</i>			Description 386B - L. Diameter Pipe Insulation - Pipe		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable	07/29/2020	Brown	98.00% Cellulose	2.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 9-3 <i>062013374-0020</i>			Description 386B - L. Diameter Pipe Insulation - Pipe		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable	07/29/2020	Brown	97.00% Cellulose	3.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 10-1 <i>062013374-0021</i>			Description 386B - L. Diameter Pipe Insulation - Misc. Fill		
			Homogeneity Heterogeneous		
PLM NYS 198.1 Friable	07/29/2020	Red/ Black		50.00% Ca Carbonate 45.00% Matrix 5.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 10-2 <i>062013374-0022</i>			Description 386B - L. Diameter Pipe Insulation - Misc. Fill		
			Homogeneity Heterogeneous		
PLM NYS 198.1 Friable	07/29/2020	Red/ Black		50.00% Matrix 10.00% Non-fibrous (other) 40.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

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528 Mineola Avenue Carle Place, NY 11514
Tel/Fax: (516) 997-7251 / (516) 997-7528
<http://www.EMSL.com> / carleplacelab@emsl.com

EMSL Order: 062013374
Customer ID: H2ML50
Customer PO: BNYD1905
Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 11-1 062013374-0023			Description 386A - Smooth Wire		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	07/30/2020	Gray/ Tan		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	07/31/2020	Gray/ Tan		100.00% Other	None Detected
Sample ID 11-2 062013374-0024			Description 386A - Smooth Wire		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	07/30/2020	Gray/ Tan		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	07/31/2020	Gray/ Tan		100.00% Other	None Detected
Sample ID 11-3 062013374-0025			Description 386A - Smooth Wire		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	07/30/2020	Gray/ Tan		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	07/31/2020	Gray/ Tan		100.00% Other	None Detected
Sample ID 12-1 062013374-0026			Description 386A - Ribbed Wire		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	07/30/2020	Gray/ Tan		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	07/31/2020	Gray/ Tan		100.00% Other	None Detected
Sample ID 12-2 062013374-0027			Description 386A - Ribbed Wire		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	07/30/2020	Gray/ Tan		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	07/31/2020	Gray/ Tan		100.00% Other	None Detected
Sample ID 12-3 062013374-0028			Description 386A - Ribbed Wire		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	07/30/2020	Gray/ Tan		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	07/31/2020	Gray/ Tan		100.00% Other	None Detected

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528 Mineola Avenue Carle Place, NY 11514
Tel/Fax: (516) 997-7251 / (516) 997-7528
<http://www.EMSL.com> / carleplacelab@emsl.com

EMSL Order: 062013374
Customer ID: H2ML50
Customer PO: BNYD1905
Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 13-1 062013374-0029		Description	386B - Pipe Insulation Jacket - Mud Fill		
		Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable	07/29/2020	White/ Black	None	30.00% Ca Carbonate 40.00% Gypsum 3.00% Non-fibrous (other)	16.00% Amosite 11.00% Chrysotile 27% Total
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 13-2 062013374-0030		Description	386B - Pipe Insulation Jacket - Mud Fill		
		Homogeneity			
PLM NYS 198.1 Friable	07/29/2020				Positive Stop (Not Analyzed)
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 13-3 062013374-0031		Description	386B - Pipe Insulation Jacket - Mud Fill		
		Homogeneity			
PLM NYS 198.1 Friable	07/29/2020				Positive Stop (Not Analyzed)
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 14-1 062013374-0032		Description	386B - Pipe Insulation Jacket - Mud Lagging		
		Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable	07/29/2020	Gray/ White	None	40.00% Gypsum 10.00% Non-fibrous (other)	40.00% Amosite 10.00% Chrysotile 50% Total
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 14-2 062013374-0033		Description	386B - Pipe Insulation Jacket - Mud Lagging		
		Homogeneity			
PLM NYS 198.1 Friable	07/29/2020				Positive Stop (Not Analyzed)
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 14-3 062013374-0034		Description	386B - Pipe Insulation Jacket - Mud Lagging		
		Homogeneity			
PLM NYS 198.1 Friable	07/29/2020				Positive Stop (Not Analyzed)
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

Initial report from: 07/31/2020 17:24:06



EMSL Analytical, Inc.

528 Mineola Avenue Carle Place, NY 11514
Tel/Fax: (516) 997-7251 / (516) 997-7528
<http://www.EMSL.com> / carleplacelab@emsl.com

EMSL Order: 062013374
Customer ID: H2ML50
Customer PO: BNYD1905
Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 15-1 062013374-0035			Description 386B - Pipe Insulation Elbow to Fiberglass		
			Homogeneity Heterogeneous		
PLM NYS 198.1 Friable	07/29/2020	Gray/ White	10.00% Cellulose	28.00% Ca Carbonate 49.00% Gypsum	13.00% Chrysotile
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 15-2 062013374-0036			Description 386B - Pipe Insulation Elbow to Fiberglass		
			Homogeneity		
PLM NYS 198.1 Friable	07/29/2020				Positive Stop (Not Analyzed)
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 15-3 062013374-0037			Description 386B - Pipe Insulation Elbow to Fiberglass		
			Homogeneity		
PLM NYS 198.1 Friable	07/29/2020				Positive Stop (Not Analyzed)
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

Initial report from: 07/31/2020 17:24:06



EMSL Analytical, Inc.

528 Mineola Avenue Carle Place, NY 11514
Tel/Fax: (516) 997-7251 / (516) 997-7528
<http://www.EMSL.com> / carleplacelab@emsl.com

EMSL Order: 062013374
Customer ID: H2ML50
Customer PO: BNYD1905
Project ID:

Test Report:Asbestos Analysis of Bulk Material

The samples in this report were submitted to EMSL for analysis by Asbestos Analysis of Bulk Materials via NYS ELAP Approved Methods. The reference number for these samples is the EMSL Order ID above. Please use this reference number when calling about these samples.

Report Comments:

Sample Receipt Date: 7/27/2020
Analysis Completed Date: 7/31/2020

Sample Receipt Time: 9:20 AM
Analysis Completed Time: 1:50 PM

Analyst(s):

Omatie Ramrattan-Scarallo PLM NYS 198.1 Friable (17)

Omatie Ramrattan-Scarallo PLM NYS 198.6 NOB (10)

Rosemary Ortega TEM NYS 198.4 NOB (8)

Samples reviewed and approved by:

Daniel Clarke, Asbestos Laboratory Manager
or Other Approved Signatory

NOB = Non Friable Organically Bound N/A = Not Applicable VCM = Vermiculite Containing Material

-In New York State, TEM is currently the only method that can be used to determine if NOB materials can be considered or treated as non-asbestos containing.

All samples examined for the presence of vermiculite when analyzed via NYS 198.1.

-NYS Guidelines for Vermiculite containing samples are available at http://www.wadsworth.org/labcert/elapcert/forms/VermiculiteInterimGuidance_Rev070913.pdf EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples were received in good condition unless otherwise noted.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. This report may contain data that is not covered by the NVLAP accreditation.

Samples analyzed by EMSL Analytical, Inc. Carle Place, NY NYS ELAP 11469

Initial report from: 07/31/2020 17:24:06

H2M L50	Site Address Brooklyn Navy Yard Bldg 386	Date Submitted: 7-24-2020
Address: 538 Broad Hollow Road 4 th Floor East Melville, NY 11747	Work Area Electrical Rm	Turn Around Time: 1 week
	Fax Results to:	E-mail Results to: KVanderSchuyt@H2M.com
		Number of Samples: 37

Analytical Procedure: (Circle One) NY ELAP Method 198.1 (friable in NY) NY ELAP Method 198.6 (non-friable-NY) NY ELAP Method 198.7 (TEM)

Filing # **BNYD1905**

Sample Number	Location	Sample Description	Comments		
1	Throughout	Brick			
1					
2		Brick Mortar			
2					
3	Exterior	Glazed Block Mortar			
3					
4		Glazed Block Mod			
4					
5		Window Glazing			
5					
6		Window Caulk			
6					
7	386 A	Smooth Wire	} FJA 7/24/2020		
7		_____			
7		_____			
7		Ribbed Wiring			
7		_____			
8	386 B	L. Diameter Pipe Insulation	} 20 JUL 21 RECEIVED STATE POLICE, NY 9:28 Roper		
8					
8					
9					
9					
Relinquished by (signature) <i>[Signature]</i>	Date	Time	Received by (signature) <i>[Signature]</i>	Date	Agent of 7/27/20 9:30 AM
Relinquished by (signature)	Date	Time	Received by (signature)	Date	Agent of

Smaller Samples * Stop at first positive **062013374**
 EMSL 528 Mineola Ave, Carle Place, NY 11514 Phone (516) 997-7251 Fax (516) 997-7528
 7/27/20 - 7/30/20 Page 1 Of 2

H2M L50		Site Address		Date Submitted:
Address: 538 Broad Hollow Road 4 th Floor East Melville, NY 11747		Work Area		Turn Around Time:
		Fax Results to:	E-mail Results to: KVanderSchuyt@H2M.com	Number of Samples:

Analytical Procedure: NY ELAP Method 198.1 (friable in NY) NY ELAP Method 198.6 (non-friable-NY) NY ELAP Method 198.4 (TEM) Billing # **BNYD1905**

Sample Number	Location	Sample Description	Comments
10 - 1	386 B	L. Diameter Pipe Insulation	Misc. Fill
10 - 2	1		
11 - 1	386 A	Smooth Wire	
11 - 2			
11 - 3			
12 - 1		Ribbed Wire	
12 - 2			
12 - 3			
13 - 1	386 B	Pipe Insulation Jacket	Mud Fill
13 - 2			
13 - 3			
14 - 1			Logging
14 - 2			
14 - 3			
15 - 1			Elbow to fiberglass
15 - 2			
15 - 3			

RECEIVED
 ENVIRONMENTAL L.I.C.
 ANALYTICAL
 SAFETY PLACE, NY
 20 JUL 27 AM 9:20

062013374

Relinquished by (signature) 	Date	Time	Received by (signature) 	Date	Agent of
Relinquished by (signature)	Date	Time	Received by (signature)	Date	Agent of

Domato Ramatta Stop at first positive
 7/29/20 EMSL 528 Mineola Ave, Carle Place, NY 11514 Phone (516) 997-7251 Fax (516) 997-7528
 - 7/30/20
 Page 2 of 2



EMSL Analytical, Inc.

528 Mineola Avenue, Carle Place, NY 11514

Phone/Fax: (516) 997-7251 / (516) 997-7528

<http://www.EMSL.com>

carleplacelab@emsl.com

EMSL Order:	062013568
CustomerID:	H2ML50
CustomerPO:	
ProjectID:	

Attn: **Kyle Vanderschuyt**
H2M Architects and Engineers
538 Broad Hollow Road
4th Floor East
Melville, NY 11747

Phone: (631) 756-8000
 Fax:
 Received: 07/27/20 9:20 AM
 Collected:

Project: **BNYD1905**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3051A/7000B)*

<i>Client Sample Description</i>	<i>Lab ID</i>	<i>Collected</i>	<i>Analyzed</i>	<i>Lead Concentration</i>
1	062013568-0001 Site: 386A/Panel Box/Metal/Black	8/1/2020		1.5 % wt
2	062013568-0002 Site: 386A/Floor Paint/Concrete/Grey	8/1/2020		0.55 % wt
3	062013568-0003 Site: 386A/Switch Gear Leg/Metal/Red	8/1/2020		14 % wt
4	062013568-0004 Site: 386A/Louvre/Metal/Red and Grey	8/1/2020		20 % wt
5	062013568-0005 Site: 386A/Louvre/Metal/Black	8/1/2020		16 % wt
6	062013568-0006 Site: 386A/Switch Gear Leg Top/Metal/Grey	8/1/2020		0.35 % wt
7	062013568-0007 Site: 386A/Switch Gear/Metal/Grey	8/1/2020		0.25 % wt
8	062013568-0008 Site: 386B/Transformer/Metal/Grey	8/1/2020		0.032 % wt
9	062013568-0009 Site: 386B/Switchgear/Metal/Blue	8/1/2020		0.12 % wt
10	062013568-0010 Site: 386B/Wall Panels/Metal/Grey Composite	8/1/2020		0.93 % wt
11	062013568-0011 Site: 386/Divider Gate/Metal/Grey	8/1/2020		1.9 % wt
12	062013568-0012 Site: 386/Window-Wood-Grey	8/1/2020		6.8 % wt
13	062013568-0013 Site: 386B/Floor-conc.-Red	8/1/2020		0.36 % wt

Alger Liang, Lead Laboratory Manager
or other approved signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted.

Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.008% wt based on the minimum sample weight per our SOP. "<" (less than) result signifies the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. Definitions of modifications are available upon request.

Samples analyzed by EMSL Analytical, Inc. Carle Place, NY Lab ID 102344 is accredited by AIHA LAP, LLC in the env. accreditation program for Lead in Paint, CT PH-0249, NYS ELAP 11469, CA 2339

Initial report from 08/01/2020 12:38:26



EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Lead (Pb) Chain of Custody

EMSL Order ID (Lab Use Only)

062013568

Company: H2ML50		EMSL-Bill to: <input type="checkbox"/> Same <input type="checkbox"/> Different If Bill to is Different note instructions in Comments**	
Street:		Third Party Billing requires written authorization from third party	
City:	State/Province: NY	Zip/Postal Code:	Country:
Report To (Name): KYLE VANDER SCHUYT		Telephone #:	
Email Address: KVANDERSCHUYT@H2M.COM		Fax #:	Purchase Order:
Project Name/Number: BNVD1905		Please Provide Results: <input type="checkbox"/> Fax <input type="checkbox"/> Email	
U.S. State Samples Taken: New York		CT Samples: <input type="checkbox"/> Commercial/Taxable <input type="checkbox"/> Residential/Tax Exempt	

Turnaround Time (TAT) Options* - Please Check

3 Hour
 6 Hour
 ~~24 Hour~~
 48 Hour
 72 Hour
 96 Hour
 1 Week
 2 Week

*Analysis completed in accordance with EMSL's Terms and Conditions located in the Price Guide

AG

Matrix	Method	Instrument	Reporting Limit	Check
Chips <input checked="" type="checkbox"/> % by wt <input type="checkbox"/> mg/cm ² <input type="checkbox"/> ppm	SW846-7000B	Flame Atomic Absorption	0.01%	<input checked="" type="checkbox"/>
Air	NIOSH 7082	Flame Atomic Absorption	4 µg/filter	<input type="checkbox"/>
	NIOSH 7105	Graphite Furnace AA	0.03 µg/filter	<input type="checkbox"/>
	NIOSH 7300 modified	ICP-AES/ICP-MS	0.5 µg/filter	<input type="checkbox"/>
Wipe* ASTM <input type="checkbox"/> non ASTM <input type="checkbox"/> *if no box is checked, non-ASTM Wipe is assumed	SW846-7000B	Flame Atomic Absorption	10 µg/wipe	<input type="checkbox"/>
	SW846-6010B or C	ICP-AES	1.0 µg/wipe	<input type="checkbox"/>
	SW846-7000B/7010	Graphite Furnace AA	0.075 µg/wipe	<input type="checkbox"/>
TCLP	SW846-1311/7000B/SM 3111B	Flame Atomic Absorption	0.4 mg/L (ppm)	<input type="checkbox"/>
	SW846-1131/SW846-6010B or C	ICP-AES	0.1 mg/L (ppm)	<input type="checkbox"/>
Soil	SW846-7000B	Flame Atomic Absorption	40 mg/kg (ppm)	<input type="checkbox"/>
	SW846-7010	Graphite Furnace AA	0.3 mg/kg (ppm)	<input type="checkbox"/>
	SW846-6010B or C	ICP-AES	2 mg/kg (ppm)	<input type="checkbox"/>
Wastewater Unpreserved <input type="checkbox"/> Preserved with HNO ₃ pH < 2 <input type="checkbox"/>	SM3111B/SW846-7000B	Flame Atomic Absorption	0.4 mg/L (ppm)	<input type="checkbox"/>
	EPA 200.9	Graphite Furnace AA	0.003 mg/L (ppm)	<input type="checkbox"/>
	EPA 200.7	ICP-AES	0.020 mg/L (ppm)	<input type="checkbox"/>
Drinking Water Unpreserved <input type="checkbox"/> Preserved with HNO ₃ pH < 2 <input type="checkbox"/>	EPA 200.9	Graphite Furnace AA	0.003 mg/L (ppm)	<input type="checkbox"/>
	EPA 200.8	ICP-MS	0.001 mg/L (ppm)	<input type="checkbox"/>
TSP/SPM Filter	40 CFR Part 50	ICP-AES	12 µg/filter	<input type="checkbox"/>
	40 CFR Part 50	Graphite Furnace AA	3.6 µg/filter	<input type="checkbox"/>
Other:				

Name of Sampler: Kyle Vander Schuyt Signature of Sampler: *[Signature]*

Sample #	Location	Volume/Area	Date/Time Sampled
1	386A / Panel Box / Metal / Black	2 in ²	0 JUL 27 AM 9:20
2	386A / Floor Paint / Concrete / Grey		
3	386A / Switch Gear leg / Metal / Red		
4	386A / Louvre / Metal / Red & Grey		
5	386A / Louvre / Metal / Black		

Client Sample #'s: - Total # of Samples: 20

Relinquished (Client): *[Signature]* Date: Time: Received (Lab): *[Signature]* Date: 7-27-2020 Time: 9:00a

Comments:

[Handwritten Signature]
8/1/20



EMSL Analytical, Inc.

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<http://www.EMSL.com / carleplacelab@emsl.com>

EMSL Order: 062100780
Customer ID: H2ML50
Customer PO: BNYD1905
Project ID:

Attention: Kyle P. Vander Schuyt
H2M Architects and Engineers
538 Broad Hollow Road
4th Floor East
Melville, NY 11747
Project: Brooklyn Navy Yard, Building 386

Phone: (631) 756-8000
Fax:
Received Date: 01/11/2021 4:12 PM
Analysis Date: 01/15/2021 - 01/18/2021
Collected Date: 01/11/2021

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 1-1 062100780-0001			Description 2nd Floor - North Side - Wall - Gypsum Board Homogeneity Heterogeneous		
PLM NYS 198.1 Friable	01/15/2021	Brown/ Tan	8.00% Cellulose	8.00% Ca Carbonate 72.00% Gypsum 12.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1-2 062100780-0002			Description 2nd Floor - North Side - Wall - Gypsum Board Homogeneity Homogeneous		
PLM NYS 198.1 Friable	01/15/2021	Tan	6.00% Cellulose 76.00% Glass	7.00% Ca Carbonate 11.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 2-1 062100780-0003			Description 2nd Floor - North Side - Wall - Joint Compound Homogeneity Heterogeneous		
PLM NYS 198.1 Friable	01/15/2021	White	3.00% Cellulose	72.00% Ca Carbonate 7.00% Mica 18.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 2-2 062100780-0004			Description 2nd Floor - North Side - Wall - Joint Compound Homogeneity Heterogeneous		
PLM NYS 198.1 Friable	01/15/2021	White	2.00% Cellulose	70.00% Ca Carbonate 6.00% Mica 22.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

Initial report from: 01/18/2021 15:18:54



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EMSL Order: 062100780
Customer ID: H2ML50
Customer PO: BNYD1905
Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 2-3 <i>062100780-0005</i>		Description	2nd Floor - North Side - Wall - Joint Compound		
		Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable	01/15/2021	White	2.00% Cellulose	72.00% Ca Carbonate 8.00% Mica 18.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 3-1 <i>062100780-0006</i>		Description	2nd Floor - North Side - Ceiling - Gypsum Board		
		Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable	01/15/2021	Tan/ White	7.00% Cellulose	8.00% Ca Carbonate 72.00% Gypsum 13.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 3-2 <i>062100780-0007</i>		Description	2nd Floor - North Side - Ceiling - Gypsum Board		
		Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable	01/15/2021	Brown/ Tan/ White	9.00% Cellulose	8.00% Ca Carbonate 73.00% Gypsum 10.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 4-1 <i>062100780-0008</i>		Description	2nd Floor - North Side - Ceiling - Joint Compound		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/15/2021	Gray/ White/ Blue	3.00% Cellulose	75.00% Ca Carbonate 8.00% Mica 14.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 4-2 <i>062100780-0009</i>		Description	2nd Floor - North Side - Ceiling - Joint Compound		
		Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable	01/15/2021	White	3.00% Cellulose	73.00% Ca Carbonate 8.00% Mica 16.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

Initial report from: 01/18/2021 15:18:54



EMSL Analytical, Inc.

528 Mineola Avenue Carle Place, NY 11514
Tel/Fax: (516) 997-7251 / (516) 997-7528
<http://www.EMSL.com> / carleplacelab@emsl.com

EMSL Order: 062100780
Customer ID: H2ML50
Customer PO: BNYD1905
Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 4-3 <i>062100780-0010</i>		Description	2nd Floor - North Side - Ceiling - Joint Compound		
		Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable	01/15/2021	White	4.00% Cellulose	74.00% Ca Carbonate 8.00% Mica 14.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 5-1 <i>062100780-0011</i>		Description	2nd Floor - North Side - 12"x12" Gray Floor Tile		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/18/2021	Gray		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/18/2021	Gray		100.00% Other	None Detected
Sample ID 5-2 <i>062100780-0012</i>		Description	2nd Floor - North Side - 12"x12" Gray Floor Tile		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/18/2021	Gray		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/18/2021	Gray		100.00% Other	None Detected
Sample ID 6-1 <i>062100780-0013</i>		Description	2nd Floor - North Side - 12"x12" Gray Floor Tile Mastic		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/18/2021	Brown		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/18/2021	Brown		100.00% Other	None Detected
Sample ID 6-2 <i>062100780-0014</i>		Description	2nd Floor - North Side - 12"x12" Gray Floor Tile Mastic		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/18/2021	Brown		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/18/2021	Brown		100.00% Other	None Detected
Sample ID 7-1 <i>062100780-0015</i>		Description	2nd Floor - North Side - Blue Cove Base		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/18/2021	Blue		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/18/2021	Blue		100.00% Other	None Detected

Initial report from: 01/18/2021 15:18:54



EMSL Analytical, Inc.

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Tel/Fax: (516) 997-7251 / (516) 997-7528
<http://www.EMSL.com> / carleplacelab@emsl.com

EMSL Order: 062100780
Customer ID: H2ML50
Customer PO: BNYD1905
Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 7-2 <i>062100780-0016</i>		Description	2nd Floor - North Side - Blue Cove Base		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/18/2021	Blue		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/18/2021	Blue		100.00% Other	None Detected
Sample ID 8-1 <i>062100780-0017</i>		Description	2nd Floor - North Side - Blue Cove Base Mastic		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/18/2021	White		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/18/2021	White		100.00% Other	None Detected
Sample ID 8-2 <i>062100780-0018</i>		Description	2nd Floor - North Side - Blue Cove Base Mastic		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/18/2021	White		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/18/2021	White		100.00% Other	None Detected
Sample ID 9-1 <i>062100780-0019</i>		Description	2nd Floor - South Side - Ceiling - Gypsum Board		
		Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable	01/15/2021	Brown/ Tan	8.00% Cellulose	11.00% Ca Carbonate 70.00% Gypsum 11.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 9-2 <i>062100780-0020</i>		Description	2nd Floor - South Side - Ceiling - Gypsum Board		
		Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable	01/15/2021	Brown/ Tan	9.00% Cellulose	8.00% Ca Carbonate 70.00% Gypsum 13.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 10-1 <i>062100780-0021</i>		Description	2nd Floor - South Side - Ceiling - Joint Compound		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/15/2021	White		78.00% Ca Carbonate 8.00% Mica 14.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

Initial report from: 01/18/2021 15:18:54



EMSL Analytical, Inc.

528 Mineola Avenue Carle Place, NY 11514
Tel/Fax: (516) 997-7251 / (516) 997-7528
<http://www.EMSL.com> / carleplacelab@emsl.com

EMSL Order: 062100780
Customer ID: H2ML50
Customer PO: BNYD1905
Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 10-2 062100780-0022		Description	2nd Floor - South Side - Ceiling - Joint Compound		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/15/2021	White		78.00% Ca Carbonate 8.00% Mica 14.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 10-3 062100780-0023		Description	2nd Floor - South Side - Ceiling - Joint Compound		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/15/2021	White		76.00% Ca Carbonate 6.00% Mica 18.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 11-1 062100780-0024		Description	2nd Floor - South Side - Wall - Joint Compound		
		Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable	01/15/2021	White/ Blue		78.00% Ca Carbonate 8.00% Mica 14.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 11-2 062100780-0025		Description	2nd Floor - South Side - Wall - Joint Compound		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/15/2021	White/ Blue	3.00% Cellulose	74.00% Ca Carbonate 8.00% Mica 15.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 11-3 062100780-0026		Description	2nd Floor - South Side - Wall - Joint Compound		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/15/2021	White/ Blue	2.00% Cellulose	73.00% Ca Carbonate 8.00% Mica 17.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

Initial report from: 01/18/2021 15:18:54



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EMSL Order: 062100780
Customer ID: H2ML50
Customer PO: BNYD1905
Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 12-1 <i>062100780-0027</i>			Description 2nd Floor - South Side - Wall - Gypsum Board Homogeneity Heterogeneous		
PLM NYS 198.1 Friable	01/15/2021	Brown/ Tan	6.00% Cellulose	9.00% Ca Carbonate 72.00% Gypsum 13.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 12-2 <i>062100780-0028</i>			Description 2nd Floor - South Side - Wall - Gypsum Board Homogeneity Heterogeneous		
PLM NYS 198.1 Friable	01/15/2021	Brown/ Tan	7.00% Cellulose	8.00% Ca Carbonate 73.00% Gypsum 12.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 13-1 <i>062100780-0029</i>			Description 2nd Floor - South Side - Blue 12"x12" Floor Tile Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/18/2021	Blue		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/18/2021	Blue		100.00% Other	None Detected
Sample ID 13-2 <i>062100780-0030</i>			Description 2nd Floor - South Side - Blue 12"x12" Floor Tile Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/18/2021	Blue		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/18/2021	Blue		100.00% Other	None Detected
Sample ID 14-1 <i>062100780-0031</i>			Description 2nd Floor - South Side - Blue 12"x12" Floor Tile Mastic Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/18/2021	Brown		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/18/2021	Brown		100.00% Other	None Detected
Sample ID 14-2 <i>062100780-0032</i>			Description 2nd Floor - South Side - Blue 12"x12" Floor Tile Mastic Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/18/2021	Brown		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/18/2021	Brown		100.00% Other	None Detected

Initial report from: 01/18/2021 15:18:54



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<http://www.EMSL.com> / carleplacelab@emsl.com

EMSL Order: 062100780
Customer ID: H2ML50
Customer PO: BNYD1905
Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 15-1 <i>062100780-0033</i>		Description	2nd Floor - South Side - White 12"x12" Floor Tile		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/18/2021	Gray		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/18/2021	Gray		100.00% Other	None Detected
Sample ID 15-2 <i>062100780-0034</i>		Description	2nd Floor - South Side - Kitchen and Bathroom - White 12"x12" Floor Tile		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/18/2021	Gray		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/18/2021	Gray		100.00% Other	None Detected
Sample ID 16-1 <i>062100780-0035</i>		Description	2nd Floor - South Side - Kitchen and Bathroom - White 12"x12" Floor Tile Mastic		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/18/2021	Yellow		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/18/2021	Yellow		100.00% Other	None Detected
Sample ID 16-2 <i>062100780-0036</i>		Description	2nd Floor - South Side - Kitchen and Bathroom - White 12"x12" Floor Tile Mastic		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/18/2021	Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/18/2021	Black		100.00% Other	None Detected
Sample ID 17-1 <i>062100780-0037</i>		Description	2nd Floor - South Side - Kitchen and Bathroom - Black Cove Base		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/18/2021	Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/18/2021	Black		100.00% Other	None Detected
Sample ID 17-2 <i>062100780-0038</i>		Description	2nd Floor - South Side - Kitchen and Bathroom - Black Cove Base		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/18/2021	Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/18/2021	Black		100.00% Other	None Detected

Initial report from: 01/18/2021 15:18:54



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EMSL Order: 062100780
Customer ID: H2ML50
Customer PO: BNYD1905
Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 18-1 062100780-0039			Description 2nd Floor - South Side - Kitchen and Bathroom - Black Cove Base Mastic Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/18/2021	Yellow		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/18/2021	Yellow		100.00% Other	None Detected
Sample ID 18-2 062100780-0040			Description 2nd Floor - South Side - Kitchen and Bathroom - Black Cove Base Mastic Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/18/2021	Yellow		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/18/2021	Yellow		100.00% Other	None Detected
Sample ID 19-1 062100780-0041			Description 2nd Floor - South Side (Also in Attic) - Pipe Insulation (Paper-Made Outer Layer) Homogeneity Heterogeneous		
PLM NYS 198.1 Friable	01/15/2021	Brown/ Tan/ White	22.00% Cellulose 22.00% Min. Wool	48.00% Non-fibrous (other)	8.00% Chrysotile
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 19-2 062100780-0042			Description 2nd Floor - South Side (Also in Attic) - Pipe Insulation (Paper-Made Outer Layer) Homogeneity		
PLM NYS 198.1 Friable	01/15/2021				Positive Stop (Not Analyzed)
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 19-3 062100780-0043			Description 2nd Floor - South Side (Also in Attic) - Pipe Insulation (Paper-Made Outer Layer) Homogeneity		
PLM NYS 198.1 Friable	01/15/2021				Positive Stop (Not Analyzed)
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 20-1 062100780-0044			Description 2nd Floor - South Side (Also in Attic) - Mud Joint Packing Homogeneity Homogeneous		
PLM NYS 198.1 Friable	01/15/2021	Tan/ White	None	22.00% Ca Carbonate 54.00% Non-fibrous (other)	24.00% Chrysotile
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

Initial report from: 01/18/2021 15:18:54



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EMSL Order: 062100780
Customer ID: H2ML50
Customer PO: BNYD1905
Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 20-2 062100780-0045		Description	2nd Floor - South Side (Also in Attic) - Mud Joint Packing		
		Homogeneity			
PLM NYS 198.1 Friable	01/15/2021				Positive Stop (Not Analyzed)
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 20-3 062100780-0046		Description	2nd Floor - South Side (Also in Attic) - Mud Joint Packing		
		Homogeneity			
PLM NYS 198.1 Friable	01/15/2021				Positive Stop (Not Analyzed)
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 21-1 062100780-0047		Description	2nd Floor - Exterior - Window Caulk		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/18/2021	Gray	None	100.00% Other	Inconclusive : <1% Chrysotile
TEM NYS 198.4 NOB	01/18/2021	Gray	None	100.00% Other	<1% Chrysotile
Sample ID 21-2 062100780-0048		Description	2nd Floor - Exterior - Window Caulk		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/18/2021	Gray	None	100.00% Other	Inconclusive : <1% Chrysotile
TEM NYS 198.4 NOB	01/18/2021	Gray	None	100.00% Other	<1% Chrysotile

Initial report from: 01/18/2021 15:18:54



EMSL Analytical, Inc.

528 Mineola Avenue Carle Place, NY 11514
Tel/Fax: (516) 997-7251 / (516) 997-7528
<http://www.EMSL.com> / carleplacelab@emsl.com

EMSL Order: 062100780
Customer ID: H2ML50
Customer PO: BNYD1905
Project ID:

Test Report:Asbestos Analysis of Bulk Material

The samples in this report were submitted to EMSL for analysis by Asbestos Analysis of Bulk Materials via NYS ELAP Approved Methods. The reference number for these samples is the EMSL Order ID above. Please use this reference number when calling about these samples.

Report Comments:

Sample Receipt Date: 1/11/2021
Analysis Completed Date: 1/15/2021

Sample Receipt Time: 4:12 PM
Analysis Completed Time: 6:40 PM

Analyst(s):

Jimmy Encalada PLM NYS 198.1 Friable (22)

Jimmy Encalada PLM NYS 198.6 NOB (22)

Rosemary Ortega TEM NYS 198.4 NOB (22)

Samples reviewed and approved by:

Daniel Clarke, Asbestos Laboratory Manager
or Other Approved Signatory

NOB = Non Friable Organically Bound N/A = Not Applicable VCM = Vermiculite Containing Material

-In New York State, TEM is currently the only method that can be used to determine if NOB materials can be considered or treated as non-asbestos containing.

All samples examined for the presence of vermiculite when analyzed via NYS 198.1.

-NYS Guidelines for Vermiculite containing samples are available at http://www.wadsworth.org/labcert/elapcert/forms/VermiculiteInterimGuidance_Rev070913.pdf EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples were received in good condition unless otherwise noted.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. This report may contain data that is not covered by the NVLAP accreditation.

Samples analyzed by EMSL Analytical, Inc. Carle Place, NY NYS ELAP 11469, NVLAP Lab Code 101048-10

Initial report from: 01/18/2021 15:18:54

062100780

H2M architects + engineers

Bulk Sheet and Chain of Custody

Page 2 OF 2

H2M L50	Site Address Brooklyn Navy Yard,	Date Submitted: 1/11/21
Address: 538 Broad Hollow Road 4 th Floor East Melville, NY 11747	Work Area Building 386	Turn Around Time: 1 Week
	Fax Results to:	E-mail Results to:
		Number of Samples: 48

Analytical Procedure: (Circle One)	NY ELAP Method 198.1 (friable in NY)	NY ELAP Method 198.6 (non-friable-NY)	NY ELAP Method 198.4 (TEM)	Billing # BNYD1905
---------------------------------------	-----------------------------------------	------------------------------------------	-------------------------------	-----------------------

Sample Number	Location	Sample Description	Comments	
12-1	2 nd Floor-South side	Wall Gypsum Board		
12-2	↓			
13-1		Blue 12x12 Floor Tile		
13-2				
14-1		Blue 12x12 Floor Tile Mastic		
14-2				
15-1		2 nd Floor-South side,	White 12x12 Floor Tile	
15-2		Kitchen + Bathroom		
16-1			White 12x12 Floor Tile Mastic	
16-2				
17-1			Black Cove Base	
17-2				
18-1			Black Cove Base Mastic	
18-2				
19-1		2 nd Floor - South side	Pipe Insulation (paper mache outer layer)	
19-2		(also in attic)		
19-3				
20-1			Mud Joint Packing	
20-2				
20-3				
21-1	2 nd Floor-Exterior	Window Caulk		
21-2				

21 JAN 11 PM 1:12
 CARLE PLACE, NY
 516 997-7528

Relinquished by (signature) <i>Doug Miller</i>	Date 1/11	Time	Received by (signature) <i>[Signature]</i>	Date	Agent of. EMSL
Relinquished by (signature)	Date	Time	Received by (signature)	Date	Agent of:

*** PLEASE STOP @ 7⁵ + ***
 EMSL 528 Mineola Ave, Carle Place, NY 11514 Phone (516) 997-7251 Fax (516) 997-7528
 1/15/21 7:46pm 1/15/21

H2M L50		Site Address Brooklyn Navy Yard		Date Submitted: 1/11/21		
Address: 538 Broad Hollow Road 4 th Floor East Melville, NY 11747		Work Area: Building 386		Turn Around Time: 1 Week		
		Fax Results to:	E-mail Results to: kvanderschuyt@h2m.com	Number of Samples: 48		
Analytical Procedure: (Circle One)			<input checked="" type="radio"/> NY ELAP Method 198.1 (friable in NY)	<input type="radio"/> NY ELAP Method 198.6 (non-friable-NY)	<input type="radio"/> NY ELAP Method 198.4 (TEM)	Billing # BNYD1905
Sample Number	Location		Sample Description	Comments		
1-1	2 nd Floor - North side		Wall Gypsum Board			
1-2			↓			
2-1			Wall Joint Compound			
2-2			↓			
2-3			↓			
3-1			Ceiling Gypsum Board			
3-2			↓			
4-1			Ceiling Joint Compound			
4-2		↓				
4-3		↓				
5-1		12x12 Grey Floor Tile				
5-2		↓				
6-1		12x12 Grey Floor Tile Mastic				
6-2		↓				
7-1		Blue Cove Base				
7-2		↓				
8-1		Blue Cove Base Mastic				
8-2		↓				
9-1	2 nd Floor - South side		Ceiling Gypsum Board			
9-2			↓			
10-1			Ceiling Joint Compound			
10-2			↓			
10-3			↓			
11-1		Wall Joint Compound				
11-2		↓				
11-3		↓				

21 JUN 11 11:14:12
EMSL
CARLE PLACE, NY

Relinquished by (signature) <i>[Signature]</i>	Date 1/11/21	Time	Received by (signature) <i>[Signature]</i>	Date 1/11/21	Agent of EMSL
Relinquished by (signature)	Date	Time	Received by (signature)	Date	Agent of

**** PLEASE STOP AT 1ST POSITIVE ****

[Signature]
1/15/21 7:46pm

EMSL 528 Mineola Ave, Carle Place, NY 11514 Phone (516) 997-7251 Fax (516) 997-7528

[Signature] 1/18/21

**EMSL Analytical, Inc.**

528 Mineola Avenue, Carle Place, NY 11514

Phone/Fax: (516) 997-7251 / (516) 997-7528

<http://www.EMSL.com>carleplacelab@emsl.com

EMSL Order: 062100800

CustomerID: H2ML50

CustomerPO: BNYD1905

ProjectID:

Attn: **Kyle P. Vander Schuyt**
H2M Architects and Engineers
538 Broad Hollow Road
4th Floor East
Melville, NY 11747

Phone: (631) 756-8000
 Fax:
 Received: 01/11/21 4:11 PM
 Collected: 1/6/2021

Project: BNYD1905

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3051A/7000B)*

<i>Client Sample Description</i>	<i>Lab ID</i>	<i>Collected</i>	<i>Analyzed</i>	<i>Lead Concentration</i>
1 Site: 386 2nd Floor-Off-White Wall Paint	062100800-0001	1/6/2021	1/16/2021	0.0086 % wt
2 Site: 386 2nd Floor-Blue Wall Paint	062100800-0002	1/6/2021	1/16/2021	<0.0080 % wt
3 Site: 2nd Floor, South-White Ceiling Paint	062100800-0003	1/6/2021	1/16/2021	<0.0080 % wt
4 Site: 2nd Floor, South-White Wall, Women's Bath	062100800-0004	1/6/2021	1/16/2021	<0.0080 % wt
5 Site: 2nd Floor, South, Kitchen-Wall, Beige	062100800-0005	1/6/2021	1/16/2021	<0.0080 % wt
6 Site: 386 Stairs-White Paint	062100800-0006	1/6/2021	1/16/2021	<0.0080 % wt
7 Site: 386 Stairs-Blue Paint	062100800-0007	1/6/2021	1/16/2021	2.9 % wt
8 Site: 1st Floor, Exterior Metal Door, Blue Paint	062100800-0008	1/6/2021	1/16/2021	0.12 % wt
9 Site: 386 Stairs, Red Paint	062100800-0009	1/6/2021	1/16/2021	<0.0080 % wt
10 Site: 386 Stairs, Yellow Paint	062100800-0010	1/6/2021	1/16/2021	1.5 % wt
11 Site: 2nd Floor North-White Ceiling Paint	062100800-0011	1/6/2021	1/16/2021	0.011 % wt
12 Site: Attic, Metal Girders-White Paint	062100800-0012	1/6/2021	1/16/2021	0.29 % wt

Alger Liang, Lead Laboratory Manager
 or other approved signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted.

Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.008% wt based on the minimum sample weight per our SOP. "<" (less than) result signifies the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. Definitions of modifications are available upon request.

Samples analyzed by EMSL Analytical, Inc. Carle Place, NY Lab ID 102344 is accredited by AIHA LAP, LLC in the env. accreditation program for Lead in Paint, CT PH-0249, NYS ELAP 11469, CA 2339

Initial report from 01/16/2021 10:40:39



EMSL ANALYTICAL, INC.
LABORATORY PRODUCTS TRAINING

Lead (Pb) Chain of Custody

EMSL Order ID (Lab Use Only):

062100800

PHONE: ()
FAX: ()

Company: H2M L50		EMSL-Bill to: <input checked="" type="checkbox"/> Same <input type="checkbox"/> Different If Bill to is Different note instructions in Comments**	
Street: 290 Broadhollow Road		Third Party Billing requires written authorization from third party	
City: Melville	State/Province: NY	Zip/Postal Code:	Country:
Report To (Name): Kyle Vander Schuyt		Telephone #:	
Email Address: kvanderschuyt@h2m.com		Fax #:	Purchase Order:
Project Name/Number: BNYD1905		Please Provide Results: <input type="checkbox"/> Fax <input type="checkbox"/> Email	
U.S. State Samples Taken: NY		CT Samples: <input type="checkbox"/> Commercial/Taxable <input type="checkbox"/> Residential/Tax Exempt	

Turnaround Time (TAT) Options* - Please Check

3 Hour
 6 Hour
 24 Hour
 48 Hour
 72 Hour
 96 Hour
 1 Week
 2 Week

*Analysis completed in accordance with EMSL's Terms and Conditions located in the Price Guide

ABR

Matrix	Method	Instrument	Reporting Limit	Check
Chips <input checked="" type="checkbox"/> % by wt. <input type="checkbox"/> mg/cm ² <input type="checkbox"/> ppm (mg/kg)	SW846-7000B	Flame Atomic Absorption	0.01%	<input type="checkbox"/> DI
Air CP	NIOSH 7082	Flame Atomic Absorption	4 µg/filter	<input type="checkbox"/>
	NIOSH 7105	Graphite Furnace AA	0.03 µg/filter	<input type="checkbox"/>
	NIOSH 7300M/NIOSH 7303	ICP-OES	0.5 µg/filter	<input type="checkbox"/>
Wipe* ASTM <input type="checkbox"/> non ASTM <input type="checkbox"/> <small>*if no box checked, non-ASTM Wipe assumed</small>	SW846-7000B	Flame Atomic Absorption	10 µg/wipe	<input type="checkbox"/>
	SW846-6010B or C	ICP-OES	1.0 µg/wipe	<input type="checkbox"/>
TCLP	SW846-1311/7000B/SM 3111B	Flame Atomic Absorption	0.4 mg/L (ppm)	<input type="checkbox"/>
	SW846-1311/SW846-6010B or C	ICP-OES	0.1 mg/L (ppm)	<input type="checkbox"/>
SPLP	SW846-1312/7000B/SM 3111B	Flame Atomic Absorption	0.4 mg/L (ppm)	<input type="checkbox"/>
	SW846-1312/SW846-6010B or C	ICP-OES	0.1 mg/L (ppm)	<input type="checkbox"/>
TTLC	22 CCR App. II, 7000B/7420	Flame Atomic Absorption	40 mg/kg (ppm)	<input type="checkbox"/>
	22 CCR App. II, SW846-6010B or C	ICP-OES	2 mg/kg (ppm)	<input type="checkbox"/>
STLC	22 CCR App. II, 7000B/7420	Flame Atomic Absorption	0.4 mg/L (ppm)	<input type="checkbox"/>
	22 CCR App. II, SW846-6010B or C	ICP-OES	0.1 mg/L (ppm)	<input type="checkbox"/>
Soil	SW846-7000B	Flame Atomic Absorption	40 mg/kg (ppm)	<input type="checkbox"/>
	SW846-6010B or C	ICP-OES	2 mg/kg (ppm)	<input type="checkbox"/>
Wastewater Unpreserved <input type="checkbox"/> Preserved with HNO ₃ pH < 2 <input type="checkbox"/>	SM3111B/SW846-7000B	Flame Atomic Absorption	0.4 mg/L (ppm)	<input type="checkbox"/>
	EPA 200.9	Graphite Furnace AA	0.003 mg/L (ppm)	<input type="checkbox"/>
	EPA 200.7	ICP-OES	0.020 mg/L (ppm)	<input type="checkbox"/>
Drinking Water Unpreserved <input type="checkbox"/> Preserved with HNO ₃ pH < 2 <input type="checkbox"/>	EPA 200.8	ICP-MS	0.001 mg/L (ppm)	<input type="checkbox"/>
	EPA 200.9	Graphite Furnace AA	0.003 mg/L (ppm)	<input type="checkbox"/>
	EPA 200.5	ICP-OES	0.003 mg/L (ppm)	<input type="checkbox"/>
TSP/SPM Filter	40 CFR Part 50	ICP-OES	12 µg/filter	<input type="checkbox"/>
	40 CFR Part 50	Graphite Furnace AA	3.6 µg/filter	<input type="checkbox"/>
Other:				<input type="checkbox"/>

Name of Sampler: **KYLE VANDERSCHUYT** Signature of Sampler: *[Signature]*

Sample #	Location	Volume/Area	Date/Time Sampled
1	386 2 nd Floor - Off-white Wall Paint	2' x 2"	1/6/21
2	386 2 nd Floor - Blue Wall Paint	↓	↓

Client Sample #s: **1 - 12** Total # of Samples: **12**

Relinquished (Client): *[Signature]* Date: **1/11/21** Time: **11:41 AM**

Received (Lab): *[Signature]* Date: **1/11/2021** Time: **4:11 PM**

Comments:

[Signature]
1/16/21

Brooklyn Navy Yard

TRANSFORMER TRACKING SHEET

BUILDING 234, DIFFERENT PROJECT

PICKUP LOCATION: 63 Flushing Ave				VENDOR - TCI of NY, LLC Page 1 of 1				SAMPLE DATE: 3/25/23	
TCI Number	Test Result	Serial Number	Gal Oil	LBS	KVA	Manuf. Name	Trans. Type	DATE	Comments
2729	165	7081400	1620	39500	4500	GE	3Ø		
2730	ND	K-6274011-401	30?			GE	OCB		
2731	215	7104499	1620	39500	4500	GE	3Ø		
2732	7	K-6274023-401	30?			GE	OCB		
2733	278	7081468	1620	39500	4500	GE	3Ø		
2734	5		30?			GE	OCB		
2735	79	7085375	482	19900	2000	GE	3Ø		Silicone
(2)	PCB	Potheads attached					Pot H		
2736	210	7085311	482	19900	2000	GE	3Ø		Silicone
(2)	PCB	Potheads attached					Pot H		
2737	415	7085372	482	19900	2000	GE	3Ø		Silicone
(2)	PCB	Potheads attached					Pot H		
2738	809	7085377	482	19900	2000	GE	3Ø		Silicone
(2)	PCB	Potheads attached					Pot H		
2739	1000	6909934	262	10100	450	GE	3Ø		Silicone
2740	13700	6909935	262	10100	450	GE	3Ø		"
2741	35	6583144	55		100	GE	3Ø		"
2742	45	6583145	55		100	GE	3Ø		"

Sample Technician

TJ Coons

Brooklyn Navy Yard 2/17/23
63 Flushing Ave Brooklyn NY

outside:

#1 General Electric 3Ø Pad 4500 Kva

S/N: 7081468 39500 Total

Core - 18400 Case - 9000 oil - 12160 @ 1620 gal

undressed = 10'6" T (Edge of Lid) x 8' W x 10' L

① Expansion Tank - Needs to be removed to make < 12' T

① Breaker cabinet (attached BY cable TRAY) - 6'6" T x 5' W x 7'6" L

① oil Breaker inside cabinet

#2 Same as #1

S/N: 7104499

Inside:

#3 General Electric 3Ø Pad 2000 Kva

Pyranol S/N: 7085372 19900 Total

3Ø Core - 8650 Case - 5000 oil - 6250 @ 482 gal

AS IS 9'9" T x 7'6" W x 8' L

② Tar/compound Assumed PCB Potheads - attached

#4 Same as #3

3Ø S/N: 7085377

Pyranol ② Tar/compound Assumed PCB Potheads - attached

#5 Same as #3

3Ø S/N: 7085375

Pyranol ② Tar/compound Assumed PCB Potheads - attached

#6 Same as #3
3Ø S/N: 7085371
Pyranol (2) Tar/compound Assumed PCB Potheads - attached

#7 General Electric 3Ø Pad 450 Kva
3Ø S/N: 6909935 10100 lbs Total
Pyranol Core-3200 Case-3500 oil-3400 @ 262 gal
As is 6'9" T x 4'w x 8'L

#8 Same as #7
3Ø S/N: 6909934
Pyranol

#9 General Electric 3Ø Pad 100 Kva
3Ø S/N: 6583144 2500 lbs Total ??
Pyranol 55 gallons
4' T x 2'6" w x 4' L

#10 Same as #9
3Ø S/N: 6583145
Pyranol

Total onsite

outside	inside
(2) Big 3Ø	(4) Lg 3Ø
(2) Breaker cabinets	(2) med 3Ø
(2) oil Breakers	(2) sm 3Ø
3240 gallons	(8) Potheads
	2562 gallons

Brooklyn Navy Yard 2/17/23
63 Flushing Ave Brooklyn NY

Units coming out at a later time

#1 General Electric 3Ø Pad 4500 KVA

3Ø S/N: 7081401 39500 Total

Core - 18400 Case - 9000 oil - 12100 @ 1620 gal

undressed = 10'6" T (Edge of Lid) x 8' W x 10' L

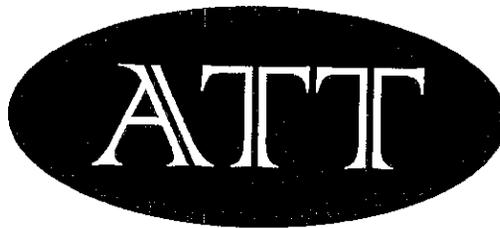
① Expansion Tank - needs to be removed to make $2'12''$ T

① Breaker Cabinet (attached to cable tray) - 6'6" T x 5' W x 7'6" L

① oil Breaker inside cabinet

#2 Same as #1

3Ø S/N: 7081400



American Testing Technologies, Inc.

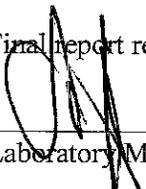
TCI of NY, LLC
Attn: Julie Bullard
PO Box 936
99 Coeymans Industrial Park Lane
Coeymans, NY 12045

Date Received: 03/28/2023
Date Reported: 04/03/2023
Date Collected: 03/25/2023
Time Collected: 9:30 AM
Matrix: Oil
Client ID: Brooklyn Navy Yard T2729
Laboratory ID: 032823-45

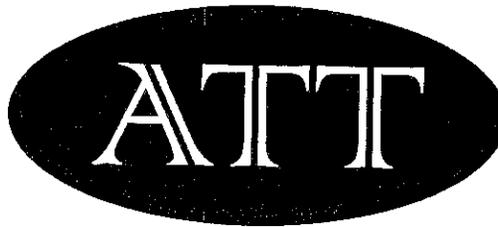
Certificate of Analysis
Brooklyn Navy Yard T2729

Parameter	Results	Detection Limits	Method	Units	Date of Analysis
Silicone	<2	2	D5185	PPM	03/30/2023
PCBs-Aroclor 1016	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1221	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1232	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1242	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1248	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1254	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1260	165	0.199	8082A	PPM	03/30/2023
PCBs, Total	165	0.199	8082A	PPM	03/30/2023

Final report reviewed by:



Laboratory Manager



American Testing Technologies, Inc.

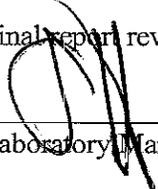
TCI of NY, LLC
Attn: Julie Bullard
PO Box 936
99 Coeymans Industrial Park Lane
Coeymans, NY 12045

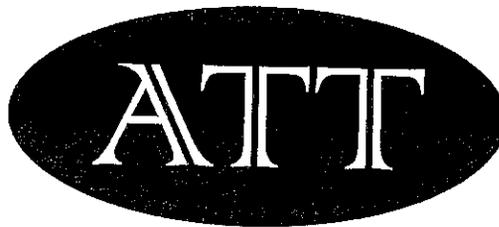
Date Received: 03/28/2023
Date Reported: 04/03/2023
Date Collected: 03/25/2023
Time Collected: 9:30 AM
Matrix: Oil
Client ID: Brooklyn Navy Yard T2730
Laboratory ID: 032823-46

Certificate of Analysis
Brooklyn Navy Yard T2730

Parameter	Results	Detection Limits	Method	Units	Date of Analysis
Silicone	<2	2	D5185	PPM	03/30/2023
PCBs-Aroclor 1016	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1221	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1232	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1242	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1248	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1254	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1260	<0.199	0.199	8082A	PPM	03/30/2023
PCBs, Total	<0.199	0.199	8082A	PPM	03/30/2023

Final report reviewed by:


Laboratory Manager



American Testing Technologies, Inc.

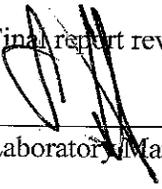
TCI of NY, LLC
Attn: Julie Bullard
PO Box 936
99 Coeymans Industrial Park Lane
Coeymans, NY 12045

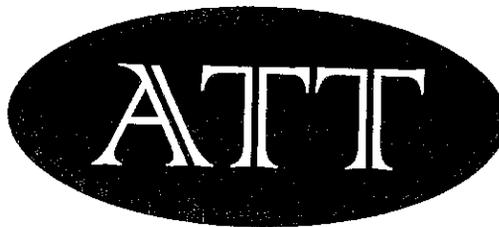
Date Received: 03/28/2023
Date Reported: 04/03/2023
Date Collected: 03/25/2023
Time Collected: 9:30 AM
Matrix: Oil
Client ID: Brooklyn Navy Yard T2731
Laboratory ID: 032823-47

Certificate of Analysis
Brooklyn Navy Yard T2731

Parameter	Results	Detection Limits	Method	Units	Date of Analysis
Silicone	<2	2	D5185	PPM	03/30/2023
PCBs-Aroclor 1016	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1221	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1232	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1242	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1248	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1254	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1260	215	0.199	8082A	PPM	03/30/2023
PCBs, Total	215	0.199	8082A	PPM	03/30/2023

Final report reviewed by:


Laboratory Manager



American Testing Technologies, Inc.

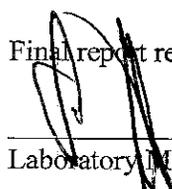
TCI of NY, LLC
Attn: Julie Bullard
PO Box 936
99 Coeymans Industrial Park Lane
Coeymans, NY 12045

Date Received: 03/28/2023
Date Reported: 04/03/2023
Date Collected: 03/25/2023
Time Collected: 9:30 AM
Matrix: Oil
Client ID: Brooklyn Navy Yard T2732
Laboratory ID: 032823-48

Certificate of Analysis
Brooklyn Navy Yard T2732

Parameter	Results	Detection Limits	Method	Units	Date of Analysis
Silicone	<2	2	D5185	PPM	03/30/2023
PCBs-Aroclor 1016	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1221	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1232	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1242	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1248	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1254	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1260	7	0.199	8082A	PPM	03/30/2023
PCBs, Total	7	0.199	8082A	PPM	03/30/2023

Final report reviewed by:



Laboratory Manager



American Testing Technologies, Inc.

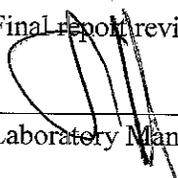
TCI of NY, LLC
Attn: Julie Bullard
PO Box 936
99 Coeymans Industrial Park Lane
Coeymans, NY 12045

Date Received: 03/28/2023
Date Reported: 04/03/2023
Date Collected: 03/25/2023
Time Collected: 9:30 AM
Matrix: Oil
Client ID: Brooklyn Navy Yard T2733
Laboratory ID: 032823-49

Certificate of Analysis
Brooklyn Navy Yard T2733

Parameter	Results	Detection Limits	Method	Units	Date of Analysis
Silicone	<2	2	D5185	PPM	03/30/2023
PCBs-Aroclor 1016	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1221	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1232	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1242	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1248	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1254	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1260	278	0.199	8082A	PPM	03/30/2023
PCBs, Total	278	0.199	8082A	PPM	03/30/2023

Final report reviewed by:



Laboratory Manager



American Testing Technologies, Inc.

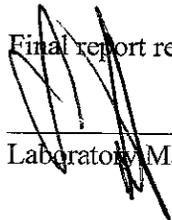
TCI of NY, LLC
Attn: Julie Bullard
PO Box 936
99 Coeymans Industrial Park Lane
Coeymans, NY 12045

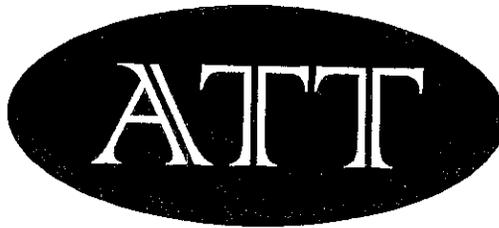
Date Received: 03/28/2023
Date Reported: 04/03/2023
Date Collected: 03/25/2023
Time Collected: 9:30 AM
Matrix: Oil
Client ID: Brooklyn Navy Yard T2734
Laboratory ID: 032823-50

Certificate of Analysis
Brooklyn Navy Yard T2734

Parameter	Results	Detection Limits	Method	Units	Date of Analysis
Silicone	<2	2	D5185	PPM	03/30/2023
PCBs-Aroclor 1016	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1221	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1232	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1242	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1248	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1254	<0.199	0.199	8082A	PPM	03/30/2023
PCBs-Aroclor 1260	5	0.199	8082A	PPM	03/30/2023
PCBs, Total	5	0.199	8082A	PPM	03/30/2023

Final report reviewed by:


Laboratory Manager



TCI of NY, LLC
 Attn: Julie Bullard
 PO Box 936
 99 Coeymans Industrial Park Lane
 Coeymans, NY 12045

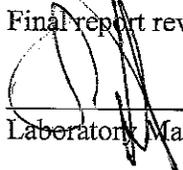
American Testing Technologies, Inc.

Date Received: 03/28/2023
 Date Reported: 04/03/2023
 Date Collected: 03/25/2023
 Time Collected: 9:30 AM
 Matrix: Oil
 Method: 8082A
 Date of Analysis: 03/30/2023

Certificate of Analysis
Brooklyn Navy Yard – 63 Flushing Ave

Lab ID No.	Client ID No.	Aroclor 1016 PPM	Aroclor 1221 PPM	Aroclor 1232 PPM	Aroclor 1242 PPM	Aroclor 1248 PPM	Aroclor 1254 PPM	Aroclor 1260 PPM	PCBs Total PPM
032823-51	T2735	<0.199	<0.199	<0.199	<0.199	<0.199	<0.199	79	79
032823-52	T2736	<0.199	<0.199	<0.199	<0.199	<0.199	<0.199	210	210
032823-53	T2737	<0.199	<0.199	<0.199	<0.199	<0.199	<0.199	415	415
032823-54	T2738	<0.199	<0.199	<0.199	<0.199	<0.199	<0.199	804	804
032823-55	T2739	<0.199	<0.199	<0.199	<0.199	<0.199	<0.199	1,000	1,000
032823-56	T2740	<0.199	<0.199	<0.199	<0.199	<0.199	<0.199	13,700	13,700
032823-57	T2741	<0.199	<0.199	<0.199	<0.199	<0.199	<0.199	35	35
032823-58	T2742	<0.199	<0.199	<0.199	<0.199	<0.199	<0.199	45	45
Detection Limits		0.199	0.199	0.199	0.199	0.199	0.199	0.199	0.199

Final report reviewed by:


 Laboratory Manager



ATTACHMENT 2

H2M'S PERSONNEL LICENSES AND CERTIFICATIONS

New York State – Department of Labor

Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

H2M Architects, Engineers, Land Surveying and
Landscape Architecture, D.P.C.
4th Floor East
538 Broad Hollow Road
Melville, NY 11747

FILE NUMBER: 00-0724
LICENSE NUMBER: 28582
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 12/11/2020
EXPIRATION DATE: 12/31/2021

Duly Authorized Representative – Debra Mattina:

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.



Eileen M. Franko, Director
For the Commissioner of Labor

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

JULY 9



FRANK J ACCIARITO
CLASS(EXPIRES)
C ATEC(07/21) D INSP(07/21)
H PM (07/21)

CERT# 18-63276
DL# 800811396

MUST BE CARRIED ON ASBESTOS PROJECTS

STATE OF NEW YORK DEPARTMENT OF LABOR



IF FOUND RETURN TO:
NYSOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12240



01213 00537034 28

EYES HAZ
HAIR BLK
HGT 5' 08"

NYC DEP ASBESTOS CONTROL PROGRAM
ASBESTOS CERTIFICATE



MILNE,
DOUGLAS
INVESTIGATOR
160491

EXPIRES: 02/12/2023
DOB:02/12/1994 M 6' 02"

MUST BE CARRIED ON ALL ASBESTOS PROJECTS



DMV ID: 316381023

This certificate must be shown to a NYCDEP representative upon request.
Report loss immediately to NYCDEP
Asbestos Control Program, 8th floor
59-17 Junction Blvd., Flushing, NY 11373

01213 004912777 27

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE



DOUGLAS B MILNE
CLASS(EXPIRES)
C ATEC(02/21) D INSP(02/21)
H PM (02/21)

CERT# 13-14307
DMV# 316381023

MUST BE CARRIED ON ASBESTOS PROJECTS



IF FOUND RETURN TO:

EYES BLU
HAIR BLN
HGT 6' 03"

NYS DOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12240

01213 005367571 62

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE




KYLE P VANDERSCHUYT
CLASS(EXPIRES)
C ATEC(09/21) D INSP(09/21)
H PM (09/21)

CERT# 12-11293
DMV# 879283550

MUST BE CARRIED ON ASBESTOS PROJECTS



01213 005580428 08



EYES BRO
HAIR BRO
HGT 6' 01"

IF FOUND RETURN TO:
NYS DOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12240

NYC DEP ASBESTOS CONTROL PROGRAM
ASBESTOS CERTIFICATE



VANDERSCHUYT,
KYLE
INVESTIGATOR
149351

EXPIRES: 09/21/2022
DOB:09/21/1993 M 6' 00"

MUST BE CARRIED ON ALL ASBESTOS PROJECTS



01213 004912433 23



DMV ID: 879283550
This certificate must be shown to a
NYCDEP representative upon request.
Report loss immediately to NYCDEP
Asbestos Control Program, 8th floor
59-17 Junction Blvd., Flushing, NY 11373

United States Environmental Protection Agency

This is to certify that

H2M Architects + Engineers

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires July 07, 2022

LBP-1482-2

Certification #

May 13, 2019

Issued On



A handwritten signature in black ink that reads "Michelle Price".

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

United States Environmental Protection Agency

This is to certify that



Kyle P Vander Schuyt

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Inspector

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires March 17, 2023

A handwritten signature in blue ink, appearing to read 'SS' with a long horizontal flourish extending to the right.

Susan Schulz, Acting Chief

Chemicals and Multimedia Programs
Branch

LBP-I-173781-2

Certification #

February 21, 2020

Issued On

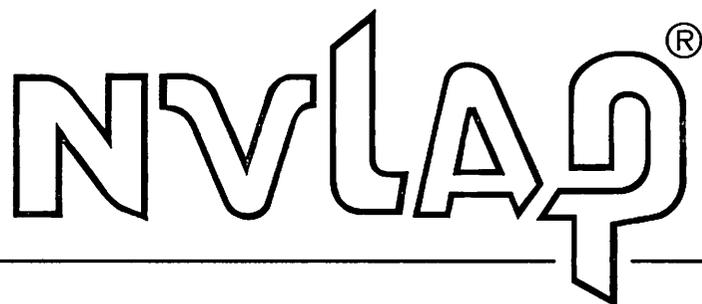




ATTACHMENT 3

EMSL'S CERTIFICATIONS

United States Department of Commerce
National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 101048-10

EMSL Analytical, Inc.
Carle Place, NY

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services,
listed on the Scope of Accreditation, for:*

Asbestos Fiber Analysis

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017.
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality
management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).*

2020-07-01 through 2021-06-30

Effective Dates



A handwritten signature in black ink, appearing to read 'Dana S. Haman', written over a horizontal line.

For the National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

EMSL Analytical, Inc.

528 Mineola Ave.

Carle Place, NY 11514

Daniel Clarke

Phone: 516-997-7251

Email: dclarke@emsl.com

http://www.emsl.com

ASBESTOS FIBER ANALYSIS

NVLAP LAB CODE 101048-10

Bulk Asbestos Analysis

Code

Description

18/A01

EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples

18/A03

EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

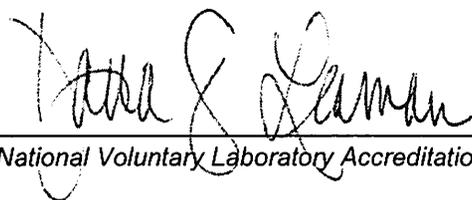
Airborne Asbestos Analysis

Code

Description

18/A02

U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.



For the National Voluntary Laboratory Accreditation Program

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2021
Issued April 01, 2020

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. DANIEL CLARKE
EMSL ANALYTICAL, INC.
528 MINEOLA AVE.
CARLE PLACE, NY 11514

NY Lab Id No: 11469

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2003) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Characteristic Testing

TCLP EPA 1311

Metals I

Lead, Total EPA 7000B

Sample Preparation Methods

EPA 3051A



Serial No.: 61401

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2021
Issued April 01, 2020

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. DANIEL CLARKE
EMSL ANALYTICAL, INC.
528 MINEOLA AVE.
CARLE PLACE, NY 11514

NY Lab Id No: 11469

*is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:*

Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual
Asbestos-Vermiculite-Containing Material	Item 198.8 of Manual
Lead in Dust Wipes	EPA 7000B
Lead in Paint	EPA 7000B

Sample Preparation Methods

EPA 3051A

NEW
YORK
STATE

Department
of Health

Serial No.: 61402

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2021
Issued April 01, 2020
Revised April 07, 2020

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. PHILLIP M. WORBY
EMSL ANALYTICAL INC
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077

NY Lab Id No: 10872

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2003) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016)	EPA 8082A
Aroclor 1221 (PCB-1221)	EPA 8082A
Aroclor 1232 (PCB-1232)	EPA 8082A
Aroclor 1242 (PCB-1242)	EPA 8082A
Aroclor 1248 (PCB-1248)	EPA 8082A
Aroclor 1254 (PCB-1254)	EPA 8082A
Aroclor 1260 (PCB-1260)	EPA 8082A
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A
PCB 1	EPA 8082A
PCB 101	EPA 8082A
PCB 110	EPA 8082A
PCB 138	EPA 8082A
PCB 141	EPA 8082A
PCB 151	EPA 8082A
PCB 153	EPA 8082A
PCB 170	EPA 8082A
PCB 18	EPA 8082A
PCB 180	EPA 8082A
PCB 183	EPA 8082A
PCB 187	EPA 8082A
PCB 206	EPA 8082A
PCB 31	EPA 8082A
PCB 44	EPA 8082A
PCB 5	EPA 8082A
PCB 52	EPA 8082A

Polychlorinated Biphenyls

PCB 66	EPA 8082A
PCB 87	EPA 8082A

Polynuclear Aromatic Hydrocarbons

2-Acetylaminofluorene	EPA 8270D
Acenaphthene	EPA 8270D
Acenaphthylene	EPA 8270D
Anthracene	EPA 8270D
Benzo(a)anthracene	EPA 8270D
Benzo(a)pyrene	EPA 8270D
Benzo(b)fluoranthene	EPA 8270D
Benzo(g,h,i)perylene	EPA 8270D
Benzo(k)fluoranthene	EPA 8270D
Chrysene	EPA 8270D
Dibenzo(a,h)anthracene	EPA 8270D
Fluoranthene	EPA 8270D
Fluorene	EPA 8270D
Indeno(1,2,3-cd)pyrene	EPA 8270D
Naphthalene	EPA 8270D
Phenanthrene	EPA 8270D
Pyrene	EPA 8270D

Priority Pollutant Phenols

2,3,4,6-Tetrachlorophenol	EPA 8270D
2,4,5-Trichlorophenol	EPA 8270D
2,4,6-Trichlorophenol	EPA 8270D
2,4-Dichlorophenol	EPA 8270D

Serial No.: 61934

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued June 16, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. BASSAM YOUSSEF
AMERICAN TESTING TECHNOLOGIES, INC
1350 HOME AVE
AKRON, OH 44310

NY Lab Id No: 12173

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Characteristic Testing

Ignitability EPA 1010B

Metals I

Cadmium, Total EPA 6010C

Chromium, Total EPA 6010C

Lead, Total EPA 6010C

Metals II

Arsenic, Total EPA 6010C

Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016) in Oil EPA 8082A

Aroclor 1221 (PCB-1221) in Oil EPA 8082A

Aroclor 1232 (PCB-1232) in Oil EPA 8082A

Aroclor 1242 (PCB-1242) in Oil EPA 8082A

Aroclor 1248 (PCB-1248) in Oil EPA 8082A

Aroclor 1254 (PCB-1254) in Oil EPA 8082A

Aroclor 1260 (PCB-1260) in Oil EPA 8082A

Serial No.: 67883

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.





ATTACHMENT 4

PHOTOGRAPHIC DOCUMENTATION



Location – Brooklyn Navy Yard Bldg. 386



Throughout – Non-ACM Glazed Block Mud & Mortar



386A – LBP Switch Gear Leg Metal Leg



386A – LBP Grey Floor



386B – ACM Pipe Insulation Jacket Mud fill, Pipe Insulation Jacket Lagging & Pipe Insulation Elbow to Fiberglass



386B – LCP Red Floor



Throughout – Non-ACM Brick & Mortar



386A – Non-ACM Smooth Wire & Ribbed Wire



386A – Black LBP Panel Box



386B – Grey Composite LBP Wall Panel



386B – ACM Large Diameter Pipe Wrap
ACM Contaminated Large Diameter Pipe Insulation Rope & Large Diameter Pipe Insulation
Miscellaneous Fill



Exterior – Non-ACM Window Glazing
ACM Window Caulk
NONPCB Window Glazing & Window Caulk



Exterior - ACM Louver Caulk
NONPCB Louver Caulk



PCB in Electrical Equipment

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Formwork, shoring, bracing and anchorage.
- B. Concrete reinforcement and accessories.
- C. Cast-in-place concrete, equipment pads.
- D. Concrete Steps
- E. Concrete curing and finishing.
- F. Grout.

1.02 RELATED SECTIONS

- A. Section 014500 - QUALITY CONTROL.

1.03 REFERENCES

- A. ACI 301 - Specifications of Structural Concrete for Buildings.
- B. ACI 304R - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
- C. ACI 305R - Hot Weather Concreting.
- D. ACI 308R - Standard Practice for Curing Concrete.
- E. ACI 318 - Building Code Requirements for Reinforced Concrete.
- F. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
- G. ASTM A615/A615M - Deformed and Plain Billet-Steel for Concrete Reinforcement.
- H. ASTM A775/A775M - Epoxy-coated reinforcing steel bars.
- I. ASTM C33/C33M - Concrete Aggregates.
- J. ASTM C94/C94M - Ready-Mixed Concrete.
- K. ASTM C150/C150M - Portland Cement.
- L. ASTM C260/C260M - Air Entraining Admixtures for Concrete.
- M. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
- N. ASTM C494/C494M - Chemical Admixtures for Concrete.
- O. ASTM C618 - Fly Ash and Raw or Calcinated Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
- P. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
- Q. ASTM D2103 - Polyethylene Film and Sheeting.

- R. CRSI 63 - Recommended Practice for Placing Reinforcing Bars.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300 - SUBMITTALS.
- B. Shop Drawings: Indicate reinforcement sizes, spacings, and locations of reinforcing steel and wire fabric, bending and cutting schedules, splicing, and supporting and spacing devices. Indicate formwork dimensioning, materials, arrangement of joints and ties.
- C. Design Data: Provide a concrete mix design for each type of concrete to be utilized on the project prior to commencement of work. The Contractor's testing laboratory shall develop concrete mix designs and test all materials and mixes for conformance with these specifications. The costs associated with development of the design mix and testing of samples shall not be paid out stipulated cash allowance and shall be included in the bid price.
- D. Furnish the Engineer's field representative with transit-mix delivery slips.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301.
- B. Maintain one copy of document on site.
- C. Concrete Testing Service: Engage a testing laboratory acceptable to the Architect/Engineer to perform material evaluation tests and to design concrete mixes under provisions of Section 014500 - QUALITY CONTROL.
- D. For each mix proposed, make and cure four (4) standard 6 inch concrete test specimens in the lab in accordance with ASTM C192. Furnish compression test results made in accordance with ASTM C39/C39M. Break two (2) cylinders at seven (7) days and two (2) at twenty-eight (28) days.

1.06 QUALIFICATIONS

- A. Prepare shop drawings under seal of professional structural engineer licensed in the state in which the project is located.

1.07 REGULATORY REQUIREMENTS

- A. Conform to ACI 304 and all applicable codes for placement of concrete and related work.

1.08 COORDINATION

- A. Coordinate work prior to commencement of work.
- B. Coordinate work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors and other inserts.
- C. Notify Engineer minimum 72 hours prior to commencement of concreting operations.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Conform to ACI 301.

- B. Plywood Forms: Douglas Fir species; solid one side grade; sound undamaged sheets. Thickness of wood shall be as required to support weight of concrete with minimal deflection.
- C. Steel Forms: Minimum 16 gage (1.5 mm) thick, stiffened to support weight of concrete with minimum deflection.
- D. Tubular Column Type Forms: Round, spirally wound laminated fiber material; inside surface treated with release agent.
- E. Form Ties: Snap-off metal, of fixed length, cone ends.
- F. Reinforcing: ASTM A615/A615M, 60 ksi (414 MPa) yield grade billet steel deformed bars; uncoated; size and dimensions as indicated on the plans.
- G. Welded Steel Wire Fabric: Plain type, ANSI/ASTM A185; in flat sheets; size and dimensions as indicated on the plans.
- H. Cement: ASTM C150/C150M, Type I - Normal.
- I. Fine and Coarse Aggregates: ASTM C33/C33M.
- J. Water: Clean and not detrimental to concrete.

2.02 ACCESSORIES

- A. Air Entraining Admixture: ASTM C260/C260M.
- B. Chemical Admixture: ASTM C494/C494M, Type as required.
- C. Bonding Agent: Polymer resin emulsion manufactured by SPECCO INDUSTRIES, INC., or specifically approved equal.
- D. Vapor Barrier: ASTM D2103, 6 mil (0.15 mm) thick clear polyethylene film.
- E. Non-Shrink Grout: Premixed compound with non-metallic aggregate, cement, water reducing and plasticizing agents; capable of minimum compressive strength of 2400 psi (16.5 MPa) at 48 hours and 7000 psi (48.3 MPa) at 28 days.
- F. Expansion Joints: ASTM D1751; 1/2 inch (13 mm) thick asphalt impregnated fiberboard or felt.
- G. Form Release Agent: Colorless material which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete; manufactured by SPECCO INDUSTRIES, INC. or specifically approved equal. Agent shall not be detrimental to the environment.
- H. Sealant: ASTM D1190; hot applied rubber compound manufactured by THE BURKE COMPANY or specifically approved equal.
- I. Absorptive Mat: Burlap-polyethylene, 8 oz/sq yd (270 g/sq m), bonded to prevent separation during use.
- J. Membrane Curing Compound: ASTM C309, Type 2, Class A.
- K. Clear Sealer: Siloxane type; manufactured by THE BURKE COMPANY or specifically approved equal.

- L. Waterstops: Rubber, complying with COE CRD-C513, maximum possible lengths, ribbed profile, performed corner sections, heated welded jointing manufactured by Kryton Concrete Waterproofing or specifically approved equal.

2.03 MIXES

- A. Mix concrete in accordance with ASTM C94, Alternative No. 2, to achieve the following:
 - 1. Compressive Strength (28 day): 4,000 psi
 - 2. Slump:
 - a. 3 +/-1 inches (initial/conventional mix)
 - b. 7 +/-1 inches (final/pump mix)
 - 3. Air Entrainment: 5 1/2 +/-1 percent
 - 4. Water/Cement Ratio: 0.50 maximum
 - 5. Large Aggregate: 3/4" crushed stone, ASTM C33/C33M, No. 67
- B. Use admixtures only when approved by the Engineer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions prior to commencement of work.
- B. Verify lines, levels, and measurement before proceeding with formwork. Ensure that dimensions agree with the plans.

3.02 PREPARATION

- A. Hand trim sides and bottom of earth forms; remove loose dirt.
- B. Align form joints.
- C. Do not apply form release agent where concrete surfaces are to receive special finishes or applied coatings which may be affected by the agent.
- D. Where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels and pack with non-shrinking grout.
- E. Prepare previously placed concrete by cleaning with steel brush and apply bonding agent in accordance with manufacturer's instructions.

3.03 INSTALLATION

- A. Place, support, and secure reinforcement against displacement at the locations and to the dimensions as indicated on the plans.
- B. Use reinforcing splices at a minimum of locations and only at locations of minimum stress. Review locations of splices with Engineer.
- C. Splice overlap shall be a minimum length of 40 diameters.
- D. Ensure reinforcement, inserts, embedded parts, formed joint fillers, joint devices and waterstops are not disturbed during concrete placement.
- E. Install joint fillers in accordance with manufacturer's instructions.

- F. Extend joint filler from bottom of slab to within 1/2 inch (13 mm) of finished slab surface.
- G. Install joint devices in accordance with manufacturer's instructions.
- H. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.
- I. Place concrete continuously between predetermined expansion, control and construction joints.
- J. Do not interrupt successive placement; do not permit cold joints to occur.

3.04 INSTALLATION - SLABS

- A. Place slabs in checkerboard pattern.
- B. Saw cut control joints at an optimum time after finishing. Cut slabs with 3/16 inch (4.8 mm) thick blade, cutting 1/4 of depth of slab thickness.
- C. Separate slabs on grade from vertical surfaces with joint filler. Extend joint filler from bottom of slab to within 1/4 inch (6 mm) of finished slab surface.
- D. Steel trowel all surfaces except as noted.
- E. Cure floor surfaces in accordance with ACI 308R.
- F. Apply curing compound in accordance with manufacturer's instructions in 2 coats with second coat at right angles to the first.

3.05 TOLERANCES

- A. Equipment Pads: Provide Class B tolerance to floor slabs according to ACI 308R.

3.06 FIELD QUALITY CONTROL

- A. Field inspection and testing of concrete will be performed under provisions of Section 014500 - QUALITY CONTROL.
- B. Testing firm will take cylinders and perform slump and air entrainment tests in accordance with ACI 301.
- C. Four concrete test cylinders will be taken for every 50 cu yds, or fraction thereof, for each class of concrete placed each day.
- D. One additional test cylinder will be taken during cold weather and be cured on site under same conditions as concrete it represents.
- E. One slump test will be taken for each set of test cylinders taken.

3.07 PROTECTION

- A. Protect finished work until completion of project.
- B. Protect concrete from damage and deformation until project is accepted by the Owner.

3.08 SCHEDULE: CONCRETE FINISHES

- A. Equipment Pads: Broom finish, trim edge.
- B. All Other Finishes: Steel trowel surface with a clear concrete sealer, unless otherwise noted.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Repair of cracked, spalled, calcinated and hollow areas on concrete interior floors.

1.02 SUBMITTALS

- A. Submit under provisions of Section 013300 - SUBMITTALS.
- B. Submit manufacturers' product data and application requirements for proposed materials used to repair spalls and cracks.
- C. Submit documentation on characteristics of proposed media for abrasive blasting.
- D. Submit documentation indicating product applicators are trained and approved by product manufacturer.

1.03 REGULATORY REQUIREMENTS

- A. Coatings shall comply with NYCRR, Part 205, of the New York State Department of Environmental Conservation (NYSDEC).
- B. Transport debris and rubbish in accordance with New York State Department of Environmental Conservation Law, Article 27, Treatment and Disposal of Refuse and Other Solid Waste.

1.04 EXISTING CONDITIONS

- A. Allow Owner to conduct an inspection after tank cleaning to identify areas for repair.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Repair cement shall comply with ANSI/NSF Standard 61 for potable water. All repair mortar shall fully bond to existing surfaces and be free of chlorides.
- B. Hydrophobic low viscosity, polyurethane chemical grout: SikaFix HH LV.
- C. Two Component, self-leveling, polyurethane elastomeric sealant: Sikaflex-2c SL.
- D. Bonding Agent and Reinforcement Protection: The bonding agent and reinforcement protection shall be a 3-component, solvent free, moisture tolerant, epoxy-modified, cementitious product specifically formulated as a bonding agent and an anti-corrosion coating. This product shall be Armatec 110 EpoCem as manufactured by SIKA CORP.
- E. Water: Potable, clean and free from oils, acids, alkali organic matter and other deleterious material.
- F. Filler: TNEMEC 63-1500.

PART 3 - EXECUTION

3.01 PROTECTION

- A. Protect pipe openings so that no materials enter into the lines during preparation and repair.

3.02 SURFACE PREPARATION

- A. Interior Abrasive blasting: Utilize abrasive blasting to remove all existing coatings and deposits at area to be repaired. Remove loose material to sound substrate. Equipment shall have ample capacity to furnish the required volume of compressed air to operate the blast effectively. The air shall be free of oil or moisture. Media shall be composed principally of silica grains. Do not utilize previously used media for abrasive blasting. Conduct abrasive blasting to prevent spread of media to adjoining property.
- B. Surfaces to be repaired and coated shall be clean.
- C. Mechanical chipping: Where necessary, and as directed by the Engineer, use chipping hammers to remove unsound concrete.

3.03 REPAIR/RESTORATION

- A. Interior Wall and Floor Crack Repair
 1. Rout with dovetail profile to a depth of ½-inch.
 2. Remove mortar at the ends of exposed wire and steel until corrosion free steel is exposed. Remove rust deposits and loose material from steel by blasting to a near white finish (SSPC-10). Coat bare steel with 20 mils (2 coats of 10 mils each) of SIKA ARMATEC 110 EPOCEM.
 3. Saturate surface with clean water.
 4. When repair area is saturated surface dry, coat entire concrete surface of repair area with 20 mils of SIKA ARMATEC 110 EPOCEM.
 5. Prepare two-component, polymer-modified, cementitious, non-sag mortar in accordance with manufacturer's standards.
 6. Apply in accordance with manufacturer's recommendations.
 7. Cure in accordance with ACI recommendations for Portland Cement Concrete.
- B. Interior Wall and Floor Repairs
 1. Remove all loose material to sound substrate.
 2. Abrasive blast to SSPC-SP13/NACE 6 Surface Preparation of Concrete.
 3. When surface preparation of area to be repaired is completed, coat entire concrete surface of repair area with 1/16-inch of TNEMEC 63-1500.

3.04 CLEANUP

- A. Maintain work area in a neat, orderly fashion. Debris such as used sand, muck, rust, scale, shall be frequently cleaned up and removed from the site. Thinners used to clean spray guns and other tools and equipment shall be held in containers and removed from the site to an approved disposal area by the Contractor. Do not clean equipment in tank.
- B. After completion of repair, thoroughly clean tank interior. Sweep broom clean.
- C. Upon completion of the work, remove all excess material, rigging, empty containers, and supplies, from the site. Buildings and grounds shall be left in as good condition as when work was started.
- D. Transport debris and rubbish in accordance with New York State Department of Environmental Conservation Law, Article 27, Treatment and Disposal of Refuse and Other Solid Waste.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Foundation walls.
 - 3. Slabs-on-grade.
 - 4. Underslab vapor retarder.

1.02 REFERENCES

- A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
- B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
- C. ACI 301 - Specifications for Structural Concrete; 2016.
- D. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.
- E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- F. ACI 305R - Guide to Hot Weather Concreting; 2010.
- G. ACI 306R - Guide to Cold Weather Concreting; 2016.
- H. ACI 308R - Guide to External Curing of Concrete; 2016.
- I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2018).
- J. ACI 347R - Guide to Formwork for Concrete; 2014, with Errata (2017).
- K. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018.
- L. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2016.
- M. ASTM A184/A184M - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement; 2017.
- N. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2013.
- O. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete; 2010a (Reapproved 2015).
- P. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2015.
- Q. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.

- R. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2016.
- S. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete; 2014a.
- T. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016.
- U. ASTM C192/C192M - Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory; 2016a.
- V. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).
- W. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019.
- X. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2018b.
- Y. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.
- Z. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.
- AA. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.
- AB. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2019.
- AC. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2019a.
- AD. ASTM C989/C989M - Standard Specification for Slag Cement for Use in Concrete and Mortars; 2017.
- AE. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2018.
- AF. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2015.
- AG. ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications; 2016.
- AH. ASTM D448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction; 2012 (Reapproved 2017).
- AI. ASTM E1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers; 2014.
- AJ. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.
- AK. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.
- AL. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2011.

AM. PS 1 - Structural Plywood; 2009.

AN. ACI 350 - Concrete Sanitary Engineering Structures.

AO. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

1.03 ACTION SUBMITTALS

- A. The contractor shall comply with the requirements of Division 01 Specification of the Project Manual, Section 013300 - SUBMITTALS.
- B. Product Data: For each type of product indicated.
- C. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
1. Indicate amounts of mixing water to be withheld for later addition at Project site.
 2. Submit mix design mixtures for each type of concrete to be used on the Project at least 30 calendar days prior to the first scheduled concrete pour. The Contractor's testing laboratory shall develop concrete mix designs and test all materials and mixes for conformance with ACI 301 and these specifications. The costs associated with development of the design mix and testing of samples shall be included in the bid price.
 3. Submit the following:
 - a. Name, address, and telephone number of Contractor's laboratory.
 - b. Mix proportions.
 - c. Source of cement, type, brand, and certified copies of mill reports, including physical and chemical analysis.
 - d. Sources of fine aggregates and results of test made in accordance with ASTM C33/C33M and ASTM C40.
 - e. Source of coarse aggregates and results of tests made in accordance with ASTM C33/C33M.
 - f. Catalog cuts of all admixtures.
 - g. Furnish test results of slump, air entrainment and water-cement ratio for each mix design.
 4. For each mix proposed, make and cure four (4) standard 6 inch concrete test specimens to the laboratory in accordance with ASTM C192/C192M. Furnish compression test results made in accordance with ASTM C39/C39M. Break two (2) cylinders at seven (7) days and two (2) at 28 days.
 5. If the concrete is intended to be pumped, design mix accordingly and submit certification that it has been tested for pumping.
 6. If adopted mix fails to produce concrete meeting the requirements for strength and placibility, the Architect may order additional cement or adjustments to mix proportions at no extra cost to the Owner.
- D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, spacing, locations, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement including steel bars and wire fabric.
- E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer licensed in the state where the project is located; detailing fabrication, assembly, and support of formwork. Shop drawings shall bear the signature and seal of the same licensed Professional Engineer.

1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal
 2. Shop drawings shall indicate formwork dimensioning, materials and arrangement of joints and ties.
 3. Manufacturer's instructions: Indicate installation procedure and interface required with adjacent work
- F. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
1. Location of construction joints is subject to approval of the Architect, if not shown on the drawings.
- G. Samples: For waterstops, vapor retarders, and vapor retarder tape.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Welding certificates.
- C. Material Certificates: For each of the following, provided by manufacturers:
1. Cementitious materials.
 2. Admixtures.
 3. Form materials and form-release agents.
 4. Steel reinforcement and accessories.
 5. Curing compounds.
 6. Adhesives and Vapor retarders.
 7. Semi rigid joint filler.
 8. Joint-filler strips.
- D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- E. Field quality-control reports.
- F. Minutes of preinstallation conference.
- G. Furnish transit-mix delivery slips to Owner's Representative.

1.05 QUALITY ASSURANCE

- A. Comply with Referenced Standards specified in Division 01 Section "References" in addition to ACI 301.
- B. Perform testing under the provisions of Division 01 Section "Quality Requirements" and the "FIELD QUALITY CONTROL" Article of Part 3 listed in this specification.
- C. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- D. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

- E. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 for testing indicated.
 - 1. The contractor shall provide an adequately sized, insulated curing box to house concrete cylinders at the discretion of the Architect, for the 48-hour period between concrete pour and sample collection pick-up by the Testing Laboratory (ASTM C31/C31M). As directed by the Architect, the contractor shall cure additional cylinders in the same fashion as the in-place concrete.
 - 2. Curing box shall be located away from the main construction area and shall be blocked up off the ground.
 - 3. A log sheet shall be provided in a waterproof sheet protector to log in the placement and removal of the concrete test samples by the testing laboratory.
 - 4. Minimum information to be logged for each pour date shall include: date of pour, date of pick-up, weather conditions at the time of pour, testing

- F. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer. To further insure consistency, coloration, finish and quality; all aggregates, cement, water and other ingredients shall each be secured from the same source for the duration of the project.
 - 1. The batching plant and raw materials may be subject to inspections and test performed by the Architect.

- G. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."

- H. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specifications for Structural Concrete", Sections 1 through 5.
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials".
 - 3. ACI 304R - "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete".

- I. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

- B. Store cement off the ground in a dry, weatherproof, adequately ventilated structure with provisions to prevent the absorption of water.

- C. Transport dry concrete batches from the central plant to the site in approved truck mixers conforming to the requirements of the Truck Mixer Manufacturer's Agitating Standards. Each truck shall contain a plate stating the capacity, drum speeds and be provided with a revolution counter.

- D. Packaged material shall be delivered and stored in the original packages until ready for use. Packages or materials showing evidence of water or other damage shall be rejected.

- E. Protect all materials from freezing.

1.07 COORDINATION

- A. Coordinate work under provisions of Division 01 Specification of this Project Manual.
- B. The Contractor shall provide at least five (5) working days advance notice prior to formwork closure to the Architect.
- C. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
- D. Notify Architect a minimum of three (3) working days prior to commencement concrete pours.

1.08 REGULATORY REQUIREMENTS

- A. Conform to ACI 304R and all applicable codes for placement of concrete and related work.

1.09 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when the ambient temperature is below 40 deg. F. or when the concrete temperature exceeds 85 deg. F. Under certain circumstances, the Engineer may approve the placement of concrete under the above conditions, provided that the procedures of ACI 305R and ACI 306R are strictly adhered to.
- B. Do not place concrete when the conditions may adversely affect the placing, curing or finishing of concrete, or its strength.
- C. Comply with the requirements contained in Section 016500 - PRODUCT DELIVERY, STORAGE AND HANDLING.

PART 2 - PRODUCTS

2.01 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Steel forms: Minimum 16 gage thick, stiffened to support weight of concrete with minimum deflection.
 - 3. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. Douglas Fir Species, solid one side grade and sound
- B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum unless indicated otherwise on the drawings.
- C. Form-Release Agent: Commercially formulated, colorless, water based, non-toxic, V.O.C. compliant, environmentally safe material which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete; manufactured by DAYTON SUPERIOR or equal. Agent shall not be detrimental to the environment.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- D. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.

2.02 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- B. Steel Bar Mats: ASTM A184/A184M, fabricated from ASTM A615/A615M, Grade 60 ; ASTM A706/A706M, deformed bars, assembled with clips.

2.03 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 2. Provide load bearing pad on bottom to prevent vapor barrier puncture.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 2. Provide load bearing pad on bottom to prevent vapor barrier puncture.

2.04 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 1. Portland Cement: ASTM C150/C150M, Type IA, gray. Supplement with the following:
 - a. Fly Ash: ASTM C618, Class F or C.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C989/C989M, Grade 100 or 120.
 2. Silica Fume: ASTM C1240, amorphous silica.
 3. Normal-Weight Aggregates: ASTM C33/C33M, No. 57 or 67 crushed stone coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 - a. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
 - b. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
 4. Water: ASTM C94/C94M, clean and not detrimental to concrete.

2.05 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C260/C260M.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 2. Retarding Admixture: ASTM C494/C494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.

4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017, Type II.

2.06 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E1745, Class C or polyethylene sheet, ASTM D4397 not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 1. Products: Subject to compliance with requirements, provide the following:
 - a. Carlisle Coatings & Waterproofing, Inc.; Blackline 400
 - b. Grace Construction Products, W. R. Grace & Co.; Florprufe 120
 - c. Insulation Solutions, Inc.; Viper VaporCheck 10.
 - d. Meadows, W. R., Inc.; Perminator 10 mil.
 - e. Reef Industries, Inc.; Griffolyn 10 mil Green.
 - f. Stego Industries, LLC; Stego Wrap 10 mil Class A.
 - g. Or approved equal.
- B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C33/C33M for fine aggregates.
 1. Depth Requirements:
 - a. Slab on grade: 6 inches (unless otherwise noted in the Geotechnical Report).
 - b. Footings: 12 inches (unless otherwise indicated in the Geotechnical Report).

2.07 FLOOR AND SLAB TREATMENTS

- A. Slip-Resistive Emery Aggregate Finish: Factory-graded, packaged, rustproof, non-glazing, abrasive, crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials with 100 percent passing No. 4 sieve.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dayton Superior Corporation; Emery Tuff Non-Slip
 - b. Lambert Corporation; EMAG-20
 - c. L&M Construction Chemicals, Inc.; Grip It
 - d. Metalcrete Industries; Metco Anti-Skid Aggregate

2.08 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 8 oz. /sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet weighing approximately 8 oz. / sq. yd. bonded to prevent separation during use.
- C. Membrane curing compound: Moisture Retention complying with ASTM C309. Products: EUCOCURE VOX by Euclid Chemical Company or equal.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating.
 1. Products: Eucocure VOX as manufactured by Euclid Chemical Company or approved equal.

2.09 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, 1/2" asphalt-saturated cellulosic fiber.
- B. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy Bonding Adhesive: three-component, solvent-free, moisture tolerant, epoxy modified cementitious product.
 - 1. Product: Armatec 110 EpoCem as manufactured by Sika Corporation or specifically approved equal.
 - 2. Types I and II, non-load bearing Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- D. Non-Shrink Grout: Premixed compound, free of chlorides, with non-metallic aggregate, cement water reducing and plasticizing agents; capable of minimum compressive strength of 2400 psi at 48 hours and 7000 psi at 28 days. Grout shall be suitable for contact with potable water. For equipment bases and pipe supports, use non-shrink grout by Master Builders, Embeco 636, Unisorb V-1 or equal.

2.10 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 211.1 and ACI 301.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
 - 1. Fly Ash: 25 percent.
 - 2. Combined Fly Ash and Pozzolan: 25 percent.
 - 3. Ground Granulated Blast-Furnace Slag: 50 percent.
 - 4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent Portland cement minimum, with fly ash or Pozzolan not exceeding 25 percent.
 - 5. Silica Fume: 10 percent.
 - 6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
 - 7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
 - 8. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use plasticizing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: Pier, Mat and Spread Footings; foundation walls, slab on grade and slab on metal deck: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.50 for all concrete building elements.
3. Slump Limits (Conventional Mix):
 - a. Slabs: 3 inches plus or minus one inch.
 - b. Piers, Foundation Walls and Footings: 4 inches plus or minus one inch.
4. Slump Limits (Pump Mix):
 - a. Final slump (Slabs): 6 1/2 inches plus or minus one inch.
 - b. Final Slump (Foundation, walls and footings): 7 1/2 inches plus or minus one inch
5. Air Content:
 - a. Piers, Mats and Spread Footings: 5.5 percent, plus or minus 1.0 percent. at the point of delivery.
 - b. Slabs: 3 percent, plus or minus 1.0 percent at point of delivery. Do not allow air content of trowel finished concrete floors to exceed 3 percent.
6. Large Aggregates: 3/4" crushed stone; ASTM C33/C33M, No. 67.
7. Use Admixtures only when approved by the Engineer.
8. Mix Grout in accordance with the manufacturer's instructions and specifications.

2.12 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94/C94M and ASTM C1116/C1116M, and furnish batch ticket information.
 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and measurements before proceeding with formwork. Ensure that dimensions agree with the plans.
- B. Inspect the formwork and reinforcing that it has been properly set and secured and that all items to be embedded, built-in or pass through concrete are at their proper locations and elevations.
- C. The General Construction Contractor shall verify that all other prime contractors have installed concrete inserts, sleeves, and embedded elements of the project, such as conduit, and their work has been totally completed and inspected by the Architect.
- D. Ensure that all points of contact with new grout are free from oil, grease and scale.

3.02 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 - 2. Class B, 1/4 inch for rough-formed finished surfaces.
 - a. Hand trim sides and bottom of earth forms and remove loose soil to the satisfaction of the Architect.
 - b. Remove water from forms and excavations and divert water flow to avoid washing over, under or through freshly placed concrete.
- D. Construct forms tight enough to prevent loss of concrete mortar. Align form joints.
- E. Do not apply form release agent where concrete surfaces are to receive special finishes or applied coatings that may be affected by the agent.
- F. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- I. Chamfer: Provide 3/4" inch chamfer on all exterior horizontal and vertical corners and edges of permanently exposed concrete.
- J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- K. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- L. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- M. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement. Do not apply form release agent where concrete surfaces are to receive special finishes or applied coatings that may be affected by the agent.
- N. Where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack with non-metallic/ non-shrink grout.

- O. Prepare previously placed concrete by cleaning with steel brush and apply a Bonding Agent in accordance with the manufacturer's specifications and instructions.

3.03 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. Ensure that all inserts and embedded items are not disturbed during concrete placement.

3.04 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.05 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturers recommended tape.
- B. Granular Course: Cover vapor retarder with fine-graded granular material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.

3.06 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars. Use reinforcing splices at minimum of locations and only at locations of minimum stress. Review locations of splices with Architect. Splice locations shall be

approved during shop drawing review phase. Rebar splice overlap shall be the minimum length as per ACI 318.

1. Weld reinforcing bars according to AWS D1.4/D1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- F. Take necessary measures to ensure that reinforcement is not disturbed during the placement of concrete.

3.07 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 5. Space vertical joints in walls as indicated or at 20' o.c. maximum. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 6. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction / Control Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 1. Sawn Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 3/16"-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 - JOINT SEALANTS are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.
- F. Ensure joint fillers and devices are not disturbed during placement of concrete.

- G. Install all joint fillers and devices in accordance with the manufacturer's instructions and specifications for floor and wall finish.
- H. Install joint device anchors. Maintain correct position to allow joint cover flush with floor and wall finish.
- I. Install joint covers in one-piece length when adjacent construction activity is complete.
- J. Apply sealants in joint devices in accordance with the manufacturer's specifications and instructions.

3.08 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
 - 2. Place concrete with the aid of mechanical vibrators which are capable of transmitting to the concrete not less than 3,000 impulses per minute. Maintain at least three (3) vibrators in good working condition, ready for use when concrete placement begins in any one area.
 - 3. Do not interrupt successive placement. Do not permit cold joints to occur.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and ACI 305R and as follows:
1. Maintain concrete temperature below 95 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.
 3. Maintain records of concrete placement. Record date, locations, quantity, air temperature and test samples taken.
 4. In areas with floor drains, maintain floor elevations at walls; pitch surfaces uniformly to the drains maintaining a 1% slope.
 5. Cure floor surfaces in accordance with ACI 308R.
 6. Apply curing compound in accordance with the manufacturer's specifications and instructions in two (2) coats with the second coat at right angles to the first.

3.09 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch 6 mm in one direction.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, and ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 2. Finish surfaces to the following tolerances, according to ASTM E1155, for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F (F) 30; and of levelness, F (L) 20; with minimum local values of flatness, F (F) 24; and of levelness, F (L) 15; for suspended slabs.

3. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft. long straightedge resting on two high spots and placed anywhere on the surface does not exceed 3/16 inch.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
 1. This surface shall be used for interior and exterior walking surfaces unless noted otherwise. Finish edges of exterior walkway flags with steel tooled radius edge.
 2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, equipment pads, and elsewhere as indicated.
 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- G. Slip-Resistive Finish: Before final floating, apply slip-resistive finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
 1. Uniformly spread 25 lb. /100 sq. ft. of dampened slip-resistive over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
 2. After broadcasting and tamping, apply float finish.
 3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aluminum granules.

3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. All exposed horizontal and vertical wall and slab corners shall have a 3/4" wide chamfered edge.

3.11 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 and ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb./sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308R and ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
- F. Liquid sealer/hardener to be applied on exposed concrete cured with moisture retentive or absorptive covers. The following materials provide varying levels of protection, sealant and hardness. Review products for project appropriateness.
1. Euclid: Euco Diamond Hard (Liquid Sealer and Hardener)
 2. L&M Construction Chemicals: Seal Hard (Liquid Sealer and Hardener)
 3. Curecrete Chemical Company: Ashford Formula (Liquid Sealer and Hardener)
 4. Midwest Floor Care: Structure Formula (Liquid Sealer and Hardener)
 5. Or approved equal.

3.12 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 1. Defer joint filling until concrete has aged at least three month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semi rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.13 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.
- B. Immediately remove all rust spots that have developed during the construction period as soon as directed by the Architect. Remove all rust spots that have formed by the use of temporary handrails.

3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and/or qualified testing and inspecting agency to perform field tests and inspections and prepare test reports. Contractor is responsible to notify the Owners representative at least 72 hours prior to the scheduled work that requires inspection / testing. The presence of the Inspector engaged by the Owner does not relieve the contractor of Quality Control Requirements.

- B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
1. Steel reinforcement placement.
 2. Headed bolts and studs.
 3. Steel reinforcement welding.
 4. Concrete placement, including conveying and depositing.
 5. Curing procedures and maintenance of curing temperature.
 6. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C172/C172M shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - a. Frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - b. One (1) additional test cylinder shall be taken during cold weather and be cured under the same conditions as the concrete it represents.
 2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C173/C173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 6. Compression Test Specimens: ASTM C31/C31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two Insert number sets of two standard cylinder specimens for each composite sample.
 7. Compressive-Strength Tests: ASTM C39/C39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete

testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7 and 28-day tests.

11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42 or by other methods as directed by Architect.
 13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness according to ASTM E1155 within 72 hours of finishing.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes
 - 1. Face brick.
 - 2. Mortar and grout.
 - 3. Ties and anchors.
 - 4. Miscellaneous masonry accessories.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
- C. Samples for Initial Selection:
 - 1. Face brick, in the form of straps of five or more bricks.
 - 2. Colored mortar.
- D. Samples for Verification: For each type and color of the following:
 - 1. Face brick, in the form of straps of five or more bricks.
 - 2. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.04 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - 2. Pre-blended, dry mortar mixes. Include description of type and proportions of ingredients.
 - 3. Anchors, ties, and metal accessories.
- B. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.05 QUALITY ASSURANCE

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- C. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
 - 1. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2017.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.07 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
- B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ERTA/ASCE 6/TMS 602.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ERTA/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.01 MASONRY UNITS, GENERAL

- A. Defective Units (failuresuch as diagonal shear cracking, flexural cracking, corner damage, pounding damage, damage due to ground settlement and the like): Referenced masonry unit standards (ASTM specifications for concrete masonry units) may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

2.02 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units.
 - 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 - 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
 - 3. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Face Brick: Facing brick complying with ASTM C 216.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Standard Modular size brick unless indicated otherwise. Texture, color and finish shall be selected by Architect from a manufacturer's standard brick selection. For assistance, contact: Rocco Maggio of Consolidated Brick: 127 W. 24th Street, 3rd Floor, New York, NY 10011. Tel.: 516-410-9030.
 - 2. Grade: SW.
 - 3. Type: FBS
 - 4. Initial Rate of Absorption: Less than 30g/30 sq. in. (30g/194 sq. cm) per minute when tested per ASTM C 67.
 - 5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."

2.03 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of Portland cement and hydrated lime containing no other ingredients.
- D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.
- E. Aggregate for Mortar: ASTM C 144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.

2.04 REINFORCEMENT

- A. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
- B. Masonry Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.187 inch (4.75 mm) diameter, hot-dip galvanized, carbon-steel continuous wire.

2.05 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
 2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
 3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
 4. Stainless-Steel Sheet: ASTM A 666, Type 304.
- B. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25.4 mm) of masonry face, made from 0.187-inch diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
- C. Adjustable Masonry-Veneer Anchors:
1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to metal studs, and as follows:
 - a. Structural Performance Characteristics: Capable of withstanding a 100-lbf (445-N) load in both tension and compression without deforming or developing play in excess of 0.05 inch (1.3 mm).
 2. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Heckmann Building Products Inc.; 315-D.
 - 2) Hohmann & Barnard, Inc.; DW-10HS.

2.06 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
1. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch (76-mm) intervals along length of flashing to provide an integral mortar bond.
- B. Flexible Flashing: Use the following unless otherwise indicated:
1. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.
 - a. Products: Subject to compliance with requirements, provide the following:
 - 1) Mortar Net USA, Ltd.; Total Flash.
 - 2) Or approved equal.
 - b. Monolithic Sheet: TPO Elastomeric thermoplastic flashing, 0.040 inch (1.0 mm) thick with integral stainless steel drip edge, drainage matrix, stainless steel termination bar with #14 x 2" fasteners at 6" o.c., integral weeps.
 - c. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
- C. Application: Unless otherwise indicated, use the following:
1. Where flashing is indicated to receive counterflashing, use metal flashing.
 2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.

3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge.
4. Where flashing is fully concealed, use flexible flashing.

2.07 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Weep/Vent Products: Use one of the following unless otherwise indicated:
 1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe, in color selected from manufacturer's standard.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Heckmann Building Products Inc.; No. 85 Cell Vent.
 - 2) Hohmann & Barnard, Inc.; Quadro-Vent.
 - 3) Wire-Bond; Cell Vent.

2.08 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Green Envy Masonry Cleaner
 - b. Green Clean 250 Manufactured Stone Cleaner

2.09 MORTAR MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 1. Do not use calcium chloride in mortar.
 2. Use Portland cement-lime mortar unless otherwise indicated.
 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Pre-blended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
 1. Pigments shall not exceed 10 percent of Portland cement by weight.
 2. Pigments shall not exceed 5 percent of masonry cement by weight.
 3. Mix to match Architect's sample.
 4. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Face brick.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - 1. Mix units from several pallets or cubes as they are placed.
- D. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.03 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
 - 2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
 - 3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
 - 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
 - 5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch (12 mm) maximum.
 - 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m) or 1/2 inch (12 mm) maximum.
 - 7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch , with a maximum thickness limited to 1/2 inch; do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
2. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
3. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.04 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in bond pattern indicated on Drawings; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

3.05 MORTAR BEDDING AND JOINTING

- A. Lay hollow brick as follows:
 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 2. With entire units, including areas under cells, fully bedded in mortar at starting course on footings or foundation walls.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.06 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:
 1. Fasten anchors with metal fasteners of type indicate as specified by manufacturers. Use two fasteners unless anchor design only uses one fastener.
 2. Embed tie sections in masonry joints. Provide not less than 2 inches (50 mm) of air space between back of masonry veneer and face of sheathing.
 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.

4. Maximum vertical offset of bed joints from one wythe to the other shall be 1 1/4 inch when utilizing adjustable wall ties such as pintle ties.
5. Pintle ties shall have two legs of W2.8 wire size minimum.
6. Space anchors as indicated, but not more than 16 inches o.c. vertically and 16 inches (407 mm) o.c. horizontally, with not less than 1 anchor for each 1.77 sq. ft. of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 8 inches (203 mm), around perimeter.

3.07 EXPANSION JOINTS

- A. General: Install expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form expansion joints in brick as follows:
 1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
 2. Build flanges of factory-fabricated, expansion-joint units into masonry.
 3. Build in compressible joint fillers where indicated.
 4. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."
- C. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 3/8 inch (10 mm).
 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.08 LINTELS

- A. Install galvanized steel lintels where indicated on drawings.
- B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.09 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
 1. For Total Flash System at base of wall: Install as directed by manufacturer.
 2. At lintels, extend flashing a minimum of 8 inches (204 mm) into masonry at each end. At heads and sills, extend flashing 8 inches at ends and turn up not less than 2 inches to form end dams.
- C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- D. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.
- E. Place weep vents in head joints at exterior wythe of cavity wall located immediately above ledges and flashing, spaced 24 inches on center, unless otherwise shown. Leave the side of the masonry units forming the vent space un-buttered and clear of mortar. Install with notched

side down. Slide vent material into joint as the two masonry units forming the weep vent are placed.

3.10 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
- B. Inspections: Level 1 special inspections according to the "International Building Code."
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.

3.11 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement. See architectural drawings for unit amounts.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean brick by bucket-and-brush hand-cleaning method described in "BIA Technical Notes 20."
 - 6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.12 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste; including excess or soil-contaminated sand, waste mortar, and broken masonry units and masonry cut-offs by crushing and mixing with fill material as fill is placed.
 - 1. Crush masonry waste to less than 4 inches (100 mm) in each dimension.
 - 2. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

- C. Legally dispose of off-site, any excess masonry waste.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Structural steel.
 - 2. Grout.
 - 3. Base Plates
- B. Related Requirements:
 - 1. Section 051213 "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.
 - 2. Division 01- "Quality Requirements" for independent testing agency procedures and administrative requirements.
 - 3. Section 053100 "Steel Decking" for field installation of shear connectors through deck.
 - 4. Section 055000 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame not defined as structural steel.
 - 5. Section 055100 "Metal Stairs"
 - 6. Section 099113 "Exterior Painting" for surface-preparation and priming requirements.
 - 7. Section 133419 "Metal Building Systems" for structural steel.

1.03 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.
- C. Heavy Sections: Rolled and built-up sections as follows:
 - 1. Shapes included in ASTM A6/A6M with flanges thicker than 1-1/2 inches (38 mm).
 - 2. Welded built-up members with plates thicker than 2 inches (50 mm).
 - 3. Column base plates thicker than 2 inches (50 mm).

1.04 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.05 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.06 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Shop drawings and required calculations shall bear the seal and signature of a registered Professional Engineer licensed in the state in which the project is located. Structural steel shop drawings will not be reviewed without said seal and signature.
 - a. A full set of engineered calculations for all beam to column moment connections shall be submitted to the engineer of record for approval. The steel fabricator drawings shall not be reviewed without said engineering calculations affixed with a seal and signature of a professional engineer licensed in the state in which the project is located.
 - 2. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 3. Include embedment Drawings.
 - 4. Indicate profiles, sizes, spacing and locations of structural members, openings, attachments, fasteners, connections, cambers, holes and other pertinent data. Include locations of structural members, openings, attachments and loads.
 - 5. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 6. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
 - 7. For structural steel connections indicated to comply with design loads, include structural design data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.07 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installer / fabricator.
- B. Welding certificates: Submit certificates certifying that welders employed in the work have met AWS qualifications within in the previous 12 months.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel, including chemical and physical properties. Indicate structural strength, destructive and non-destructive test analysis.
- E. Product Test Reports: For the following:
 - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 2. Direct-tension indicators.
 - 3. Tension-control, high-strength, bolt-nut-washer assemblies.
 - 4. Shear stud connectors.
 - 5. Shop primers.
 - 6. Non-shrink grout.

1.08 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- B. Fabricator shall have a minimum of five (5) years documented experience with performing the work of this section.
- C. Installer Qualifications: A qualified installer specializing in performing the work of this section with a minimum of three (3) years of documented experience.
- D. Delegated Connection Designer: Connections not fully detailed on the contract drawings shall be designed under the direct supervision of a professional structural engineer experienced in the design of this work and licensed in the state in which the work is located. The shop drawings shall bear the seal and signature of same professional engineer.
- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
 - 2. Welders who are welding structural members fabricated in the shop or in the field, in the five boroughs must have a NYCDOB issued welder licence.
- F. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC Code of Standard Practice for Steel Buildings and Bridges - AISC 303.
 - 2. AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings - AISC 360.
 - 3. RCSC's "Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts."

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle products to/at the site under the supervision of Division 01 of this Project Manual.
- B. Schedule deliveries of materials to the site at intervals which will ensure uninterrupted progress of the work.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- D. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and experience. who bolts and nuts that become dry or rusty before use.
 - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F1852 fasteners and for retesting fasteners after lubrication.

1.10 COORDINATION

- A. Coordinate the work under Division 01 specification of this Project Manual.
- B. Coordinate the selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturer's recommendations to ensure that shop primers and topcoats are compatible with one another.
- C. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions and directions for installation.
- D. Coordinate the work of this section with utility installations and all other adjacent work.
- E. Coordinate the work of this section such that general progress of the Work is not interrupted.

1.11 FIELD MEASUREMENTS

- A. Verify that field measurements are as shown on the plans and approved shop drawings.
- B. The contractor is responsible for the proper location and elevations of the work.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated where beam end reactions are not shown on drawings. Connection designer shall design shear connections to resist the reaction resulting from the maximum allowable uniform load of the beam found in the AISC Specification being applied along its full length.
 - 1. Select and complete connections using AISC 360.
 - 2. Use Load and Resistance Factor Design; data are given at factored-load level.
- B. Moment Connections: Type FR, fully restrained. Provide design and details of moment connections to resist forces shown on the contract drawings.
- C. Construction: Moment frame.

2.02 STRUCTURAL-STEEL MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. W-Shapes: ASTM A 992/A 992M.
- C. Channels, Angles, M-Shapes: ASTM A 36/A 36M.
- D. Plate and Bar: ASTM A 36/A 36M.
- E. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade C, seamless structural tubing.

- F. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.
 - 1. Weight Class: as indicated on the contract documents.
 - 2. Finish: Black except where indicated to be galvanized.

G. Welding Electrodes: Comply with AWS requirements.

2.03 BOLTS, CONNECTORS, AND ANCHORS

- A. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH (ASTM A 563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
 - 1. Finish: Hot-dip zinc coating.
 - 2. Direct-Tension Indicators: ASTM F959/F959M, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with mechanically deposited zinc coating finish.
- B. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers; all with plain finish.
- C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A490 (A 490M), Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A563, Grade DH, (ASTM A563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers with plain finish.
 - 1. Direct-Tension Indicators: ASTM F959, Type 490 (ASTM F 959M, Type 10.9), compressible-washer type with plain finish.
- D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F1852, Type 1, round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
 - 1. Finish: Plain.
- E. Shear Connectors: ASTM A108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- F. Anchor Bolts: ASTM A307, Grade C for non-moment resisting anchor rods. ASTM F1554, 36 and 55 ksi yield strength for moment resisting anchor rods.
 - 1. Nuts: ASTM A563 heavy-hex carbon steel.
 - 2. Plate Washers: ASTM A36/A36M carbon steel.
 - 3. Washers: ASTM F436/F436M, Type 1, hardened carbon steel.
 - 4. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- G. Threaded Rods: ASTM A 36/A 36M.
 - 1. Nuts: ASTM A563 ASTM A563M heavy-hex carbon steel.
 - 2. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
 - 3. Finish: Plain.
- H. Clevises: Made from cold-finished carbon steel bars, ASTM A108, Grade 1035.
- I. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A108, Grade 1030.
- J. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A108, Grade 1018.

2.04 PRIMER

- A. Primer: Comply with Division 09
- B. Primer: SSPC-Paint 15, Type I, red oxide.
- C. Ensure primer is compatible with required topcoat.
- D. Galvanizing Repair Paint: ASTM A 780/A 780M.

2.05 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
- B. Grout shall consist of a premixed compound with cement, water reducing and plasticizing additives capable of developing a minimum compressive strength of 7000 psi at 28 days.

2.06 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Identify high-strength structural steel according to ASTM A6/A6M and maintain markings until structural steel has been erected.
 - 4. Mark and match-mark materials for field assembly.
 - 5. All wide flange structural steel members shall be fabricated in accordance with ASTM A992/A992M. All miscellaneous steel members including channels, angles, S, HP, and M shapes shall be fabricated in accordance with ASTM A36/A36M.
 - 6. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
 - 7. All shop connections shall be welded or high strength bolted.
 - 8. Bearing surfaces shall be planed true to provide full bearing over the entire surface.
 - 9. Continuously seal joined members by intermittent welds and plastic filler. Grind welds smooth where exposed or where interference with other building materials is encountered.
 - 10. Splicing is not permitted unless indicated on the Contract Documents or accepted on the final approved Shop Drawings.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces. Mechanically thermal cut bolt holes shall not be permitted unless prior approval by the Architect is obtained in writing.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning," or SSPC-SP 3, "Power Tool Cleaning," unless a more stringent cleaning method is required for selected primers and / or other coatings.

- F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- G. Shop prime non-exposed steel members after fabrication in accordance with SSPC- PA. Do not prime surfaces that will be fireproofed, field welded or are in contact with concrete or high strength bolts.
- H. Paint exposed structural steel members in accordance with the applicable Division 09 Specification section.
- I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning unless approved by the Architect in writing.
 - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.07 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM F3125/F3125M, Grade A325 or Grade A490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened unless otherwise shown on the contract documents or required by the connection designer.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.08 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
 - 2. Surfaces to be field welded.
 - 3. Surfaces of high-strength bolted, slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 5. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 2, "Hand Tool Cleaning."
 - 2. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.09 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A123/A123M.
 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
 2. Galvanize lintels, shelf angles and welded door frames attached to structural-steel frame and located in exterior walls.

2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
 1. Inspection and Tests will not relieve the contractor of responsibility for providing materials, fabrication and erection procedures in compliance with the specified requirements. The contractor shall verify that all materials meet or exceed the requirements specified in these specifications, Contract drawings and related references. Materials not in compliance with the specified requirements will be rejected and required to be removed from the site.
- C. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM F3125/F3125M , Grade A325 or Grade A490 Bolts."
- D. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M type required for materials being welded and the following inspection procedures, at testing agency's option:
 1. Liquid Penetrant Inspection: ASTM E165/E165M.
 2. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 3. Ultrasonic Inspection: ASTM E164.
 4. Radiographic Inspection: ASTM E94.
- E. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other drawings for compliance with requirements.
 1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other drawings showing dimensions, locations, angles, and elevations.

- B. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of installation will indicate that the erector accepts the conditions which exist.

3.02 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
 - 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.
 - 2. Clean bearing surfaces and other surfaces which will be in permanent contact with the work.

3.03 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Proceed with the installation only after unsatisfactory conditions have been corrected. Commencement of installation will indicate that the erector accepts the conditions which exist.
- C. Allow for erection loads and for sufficient temporary bracing to maintain structure safe, plumb and in true alignment until completion of erection and installation of permanent bracing.
- D. Coordinate placement of anchors in concrete or masonry construction for securing bearing plates.
- E. Erect all components in accordance with the approved shop drawings.
- F. Field weld components and shear studs as indicated on approved shop drawings and in accordance with AWS D1.1/D1.1M.
- G. Do not field cut or alter structural members without written approval of the Engineer.
- H. Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of baseplate.
 - 3. Snug-tighten Pretension anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
 - 5. Coordinate placement of anchors in concrete or masonry construction for securing base plates.
- I. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- J. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in

permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- K. Splice members only where indicated.
- L. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
- M. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- N. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- O. Erect all components in accordance with approved shop drawings. After erection, prime welds, abrasions and surfaces not shop primed or galvanized as required, except surfaces to be in contact with concrete.
- P. Field weld components and shear studs as indicated on the approved shop drawings and in accordance with AWS D1.1/D1.1M.

3.04 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM F3125/F3125M, Grade A325 or Grade A490 Bolts" for type of bolt and type of joint specified.
1. Joint Type: Snug tightened Pretensioned unless specifically identified as pretensioned or slip-critical on the contract documents or calculations by the Delegated Connection designer.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.
 4. Connections and abrasions shall be cleaned, prepared and finished in the same manner and with the same materials used in shop finishing.

3.05 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
1. Verify structural-steel materials and inspect steel frame joint details.
 2. Verify weld materials and inspect welds.
 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

- C. Bolted Connections: Inspect and test high strength bolted connections according to RCSC's "Specification for Structural Joints Using ASTM F3125/F3125M, Grade A325 or Grade A490 Bolts."
- D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
 - 1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E165/E165M.
 - b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E164.
 - d. Radiographic Inspection: ASTM E94.
- E. Post Installed Mechanical Anchors, Adhesive Anchors and Screw Anchors: Comply with NYS IBC Table 1704.32.
 - 1. The special inspection shall include the verification of compliance with approved construction documents and standards established by the Commissioner pursuant to Section 28-113.2.2 of the Administrative Code.
- F. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
 - 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.
- G. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.06 TOLERANCES

- A. All members shall be installed within AISC tolerances and as follows:
 - 1. Maximum variation from plumb: 1/4" (6mm) per story, non-cumulative.
 - 2. Maximum offset from true alignment: 1/4" (6mm).

3.07 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A780/A780M.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Clean and prepare surfaces by SSSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
- C. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- D. Touchup Priming: Cleaning and touchup priming as specified in Division 9 "High-Performance Coatings" or compatible primer established at the fabricators shop to be compatible with the final finish.

3.08 ADJUSTING

- A. All misfits due to errors in location, fabrication, inaccuracies in the setting of anchor bolts or other items of attachment or support shall be immediately reported to the Engineer and corrected in a manner subject to the approval of the Engineer.
- B. Submit method of correction to the Architect under Division 01 Specification provisions.
- C. Proceed with corrective work only after receiving written approval from the Architect.
- D. All corrections shall be made at no additional cost to the Owner.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Composite floor deck.
 - 2. Pourstop angles, cell closures and end forms to contain wet concrete.
 - 3. Bearing plates and angles
 - 4. Framing for openings up to and including 18 inches.
 - 5. Closure panels for cell voids.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated provide deck profile characteristics and dimension, structural properties and finish.
 - 1. Include a statement indicating costs for each product having recycled content.
- B. Shop Drawings:
 - 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction. Indicate temporary shoring of decking where required. Indicate welded connections using standard AWS A2.0 welding symbols and indicate net weld lengths.

1.04 INFORMATIONAL SUBMITTALS

- A. Submit under the provisions of Section 013300 - SUBMITTALS.
- B. Welding certificates.
- C. Product Certificates: For each type of steel deck by product manufacturer.
- D. Manufacturer's instructions: indicate special installation sequence and special instructions required for proper installation.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - 1. Power-actuated mechanical fasteners.
- F. Research/Evaluation Reports: For steel deck.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.
- B. Installer: Company specializing in performing the work of this section with a minimum of Three (3) years of documented experience.
- C. Design deck layout, spans, fastening and joints under the supervision of a Professional Structural Engineer experienced in the design of this work and licensed in the State in which the project is located.

- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- E. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those tested for fire resistance per ASTM E119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- F. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.
- G. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- H. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

1.06 PERFORMANCE REQUIREMENTS

- A. Metal decking design shall be in accordance with SDI Design Manual for Composite Decks, Form Decks, and Roof Decks. Substitutions shall be designed to meet or exceed published section properties of the specified materials. Section properties shall be computed in accordance with American Iron and Steel Institute Specification for the Design of Cold Formed Steel Structural Members.
- B. Lateral deflection of diaphragm shall not exceed 1/500 of the story height. Maximum vertical deflection shall not exceed 1/240 of the span length.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Cut plastic wrap to encourage ventilation.
- C. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
- D. Do not handle products in a manner which will distort or damage materials.
- E. Do not store decking directly on the ground.
- F. Store materials in a manner which will permit ease of access for inspection and identification.
- G. Schedule delivery of the materials to the site at intervals which will ensure uninterrupted progress of the work.
 - 1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

1.08 FIELD MEASUREMENTS

- A. Verify that field measurements are as shown on the contract drawings and approved shop drawings as required by the manufacturer.
- B. The contractor is responsible for the proper locations and elevations of the work of this section.

1.09 COORDINATION

- A. Coordinate the work under provisions of Section 013100 - PROJECT MANAGEMENT AND COORDINATION.
- B. Coordinate the work of this section with utility installations and all other adjacent work.
- C. Coordinate the work such that the general progress of the work is not interrupted.

1.10 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- B. Metal decking design shall be in accordance with SDI Design Manual for Composite Decks, Form Decks, and Roof Decks. Substitutions shall be designed to meet or exceed published section properties of the specified materials. Section properties shall be computed in accordance with the American Iron and Steel Institute Specification for the Design of Cold Formed Steel Structural Members
- C. Lateral deflection of diaphragm shall not exceed 1/500th of the story height. Maximum vertical deflection shall not exceed L/240th of the span length.
- D. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- E. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

PART 2 - PRODUCTS

2.01 COMPOSITE FLOOR DECK

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Nucor Corp.; Vulcraft Group.
 - 2. Canam.
 - 3. New Millennium Building Systems.
 - 4. Or approved equal.
- B. Composite Form Deck: Fabricate ribbed-steel sheet composite form-deck panels to comply with "SDI Specifications and Commentary for Composite Steel Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
 - 1. Prime-Painted Steel Sheet: ASTM A1008/A1008M, Structural Steel (SS), Grade 80 (550) minimum, with top and underside surface shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: Manufacturer's standard.
 - 2. Galvanized and Shop-Primed Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 80 (550), G60 (Z180) zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: Gray.
 - 3. Profile Depth: As indicated on the contract drawings.
 - 4. Design Uncoated-Steel Thickness: As indicated on the contract drawings.
 - 5. Span Condition: Simple span.
 - 6. Side Laps: Overlapped.

2.02 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Welded Materials: AWS D1.1/D1.1M.
- C. Primer: Flexible, Rust inhibitive.
- D. Touch-up Primer: Red Oxide Type.
- E. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- F. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.
- G. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber. one inch thick profile to fit tight to decking in compression.
- H. Shear Connectors: 3/4 inch diameter. 4 1/2" inch long welded headed studs. locate as indicated on the contract drawings.
- I. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material, gage and finish as deck; of profile indicated or required for application.
- J. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.
- K. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.
- L. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter, 1/8 inch thick.
- M. Recessed Sump Pans: Single-piece steel sheet, 14 gage or 0.0747 inch (1.90 mm) thick, of same material and finish as deck, with 3-inch (76-mm) wide flanges and sloped recessed side pans of 1-1/2inch (38-mm) minimum depth below deck surface. For drains, cut holes in the field.
- N. Galvanizing Repair Paint: ASTM A780/A780M.
- O. Bearing Plates and Angles: ASTM A36/A36M steel, unfinished.
- P. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.
- Q. Closure Panels: Neoprene Blend-FR as manufactured by Carrington Specialty Products, Inc., or approved equal.
 - 1. Fire-rated Neoprene-blend formed to match profile of deck at each location.
 - 2. Install compatible backer rod and sealant to seal all edge conditions airtight.
 - 3. Physical Characteristics:
 - a. Nominal Density: 5 to 7 pcf.
 - b. Tensile Strength: 50 psi.
 - c. Elongation: 150% to break.
 - d. Compression Set: 50% of original thickness.

- e. Compression Strength: 2 to 5 psi (at 25% deflection).
- f. Working Temperature: -40 to 160 degrees F.
- g. Water Absorption by Weight: 5% maximum.
- h. Flammability: HF-1 as per UL 94.

2.03 SOURCE QUALITY CONTROL

- A. Testing and analysis of components will be performed under provisions of Section 014500 - QUALITY CONTROL.
- B. Inspection and tests will not relieve the Contractor of responsibility for providing materials and fabrication and erection procedures in compliance with specified requirements. The Contractor is to verify that all materials meet or exceed the requirements specified in these specifications.
- C. Materials not in compliance with the specified requirements will be rejected

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected. Beginning of installation means that the installer accepts the existing conditions.

3.02 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Clean all bearing surfaces of debris and foreign matter.
- E. Verify bearing surface is smooth and flat.
- F. Bear decking on steel supports with 1 1/2 inch (38 mm) minimum bearing.
- G. Provide decking free of amounts of lubricants or oils which would impair the adhesion of spray on fireproofing or painting.
- H. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- I. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- J. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- K. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

- L. Fasten deck to steel support members at ends and intermediate supports with fusion welds at 12 inches on center maximum, parallel with the deck flute and at each transverse flute. Weld washers are to be used only with decks 24 gage or thinner.
- M. Mechanically fasten male/female side laps at 24 inches on center maximum for decking thinner than 20 gage. Weld male/female side laps at 18 inches on center maximum for decks 20 gage and heavier.
- N. Reinforce steel deck openings from 6 to 18 inches (150 to 460 mm) in size with 2 inch x 2 inch x 1/4 inch (50 mm x 50 mm x 6 mm) steel angles. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld to deck at each flute.
- O. Install 6 inch (150 mm) minimum wide sheet steel cover plates, of same thickness as decking, where deck changes direction. Fusion weld 12 inches (300 mm) on center maximum.
- P. Install sheet steel closures and angle flashings to close openings between deck and walls, columns and openings.
- Q. Install single row of foam flute closures above walls and partitions perpendicular to deck flutes.
- R. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- S. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.03 FLOOR-DECK INSTALLATION

- A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
 - 1. Weld Diameter: 3/4 inch (19 mm), nominal.
 - 2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches (305 mm) apart, but not more than 18 inches (457 mm) apart.
 - 3. Weld Spacing: Space and locate welds as indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches (914 mm), and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
 - 2. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds where deck is thicker than 20 gauge..
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
 - 1. End Joints: Lapped.
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated. Where steel angles are not utilized, install stops at floor edge upturned to the top surface of the slab to contain wet concrete. Provide stop of sufficient strength to remain in place and stationary without distortion.
- E. Floor deck closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and deck.

- F. Position floor drain pans with the flanges bearing on the top surface of deck. Fusion weld at each deck flute.
- G. Install piercing hanger tabs at 14 inches (355 mm) apart in both directions, within 9 inches (228 mm) of walls at ends, and not more than 12 inches (305 mm) from walls at sides unless otherwise indicated.

3.04 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.05 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
- C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Stud wall framing.
 - 2. Joist framing.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory.
- B. Shop Drawings:
 - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
 - 3. The design of the cold-formed steel framing shall be the responsibility of the contractor's fabricator. The sizes (depth) of the steel studs shall be as shown on the contract drawings. Unless specifically indicated on the construction documents, it shall be the responsibility of the design engineer to size the spacing and gauge of the element as well as the total depth of the member in the case of header and sill design.
 - 4. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 5. The contractor's fabricator shall provide a full set of engineering calculations as well as a complete set of shop drawings affixed with a New York State Professional Engineer's sign and seal. The design of the cold-formed steel elements shall be in conformance with the information shown on the contract documents and shall be in accordance with the 2020 Building Code of New York State.
- C. Fabrication Drawings:
 - 1. Prior to fabrication submit fabrication and erection drawings for review and approval by the architect/ engineer. Indicate component details, framing for openings, bearing anchorage, temporary bracing, welds or type and location of mechanical fasteners and accessories or items required of other work for complete installations. Included manufacturer's instructions for securing studs to tracks and for other framing connections.
 - 2. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
 - 1. Steel sheet.

2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

D. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E329 to conduct the testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- D. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- E. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. ClarkDietrich Building Systems, LLC.
 2. MarinoWARE
 3. Architect/ Engineer approved equivalent.

2.02 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
 1. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

- a. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft.

2.03 COLD-FORMED STEEL FRAMING, GENERAL

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.
- B. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 1. Grade: ST33H.
 2. Coating: G90 or equivalent.
- C. Steel Sheet for Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:
 1. Grade: 50, Class 1 or 2.
 2. Coating: G90.
- D. All studs and/or joists and accessories shall be the type, size, gage, and spacing shown on the plans. Studs, runners (track) bracing, and bridging shall be manufactured per ASTM C955.
- E. All galvanized studs, joists, and accessories shall be formed from steel that conforms to the requirements of ASTM A653/A653M, as set forth in Section 1.02 of the AISI specification for design of cold-formed steel structural members.
- F. All galvanized studs joists and accessories shall have a minimum G60 coating.
- G. Minimum steel gauges shall be 18 gauge for all structural elements subject to gravity and/or lateral wind forces.
- H. Minimum steel gauge for interior elements subject to partition loadings shall be 20 gauge.
- I. All section properties shall be calculated in accordance with the AISI specification for the design of cold-formed steel structural members (latest edition).
- J. Facing materials may not be substituted for bridging. Horizontal bridging must be installed prior to loading the wall and/or floor/roof joists.
- K. The physical and structural properties published by approved supplier will be accepted; otherwise these properties must be substantiated by calculations for loading stresses and deflections of the designed framing sealed by a professional engineer licensed in the State of New York.
- L. Prior to fabrication submit fabrication and erection drawings for review and approval by the architect/ engineer. Indicate component details, framing for openings, bearing anchorage, temporary bracing, welds or type and location of mechanical fasteners and accessories or items required of other work for complete installations. Included manufacturer's instructions for securing studs to tracks and for other framing connections.

2.04 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: 0.033 inch, 20 gauge.
 2. Flange Width: 1-5/8 inches.

- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, un-punched, with un-stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0428 inch, 18 gauge.
 - 2. Flange Width: 1-1/4 inches.

- C. Vertical Deflection Clips: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ClarkDietrich Building Systems, LLC.
 - b. MarinoWARE
 - c. Steel Network, Inc. (The).

- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; un-punched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0428 inch, 18 gauge.
 - 2. Flange Width: 1 inch plus the design gap for one-story structures and 1 inch plus twice the design gap for other applications.

2.05 SOFFIT FRAMING

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0428 inch, 18 gauge or as indicated on the construction documents..
 - 2. Flange Width: 2 inches, minimum.

2.06 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. Anchor clips.
 - 5. End clips.
 - 6. Stud kickers and knee braces.
 - 7. Hole reinforcing plates.
 - 8. Backer plates.

2.07 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.

- B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153/A153M, Class C.

- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E488/E488M conducted by a qualified testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.
- G. Column Flange Grip Clips: Pre-manufactured Column/Beam connectors for rapid installation of board type materials to Steel Column and Beam Flanges. ASTM A1003/A1003M Structural Grade 33 (230) Type H, ST33H (ST230H): 33ksi (230MPa) minimum yield strength, 45ksi (310MPa) minimum tensile strength, 27mil minimum thickness (22 gauge, 0.0283" design thickness) with ASTM A653/A653M G60 (Z180) hot dipped galvanized coating. Manufacturer: The Steel Network, Inc. Unit connection box measures 1 inch deep, 2 inches wide and 2 1/2 inches long with a spring clip depth of 2.375 inches and a curved clip spring clearance of .2 inches.
 - 1. Install as indicated on the drawings. Maximum spacing 24 inches on center.

2.08 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A780/A780M.
- B. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C1107/C1107M, with fluid consistency and 30-minute working time.
- C. Shims: Load bearing, high-density multimonomer plastic, and non-leaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.09 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.03 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 1. Cut framing members by sawing or shearing; do not torch cut.
 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work. Welds may be butt, fillet, spot or groove type. The appropriateness of which shall be determined by and within the design calculations. All welds shall be touched-up using zinc -rich paint to galvanized members and paint similar to that used by the manufacturer for painted members.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- D. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

- E. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- F. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- G. Install insulation, specified in Section 072100 - THERMAL INSULATION in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- I. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
- J. Wire tying in structural applications is not permitted.

3.04 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
 - 1. Anchor Spacing: To match stud spacing.

3.05 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: 16 inches unless indicated otherwise.
- C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single-leg deflection tracks and anchor to building structure.
 - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 - 3. Connect vertical deflection clips to infill studs and anchor to building structure.
 - 4. Connect drift clips to cold formed metal framing and anchor to building structure
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - a. Install solid blocking at centers indicated on Shop Drawings.

2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.06 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. All members shall be checked for proper alignment, bearing, completeness of attachments, proper placement and reinforcing.
- D. Testing agency will report test results promptly and in writing to Contractor and Architect.
- E. Remove and replace work where test results indicate that it does not comply with specified requirements.
- F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.07 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

3.08 TOLERANCES

- A. Vertical alignment (plumbness) of studs shall be within 1/8 inch in 4 feet of the span.
- B. Horizontal alignment (levelness) of walls shall be within 1/8 inch in 4 feet of their respective lengths.
- C. Spacing of studs shall not be more than +1/8 inch from the designed spacing providing that the cumulative error does not exceed the requirements of the finishing materials.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Metal floor plate and supports.
 - 2. Abrasive metal nosings.
 - 3. Loose bearing, Lintels and leveling plates for applications where they are not specified in other Sections.
- B. Products furnished, but not installed, under this Section include the following:
 - 1. Loose steel lintels.
 - 2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

1.03 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.04 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Metal nosings.
 - 2. Grout.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
 - 1. Metal floor plate and supports.
 - 2. Abrasive metal nosings.
 - 3. Loose steel lintels.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Welding certificates.

1.06 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.07 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on the shop drawings.
 1. Established dimensions: Where field measurements cannot be made without delaying the work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond with established dimensions.

PART 2 - PRODUCTS

2.01 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Abrasive-Surface Floor Plate: Steel plate with abrasive material metallically bonded to steel.
 1. Products Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. IKG Industries, a division of Harsco Corporation; Mebac
 - b. Or approved equal.
- C. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
 1. Size of Channels: or as indicated.
 2. Material: Galvanized steel, ASTM A653/A653M, commercial steel, Type B, with G90 coating; 0.108-inch nominal thickness.
- D. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.

2.02 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners.
 1. Provide stainless-steel fasteners for fastening aluminum.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A653/A653M; and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- D. Plain Washers: Round, ASME B18.22.1.
- E. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
- F. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM

A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

2.03 MISCELLANEOUS MATERIALS

- A. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- D. Non-shrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, non-gaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- E. Concrete: Comply with requirements in Section 033000 - CAST-IN PLACE CONCRETE for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 4000 psi.

2.04 FABRICATION, GENERAL

- A. Shop Assembly: Pre-assemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form exposed work with accurate angles and surfaces and straight edges.
- D. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- E. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- F. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- G. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- H. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.05 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.
- C. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.
 - 1. Unless otherwise indicated, fabricate from Schedule 40 steel pipe.
 - 2. Unless otherwise indicated, provide 1/2-inch baseplates with four 5/8-inch anchor bolts and 1/4-inch top plates.
- D. Galvanize miscellaneous framing and supports where indicated.

2.06 METAL FLOOR PLATE

- A. Fabricate from rolled-steel floor abrasive-surface floor plate of thickness indicated below:
- B. Provide steel angle supports as indicated.
- C. Provide flush steel bar drop handles for lifting removable sections, one at each end of each section.

2.07 ABRASIVE METAL NOSINGS

- A. Cast-Metal Units: Cast aluminum, with an integral-abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in lengths necessary to accurately fit openings or conditions.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Balco, Inc
 - b. Safe-T-Metal Company, Inc
 - c. Wooster Products Inc
 - 2. Nosings: Cross-hatched units, 4 inches wide with 1/4-inch lip, for casting into concrete.
- B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
- C. Drill for mechanical anchors and countersink. Locate holes not more than 4 inches (100 mm) from ends and not more than 12 inches (300 mm) o.c., evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by manufacturer.
- D. Apply bituminous paint to concealed surfaces of cast-metal units.

2.08 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

- B. Hot Dip Galvanize plates (2.0 oz. / sq. ft.).

2.09 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Galvanize loose steel lintels located in exterior walls - Hot Dip Galvanize (2.0 oz. / s.f.).

2.10 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.11 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M and ASTM A653/A653M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with universal shop primer primers specified in Section 099113 - EXTERIOR PAINTING unless indicated otherwise.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- B. Examine materials upon arrival at site. Notify the carrier and manufacturer of any damage.

3.02 INSTALLATION, GENERAL

- A. Install all factory-fabricated items in accordance with the manufacturer's specifications and recommendations.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

- D. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- E. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, and other connectors.
- F. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- G. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 - 1. Cast Aluminum: Heavy coat of bituminous paint.

3.03 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for securely to, and rigidly brace from, building structure.
- C. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

3.04 INSTALLING NOSINGS, TREADS, AND THRESHOLDS

- A. Center nosings on tread widths unless otherwise indicated.
- B. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.

3.05 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with non-shrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.06 PROTECTION

- A. Protect installed products until completion of project.

3.07 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Steel tube railings attached to metal deck.
 - 2. Steel tube handrails attached to concrete stairs.

1.03 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
 - 1. Uniform Load: 100 lbf/sq. ft (4.79 kN/sq. m).
 - 2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in (2580 sq. mm).
 - 3. Uniform and concentrated loads need not be assumed to act concurrently.
 - 4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
 - 5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch (6.4 mm), whichever is less.
- C. Structural Performance of Handrails and Railings: Handrails and railings shall withstand the structural loads required by ASCE 7 without exceeding the allowable design working stress of the materials for handrails, railings anchors and connections. Gravity loads and the following loads and stresses within the limits and under the conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
- D. Seismic Performance: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7, Minimum Design Loads for Buildings and Other Structures": Section 9 "Earthquake Loads".
 - 1. Component Importance Factor is 1.15.

1.04 ACTION SUBMITTALS

- A. Product Data: For metal stairs and the following:
 - 1. Refilled metal-pan stair treads.
 - 2. Abrasive nosings.
 - 3. Paint products.
 - 4. Grout.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Provide templates for anchors and bolts specified for installation under other sections.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer.
- B. Welding certificates. Certified welder employed on the work shall have AWS Certification within the previous 12 months.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for stairs.
- E. Special Inspection Requirements:
 - 1. Where materials, welding procedures and qualifications of welders are verified prior to the start of work, periodic inspections of the work in progress and a visual inspection of all welds are made prior to shipping of shop welding, continuous special inspections of welding will not be required.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Professional Engineer Qualifications: A Professional Engineer who is legally qualified to practice in the state in which the project is located and who is experienced in providing engineering services of the type indicated and required for this section of the work. Engineering services are defined as those performed for installations of Metal Stairs including handrails and railing systems, that are similar to those indicated for this project in material, design and extent.
- C. Fabricator Qualifications: A firm experienced in producing Metal Stairs similar to those indicated for this project and with a record of successful in-service performance, as well as sufficient production capability to produce the required units.
- D. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
 - 1. Preassembled Stairs: Commercial class.
 - 2. Ornamental Stairs: Architectural class.
- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- F. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.07 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items

with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

- C. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

PART 2 - PRODUCTS

2.01 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.02 FERROUS METALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Steel Tubing: ASTM A500/A500M (cold formed).
- D. Uncoated, Cold-Rolled Steel Sheet: ASTM A1008/A1008M, either commercial steel, or structural steel, Grade 25 (Grade 170), unless another grade is required by design loads; exposed.

2.03 ABRASIVE NOSINGS

- A. Cast-Metal Units: Cast aluminum, with an integral abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in lengths necessary to accurately fit openings or conditions.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Safety Tread Co., Inc.
 - b. Balco Inc.
 - c. Barry Pattern & Foundry Co., Inc.
 - d. Safe-T-Metal Company, Inc.
 - e. Wooster Products Inc.
 - 2. Configuration: Cross-hatched units, 3 inches (75 mm) wide without lip.
- B. Extruded Units: Aluminum units with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Safety Tread Co., Inc.
 - b. Balco Inc.
 - c. Wooster Products Inc.
 - a. Nosings: Square-back units, 3 inches (75 mm) wide, without lip.
- C. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
- D. Apply bituminous paint to concealed surfaces of cast-metal units set into concrete.

- E. Apply clear lacquer to concealed surfaces of extruded units set into concrete.

2.04 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).
- D. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).
- E. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).
- F. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 2 (A4) stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.05 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, non-gaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- D. Concrete Materials and Properties: Comply with requirements in Section 033000 - CAST-IN PLACE CONCRETE for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 4000 psi (20 MPa) unless otherwise indicated.
- E. Nonslip-Aggregate Concrete Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and non-glazing; unaffected by freezing, moisture, or cleaning materials.
- F. Welded Wire Fabric: ASTM A 185/A 185M, 6 by 6 inches (152 by 152 mm), W1.4 by W1.4, unless otherwise indicated.

2.06 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 - 1. Join components by welding unless otherwise indicated.

2. Use connections that maintain structural value of joined pieces.
- B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work with accurate angles and surfaces and straight edges.
- F. Weld connections to comply with the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. Weld exposed corners and seams continuously unless otherwise indicated.
 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.
- H. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.07 STAIR RAILINGS

- A. Comply with applicable requirements in Section 055213 - PIPE AND TUBE RAILINGS or as indicated in this Section.
 1. Rails may be bent at corners, rail returns, and wall returns, instead of using prefabricated fittings.
 2. Connect posts to stair framing by direct welding unless otherwise indicated.
- B. Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.
 1. Rails and Posts: 1-1/2-inch round top and bottom rails and 1-1/2-inch round posts.
 2. Picket Infill: 1/2-inch round pickets spaced less than 3 7/8" inches clear.
 3. Intermediate Rails Infill: 1-1/2-inch round intermediate rails spaced less than 21 inches clear or as shown on the drawings.
 4. Gates: Form gates from steel tube of same size and shape as top rails, with infill to match guards. Provide with cam-type, self-closing hinges for fastening to wall and overlapping stop with rubber bumper to prevent gate from opening in direction opposite egress.
- C. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 1. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.

- D. Form changes in direction of railings as follows:
 - 1. As detailed.
 - 2. By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.
- E. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- F. Close exposed ends of railing members with prefabricated end fittings.
- G. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
 - 1. Connect posts to stair framing by direct welding unless otherwise indicated.
 - 2. For non-galvanized railings, provide non-galvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

2.08 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal stairs after assembly.
- C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 1. Interior Stairs: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.

Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

- F. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.
- G. Place and finish concrete fill for treads and platforms to comply with Section 033000 - CAST-IN PLACE CONCRETE
 - 1. Steel trowel concrete to a smooth finish, free of trowel marks and uniform in texture and appearance. allow concrete to cure for three days. Do not allow traffic on concrete.
 - 2. Install abrasive nosings with anchors fully embedded in concrete. Center nosings on tread width.

3.02 INSTALLING METAL STAIRS WITH GROUTED BASEPLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of baseplates.
- B. Set steel stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - 1. Use nonmetallic, nonshrink grout unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.03 INSTALLING RAILINGS

- A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:
 - 1. Anchor posts to steel by welding directly to steel supporting members.
 - 2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.
- B. Attach handrails to wall with wall brackets. Use type of bracket with predrilled hole for exposed bolt anchorage. Provide bracket with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 2. For hollow masonry anchorage, use toggle bolts.
 - 3. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.04 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 - EXTERIOR PAINTING and Section 099123 - INTERIOR PAINTING

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Metal bar gratings.
 - 2. Metal frames and supports for gratings.

1.03 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design gratings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Gratings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
 - 1. Floors: Uniform load of 125 lbf/sq. ft. (6.00 kN/sq. m) or concentrated load of 2000 lbf (8.90 kN), whichever produces the greater stress.
 - 2. Floors: Uniform load of 250 lbf/sq. ft. (11.97 kN/sq. m) or concentrated load of 3000 lbf (13.40 kN), whichever produces the greater stress.
 - 3. Walkways and Elevated Platforms Other Than Exits: Uniform load of 60 lbf/sq. ft. (2.87 kN/sq. m).
 - 4. Walkways and Elevated Platforms Used as Exits: Uniform load of 100 lbf/sq. ft. (4.79 kN/sq. m).
 - 5. Sidewalks and Vehicular Driveways, Subject to Trucking: Uniform load of 250 lbf/sq. ft. (11.97 kN/sq. m) or concentrated load of 8000 lbf (35.60 kN), whichever produces the greater stress.
 - 6. Limit deflection to L/360 or 1/4 inch (6.4 mm), whichever is less.
- C. Seismic Performance: Provide gratings capable of withstanding the effects of earthquake motions determined according to ASCE/SEI 7.

1.04 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Pressure Locked Galvanized Metal Gratings.
 - 2. Clips and anchorage devices for gratings.
 - 3. Paint products.
- B. Shop Drawings: Include plans, sections, details, and attachments to other work.
- C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer.
- B. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.

- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.06 QUALITY ASSURANCE

- A. Metal Bar Grating Standards: Comply with NAAMM MBG 531, "Metal Bar Grating Manual" and NAAMM MBG 532, "Heavy-Duty Metal Bar Grating Manual."
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.

1.08 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for gratings, grating frames, and supports. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.01 FERROUS METALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Steel Bars for Bar Gratings: ASTM A36/A36M or steel strip, ASTM A1011/A1011M or ASTM A 1018/A 1018M.
- D. Wire Rod for Bar Grating Crossbars: ASTM A510/A510M.
- E. Uncoated Steel Sheet: ASTM A1011/A1011M, structural steel, Grade 30 (Grade 205).
- F. Galvanized-Steel Sheet: ASTM A653/A653M, structural quality, Grade 33 (Grade 230), with G90 (Z275) coating.
- G. Expanded-Metal Carbon Steel: ASTM F1267, Class 1.
- H. Expanded-Metal Galvanized Steel: ASTM F1267, Class 2, Grade A.

2.02 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
- B. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts, and, where indicated, flat washers; ASTM F593 for bolts and ASTM F594 for nuts, Alloy Group 2 (A4).
- C. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- D. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).
- E. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).
- F. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 2 (A4) stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.03 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy that is welded.
- B. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Primers: Provide primers that comply with Section 099113 - EXTERIOR PAINTING and Section 099123 - INTERIOR PAINTING and Section 099600 "High-Performance Coatings."
- D. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- E. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.04 FABRICATION

- A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.
- D. Fit exposed connections accurately together to form hairline joints.
- E. Welding: Comply with AWS recommendations and the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
- F. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.
 - 1. Fabricate toeplates to fit grating units and weld to units in shop unless otherwise indicated.
 - 2. Fabricate toeplates for attaching in the field.
 - 3. Toeplate Height: 4 inches (100 mm) unless otherwise indicated.

2.05 METAL BAR GRATINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Barnett Bates Corporation.
 - 2. Borden Metal Products (Canada) Limited.
 - 3. IKG Industries; a division of Harsco Corporation.
 - 4. Ohio Gratings, Inc.
- B. Pressure-Locked Steel Grating: Fabricated by pressing rectangular flush-top crossbars into slotted bearing bars or swaging crossbars between bearing bars.
 - 1. Bearing Bar Spacing: 15/16 inch (24 mm) o.c.
 - 2. Bearing Bar Depth: As required to comply with structural performance requirements.
 - 3. Bearing Bar Thickness: As required to comply with structural performance requirements.
 - 4. Crossbar Spacing: 4 inches (102 mm) o.c.
 - 5. Grating Mark: As indicated.
 - 6. Traffic Surface: Serrated.
 - 7. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.8 oz./sq. ft. (550 g/sq. m) of coated surface.
- C. Removable Grating Sections: Fabricate with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated or, if not indicated, as recommended by manufacturer for attaching to supports.
 - 1. Provide no fewer than four weld lugs for each heavy-duty grating section, with each lug shop welded to two bearing bars.

2. Provide no fewer than four saddle clips for each grating section composed of rectangular bearing bars 3/16 inch (4.8 mm) or less in thickness and spaced 15/16 inch (24 mm) or more o.c., with each clip designed and fabricated to fit over two bearing bars.
 3. Provide no fewer than four weld lugs for each grating section composed of rectangular bearing bars 3/16 inch (4.8 mm) or less in thickness and spaced less than 15/16 inch (24 mm) o.c., with each lug shop welded to three or more bearing bars. Interrupt intermediate bearing bars as necessary for fasteners securing grating to supports.
 4. Provide no fewer than four flange blocks for each section of aluminum I-bar grating, with block designed to fit over lower flange of I-shaped bearing bars.
 5. Furnish threaded bolts with nuts and washers for securing grating to supports.
 6. Furnish self-drilling fasteners with washers for securing grating to supports.
 7. Furnish galvanized malleable-iron flange clamp with galvanized bolt for securing grating to supports. Furnish as a system designed to be installed from above grating by one person.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Kee Industrial Products, Inc.; Grating Clip.
 - 2) Lindapter North America, Inc.; Grate-Fast.
- D. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.
1. Edge-band openings in grating that interrupt four or more bearing bars with bars of same size and material as bearing bars.
- E. Do not notch bearing bars at supports to maintain elevation.

2.06 GRATING FRAMES AND SUPPORTS

- A. Frames and Supports for Metal Gratings: Fabricate from metal shapes, plates, and bars of welded construction to sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.
1. Equip units indicated to be cast into concrete or built into masonry with integrally welded anchors. Unless otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.
- B. Galvanize steel frames and supports in the following locations:
1. Exterior.
 2. Interior, where indicated.
 3. Carrier angles for Galvanized Steel Grate treads and toeplates.

2.07 STEEL FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish gratings, frames, and supports after assembly.
- C. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.
- D. Fit exposed connections accurately together to form hairline joints.
 - 1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- E. Attach toeplates to gratings by welding at locations indicated.
- F. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
- G. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.02 INSTALLING METAL BAR GRATINGS

- A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.
- B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.
- C. Attach non-removable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

3.03 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 - EXTERIOR PAINTING and Section 099123.01 - INTERIOR PAINTING.

- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Treated Wood Members.
 - 2. Miscellaneous Framing and Sheathing.
 - 3. Plywood Subfloors.
 - 4. Fasteners.
 - 5. Structural Hold Downs, Connectors and Framing Accessories.
 - 6. Framing with timber.
 - 7. Framing with engineered wood products.
 - 8. Wood blocking, cants, and nailers.
 - 9. Wood furring and grounds.

1.03 REFERENCES:

- A. AWWPA - (American Wood Preservers Association) C1 - All Timber Products Preservative Treatment by Pressure Process.
- B. APA - American Plywood Association.
- C. AITC - American Institute of Timber Construction.
- D. US Department of Commerce (DOC):
 - 1. DOC PS 1 - Performance Standard for Structural Plywood.
 - 2. DOC PS 2 - Performance Standard for Wood-Based Structural Panels.
- E. International Code Council (ICC):
 - 1. ICC IBC - International Building Code

1.04 DEFINITIONS

- A. Exposed Framing: Framing not concealed by other construction.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- C. Timber: Lumber of 5 inches nominal or greater in least dimension.
- D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NLGA: National Lumber Grades Authority.
 - 3. SPIB: The Southern Pine Inspection Bureau.
 - 4. WCLIB: West Coast Lumber Inspection Bureau.
 - 5. WWPA: Western Wood Products Association.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.06 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- B. Evaluation Reports: For the following, from ICC-ES:
 1. Wood-preservative-treated wood.
 2. Fire-retardant-treated wood.
 3. Plywood.
 4. Engineered wood products.
 5. Shear panels.
 6. Power-driven fasteners.
 7. Powder-actuated fasteners.
 8. Expansion anchors.
 9. Metal framing anchors.

1.07 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Handle, Transport and Store Plywood Panels in accordance with the APA Storage and Handling recommendations.
- B. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.
- C. Stack panels flat with a minimum of three, full panel width, 4 inch by 4 inch spacers per eight foot panel length beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.01 WOOD PRODUCTS, GENERAL

- A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship" for the following:
1. Dimension lumber framing.
 2. Timber.
 3. Laminated-veneer lumber.
 4. Parallel-strand lumber.
 5. Miscellaneous lumber.
- B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 4. Provide dressed lumber, S4S, unless otherwise indicated.
- C. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness 15 percent for 2-inch nominal thickness or less, no limit for more than 2-inch nominal thickness unless otherwise indicated.
- D. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- E. Plywood: Conform to requirements and recommendations provided in DOC PS 1 - Voluntary Product Standard for Construction and Industrial Structural Plywood.

2.02 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPA U1; UC2 (Interior Construction - Above Ground - Damp) for interior construction not in contact with the ground, Use Category UC3B (Above Ground Exposed) for exterior construction not in contact with the ground, and UC4B (Ground Contact or Fresh Water - Heavy Duty) for items in contact with the ground.
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
 2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - 4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.
 - 5. Wood floor plates that are installed over concrete slabs-on-grade.

2.03 DIMENSION LUMBER FRAMING

- A. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade.
 - 1. Application: Interior partitions not indicated as load-bearing.
 - 2. Species:
 - a. Hem-fir (north); NLGA.
 - b. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
 - c. Northern species; NLGA.
- B. Load-Bearing Partitions: No. 2 grade.
 - 1. Species:
 - a. Southern pine; SPIB.
 - b. Douglas fir-larch; WCLIB or WWPA.
 - c. Hem-fir; WCLIB or WWPA.
 - d. Douglas fir-larch (north); NLGA.
 - e. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
- C. Load-Bearing Partitions: Any species and grade with a modulus of elasticity of at least 1,600,000 psi and an extreme fiber stress in bending of at least for 2-inch nominal thickness and 12-inch nominal width for single-member use.
 - 1. Application: Exterior walls and interior load-bearing partitions.
- D. Ceiling Joists: Construction or No. 2 grade.
 - 1. Species:
 - a. Southern pine; SPIB.
 - b. Hem-fir; WCLIB or WWPA.
 - c. Douglas fir-south; WWPA.
 - d. Eastern softwoods; NeLMA.
- E. Joists, Rafters, and Other Framing Not Listed Above: No. 1 grade.
 - 1. Species:
 - a. Douglas fir-larch; WCLIB or WWPA.
 - b. Douglas fir-larch (north); NLGA.
 - c. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

- F. Joists, Rafters, and Other Framing Not Listed Above: Any species and grade with a modulus of elasticity of at least 1,500,000 psi (10 350 MPa) and an extreme fiber stress in bending of at least 1000 psi (6.9 MPa) for 2-inch nominal thickness and 12-inch nominal width for single-member use.
- G. Exposed Framing: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.
 - 1. Species and Grade: Southern pine; No. 1 grade; SPIB.
 - 2. Species and Grade: Douglas fir-south; No. 1 grade; WWPA.
 - 3. Species and Grade: Hem-fir; No. 1 grade; WCLIB or WWPA.

2.04 TIMBER FRAMING

- A. Provide timber framing complying with the following requirements, according to grading rules of grading agency indicated:
 - 1. Species and Grade: Douglas fir-larch, Douglas fir-larch (north), or Douglas fir-south; No. 1 grade; NLGA, WCLIB, or WWPA.
 - 2. Species and Grade: Eastern hemlock, eastern hemlock-tamarack, or eastern hemlock-tamarack (north); No. 1 grade; NeLMA or NLGA.
 - 3. Species and Grade: Mixed oak; Select Structural grade; NeLMA.

2.05 PLYWOOD SUBFLOORS

- A. Plywood Subflooring: 3/4 Performance category APA Rated STURD-I-FLOOR, 24" o.c., Group 1, Exterior, 48 inch by 96 inch, B-C face grades, Tongue and Groove (T&G) edges.

2.06 CONSTRUCTION MOUNTING PANELS

- A. Communications and Electrical Room Mounting Boards: PS 1, APA rated A-D faced plywood or MDF; 3/4 inch thick; flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.07 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Grounds.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber and any of the following species:
 - 1. Hem-fir (north); NLGA.
 - 2. Mixed southern pine; SPIB.
 - 3. Hem-fir; WCLIB or WWPA.
 - 4. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
- C. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:
 - 1. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
 - 2. Eastern softwoods; No. 2 Common grade; NeLMA.

- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.08 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M or Type 304 stainless steel.
- B. Power-Driven Fasteners: NES NER-272.
- C. Wood Screws: ASME B16.1.
- D. Lag Bolts: ASME B18.2.1.
- E. Bolts: Steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and, where indicated, flat washers.
- F. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E488/E488M conducted by a qualified independent testing and inspecting agency.
 - 1. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

2.09 METAL FRAMING ANCHORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Cleveland Steel Specialty Co.
 - 2. Simpson Strong-Tie Co., Inc.
 - 3. USP Structural Connectors.
- B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- C. Provide products that have been approved by the ICC-Evaluation Service with an accompanying Evaluation Service Report (ESR) listing locations of allowable use.
- D. Joist Hangers: U-shaped joist hangers with 2-inch long seat and 1-1/4-inch wide nailing flanges at least 85 percent of joist depth.
 - 1. Thickness: 0.062 inch.

- E. I-Joist Hangers: U-shaped joist hangers with 2-inch long seat and 1-1/4-inch wide nailing flanges full depth of joist. Nailing flanges provide lateral support at joist top chord.
 - 1. Thickness: 0.062 inch.
- F. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.
 - 1. Strap Width: 1-1/2 inches.
 - 2. Thickness: 0.062 inch.
- G. Bridging: Rigid, V-section, nail-less type, 0.050 inch thick, length to suit joist size and spacing.
- H. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.
 - 1. Width: 1-1/4 inches.
 - 2. Thickness: 0.062 inch.
 - 3. Length: As indicated.
- I. Rafter Tie-Downs: Bent strap tie for fastening rafters or roof trusses to wall studs below, 1-1/2 inches wide by 0.050 inch thick. Tie fasteners to side of rafter or truss, face of top plates, and side of stud below.
- J. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below, 2-1/4 inches wide by 0.062 inch thick. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates, and side of stud below.
- K. Floor-to-Floor Ties: Flat straps, with holes for fasteners, for tying upper floor wall studs to band joists and lower floor studs, 1-1/4 inches wide by 0.050 inch thick by 36 inches long.
- L. Hold-Downs: Brackets for bolting to wall studs and securing to foundation walls with anchor bolts or to other hold-downs with threaded rods and designed with first of two bolts placed seven bolt diameters from reinforced base.
 - 1. Bolt Diameter: 3/4 inch.
 - 2. Width: 3-3/16 inches.
 - 3. Body Thickness: 0.138 inch.
 - 4. Base Reinforcement Thickness: 0.108 inch.
- M. Wall Bracing: T-shaped bracing made for letting into studs in saw kerf, 1-1/8 inches (29 mm) wide by 9/16 inch deep by 0.034 inch thick with hemmed edges.
- N. Wall Bracing: Angle bracing made for letting into studs in saw kerf, 15/16 by 15/16 by 0.040 inch thick with hemmed edges.

2.10 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.
- B. Adhesives for Gluing Furring to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

PART 3 - EXECUTION

3.01 PREPARATION OF SURFACES

- A. Surfaces to receive new wood members shall be free of all dirt, debris, and loose materials. Exposed surfaces shall be mechanically scraped if necessary, to remove projections.

- B. Surfaces shall have no free water present in any form (rain, dew, frost, snow or ice).
- C. Contractor is responsible to inspect all exposed surfaces to see that conditions are satisfactory for installation of new work.

3.02 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb and in true alignment until completion of erection and installation of permanent bracing.
- D. Place horizontal members flat, crown side up.
- E. Construct load bearing framing and curb members full length without splices.
- F. Double members at all openings. Space short members over and under opening to member spacing.
- G. Bridge framing in excess of 8 feet span at midspan.
- H. Coordinate installation of adjacent construction.
- I. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- J. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.
- K. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- L. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.
- M. Do not splice structural members between supports unless otherwise indicated.
- N. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- O. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not

- inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
3. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
- P. Comply with AWWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- Q. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
1. NES NER-272 for power-driven fasteners.
 2. Table 2304.10.1, "Fastening Schedule," in ICC's "International Building Code" and the 2020 Building Code of New York State".
 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
- R. Warped wood members shall not be used unless they can be fastened adequately to permanently hold them in their required alignment.
- S. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
1. Comply with approved fastener patterns where applicable. Before fastening, mark fastener locations, using a template made of sheet metal, plastic, or cardboard.
 2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
 3. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.03 WOOD GROUND, BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.04 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

3.05 FLOOR JOIST FRAMING INSTALLATION

- A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:
 1. Where supported on wood members, by toe nailing or by using metal framing anchors.

2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.
- B. Fire Cuts: At joists built into masonry, bevel cut ends 3 inches and do not embed more than 4 inches.
 - C. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.
 - D. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 2 inches from top or bottom.
 - E. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.
 - F. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.
 - G. Anchor members paralleling masonry with 1/4-by-1-1/4 inch metal strap anchors spaced not more than 96 inches o.c., extending over and fastening to three joists. Embed anchors at least 4 inches into grouted masonry with ends bent at right angles and extending 4 inches beyond bend.
 - H. Provide solid blocking between joists under jamb studs for openings.
 - I. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.
 1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.
 - J. Provide bridging of type indicated below, at intervals of 96 inches o.c., between joists.
 1. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal size lumber, double-crossed and nailed at both ends to joists.
 2. Steel bridging installed to comply with bridging manufacturer's written instructions.

3.06 CEILING JOIST AND RAFTER FRAMING INSTALLATION

- A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
 1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal size or 2-by-4-inch nominal size stringers spaced 48 inches o.c. crosswise over main ceiling joists.
- B. Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.
 1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
 2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.

- C. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal size boards between every third pair of rafters, but not more than 48 inches o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.
- D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

3.07 TOLERANCES

- A. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.08 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Wall sheathing.
 - 2. Sheathing joint and penetration treatment.

1.02 REFERENCES

- A. American Society of Mechanical Engineers (ASME):
 - 1. ASME B18.6.1 - Wood Screws (Inch Series).
- B. ASTM International (ASTM):
 - 1. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - 2. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials
 - 3. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials
 - 4. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
- C. International Code Council (ICC):
 - 1. ICC IBC - International Building Code.
- D. ICC Evaluation Service, Inc. (ICC-ES):
 - 1. AC38 - Acceptance Criteria for Weather Resistant Barriers
 - 2. ICC-ES AC116 - Acceptance Criteria for Nails and Spikes
 - 3. ICC-ES AC148 - Acceptance Criteria For Flexible Flashing Materials

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1.04 INFORMATIONAL SUBMITTALS

- A. Product Certifications: From manufacturer, indicating that sheathing products comply with ICC ES AC266 and ICC-ES AC310.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Handle, Transport and Store Plywood Panels in accordance with the APA Storage and Handling recommendations.
- B. Stack panels flat with a minimum of three, full panel width, 4 inch by 4 inch spacers per eight foot panel length beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory".

2.02 WALL SHEATHING

- A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. CertainTeed Corporation; GlasRoc.
 - b. G-P Gypsum Corporation; Dens-Glass Gold.
 - c. National Gypsum Company; Gold Bond e(2)XP.
 - d. United States Gypsum Co.; Securock.
 - 2. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick.
 - 3. Size: 48 by 96 inches (1219 by 2438 mm) for vertical installation.

2.03 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M or Type 304 stainless steel..
- B. Nails, Brads, and Staples: ASTM F1667, ICC AC116 and ICC AC201.
- C. Power-Driven Fasteners: ICC-ES-1539 or NES NER-272.
- D. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117.
 - 1. For steel framing less than 0.0329 inch (0.835 mm) thick, use screws that comply with ASTM C1002.
 - 2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C954.

2.04 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
 - 1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
- D. Coordinate wall and sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.02 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 2. Install boards with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
 - 3. Install boards with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.
 - 1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards unless a tighter spacing is required by Structural Drawings
 - 2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
 - 1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards unless a tighter spacing is required by Structural Drawings.

2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- E. Seal sheathing joints according to sheathing manufacturer's written instructions.
1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 1. Polyisocyanurate foam insulation with foil facers
 2. Glass-fiber blanket insulation.
 3. Vapor retarders.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Manufacturer's Certificate: Certify panels will conform to specified performance requirements.

1.04 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
- B. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.05 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.
- C. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 - PRODUCTS

2.01 POLYISOCYANURATE BOARD INSULATION

- A. Acceptable Manufacturer: Insulating panels shall be XCI products produced by Hunter Panels, 15 Franklin Street, Portland, Maine 04101. Phone: (207) 761-5678 or (888) 746-1114. Fax: (877) 115-1769. E-mail: info@hpanels.com.
 - 1. Or approved equal
- B. Board Insulation with Foil Facers: Hunter Panels Xci Foil (Class A) complies with ASTM C1289 and ASTM E84 Class A (25 or less) Panels are a high thermal resistive rigid insulation panel composed of a closed cell polyisocyanurate foam core bonded on both sides to reinforced foil facers.
 - 1. Type: ASTM C1289, Type I
 - a. Grade 3 (25 psi).
 - b. Panel Size:
 - 1) 4 feet by 8 feet (1220 mm by 2440 mm).
 - c. R Value: ASTM C518 at 75 degrees F (23.9 degrees C). Provide thickness requirements indicated on the drawings
 - 1) 2.0 inches (51 mm) / R Value 13.0
- C. Complies with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
- D. Panel fasteners shall be corrosion resistant type as approved by the panel manufacturer. Length of fasteners shall be as recommended by the panel manufacturer

2.02 GLASS-FIBER BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Johns Manville.
 - 2. Knauf Insulation.
 - 3. Owens Corning.
- B. Foil-Faced, Glass-Fiber Blanket Insulation: ASTM C665, Type III (reflective faced), Class B (faced surface with a flame-propagation resistance of 0.12 W/sq. cm); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

2.03 VAPOR RETARDERS

- A. Reinforced-Polyethylene Vapor Retarders: Two outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nylon cord or polyester scrim and weighing not less than 25 lb/1000 sq. ft., with maximum permeance rating of 0.0507 perm on the exterior and interior walls.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Raven Industries Inc.; DURA-SKRIM 6WW.
 - b. Reef Industries, Inc.; Griffolyn T-65.
 - c. Stego Industries, LLC StegoWrap 15 mil
 - d. or approved equal.
- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

- C. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.
- D. Single-Component Nonsag Urethane Sealant: ASTM C920, Type I, Grade NS, Class 25, Use NT related to exposure, and Use O related to vapor-barrier-related substrates.
- E. Adhesive for Vapor Retarders: Product recommended by vapor-retarder manufacturer and has demonstrated capability to bond vapor retarders securely to substrates indicated.

2.04 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.
 - 1. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - 2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.
- B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
 - 1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
 - a. Ceiling plenums.
- C. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 1 inch between face of insulation and substrate to which anchor is attached.
- D. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

3.02 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.03 INSTALLATION OF BELOW-GRADE INSULATION

- A. On vertical surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
 - 1. If not otherwise indicated, extend insulation a minimum of 48 inches in from exterior walls.

3.04 INSTALLATION OF CAVITY-WALL INSULATION

- A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.
 - 1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Division 04

3.05 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
 - 5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
 - a. Exterior Walls: Set units with facing placed toward interior of construction.
 - b. Interior Walls: Set units with facing placed toward areas of high humidity.
- D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.06 INSTALLATION OF VAPOR RETARDERS

- A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.
- C. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.07 CLEANING

- A. Final Cleaning: Upon completion, remove surplus materials, rubbish, tools and equipment in accordance with Section 017423 - CLEANING.

3.08 PROTECTION

- A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes vapor-permeable, fluid-applied air and water barriers.

1.03 REFERENCED STANDARDS

- A. References, General: Versions of the following standards current as of the date of issue of the project apply to the Work of this Section.
- B. American Association of Textile Chemists and Colorists (AATCC):
 - 1. AATCC-127-2008 Water Resistance: Hydrostatic Pressure Test.
- C. ASTM International (ASTM):
 - 1. ASTM C 1305 – Standard Test Method for Crack Bridging Ability of Liquid-Applied Waterproofing Membrane.
 - 2. ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
 - 3. ASTM D1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - 4. ASTM D4541 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
 - 5. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.
 - 6. ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
 - 7. ASTM E2178 Standard Test Method for Air Permeance of Building Materials.
 - 8. ASTM E2357 Standard Test Methods for Determining Air Leakage of Air Barrier Assemblies.
- D. National Fire Protection Association (NFPA):
 - 1. NFPA 285 - Standard Fire Test Method for Evaluation Of Fire Propagation Characteristics Of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

1.04 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For weather barrier, include data on air and water-vapor permeance based on testing in accordance with referenced standards.
- B. Manufacturer's Instructions: For installation of each product specified.
 - 1. Substrate preparation instructions and recommendations.
- C. Manufacturer Qualifications: A qualified manufacturer[listed in this Section] with minimum five years' experience in manufacture of air barrier membrane as one of its principal products.
- D. Manufacturer's Product Compatibility Certificate: Certify compatibility of air barrier products with adjacent materials.
- E. Sample Warranty: For manufacturer's warranty.

F. Installer Qualifications:

1. A qualified firm that is certified by weather barrier system manufacturer to install manufacturer's product.
2. A firm with minimum three (3) years' experience in installation of specified products in successful use on similar projects, employing workers trained by manufacturer, including a full-time on-site supervisor with a minimum of three (3) years' experience installing similar work, able to communicate verbally with Contractor, Architect, and employees.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Accept materials on site in manufacturer's unopened original packaging.
- B. Store products in weather protected environment, clear of ground and moisture, within temperature ranges recommended by air barrier manufacturer.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.
 1. Protect substrates from environmental conditions that affect air-barrier performance.
 2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

1.07 COORDINATION AND SCHEDULING

- A. Coordinate installation of membrane air barrier with completion of roofing and other work requiring interface with air barrier.
- B. Schedule work so air barrier applications may be inspected prior to concealment.
- C. Ensure air barrier materials are cured before covering with other materials.

1.08 WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form in which air barrier manufacturer agrees to furnish and install air barrier material to repair or replace those materials installed according to manufacturer's written instructions that exhibit material defects or otherwise fail to perform as specified under normal use within warranty period specified.
 1. Access for Repair: Owner shall provide unimpeded access to the Project and the air barrier system for purposes of testing, leak investigation, and repair, and shall reinstall removed cladding materials upon completion of repair.
 2. Cost Limitation: Manufacturer's obligation for repair or replacement shall be limited to the original installed cost of the work.
 3. Warranty Period: Two (2) years date of Substantial Completion.
- B. Special warranties specified in this article exclude deterioration or failure of air barrier materials from the following:
 1. Movement of the structure caused by structural settlement or stresses on the air barrier exceeding manufacturer's written specifications for elongation.
 2. Mechanical damage caused by outside agents.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations: Obtain weather barrier assembly components, including weather barrier, weather barrier flashing and sealants from same manufacturer as weather barrier or manufacturer approved by weather barrier manufacturer.
- B. Basis-of-Design Products: Provide air barrier products manufactured by Tremco, Inc., Beachwood OH; www.tremcosealants.com.

2.02 PERFORMANCE REQUIREMENTS

- A. General: Membrane air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a moisture drainage plane transitioned to adjacent flashings and discharging water to the building exterior. Membrane air barriers shall accommodate substrate movement and seal expansion and control joints, construction material transitions, opening transitions, penetrations, and perimeter conditions without moisture deterioration and air leakage exceeding performance requirements.
- B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. when tested according to ASTM E 2357.
- C. Fire Propagation Characteristics: Provide air barrier system qualified as a component of a comparable wall assembly that has been tested and passed NFPA 285.
- D. VOC Content: 250 g/L maximum per 40 CFR 59, Subpart D (EPA Method 24) and complying with requirements of authorities having jurisdiction.
- E. Compatibility: Provide membrane air barrier materials that are compatible with one another and with adjacent materials under conditions of service and application required, as demonstrated by membrane air barrier manufacturer based on testing and field experience.

2.03 MEMBRANE AIR BARRIER

- A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: Elastomeric, UV-resistant, synthetic membrane, formulated for application in a range of 48 - 70 mils (wet), 25 - 35 mils (dry).
 - 1. Basis of Design Product: Tremco, Inc., ExoAir 230.
 - 2. Air Permeance, ASTM E 2178: 0.004 cfm/sq. ft of surface area at 1.57-lbf/sq. ft. pressure difference, maximum.
 - 3. Vapor Permeance, ASTM E 96/E96M: Minimum 12 perms.
 - 4. Elongation, Ultimate, ASTM D 412, Die C: 600 percent, minimum.
 - 5. Combustion Characteristics: Class A, flame spread, not greater than 25; smoke developed, not greater than 450, per ASTM E 84.
 - 6. UV Resistance, QUV-B: Over 160 cycles of UV and water spray with no observable deterioration.
 - 7. VOC Content: Less than 50 g/L.

2.04 WEATHER BARRIER FLASHING

- A. Conformable Weather Barrier Flashing: Composite flashing material composed of micro-creped, polyethylene laminate with a 100 percent butyl-based adhesive layer; AAMA 711 Class A (no primer), Level 3 thermal exposure of 176 deg F (80 deg C) for seven days.
 - 1. Basis-of-Design Product: DuPont Safety & Construction: E. I. du Pont de Nemours and Company; FlexWrap™ NF.

- a. Or approved equal.
 2. Conformability: Able to create a seamless sill pan extending up the jambs without cuts, patches, or fasteners.
- B. Strip Flashing: Composite flashing material composed of spunbonded polyethylene laminate with a 100 percent butyl-based adhesive layer; AAMA 711, Class A (no primer), Level 3 thermal exposure of 176 deg F (80 deg C) for seven days.
1. Basis-of-Design Product: DuPont Safety & Construction: E. I. du Pont de Nemours and Company; Tyvek® StraightFlash™, Tyvek® StraightFlash™ VF.
 - a. Or approved equal.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 2. Verify that substrates have cured and aged for minimum time recommended in writing by weather barrier manufacturer.
 3. Verify that substrates are visibly dry and frost-free.
 - a. Fluid-applied weather barrier may be applied to damp surfaces.
 - b. Surfaces are considered damp if there is no visible water on the surface, and no transfer of water to the skin when touched.
 - c. Apply accessory products only to clean and dry surfaces.
 4. Verify that substrates are free of efflorescence and mold.
 5. Verify that masonry joints are flush and filled with mortar. Test for capillary moisture by method recommended in writing by air barrier manufacturer.
 6. Verify that top-of-wall system has been capped or covered to prevent water getting behind the facade and into wall cavity.
 7. Verify continuous path for moisture drainage.
 - a. Verify that continuous path for drainage is not blocked or disrupted, which results in excess moisture buildup in wall cavity.
 8. Verify that surfaces to receive weather barrier are above grade.
- B. Verify that substrate and surface conditions are in accordance with commercial weather barrier manufacturer recommendations prior to installation.
1. Verify that rough sill framing for doors and windows slopes downward towards the exterior and is level across width of opening.
- C. Verify air and surface temperatures are above 25 deg F with a maximum surface temperature of 140 deg F. Do not install once ambient temperature exceeds 95 deg F, unless surface is shaded.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate in accordance with manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.
- B. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

- C. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.
- D. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- E. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- F. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.
- G. Mask adjacent finished surfaces.
- H. Treat all non-moving transition joints to beams, columns, and dissimilar materials by applying a 2 inch- wide by 60-mil- thick coat of fluid-applied flashing across the joint.
- I. Apply 25-mil- thick coat of fluid-applied flashing, extending a minimum 2 inches on each surface, and treat the following conditions:
 - 1. Joints up to 1/4 inch.
 - 2. Joints 1/4- to 1/2-inch; reinforce with fiberglass-mesh tape.
 - 3. Joints and transitions up to 1 inch; treat using strip flashing.
- J. Treat inside and outside corners by applying a 25-mil- thick coat of fluid applied weather barrier a minimum 2 inches on each adjoining surface. Apply fillet bead of fluid-applied sealant to inside corners to ensure continuity. Alternatively, treat corners using strip flashing. Press strip flashing into inside corners; ensure that it is fully adhered to substrate.
- K. Seal penetrations using fluid-applied flashing or sealant. Extend fillet bead 1/2 inch onto both surfaces.
- L. Treat embedded masonry anchors by applying a coat of fluid-applied weather barrier or fluid-applied flashing around base of the anchor.

3.03 ACCESSORIES INSTALLATION

- A. Install accessory materials in accordance with air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.
 - 1. Coordinate installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 - 2. Install transition strip on roofing membrane or base flashing, for a minimum 3 inches coverage over each substrate.
 - 3. Apply pressure along entire surface of strip flashing for good bond using a J-roller or firm hand pressure. Remove all wrinkles and bubbles by smoothing surface and repositioning as necessary.
- B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
 - 1. Seal top of through-wall flashings to membrane air barrier with a continuous bead of approved sealant recommended by air barrier manufacturer.
- C. When applying self-adhered flashing products over a cured fluid-applied membrane, first apply a wet bed of fluid-applied product.

- D. Seal fasteners of mechanically attached supports or furring strips in high-performance building envelope designs.
 - 1. Apply double-sided butyl tape to back of support bracket at fastener location.
 - 2. Embed support bracket into an additional wet bed of fluid applied product.
 - 3. Adhere butyl-based flashing patch to wall at fastener location.
 - 4. Use alternate method as approved by the manufacturer.
- E. At end of each working day, seal top edge of strips and transition strips to substrate with manufacturer approved product.
- F. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Flashing Sill Area for Windows and Doors:
 - 1. Install without stretching conformable flashing when installing along sills or jambs. Conformable flashing is intended to be stretched when covering corners or curved sections.
- H. Apply fluid-applied flashing products from head of opening down. Use a corner trowel to smooth corners.
- I. Repairs:
 - 1. Coat small damaged areas with layer of fluid-applied product.
 - 2. Reinforce large damaged areas with fiberglass mesh or replace damaged substrate before reapplying fluid-applied product.
 - 3. Seal punctures, voids, and seams. Patch with approved transition and accessory materials following air barrier manufacturer's recommendations and extend repair beyond repaired areas to maintain continuity.

3.04 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

- A. Apply air-barrier material to form a seal with strips and transition strips, and to achieve a continuous air barrier in accordance with air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.
 - 1. Apply fluid air barrier material in full contact with substrate to produce a continuous seal according to membrane air barrier manufacturers written instructions.
 - 2. Fluid applied products may be overcoated once a touch-free skin has formed. Exterior insulation and cladding may be installed once the membrane has cured sufficiently to resist damage during installation.
- B. Apply air barrier material in accordance with air-barrier manufacturer's written instructions and recommendations.
 - 1. Roller Application:
 - a. Nap rolling: Use a roller cover with a 1/2- to 3/4-inch nap.
 - 2. Total dry film thickness shall be as recommended in writing by manufacturer to meet performance requirements, in a range of 25 – 35 mils dry film thickness depending on substrate, applied in one or more equal coats, roller- or spray- applied.
- C. Integrate fluid-applied product with through-wall flashing and window and door flashing by overlapping flashing with fluid-applied product a minimum 2 inches.
- D. Inspect surfaces to ensure that fluid-applied products are continuous and free of any voids or pinholes.

- E. Seal punctures, voids, and seams. Patch with approved transition and accessory materials following air barrier manufacturer's recommendations and extend repair beyond repaired areas to maintain continuity.
- F. Do not cover air barrier until it has been tested and inspected by the testing agency.
- G. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.05 FIELD QUALITY CONTROL

- A. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
 - 1. Continuity of air-barrier system has been achieved throughout the building envelope without gaps, holes, or pinholes.
 - 2. Air-barrier dry film thickness.
 - 3. Continuous structural support of air-barrier system provided.
 - 4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
 - 5. Site conditions for application temperature, and dryness of substrates are maintained.
 - 6. Maximum exposure time of materials to UV deterioration not exceeded.
 - 7. Surfaces primed, where applicable.
 - 8. Laps in strips and transition strips comply with minimum requirements, are shingled in correct direction (or mastic applied on exposed edges), and are without fishmouths.
 - 9. Termination mastic applied on cut edges.
 - 10. Strips and transition strips firmly adhered to substrate.
 - 11. Compatible materials used.
 - 12. Transitions at changes in direction and structural support at gaps provided.
 - 13. Connections between assemblies (air-barrier and sealants) comply with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
 - 14. Each penetration sealed.
- B. Air barriers will be considered defective if they do not pass tests and inspections.
 - 1. Apply additional air-barrier material, in accordance with manufacturer's written instructions, where inspection results indicate insufficient thickness.
 - 2. Remove and replace deficient air-barrier components for retesting as specified above.
- C. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.
- D. Prepare test and inspection reports.

3.06 CLEANING AND PROTECTION

- A. Protect air-barrier system from damage during application and remainder of construction period, in accordance with manufacturer's written instructions.
 - 1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials in accordance with air-barrier manufacturer's written instructions.
 - 2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

- B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.
- C. Remove masking materials after installation.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glass fiber reinforced plastic (FRP/GRP) Tank Cover Panels, Access Hatches, and Structural Framing and Beams.
- B. FRP/GRP trim and flashing.
- C. Fasteners and anchors.
- D. Gaskets.
- E. Accessories and appurtenances.

1.02 REFERENCES

- A. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2019.
- B. ANSI A326.3 - American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials; 2021.
- C. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010 (Reapproved 2018).
- D. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2018).
- E. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2014.
- F. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2015.
- G. ISO 9001 - Quality Management Systems — Requirements; 2015.
- H. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2017.
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2019b.

1.03 PERFORMANCE REQUIREMENTS

- A. Design Requirements:
 - 1. The roof system shall be designed and furnished by the manufacturer as a complete system. Materials shall comply with Federal and Local laws or ordinances, applicable codes, standards, regulations, and/or regulatory agency requirements.
 - 2. Structural framing and deck panels shall meet performance and design criteria listed herein for span conditions indicated on the drawings. Individual units shall demonstrate compliance with design criteria by large-scale testing.
 - a. FRP Deck Panels: Uniform Load and Deflection Test
 - b. FRP Structural Components: 3 Point Load Bending Test
 - 3. Design Loads shall comply with local codes with combined loads determined by Allowable Stress Method.
 - a. Live or Snow: 100 psf.
 - b. Wind Uplift: 55 psf.
 - c. Dead Load: 25 psf

- 1) Deck panels: Individual unit weight plus other materials attached to and supported by panels.
- 2) Cover structure: Individual unit weight plus other materials attached to and supported by cover structure.
4. Design Limits
 - a. Dead + Live or Snow Load: Deflection Limit: L/240 (max.); Factor of Safety: 2.5.
 - b. Personnel Load: Cover shall be capable of supporting 300 pound concentrated load over 30 inch by 30 inch square area located at panel midspan with L/240 deflection limit or total deflection not to exceed 5/8 inch.
5. Cover Panel Removability:
 - a. Each cover panel shall be removable without having to remove any adjacent cover panel.
 - b. Each cover panel shall be removable vertically and without cutting of a cover component.
6. Slip Resistance of Cover System
 - a. Cover panels, end-to-end joint flashing and side-joint, locking channel shall utilize TreadMAX integral, non-skid surface technology or meet the following criteria:
 - 1) The cover shall have a slip-resistant walking surface designed for operator foot traffic.
 - 2) Non-skid surface shall be an integral (embedded) part of the cover panel and not achieved by use of coatings/paint, adhesive tapes, or other applied product after the manufacturing process.
 - 3) Slip resistance tread shall be at minimum bi-directional.
 - b. Minimum average Dynamic Coefficient of Friction (DCOF) shall be 0.50 per ANSI A137.1 and ANSI A326.3 Dynamic Coefficient of Friction Tests.
 - c. Minimum wet Pendulum Test Value (PTV) shall be 45, with Four S (96) hard rubber slider, per AS HB198:2014 (AS/NZS 4586) Pendulum Test.
7. Collateral loads shall not be applied to the roof panels.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300 - SUBMITTALS.
- B. Product Data: Manufacturer's data sheets on each product to be used including:
 1. Manufacturer's technical data, including calculations, demonstrating compliance with specified design criteria noted in the PERFORMANCE REQUIREMENTS Article.
 2. Storage and handling instructions.
 3. Installation instructions.
- C. Shop Drawings including layouts, product description, connection and framing details, fastener types and spacing.
 1. Drawings shall be approved prior to manufacture and fabrication.
- D. Certifications as specified herein.

1.05 QUALITY ASSURANCE

- A. Tank cover supplier shall manufacture and fabricate all FRP components in its own facility, which must be ISO 9001 certified..
- B. Manufacturer shall submit names and addresses of ten (10) previous projects of comparable scope completed in the last five (5) years to the Architect/Engineer.
- C. Contractor shall verify all field dimensions for development of manufacturer's drawings.
- D. Contractor shall review and confirm in writing approval of manufacturer's drawings.

13. Cover panels shall utilize integral TreadMAX non-skid surface technology.
Note: coatings/paints, adhesive tapes, or other applied product after the manufacturing process will not be accepted nor approved as a substitution.
 14. Color of deck panels shall be standard gray.
- B. Flashing and Trim
1. FRP flashing shall be isophthalic polyester with dimensions, and profile as indicated on the drawings and as required by the manufacturer.
 2. Non-radius end flashing shall be factory attached to individual deck panels.
 3. Flashing with a radius or at the perimeter of a circular tank shall be a separate part and field attached by the installing contractor.
- C. FRP Structural Framing (as indicated on the drawings)
1. Resin type for FRP beams and framing members shall be vinyl ester.
 2. Glass fiber reinforcements shall be a minimum of 50% of the material weight.
 3. Structural components shall be fire retardant with flame spread rating of 25 or less per ASTM E84.
 4. If cover is flush mounted, ledger angles shall be Type 316 Stainless Steel.
 5. All connections for attachment to FRP beams or fastening connections shall be Type 316 Stainless Steel angles or plates.
- D. Hardware
1. Fasteners, anchorage, hinges, and other structural accessories located on underside of cover shall be Type 316 Stainless Steel.
 2. Perimeter flashing anchors, concrete anchors, or other hardware not exposed to the inside environment of tank shall be Type 304 Stainless Steel.
 3. Fasteners to attach tank cover decking to structural supports shall be Type 316 Stainless Steel
- E. Gaskets and Sealants
1. All panel side laps and perimeter conditions shall have gaskets.
 2. Gaskets under flashing with radius and at perimeter of circular tanks shall be installed by the contractor.
 3. Adhesive sealant shall be applied by contractor at various locations as required by manufacturer for odor containment.

2.03 ACCESSORIES

- A. Accessories shall include flashing, trim, closures, sealant, fasteners, and other items as required for a complete installation.
- B. FRP/GRP flashing and trim shall be in thickness, dimensions, and profile as required.
- C. Fasteners
1. Structural fasteners shall be Type 316 stainless steel with seal washers and installed per manufacturer's instructions.
 2. Side lap and flashing fasteners shall be Type 316 stainless steel SB2 grommets and installed per manufacturer's instructions.
- D. Closures and Sealant
1. Closures shall be EPDM material and match panel profile.
 2. Sealant for opaque roofing shall be 3/32 x 1/2 inch, non-shrink/non-hardening butyl tape.
 3. Sealant for translucent roofing shall be Boss 385 Silicon or Silglaze II SCS 2800 caulk.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Installation shall not begin until substrates have been properly prepared.

3.02 INSTALLATION

- A. Materials shall be installed in accordance with Manufacturer's Installation Instructions and Drawings.
- B. Before placing and attaching components, erector must confirm alignment and location of bearing plates, surfaces, brackets, saddles, etc. All bearing surfaces must be clean and free of debris.
- C. Before placing secondary framing members or deck, erector must check the alignment and location of supports.
- D. Erection shall proceed according to sequence shown on the approved drawings.
- E. If applicable, contractor shall install structural members, beam seats, or ledger angles in locations shown on the approved drawings. Contractor shall assemble trusses as required.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Drip edges.
 - 2. Base and Counter flashing.
 - 3. Through-wall flashing.

1.03 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.04 REFERENCES:

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- B. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- C. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2012 (Reapproved 2019).
- D. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: For sheet metal flashing and trim.
 - 1. Detail fabrication and installation layouts, details. Distinguish between shop- and field-assembled work.
 - 2. Include identification of material, thickness, weight, and finish for each item and location in Project.
 - 3. Include details for forming, including profiles, shapes, seams, and dimensions.
 - 4. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 5. Include details of termination points and assemblies.
 - 6. Include details of special conditions.
 - 7. Include details of connections to adjoining work.
- C. Samples for Verification: For each type of exposed finish.

1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

1.07 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Perform work in accordance with SMACNA (ASMM), CDA A4050, and approved manufacturers requirements and standard details, except as otherwise indicated.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.09 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- C. FM Approvals Listing: Manufacture and install copings, roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-180 Identify materials with name of fabricator and design approved by FM Approvals.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material

2.02 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
 - 1. Thickness: 0.040 inch minimum or as indicated on the drawings.
 - 2. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - b. Modified Silicone Polyester Coating: Pigmented Organic Coating System, AAMA 2603; baked enamel finish system.
 - c. Color: as selected by the Architect from the manufacturer's full range of color offerings.
 - 3. Anodized Finishes:
 - a. Clear Anodized Finish: AAMA 611 AA-M12C22A41 Class I clear anodic coating not less than 0.7 mils (0.018 mm) thick.
 - b. Color Anodized Finish: AAMA 611 AA-M12C22A42/44 Class I integrally or electrolytically colored anodic coating not less than 0.7 mils (0.018 mm) thick.
 - 4. Color: as selected by the Architect from the manufacturer's full range of color offerings.
 - 5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.
- C. Stainless Steel: ASTM A666, Type 304, soft temper, 28 gage thick; smooth No. 4 finish.

2.03 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- D. Elastomeric Sealant: ASTM C920, elastomeric polyurethane silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

- E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

2.04 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 2. Obtain field measurements for accurate fit before shop fabrication.
 - 3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 - 4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, non-corrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- G. Seams: Fabricate non-moving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

2.05 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings: Fabricate head, sill, jamb, and similar flashings to extend 6 inches beyond wall openings. Form head and sill flashing with 2-inch (50-mm-) high, end dams. Fabricate from the following materials:
 - 1. Aluminum: 0.032 inch thick. Finish color as selected by the Architect
 - 2. Stainless Steel: 22 gauge

2.06 MISCELLANEOUS FLASHINGS - COORDINATED SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following materials:
 - 1. Stainless Steel: 0.018 (26 gauge) thick.
 - 2. Aluminum Sheet: 0.040 inch thick. Finish color as selected by the Architect.

2.07 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 - 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 - 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 - 5. Torch cutting of sheet metal flashing and trim is not permitted.
 - 6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
 - 1. Coat concealed side of sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.
- E. Seal joints as required for watertight construction.
 - 1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 - 2. Prepare joints and apply sealants to comply with requirements in Section 079200 - JOINT SEALANTS.
- F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.
 - 1. Do not solder aluminum sheet.
 - 2. Do not use torches for soldering.
 - 3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 - 4. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

3.03 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of through-wall flashing is specified in Division 04.
- C. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 6 inches beyond wall openings.

3.04 MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.
- B. Overhead-Piping Safety Pans: Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

3.05 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.06 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 1. Silicone joint sealants.
 2. Polyurethane joint sealants.
 3. Latex joint sealants.
 4. Preformed joint sealants.
 5. Acoustical joint sealants.

1.03 PRECONSTRUCTION TESTING

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 1. Use ASTM C1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 2. Samples for Verification: For each type of sealant submit a color sample board and one sample joint, 1/2" wide by 6" long including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
 5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

1.04 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Joint-Sealant Schedule: Include the following information:
 1. Joint-sealant application, joint location, and designation.
 2. Joint-sealant manufacturer and product name.
 3. Joint-sealant formulation.
 4. Joint-sealant color.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer and testing agency.
- B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
- D. Warranties: Sample of special warranties.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project with a minimum of three-years experience in the installation of the work of this section.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.
 - 2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

1.07 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 degrees F.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.08 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - 1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Architectural Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Liquid-Applied Joint Sealants: Comply with ASTM C920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.
1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- D. Stain-Test-Response Characteristics: Where sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C1248 and have not stained porous joint substrates indicated for Project.
- E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- F. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full color range.

2.02 SILICONE JOINT SEALANTS

- A. Single-Component, Non-sag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use NT.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 790.
 - b. Pecora Corporation; 301 NS
 - c. Sika Corporation, Construction Products Division; SikaSil-WS 290
 - d. Tremco Incorporated; Spectrem 1.

2.03 POLYURETHANE JOINT SEALANTS

- A. Single-Component, Non-sag, Polyurethane Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Sika Corporation, Construction Products Division; Sikaflex - 15LM.
 - b. Tremco Incorporated; Dymonic 100.
 - c. Or approved Equal.

2.04 LATEX JOINT SEALANTS

- A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Building Systems; Sonolac.
 - b. Bostik, Inc.; Chem-Calk 600.
 - c. Pecora Corporation; AC-20+.
 - d. Tremco Incorporated; Tremflex 834.
 - e. Sherwin Williams Company (SherMax Urethanized Elastomeric Sealant).

2.05 PREFORMED JOINT SEALANTS

- A. Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from Polyurethane foam with minimum density of 10 lb/cu. ft. (160 kg/cu. m) and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Tremco Incorporated; Spectrum SimpleSeal.
 - b. Tremco Incorporated; Illmod 600
 - c. Dayton Superior Specialty Chemicals; Polytite Standard.
 - d. Sandell Manufacturing Co., Inc.; Polyseal.

2.06 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Joint Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pecora Corporation; AC-20 FTR.
 - b. Sherwin-Williams Company, Sher-Max Urethanized Elastomeric Sealant
 - c. Tremco Incorporated; Tremflex 834, Acoustical/Curtain Wall Sealant
 - d. USG Corporation; SHEETROCK Acoustical Sealant.

2.07 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin) Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.08 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or

by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.03 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C1193, unless otherwise indicated.
 - 4. Provide flush joint profile where indicated per Figure 8B in ASTM C1193.
 - 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
- G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations and at perimeters of acoustical Panel edge channels of Acoustical Panel Ceiling systems. with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written recommendations.

3.04 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 - 1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform 1 test for each 500 feet of joint length thereafter or 1 test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 3. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
 4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
 5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.05 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.06 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.07 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
 1. Joint Locations:
 - a. Control and expansion joints in paver and pavement installations.
 - b. Isolation and contraction joints in cast-in-place concrete slabs.
 - c. Tile control and expansion joints.
 2. Silicone Joint Sealant: Single component, non-sag, traffic grade, neutral curing.
 3. Polyurethane Joint Sealant: Single component, non-sag, traffic grade Single component, pourable, traffic grade.
 4. Preformed Joint Sealant: Preformed foam sealant.
 5. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion.
 1. Joint Locations:

- a. Joints in pedestrian plazas.
 2. Polyurethane Joint Sealant: Immersible, multicomponent, non-sag, traffic grade.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal non-traffic surfaces.
1. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Control and expansion joints in unit masonry.
 - c. Joints in dimension stone cladding.
 - d. Joints between metal panels.
 - e. Joints between different materials listed above.
 - f. Perimeter joints between materials listed above and frames of doors windows and louvers.
 - g. Control and expansion joints in ceilings and other overhead surfaces.
 2. Silicone Joint Sealant: Single component, non-sag, neutral curing, Class 100/50.
 3. Polyurethane Joint Sealant: Single component, non-sag, Class 100/50.
 4. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in tile flooring.
 2. Polyurethane Joint Sealant: Single component, non-sag, traffic grade.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces.
1. Joint Locations:
 - a. Perimeter joints of exterior openings where indicated.
 - b. Tile control and expansion joints.
 - c. Vertical joints on exposed surfaces of walls and partitions.
 - d. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
 2. Joint Sealant: Latex Acrylic based.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- F. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic surfaces.
1. Joint Sealant Location:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 2. Joint Sealant: Mildew resistant, single component, non-sag, neutral curing, Silicone.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- G. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal non-traffic surfaces.
1. Joint Location:
 - a. Acoustical joints where indicated.
 - b. Other joints as indicated.
 2. Joint Sealant: Acoustical joint sealant.

3.08 SEALANT INSTALLATION LOG

- A. A tabular log of all sealant installations on the project shall be kept and submitted with the O & M manuals at the completion of the project.

- B. Tabular log shall have columns for:
1. Sealant type
 2. Sealant installation location
 3. Temperature during installation
 4. Date of Installation
 5. Manufacturer
 6. Sealant color installed.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes hollow-metal doors, fixed panels and frames.

1.03 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.04 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.
- C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.06 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ceco Door Products; an Assa Abloy Group company.
 - 2. Curries Company; an Assa Abloy Group company.
 - 3. Steelcraft; an Ingersoll-Rand company.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.02 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra Heavy-Duty Doors and Frames: SDI A250.8 - Level 3. At locations indicated in the Door and Frame Schedule.
 - 1. Physical Performance: Level A according to SDI A250.4.
 - 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1 3/4 inches.
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (16 gauge) (Level 3), with minimum A60 coating.
 - d. Edge Construction: Model 2, Seamless.
 - e. Core Materials:
 - 1) Thermal-Rated Doors: Provide doors fabricated with a thermal-resistance value (R-value) of not less than R-10 when tested according to ASTM C1363. Provide Polyisocyanurate insulation.
 - 3. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (16 gauge) (Level 3), with minimum A60 (ZF120) coating.
 - b. Construction: Full Profile Weld Type.
 - 4. Exposed Finish: Prime.

2.03 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 - 2. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.04 MATERIALS

- A. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- C. Frame Anchors: ASTM A879/A879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M, hot-dip galvanized according to ASTM A153/A153M, Class B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.

2.05 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
 - 1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
 - 2. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
 - 3. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.
 - 4. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.
 - 5. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 - 6. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 2. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 - 3. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.

- b. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
 - 4. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
 - 5. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to ANSI/SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Reinforce doors and frames to receive non-templated, mortised, and surface-mounted door hardware.
 - 2. Comply with applicable requirements in ANSI/SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

2.06 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

3.03 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - b. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - c. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 4. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
 - c. At Bottom of Door: 5/8 inch plus or minus 1/32 inch.
 - d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.

3.04 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- C. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Overhead coiling insulated doors.

1.02 REFERENCES

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2019a.
- B. ASTM A924/A924M - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process; 2017a.
- C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- D. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.
- E. NFRC 102 - Test Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems.

1.03 DESIGN / PERFORMANCE REQUIREMENTS

- A. Overhead coiling insulated doors:
 - 1. Wind Loads: Design door assembly to withstand wind/suction load of +/- 32 psf without damage to door or assembly components in conformance with ASTM E 330.
 - 2. Operation: Design door assembly, including operator, to operate for not less than 20,000 cycles.
- B. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.
- C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300 - SUBMITTALS.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Details of construction and fabrication.
 - 4. Installation instructions.
- C. Shop Drawings: Include detailed plans, elevations, details of framing members, anchoring methods, required clearances, hardware, and accessories. Include relationship with adjacent construction.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) long, representing actual product, color, and patterns.
- F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- G. Operation and Maintenance Data: Submit lubrication requirements and frequency, and periodic adjustments required.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five-years experience in the fabrication and installation of security closures.
- B. Installer Qualifications: Installer Qualifications: Company specializing in performing Work of this section with minimum three-years and approved by manufacturer.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.
- C. Store materials in a dry, warm, ventilated weathertight location.

1.07 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 COORDINATION

- A. Coordinate Work with other operations and installation of adjacent materials to avoid damage to installed materials.

1.09 WARRANTY

- A. Warranty: Manufacturer's limited door and operator system, except the counterbalance spring and finish, to be free from defects in materials and workmanship for 3 years or 20,000 cycles, whichever occurs first.
- B. Warranty: Manufacturer's limited door system warranty for 2 years for all parts and components.
- C. PowderGuard Finish
 - 1. PowderGuard Max: Applied to curtain, guides, bottom bar, headplates: Manufacturer's limited Max Finish warranty for 5 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer: Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: info@overheaddoor.com.
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.02 INSULATED OVERHEAD COILING SERVICE DOORS

- A. Overhead Coiling Stormtite Insulated Service Doors: Overhead Door Corporation Model 625.
 - 1. Curtain: Interlocking roll-formed slats as specified following. Endlocks shall be attached to each end of alternate slats to prevent lateral movement.
 - a. Flat profile type F-265i for doors up to 40 feet (12.19 m) wide.
 - b. Front slat fabricated of:
 - 1) 22 gauge galvanized steel.
 - c. Back slat fabricated of:
 - 1) 22 gauge galvanized steel.
 - d. Slat cavity filled with CFC-free foamed-in-place, polyurethane insulation.
 - 1) R-Value: 7.7, U-Value: 0.13.
 - 2) Sound Rating: STC-21.
 - 2. Performance:
 - a. Through Curtain Sound Rating: Sound Rating: STC-28 (STC-30+ with HZ noise generator) as per ASTM E 90.
 - b. Installed System Sound Rating: STC-21 as per ASTM E 90.
 - c. U-factor: 0.91 NFRC test report, maximum U-factor of no higher than 1.00.
 - d. Air Infiltration: Meets ASHRAE 90.1 & IECC 2012/2015 C402.4.3 Air leakage <1.00 cfm/ft².
 - 3. Slats and Hood Finish:
 - a. Galvanized Steel: Slats and hood galvanized in accordance with ASTM A 653 and receive rust-inhibitive, roll coating process, including 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on polyester top coat.
 - 1) Powder Coat:
 - (a) PowderGuard Premium powder coat color as selected by the Architect.
 - 2) Non-galvanized exposed ferrous surfaces shall receive one coat of rust-inhibitive primer.
 - 4. Weatherseals:
 - a. Vinyl bottom seal, exterior guide and internal hood seals.
 - b. Interior guide weatherseal.
 - c. Lintel weatherseal.
 - d. Air Infiltration Package, IECC 2012/2015 listed; product to meet C402.4.3 2012 Air leakage <1.00 cfm/ft².
 - 1) Air infiltration perimeter seal package includes: guide cover, guide cap, dual brush exterior guide seal, 4 inch finned lintel brush seal and vinyl bottom seal.
 - 5. Bottom Bar:
 - a. Two galvanized steel angles minimum thickness 1/8 inch (3 mm) bolted back to back to reinforce curtain in the guides.
 - 6. Guides: Three structural steel angles, hot-dipped galvanized.
 - 7. Brackets:
 - a. Galvanized steel to support counterbalance, curtain and hood.

8. Finish; Bottom Bar, Guides, Headplate and Brackets:
 - a. Finish: PowderGuard Zinc base coat, gray with PowderGuard Premium powder coat color as selected by the Architect.
9. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 inch per foot of span. Counterbalance is adjustable by means of an adjusting tension wheel.
10. Hood: Provide with internal hood baffle weatherseal.
 - a. 24 gauge galvanized steel with intermediate supports as required.
11. Electric Motor Operation: Provide UL listed electric operator, size as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second.
 - a. Sensing Edge Protection:
 - 1) Pneumatic sensing edge.
 - b. Operator Controls:
 - 1) Push-button and key operated control stations with open, close, and stop buttons.
 - 2) Controls for both interior and exterior location.
 - 3) Controls surface mounted.
 - c. Special Operation:
 - 1) Commercial light package.
 - d. Motor Voltage: 115/230 single phase, 60 Hz.
12. Windload Design:
 - a. Standard windload shall be 32 PSF.
13. Locking:
 - a. Chain keeper locks for chain hoist operation.
14. Wall Mounting Condition:
 - a. Face-of-wall mounting.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify opening sizes, tolerances and conditions are acceptable.
- B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Coordinate installation of electrical service with Section 16150. Complete wiring from disconnect to unit components.
- F. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07900.
- G. Install perimeter trim and closures.
- H. Instruct Owner's personnel in proper operating procedures and maintenance schedule.

3.04 ADJUSTING

- A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.
- B. Adjust hardware and operating assemblies for smooth and noiseless operation.

3.05 CLEANING

- A. Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.
- B. Remove labels and visible markings.
- C. Touch-up, repair or replace damaged products before Substantial Completion.

3.06 PROTECTION

- A. Protect installed products until completion of project.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes:
 - 1. Mechanical door hardware for the following:
 - a. Swinging doors.
 - b. Overhead and Sectional Doors.
 - 2. Cylinders for door hardware specified in other Sections.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Other Action Submittals:
 - 1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - a. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
 - b. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page.
 - c. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
 - d. Content: Include the following information:
 - 1) Identification number, location, hand, fire rating, size, and material of each door and frame.
 - 2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - 3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - 4) Fastenings and other pertinent information.
 - 5) Explanation of abbreviations, symbols, and codes contained in schedule.
 - 6) Mounting locations for door hardware.
- C. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

- B. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
- C. Warranty: Special warranty specified in this Section.
- D. CLOSEOUT SUBMITTALS
 - 1. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.
- E. QUALITY ASSURANCE
 - 1. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
 - a. Warehousing Facilities: In Project's vicinity.
 - b. Scheduling Responsibility: Preparation of door hardware and keying schedules.
 - c. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
 - 2. Source Limitations: Obtain each type of door hardware from a single manufacturer.
 - 3. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- F. DELIVERY, STORAGE, AND HANDLING
 - 1. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
 - 2. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
 - 3. Deliver keys and permanent cores to Owner by registered mail or overnight package service.
- G. COORDINATION
 - 1. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
 - 2. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
 - 3. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.
- H. WARRANTY
 - 1. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - a. Failures include, but are not limited to, the following:
 - 1) Structural failures including excessive deflection, cracking, or breakage.
 - 2) Faulty operation of doors and door hardware.
 - 3) Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - b. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.

- 1) Manual Closers: 10 years from date of Substantial Completion.
- I. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 1. Function of building, purpose of each area and degree of security required.
 2. Plans for existing and future key system expansion.
 3. Requirements for key control storage and software.
 4. Installation of permanent keys, cylinder cores and software.
 5. Address and requirements for delivery of keys.
- J. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

PART 2 - PRODUCTS

2.01 DOOR HARDWARE

- A. Provide door hardware for each door as scheduled on Drawings to comply with requirements in this Section.
 1. Door Hardware Sets: Provide quantity, item, size, finish or color required for each new door leaf. Provide function as required by location.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:
 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Schedule" Article.
 2. References to BHMA Designations: Provide products complying with these designations and requirements for description, quality, and function.

2.02 HINGES

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. Hager Companies.
 - b. IVES Hardware; an Ingersoll-Rand company.
 - c. McKinney Products Company; an ASSA ABLOY Group company.
 - d. Stanley Commercial Hardware; Div. of The Stanley Works.
 2. Quantity: Provide the following hinge quantity, unless otherwise indicated:
 - a. Three Hinges: For doors with heights 61 to 90 inches.
 3. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'-0": 4-1/2 inch standard.
 4. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.

2.03 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL 305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 2. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
 3. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is not acceptable except in any case where the door light extends behind the device as in a full glass configuration.
 4. Flush End Caps: Provide heavy weight impact resistant flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.
 5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty trim with cold forged escutcheons, beveled edges, and four threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets. Provided free-wheeling type trim where indicated.
 - b. Where function of exit device requires a cylinder, provide an interchangeable core type keyed cylinder (Rim or Mortise) as specified in Hardware Sets.
 6. Vertical Rod Exit Devices: Provide and install concealed vertical rod exit devices unless otherwise indicated.
 7. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 8. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices, Aluminum Entrances: BHMA A156.3, Grade 1 certified panic devices furnished in the functions specified in the Hardware Sets. Push bar to be made of extruded aluminum, maximum projection of 3 inches, available in clad or anodized architectural finishes. Exit device design to fit narrow (minimum 2 inch), medium, or wide stile aluminum door applications.
- C. Acceptable Manufacturers:
1. Von Duprin, an Allegion company - 99 Series.
 2. Adams Rite Manufacturing - 8000 Series.
 3. Falcon Hardware - Dor-O-Matic 1490/1590 Series.

2.04 SURFACE BOLTS

- A. Surface Bolts: BHMA A156.16.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on the drawings or comparable product by one of the following:
 - a. IVES Hardware; an Allegion company.
 - b. Rockwood Mfg.; an ASSA ABLOY Company

2.05 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. Best Access Systems; Div. of Stanley Security Solutions, Inc.
 - b. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
 - c. Corbin Russwin Manufacturing Company; an ASSA ABLOY Group company.

2.06 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
 - 1. Existing System:
 - a. Master key or grand master key locks to Owner's existing system.
- B. Keys: Nickel silver.
 - 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: "DO NOT DUPLICATE."

2.07 OPERATING TRIM

- A. Operating Trim: BHMA A156.6; stainless steel, unless otherwise indicated.

2.08 SURFACE CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
 - 1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
 - 2. Standards: Closers to comply with UL 10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 - 3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
 - 4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ICC A117.1.
 - 5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 - 6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 - 7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates, and through-bolt and security type fasteners as required for proper installation.
- B. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. Corbin Russwin Hardware (RU) - DC6000 Series
 - b. DORMA Architectural Hardware; Member of The DORMA Group North America.
 - c. LCN Closers (LC); an Allegion Company - 4040 Series.
 - d. Norton Door Controls (NO); an ASSA ABLOY Group company - 7500 Series.
 - e. Yale Locks and Hardware (YA) - 4400 Series.

2.09 MECHANICAL STOPS AND HOLDERS

- A. Wall- and Floor-Mounted Stops: BHMA A156.16; polished cast brass, bronze, or aluminum base metal.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. IVES Hardware; an Allegion company.
 - b. Rockwood Mfg.; an ASSA ABLOY Company

2.10 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
- B. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- C. Acceptable Manufacturers:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. National Guard Products.
 - b. Pemko Manufacturing Co.; an ASSA ABLOY Group company.
 - c. Zero International.

2.11 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. National Guard Products.
 - b. Pemko Manufacturing Co.; an ASSA ABLOY Group company
 - c. Zero International.

2.12 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
- B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
- C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means

of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

2. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.13 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

3.03 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
 1. Standard Steel Doors and Frames: ANSI/SDI A250.8
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing. Do not install surface-mounted items until finishes have been completed on substrates involved.
 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant.

- E. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- F. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.04 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

3.05 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.06 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.07 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- B. The supplier is responsible for handing and sizing all products as listed in the door hardware sets. Quantities listed are for each pair of doors, or for each single door.

HARDWARE SCHEDULE

HARDWARE SET #1

3 pr.	Hinges	Stanley FBB199 5"x4-1/2"	US32D
2	Closers	LCN 4111 - CUSH	Painted Alum.
1	Panic Device	Von Duprin 9975L-996L	US32D
1	Panic Device	Von Duprin 9947L-NL	US32D
1	Mortise Cylinder	1E-74	BHMA 630
1	Coordinator	Ives COR52 with mounting brackets and optional filler bar	US32D
1	Astragal	Zero 44STST	Alum.
4	Jamb Seals	Zero 139A (2 sides per door)	Alum.
2	Door Bottoms	Zero 39A	Alum.

SECTION 087100 - DOOR HARDWARE

H2M

2	Wall Stops	Ives WS407-CVX	BHMA 630
2	Kickplates	Rockwood K1125 (12" high)	US32D
1	Saddle	National Guard Products 896HD	Mill Alum.
1	X4 Mortise/ Rim Cylinder	100X00N MK	626

HARDWARE SET #2

4 pr	Hinges	Stanley FBB199 5"x4-1/2"	US32D
2	Closers	LCN 4111 - CUSH	Painted Alum.
1	Mortise Cylinder	IE-74	BHMA 630
1	Coordinator	Ives COR52 with mounting brackets and optional filler bar	US32D
1	Astragal	Zero 44STST	Alum
4	Jamb Seals	Zero 139A (2 sides per door)	Alum
2	Door Bottoms	Zero 39A	Alum
2	Wall Stops	Ives WS407-CVX	BHMA 630
2	Kickplates	Rockwood K1125 (12" high)	US32D
1	Saddle	National Guard Products 896HD	Mill Alum.
1	X4 Mortise/ Rim Cylinder	1000X00N MK	626

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1.03 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C1036.
- C. Interspace: Space between lites of an insulating-glass unit.
- D. Sealed Insulating Glass Unit Surface Designations:
 - 1. Surface #1 - Exterior surface of the outer glass lite
 - 2. Surface #2 - Interspace surface of the outer glass lite
 - 3. Surface #3 - Interspace surface of the inner glass lite
 - 4. Surface #4 - Interior surface of the inner glass lite or the interlayer surface of the first layer of laminated glass.

1.04 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E1300 by a qualified professional engineer, using the following design criteria:
 - 1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
 - a. Wind Design Data: As indicated on Drawings.
 - b. Basic Wind Speed: 120 mph.
 - c. Importance Factor: III.
 - 2. Design Snow Loads: As indicated on Drawings.
 - 3. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
 - 4. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - 1. Temperature Change: 120 deg F (49 deg C), ambient; 180 deg F (82 deg C), material surfaces.

1.05 ACTION SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Glass Samples: For each type of the following products; 12 inches (300 mm) square.
 - 1. Coated glass.
- C. Glazing Accessory Samples: For gaskets sealants and colored spacers, in 12-inch (300-mm) lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installers manufacturers of insulating-glass units with sputter-coated, low-e coatings glass testing agency and sealant testing agency.
- B. Product Certificates: For glass and glazing products, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for tinted glass coated glass insulating glass glazing sealants and glazing gaskets.
 - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- D. Warranties: Sample of special warranties.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.
- E. Source Limitations for Glass: Obtain tinted float glass coated float glass laminated glass and insulating glass from single source from single manufacturer for each glass type.
- F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

- G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- H. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.09 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

1.10 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
1. Warranty Period: 10 years from date of Substantial Completion.
- C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
 1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
- C. Windborne-Debris-Impact Resistance: Provide exterior glazing that passes enhanced-protection testing requirements in ASTM E1996 for Wind Zone 3 when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than glazing indicated for use on the Project and shall be installed in same manner as glazing indicated for use on the Project.
 1. Large-Missile Test: For all glazing, regardless of height above grade.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
 2. For laminated-glass lites, properties are based on products of construction indicated.
 3. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
 4. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 5. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.02 GLASS PRODUCTS

- A. Heat-Treated Float Glass: ASTM C1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 2. For uncoated glass, comply with requirements for Condition A.
 3. For coated vision glass, comply with requirements for Condition C (other coated glass).
- B. Pyrolytic-Coated, Self-Cleaning, Low-Maintenance Glass: Clear float glass with a coating on first surface having both photocatalytic and hydrophilic properties that act to loosen dirt and to cause water to sheet evenly over the glass instead of beading.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cardinal Glass Industries; LoE2 Plus
 - b. Pilkington North America; Activ
 - c. Vitro Architectural Glass Industries, Inc.; SunClean

2.03 LAMINATED GLASS

- A. Laminated Glass: ASTM C1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 - 1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
 - 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 - 3. Interlayer Color: Clear unless otherwise indicated.
- B. Windborne-Debris-Impact-Resistant Laminated Glass: ASTM C1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, with "Windborne-Debris-Impact Resistance" Paragraph in "Glass Products, General" Article, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 - 1. Construction: Laminate glass with the following to comply with interlayer manufacturer's written recommendations:
 - a. Polyvinyl butyral interlayer.
 - 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 - 3. Interlayer Color: Clear unless otherwise indicated.
- C. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Laminated-Glass Types" Article.

2.04 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
 - 1. Neoprene complying with ASTM C864.
 - 2. EPDM complying with ASTM C864.
 - 3. Silicone complying with ASTM C1115.
 - 4. Thermoplastic polyolefin rubber complying with ASTM C1115.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene EPDM gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
 - 1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

2.05 GLAZING SEALANTS

- A. General:
 - 1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the

Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 100/50, Use NT.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 795
 - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700
 - c. Pecora Corporation; 890
 - d. Sika Corporation, Construction Products Division; SikaSil-C990
 - e. Tremco Incorporated; Spectrem 1

- C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.06 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 1. AAMA 804.3 tape, where indicated.
 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.07 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

- F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

- G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.08 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

2.09 MONOLITHIC-GLASS TYPES

- A. Glass Type MG-1: Clear fully tempered float glass.
 - 1. Thickness: 1/4 inch (6.0 mm).
 - 2. Provide safety glazing labeling.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.03 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.04 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.

- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.05 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.06 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.07 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove non-permanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior gypsum board assemblies.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.04 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For firestop tracks, from ICC-ES.

PART 2 - PRODUCTS

2.01 FRAMING SYSTEMS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Framing Members, General: Comply with ASTM C754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C645 requirements for metal unless otherwise indicated.
 - 2. See "Corrosion Protection of Steel Framing" Article in the Evaluations for a discussion of corrosion-resistant coatings on components.
 - 3. Protective Coating: ASTM A653/A653M, G60 (Z180), hot-dip galvanized unless otherwise indicated.
- C. Studs and Runners: ASTM C645. Use either steel studs and runners or dimpled steel studs and runners.
 - 1. Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: 20 gauge (0.033 inch).
 - b. Depth: 4 inches, 3-5/8 inches, 2-1/2 inches, 1-5/8 inches as indicated on the drawings.
 - 2. Dimpled Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: 22 gauge (0.027 inch)0.025 inch.
- D. Slip-Type Head Joints: Where indicated, provide one of the following:
 - 1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
 - 2) Steel Network Inc. (The); VertiTrack VTD Series.
- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 - 1. Minimum Base-Metal Thickness: As indicated on Drawings or a minimum of 0.033 inch.

- F. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2-inch wide flanges.
 - 1. Depth: 1-1/2 inches.
 - 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch thick, galvanized steel.

2.02 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Metal Framing: Type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
 - 1. Asphalt-Saturated Organic Felt: ASTM D226/D226M, Type I (No. 15 asphalt felt), non-perforated.
 - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support equipment or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.03 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
- E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 1. Fire resistive Type X Gypsum Board.
 2. Trim and Accessories.
 3. Joint treatment, tapes, compounds and finishing.
 4. Miscellaneous metal framing, furring, and fasteners.
 5. All related items necessary to complete the work of this section.

1.03 SUBMITTALS

- A. Product Data: For each type of product.
- B. Submit manufacturers' product information, specifications, and installation instructions for the specified products including joint compounds, fasteners, trim, control joints, joint reinforcing, metal furring members, metal studs, tracks, runners, resilient clips, steel grounds, and all related accessories.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.05 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.02 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.03 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. National Gypsum Company.
 - 2. USG Corporation.
 - 3. Or approved equal.
- B. Gypsum Board, Type X: ASTM C1396/C1396M.
 - 1. Thickness: 5/8 inch (15.9 mm) and 1 inch (25.4 mm).
- C. Abuse-Resistant Gypsum Board: ASTM C1629/C1629M, Level 3.
 - 1. Long Edges: Tapered.
 - 2. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D 3274.
 - 3. Weight: 2.8 lbs. per sf.
 - 4. Flame spread rating: ASTM E84, 15.
 - 5. Water Absorption: ASTM C473, Less than 5%.
- D. Moisture- and Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.
 - 1. Core: 5/8 inch (15.9 mm), regular type; 5/8 inch Type X.
 - 2. Long Edges: Tapered.
 - 3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D 3274.

2.04 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 - 2. Shapes:
 - a. Cornerbead.
 - b. L-Bead: L-shaped; exposed long flange receives joint compound.
 - c. Expansion (control) joint.

2.05 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
 - 2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 - 3. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Pre-filling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.

2.06 MATERIALS

- A. Metal Framing: Protective coating of framing shall conform to ASTM A653/A653M - G40 minimum, or shall be a protective coating with equal or better corrosion resistance.
 1. Runners: In compliance with ASTM C645, provide 1-1/2" galvanized steel runners to match applicable assembly specified, to match wall framing members, unless indicated otherwise.
 2. Fasteners for Metal Framing: Provide fasteners of type, size, style, grade, holding power, class, and other properties required for secure installation of framing and furring. Galvanize all fasteners and accessories. All devices, other than bolts, used to interconnect ceiling members are required to be certified and listed by an Approved Agency.
- B. Fasteners: Fasteners for securing board to metal furring or wood shall be Phillips Head, black oxidized screws made for fastening gypsum wall board, size and length as recommended by the drywall manufacturer for the applications shown.

2.07 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C1002, unless otherwise indicated.
 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered

edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch (6.4- to 9.5-mm-) wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4 to 1/2-inch (6.4 to 12.7-mm) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.03 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Wallboard Type: As indicated on Drawings.
 - 2. Type X: As indicated on Drawings.
 - 3. Ceiling Type: As indicated on Drawings.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.04 CONSTRUCTION TOLERANCES

- A. Do not exceed 1/8" in 8'-0" variation from plumb or level in any exposed line or surface, except at joints between units do not exceed 1/16" variation between planes of abutting edges or ends. Shim as required to comply with specified tolerances. Variations shall not be visible in finished surfaces.

3.05 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 1. Exposed Edges: Where an exposed edge of gypsum drywall abuts dissimilar materials use Gold Bond #C250 casing bead or equal. Casing beads to be finished with joint compound. Same casing bead and joint treatment is to be used on exposed wallboard edges.
- D. Trim: 1/16 inch thick extruded aluminum 6063-T5 mill finish manufactured by Gorden Inc. or approved equal:
 1. J-Trim: Model JD-58
 2. Control Joint: Model RD-5810
 3. Corner Joint: Model FD-5810
 4. 'F' Reveal: Model 412-5/8
 5. Reveal Trim: Series 900, Model 904 RT-12
 6. Trim Reveal: Series 300, Model 312-5/8.
- E. Neatly cut all openings so that they may be covered by plates and escutcheons.
- F. Place control joints consistent with lines of building spaces as directed.
 1. Gypsum Panel surfaces should be isolated with control joints or other means where:
 - a. Partition, furring or column fireproofing abuts a structural element (except floor) or dissimilar wall or ceiling;
 - b. Ceiling abuts a structural element, dissimilar wall or partition or other vertical penetration; construction changes or ceiling;
 - c. Construction changes within the plane of the partition or ceiling;
 - d. Partition or furring run exceeds 30 feet;
 - e. Ceiling dimensions exceed 50 feet in either direction;
 - f. The area within separate ceiling sections exceeds 2,500 sq. ft.;

- g. Wings of "L", "U", and "T" shaped ceiling areas are joined;
2. Penetrations of the gypsum panel diaphragm, such as door frames, borrowed-light openings, vents, grilles, access panels and light troffers, require additional reinforcement at the corners to distribute concentrated stresses if a control joint is not used.
3. Place edge trim where gypsum board abuts dissimilar materials. Use longest practical length.
4. Provide additional framing and blocking as required to support gypsum board at openings and cutouts, and to support built-in anchorage and attachment devices for other work.
5. Coordinate installation of joint sealers specified in Section 079200 at penetrations and where abutting different materials.
6. Cornerbead: Use at outside corners unless otherwise indicated.
7. LC-Bead: Use where indicated.
8. L-Bead: Use where indicated.

3.06 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Pre-fill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated. All joints and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Prepared surface shall be coated with a drywall primer/sealer prior to the application of finish paint.
 - a. Primer and its application to surfaces are specified in Section 099100 - Painting.

3.07 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

PART 1 - GENERAL

1.01 1.1 RELATED DOCUMENTS

1.02 A. SECTION INCLUDES

- A. Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.03 1.2 SUMMARY

1.04 A. SECTION INCLUDES

- A. 1. Acoustical metal ceiling panels
- B. 2. Exposed grid suspension system
- C. 3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings
- D. 4. Perimeter Trim

1.05 B. RELATED SECTIONS:

- A. 1. Section 09 51 33.13 Acoustical Snap in Metal Pan Ceiling
- B. 2. Section 09 20 00 (09250) - Plaster and Gypsum Board
- C. 3. Section 09 51 13 (09500) - Acoustical Fabric-Faced Panel Ceilings
- D. 4. Section 09 53 00 (09500) - Acoustical Ceiling Suspension Assemblies
- E. 5. Section 09 54 00 Specialty Ceilings
- F. 6. Divisions 23 - HVAC Air Distribution
- G. 7. Division 26 - Electrical

1.06 C. ALTERNATES

- A. 1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products that have not been approved by Addenda, the specified products shall be provided without additional compensation.
- B. 2. Submittals that do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.

1.07 1.3 REFERENCES

1.08 A. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

1.09 1. ASTM A 1008 STANDARD SPECIFICATION FOR STEEL, SHEET, COLD ROLLED, CARBON, STRUCTURAL, HIGH-STRENGTH LOW-ALLOY AND HIGH-STRENGTH LOW-ALLOY WITH IMPROVED FORMABILITY

1.10 2. ASTM A 641 STANDARD SPECIFICATION FOR ZINC-COATED (GALVANIZED) CARBON STEEL WIRE

1.11 3. ASTM A 653 STANDARD SPECIFICATION FOR STEEL SHEET, ZINC-COATED (GALVANIZED) BY THE HOT-DIP PROCESS

1.12 4. ASTM C 423 SOUND ABSORPTION AND SOUND ABSORPTION COEFFICIENTS BY THE REVERBERATION ROOM METHOD

1.13 5. ASTM C 635 STANDARD SPECIFICATION FOR METAL SUSPENSION SYSTEMS FOR ACOUSTICAL TILE AND LAY-IN PANEL CEILINGS

1.14 6. ASTM C 636 RECOMMENDED PRACTICE FOR INSTALLATION OF METAL CEILING SUSPENSION SYSTEMS FOR ACOUSTICAL TILE AND LAY-IN PANELS

1.15 7. ASTM D 3273 STANDARD TEST METHOD FOR RESISTANCE TO GROWTH OF MOLD ON THE SURFACE OF INTERIOR COATINGS IN AN ENVIRONMENTAL CHAMBER

1.16 8. ASTM E 84 STANDARD TEST METHOD FOR SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS

1.17 9. ASTM E 580 INSTALLATION OF METAL SUSPENSION SYSTEMS IN AREAS REQUIRING MODERATE SEISMIC RESTRAINT

1.18 10. ASTM E 1111 STANDARD TEST METHOD FOR MEASURING THE INTERZONE ATTENUATION OF CEILINGS SYSTEMS

1.19 11. ASTM E 1414 STANDARD TEST METHOD FOR AIRBORNE SOUND ATTENUATION BETWEEN ROOMS SHARING A COMMON CEILING PLENUM

1.20 12. ASTM E 1264 CLASSIFICATION FOR ACOUSTICAL CEILING PRODUCTS

1.21 B. INTERNATIONAL BUILDING CODE

1.22 C. ASHRAE STANDARD 62.1-2004 VENTILATION FOR ACCEPTABLE INDOOR AIR QUALITY

1.23 D. NFPA 70 NATIONAL ELECTRICAL CODE

1.24 E. ASCE 7 AMERICAN SOCIETY OF CIVIL ENGINEERS, MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES

1.25 F. INTERNATIONAL CODE COUNCIL-EVALUATION SERVICES - AC 156 ACCEPTANCE CRITERIA FOR SEISMIC QUALIFICATION TESTING OF NON-STRUCTURAL COMPONENTS

1.26 G. INTERNATIONAL CODE COUNCIL-EVALUATION SERVICES REPORT - SEISMIC ENGINEER REPORT

- A. 1. ESR 1308 - Armstrong Suspension Systems
- B. H. LEED - Leadership in Energy and Environmental Design is a set of rating systems for the design, construction, operation, and maintenance of green buildings.

- 1.27 1.4 SYSTEM DESCRIPTION
- 1.28 CONTINUOUS/WALL-TO-WALL
- 1.29 1.5 SUBMITTALS
- 1.30 A. PRODUCT DATA: SUBMIT MANUFACTURER'S TECHNICAL DATA FOR EACH TYPE OF ACOUSTICAL CEILING UNIT AND SUSPENSION SYSTEM REQUIRED.
- 1.31 B. SAMPLES: MINIMUM 6-INCH X 6-INCH SAMPLES OF SPECIFIED ACOUSTICAL PANEL; 8-INCH-LONG SAMPLES OF EXPOSED WALL MOLDING AND SUSPENSION SYSTEM, INCLUDING MAIN RUNNER AND 4-FOOT CROSS TEES.
- 1.32 C. SHOP DRAWINGS: LAYOUT AND DETAILS OF ACOUSTICAL CEILINGS SHOW LOCATIONS OF ITEMS THAT ARE TO BE COORDINATED WITH OR SUPPORTED BY THE CEILINGS.
- 1.33 D. CERTIFICATIONS: MANUFACTURER'S CERTIFICATIONS THAT PRODUCTS COMPLY WITH SPECIFIED REQUIREMENTS, INCLUDING LABORATORY REPORTS SHOWING COMPLIANCE WITH SPECIFIED TESTS AND STANDARDS. FOR ACOUSTICAL PERFORMANCE, EACH CARTON OF MATERIAL MUST CARRY AN APPROVED INDEPENDENT LABORATORY CLASSIFICATION OF NRC, CAC, AND AC.
- 1.34 E. IF THE MATERIAL SUPPLIED BY THE ACOUSTICAL SUBCONTRACTOR DOES NOT HAVE AN UNDERWRITER'S LABORATORY CLASSIFICATION OF ACOUSTICAL PERFORMANCE ON EVERY CARTON, SUBCONTRACTOR SHALL BE REQUIRED TO SEND MATERIAL FROM EVERY PRODUCTION RUN APPEARING ON THE JOB TO AN INDEPENDENT OR NVLAP APPROVED LABORATORY FOR TESTING, AT THE ARCHITECT'S OR OWNER'S DISCRETION. ALL PRODUCTS NOT CONFORMING TO MANUFACTURER'S CURRENT PUBLISHED VALUES MUST BE REMOVED, DISPOSED OF, AND REPLACED WITH COMPLYING PRODUCT AT THE EXPENSE OF THE CONTRACTOR PERFORMING THE WORK.
- 1.35 1.6 QUALITY ASSURANCE
- 1.36 A. SINGLE-SOURCE RESPONSIBILITY: PROVIDE ACOUSTICAL PANEL UNITS AND GRID COMPONENTS BY A SINGLE MANUFACTURER.
- 1.37 B. FIRE PERFORMANCE CHARACTERISTICS: IDENTIFY ACOUSTICAL CEILING COMPONENTS WITH APPROPRIATE MARKINGS OF APPLICABLE TESTING AND INSPECTING ORGANIZATION.
- 1.38 A. SURFACE BURNING CHARACTERISTICS: ASTM E 84 AND COMPLYING WITH ASTM E 1264 CLASSIFICATION.
- 1.39 C. ACOUSTIC PANELS: AS WITH OTHER ARCHITECTURAL FEATURES LOCATED AT THE CEILING, MAY OBSTRUCT, OR SKEW THE PLANNED FIRE SPRINKLER WATER DISTRIBUTION PATTERN THROUGH POSSIBLY DELAY OR ACCELERATE THE ACTIVATION OF THE SPRINKLER OR FIRE DETECTION SYSTEMS BY CHANNELING HEAT FROM A FIRE EITHER TOWARD OR AWAY FROM THE DEVICE. DESIGNERS AND INSTALLERS ARE ADVISED TO CONSULT A FIRE PROTECTION ENGINEER, NFPA 13, OR THEIR LOCAL CODES FOR GUIDANCE WHERE AUTOMATIC FIRE DETECTION AND SUPPRESSION SYSTEMS ARE PRESENT.
- 1.40 D. COORDINATION OF WORK: COORDINATE ACOUSTICAL CEILING WORK WITH INSTALLERS OF RELATED WORK INCLUDING, BUT NOT LIMITED TO BUILDING INSULATION, GYPSUM BOARD, LIGHT FIXTURES, MECHANICAL SYSTEMS, ELECTRICAL

SYSTEMS, AND SPRINKLERS.

1.41 1.7 DELIVERY, STORAGE AND HANDLING

1.42 A. DELIVER ACOUSTICAL CEILING UNITS TO PROJECT SITE IN ORIGINAL, UNOPENED PACKAGES AND STORE THEM IN A FULLY ENCLOSED SPACE WHERE THEY WILL BE PROTECTED AGAINST DAMAGE FROM MOISTURE, DIRECT SUNLIGHT, SURFACE CONTAMINATION, AND OTHER CAUSES.

1.43 B. BEFORE INSTALLING ACOUSTICAL CEILING UNITS, PERMIT THEM TO REACH ROOM TEMPERATURE AND A STABILIZED MOISTURE CONTENT.

1.44 C. HANDLE ACOUSTICAL CEILING UNITS CAREFULLY TO AVOID CHIPPING EDGES OR DAMAGED UNITS IN ANY WAY.

1.45 1.8 PROJECT CONDITIONS

1.46 A. SPACE ENCLOSURE:

1.47 STANDARD CEILINGS: DO NOT INSTALL INTERIOR CEILINGS UNTIL SPACE IS ENCLOSED AND WEATHERPROOF; WET WORK IN PLACE IS COMPLETED AND NOMINALLY DRY; WORK ABOVE CEILINGS IS COMPLETE; AND AMBIENT CONDITIONS OF TEMPERATURE AND HUMIDITY ARE CONTINUOUSLY MAINTAINED AT VALUES NEAR THOSE INTENDED FOR FINAL OCCUPANCY. BUILDING AREAS TO RECEIVE CEILINGS SHALL BE FREE OF CONSTRUCTION DUST AND DEBRIS.

1.48 1.9 LEED

1.49 A. ARMSTRONG METAL CEILINGS QUALIFY FOR THE FOLLOWING CREDITS:

A. a. Category - Material & Resources

B. i. MR Credit 2.1, 2.2 - Construction Waste Management Divert 50% or 75% from disposal

C. ii. MR Credit 4.1, 4.2 - Recycled Content

D. iii. MR Credit 5.1, 5.2 - Regional Materials (dependent on location)

1. LEED NC - 10% Extracted, Processed & Manufactured Regionally

2. LEED CI - 20% Manufactured Regionally

E. b. Category - Indoor Environmental Quality

1. i. EQ Credit 4.1 to 4.6 - Low-Emitting Materials

F. c. Category - Innovation and Design Process

1. i. ID Credit - Acoustic Performance

1.50 1.10 WARRANTY

1.51 A. ACOUSTICAL PANEL: SUBMIT A WRITTEN WARRANTY EXECUTED BY THE MANUFACTURER, AGREEING TO REPAIR OR REPLACE PANELS THAT FAIL WITHIN THE WARRANTY PERIOD. FAILURES INCLUDE, BUT ARE NOT LIMITED TO THE FOLLOWING:

A. 1. Acoustical Panels: Sagging and warping

B. 2. Grid System: Rusting and manufacturer's defects.

1.52 B. WARRANTY PERIOD:

- A. 1. Acoustical Metal panels: One (1) year from date of substantial completion
- B. 2. Grid: One (1) year from date of substantial completion

1.53 C. THE WARRANTY SHALL NOT DEPRIVE THE OWNER OF OTHER RIGHTS THE OWNER MAY HAVE UNDER OTHER PROVISIONS OF THE CONTRACT DOCUMENTS AND WILL BE IN ADDITION TO AND RUN CONCURRENT WITH OTHER WARRANTIES MADE BY THE CONTRACTOR UNDER THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

1.54 1.11 MAINTENANCE

1.55 A. EXTRA MATERIALS: DELIVER EXTRA MATERIALS TO OWNER. FURNISH EXTRA MATERIALS DESCRIBED BELOW THAT MATCH PRODUCTS INSTALLED. PACKAGED WITH PROTECTIVE COVERING FOR STORAGE AND IDENTIFIED WITH APPROPRIATE LABELS.

- A. 1. Acoustical Metal Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
- B. 2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.01 2.1 MANUFACTURERS

2.02 A. METAL CEILING PANELS:

- A. 1. Armstrong World Industries, Inc.

2.03 B. SUSPENSION SYSTEMS:

- A. 1. Armstrong World Industries, Inc.

2.04 2.2.1 ACOUSTICAL CEILING UNITS

2.05 A. ACOUSTICAL PANELS TYPE AMP

- A. 1. Acoustical Panels Type AMP-1:
 - B. a. Surface Texture: Smooth
 - C. b. Composition: Electrogalvanized Steel 0.028"
 - D. c. Color: White
 - 1. d. Size: 61Nx 96IN
 - 2. e. Edge Profile: Linear
 - 3. f. Perforation Option: Unperforated-M1
 - 4. g. Noise Reduction Coefficient(NRC): 0.70
 - 5. h. Ceiling Attenuation Class (CAC) : N/A
 - 6. i. Sabin: N/A
 - 7. j. Articulation Class (AC): N/A
 - 8. k. Flame Spread: ASTM E 1264; Class A (FM)
 - 9. l. Light Reflectance White Panel: 0.83

10. m. Dimensional Stability: Standard
11. n. Acceptable Product: Armstrong MetalWorks Linear - Synchro,
 - a. (8223W02___) (8223W04___) ((8223W06___) (8223W99___) (8223W11___)
 - b. (8223W13___) as manufactured by Armstrong World Industries
12. 2. Infill Metal Panel Accessories:
13. 3. 8233W06M1___ 6IN End Cap
14. 9. 8243W06 – 6IN Splice Plate
 - a. 11. 7237 – Cut Plank Support
 - b. 12. 7277MF – Main Beam Carrier 2 (MBCB) -Mill Finish
 - 1) 13. 5574WH2-Carrier Molding
 - 2) 15. XL8926G90– 2' Drywall Cross Tee

PART 3 - EXECUTION

3.01 3.1 EXAMINATION

- 3.02 A. DO NOT PROCEED WITH INSTALLATION UNTIL ALL WET WORK SUCH AS CONCRETE, TERRAZZO, PLASTERING AND PAINTING HAS BEEN COMPLETED AND THOROUGHLY DRIED OUT, UNLESS EXPRESSLY PERMITTED BY MANUFACTURER'S PRINTED RECOMMENDATIONS. (EXCEPTION: HUMIGUARD MAX CEILINGS)

3.03 3.2 PREPARATION

- 3.04 A. MEASURE EACH CEILING AREA AND ESTABLISH LAYOUT OF ACOUSTICAL UNITS TO BALANCE BORDER WIDTHS AT OPPOSITE EDGES OF EACH CEILING. AVOID USE OF LESS THAN HALF WIDTH UNITS AT BORDERS AND COMPLY WITH REFLECTED CEILING PLANS. COORDINATE PANEL LAYOUT WITH MECHANICAL AND ELECTRICAL FIXTURES.

3.05 3.3 INSTALLATION

- 3.06 A. FOLLOW MANUFACTURER INSTALLATION INSTRUCTIONS

- 3.07 B. INSTALL SUSPENSION SYSTEM AND PANELS IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS BPLA-292540, AND IN COMPLIANCE WITH ASTM C636 AND WITH THE AUTHORITIES HAVING JURISDICTION.

3.08 3.4 ADJUSTING AND CLEANING

- 3.09 A. REPLACE DAMAGED AND BROKEN PANELS.

- 3.10 B. CLEAN EXPOSED SURFACES OF CEILINGS PANELS, INCLUDING TRIM, EDGE MOLDINGS, AND SUSPENSION MEMBERS. COMPLY WITH MANUFACTURER'S INSTRUCTIONS FOR CLEANING AND TOUCH UP OF MINOR FINISH DAMAGE. REMOVE AND REPLACE WORK THAT CANNOT BE SUCCESSFULLY CLEANED AND REPAIRED TO PERMANENTLY ELIMINATE EVIDENCE OF DAMAGE.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Surface Preparation.
 - 2. Extent of painting work is shown on drawings and schedules, and as herein specified.
 - 3. The Work includes painting and finishing of all interior and exterior work, except as otherwise indicated.
 - 4. Stencil painting fire rated and/or smoke tight wall assembly identification.
- B. Work Not Included
 - 1. Exposed galvanized structural and miscellaneous steel.
 - 2. Exposed equipment, ductwork, piping, and conduits.

1.03 STANDARDS

- A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.
- B. ASTM D16 "Standard Terminology for Paint, Related Coatings, Materials, and Applications".
- C. ASTM D4214 "Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films".
- D. ASTM D660 "Standard Test Method for Evaluating Degree of Checking of Exterior Paints".
- E. ASTM D661 "Standard Test Method for Evaluating Degree of Cracking of Exterior Paints".
- F. ASTM D714 "Standard Test Method for Evaluating Degree of Blistering of Paints".
- G. ASTM D5324 "Standard Guide for Testing Water-Borne Architectural Coatings".
- H. ASTM D3170 "Standard Test Method for Chipping Resistance of Coatings".
- I. SSPC - SP 1 "Solvent Cleaning".
- J. SSPC - SP 2 "Hand Tool Cleaning".
- K. SSPC - SP 3 "Power Tool Cleaning".
- L. SSPC - SP 13/NACE No. 6 "Surface Preparation for Concrete".
- M. EPA-Method 24.
- N. OTC (Ozone Transport Commission) Regulation No. 41.

1.04 SUBMITTALS

- A. Submit pursuant to Section 013300 - Submittal Procedures:

- B. Submit pursuant to Section 016000 - Product Requirements.
- C. Manufacturer's Literature: Material description and application instructions for each type of material specified or required.
- D. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples ("drops") of each color and finish used.
- E. Manufacturer's latest array of full line of colors (color fans).
- F. For materials to receive stain & polyurethane provide two samples of each selected stain color on each wood species being used.
- G. Submit OTC (Ozone Transport Commission) lower VOC compliant products only. Colorant/Tint used in coatings shall add no additional VOC to final product.
- H. Provide Manufacturer Safety Data Specs (MSDS).

1.05 QUALITY ASSURANCE

- A. Experienced workmen familiar with the work shall perform all work of this section according to manufacturers' recommendations and/or industry standards.
- B. Provide materials only in factory sealed and labeled containers. Reuse of any containers for any reason is prohibited and will result in work not being acceptable.
- C. Unless specified, or Architect approved to the contrary, provide all coating materials from same manufacturer.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Pursuant to manufacturers published instructions.
- B. Protect against moisture exposure and damage.
- C. Receive paint materials only in unopened, original containers with labels intact. Store materials on site in an approved location. When so ascertained, remove immediately from job site all damaged or otherwise defective material.
- D. Provide labels on each container with the following information:
 - 1. Name or title of product.
 - 2. Manufacturer's color identification code
 - 3. Manufacturer's stock number.
 - 4. Manufacturer's name.
 - 5. VOC Content.
 - 6. Batch Date.
 - 7. Contents by volume, for major pigment and vehicle constituents.
 - 8. Thinning instructions.
 - 9. Application instructions.

1.07 PROJECT/SITE CONDITIONS

- A. Environmental conditions can be modified only if such requirements are a part of manufacturer's published application instructions.
- B. Apply paint materials only when surface and air temperatures are above 50 degrees F for 48 hours before, during, and after the paint application.
- C. Do not apply exterior paint or stain during rain, snow, or damp weather.
- D. Do not apply paint in direct sunlight.
- E. Apply paint materials only when relative humidity is lower than 85% and surface temperature is at least 5 degrees F above dew point.
 - 1. Conditions must remain acceptable to manufacturer's recommendations during drying time.
- F. Apply paint only to surfaces that are free of surface moisture.
- G. Do not apply paint in areas with airborne dust or where dust can be generated.

1.08 SAMPLING OF MATERIALS

- A. Samples of materials being used on the job may be taken at any time at discretion of Architect and checked for compliance to these specifications.

1.09 EXTRA STOCK

- A. Provide 1 gallon of each separate color and finish product used on Project.
- B. Label each container with color, texture, sheen, and room designation, in addition to manufacturer's unobstructed label.

1.10 DEFINITIONS

- A. Conform to ANSI/ASTM D16 for interpretation of terms used in this Section.
- B. The term "Paint", as used herein, includes enamels, paints, sealers, fillers, emulsions, stains, varnishes and other coatings whether used as prime, intermediate, or finish coats.
- C. "MDF" equals minimum dry film thickness. The numbers specified denote the thickness of each coat.
- D. "Properly Painted Surface" - A surface that is uniform in appearance, color, sheen, and without telegraphing of any portion of the substrate. It is one that is free of foreign material, lumps, skins, runs, sags, holidays, misses, strike-through, or insufficient coverage. It is a surface that is free of drips, spatters, spills, or overspray which a Contractor's workforce may cause. Compliance to meeting the criteria of a "Properly Painted Surface" shall be determined by the Architect when viewed without magnification at a distance of five (5) feet or more under normal lighting (both daylight and artificial) conditions and from a normal viewing position.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. General Architectural Coatings
 - a. Sherwin Williams Company (Basis of Design).
 - b. Benjamin Moore & Co.
 - c. Architect Approved Equivalent.
- B. Provide products specifically formulated for geographical area in which Project is located.

2.02 COLORS

- A. Selection: by Architect from manufacturer's full range.
- B. Proprietary names used to designate colors or materials are not intended to imply that products of those manufacturers are required to the exclusion of Architect approved equivalent products of other manufacturers - unless noted otherwise.

2.03 COATING SYSTEMS

- A. Gypsum board, interior:
 - 1. Sherwin Williams
 - a. Drywall Primer: USG Sheetrock Brand First Coat Primer MDF 0.9-1.2
 - b. Paint Primer: ProMar 200 Zero VOC Primer; MDF 1.5
 - c. Two coats: ProMar 200 Zero VOC Low Sheen Eg-Shel; MDF 1.6
 - d. Total System: MDF 4.7
- B. Ferrous metals, shop primed (flat and gloss, solvent base)
 - 1. Sherwin Williams
 - a. Primer: Pro Industrial Pro-Cryl Universal Primer (B66-310);
 - b. MDF 2.0-4.0
 - c. Two coats: Pro Industrial Acrylic Semi-Gloss; MDF 2.5 per coat
 - d. Total System: MDF 7.0 - 9.0
- C. Ferrous Metal hidden from view (e.g. - back side of door frames, lintels, etc.);
 - 1. Sherwin Williams
 - a. One Coat: Pro Industrial Pro-Cryl Universal Primer (B66-310); MDF 2.0-4.0
- D. Concrete Floor:
 - 1. Sherwin Williams
 - a. One Coat: ArmorSeal Tread-Plex Primer (B90W110); MDF 1.5-2.0
 - b. Two Coats: ArmorSeal Tread-Plex 100% Acrylic Water Based Floor Coating (B90 Series); MDF 1.5-2.0
 - c. Total System: MDF 6.0
- E. Steel Substrates:
 - 1. Sherwin Williams
 - a. One Coat: Pro Industrial DTM Acrylic Primer/Finish (B66W1); MDF 2.5-5.0
 - b. Two Coats: Pro Industrial DTM Acrylic Eg-Shel (B66-1250 Series); MDF 2.5-4.0
 - c. Total System: MDF 13.0

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
 - 1. Gypsum Wallboard: 12 percent.
 - 2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
 - 3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 GENERAL PREPARATION (ALL SUBSTRATES)

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.

3.03 CONCRETE AND CMU PREPARATION

- A. Remove all surface dust, dirt and other contaminants by brooming, air blast, or vacuum cleaner.
- B. Remove form release agents, laitance, dirt and other contamination, as required by coatings manufacturer, by using a light blast with fine silica sand.
- C. Obtain allowable moisture content level from coatings manufacturer. Determine moisture content by means of a moisture meter designed specifically for concrete and operated by a qualified inspector. Apply coatings only after all conditions conform to published requirements of coating manufacturer.

3.04 GYPSUM BOARD SURFACE PREPARATION

- A. Do not use linseed oil putty, glazing materials, patching pencils, caulking, or masking tape on surfaces to be painted.
- B. Sand and dust as necessary.
- C. Remove all dust, dirt, powdery residue, grease, oil, wax, or any other contaminants.
- D. Spot prime defects after repair.

3.05 FERROUS METAL SURFACE PREPARATION

- A. Shop Primed
 - 1. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 - 2. Remove oils and lubricants by using mineral spirits or xylol solvents. Change applicators frequently to avoid recontamination. Execute pursuant to SSPC SP-1.

3.06 APPLICATION

- A. Beginning of installation means acceptance of existing surfaces.
- B. Apply paint pursuant manufacturer's directions. Use applicators and techniques best suited for type of material being applied.
- C. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
- D. Sand lightly between each succeeding enamel or varnish coat.
- E. Spray Painting: allowable interiors to be approved by the Architect. Limit spray-painting on interior surface to acoustical plaster (if any) and service spaces such as mechanical equipment rooms.
- F. Minimum coating thickness: apply each material at not less than manufacturer's recommended spreading rate.
- G. Prime coats: apply a prime coat if specified to material which is required to be painted or finished, and which has not been prime coated.
- H. Recoat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.
- I. Roller Applications: roll and redistribute paint to an even and fine texture. Leave no evidence of rolling such as laps, irregularity in texture, skid marks, or other surface imperfections.
- J. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections are not acceptable. Cut in sharp lines and color breaks.
- K. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint Work not in compliance with specified requirements.

3.07 INCLUSIONS

- A. Paint all surfaces specified, scheduled, illustrated, and otherwise exposed to view except those items or surfaces specifically noted.
- B. Finish recesses same as adjoining rooms. Finish all other surfaces same as nearest or adjoining surfaces unless specifically noted otherwise.

- C. Paint surfaces behind equipment and furniture same as equal or adjacent exposed surfaces.
- D. Paint all hollow metal doors and frames that do not have a factory provided finish.
 - 1. As directed by Architect, hollow metal frames and doors may be different colors on each side of frame and/or door.
 - 2. Finish door tops, bottoms and side edges same as faces, unless otherwise indicated.
 - 3. Hollow metal doors and/or frames may be painted different colors from one side to the other.
- E. Paint overhead door steel jambs and lintels.
- F. Stencil paint in contrasting color "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS" at tops of all fire rated and/or smoke tight walls and or partitions. Lettering must be a minimum 3.0 inches in height, must appear within 15 feet of the end of each wall or partition and at intervals not exceeding 30 feet measured horizontally along the wall or partition.

3.08 PROTECTION OF OTHER WORK

- A. Protect adjacent surfaces, whether to be painted or not, against damage by painting and finishing work. Correct any damages by cleaning, repairing or replacing, and repainting, as directed by Architect.
- B. Coordinate the maintenance and subsequent removal of temporary protective wrappings.

3.09 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.10 CLEANING

- A. Daily clean up: During the progress of the Work, remove from the project daily, all discarded paint materials, rubbish, cans and rags.
- B. Properly handle, store, and dispose of all hazardous materials.
- C. Upon completion, clean all glass and other paint--spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage-finished surfaces. Restore all damaged surfaces to their original condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
 - 1. Wood.

1.03 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and not more than 10 units at 85 degrees, according to ASTM D523.
- B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.
- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.
- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.
- G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 3. VOC content.

1.05 CLOSEOUT SUBMITTALS

- A. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams "Custodian Project Color and Product Information report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.06 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.07 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.
- B. Delivery and Handling: Deliver products to Project site in an undamaged condition in manufacturer's original sealed containers, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Packaging shall bear the manufacturer's label with the following information:
 - 1. Product name and type (description).
 - 2. Batch date.
 - 3. Color number.
 - 4. VOC content.
 - 5. Environmental handling requirements.
 - 6. Surface preparation requirements.
 - 7. Application instructions.

1.09 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Sherwin Williams

2. Benjamin Moore & Co.
 3. PPG Architectural Finishes, Inc.
- B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in other Part 2 articles for the paint category indicated.

2.02 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.
- D. Colors: As selected by Architect from manufacturer's full range.

2.03 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 2. Testing agency will perform tests for compliance with product requirements.
 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

2.04 WOOD PRIMERS

- A. Primer, Latex for Exterior Wood: MPI #6.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers. Where acceptability of substrate conditions is in question, apply samples and perform in-situ testing to verify compatibility, adhesion, and film integrity of new paint application.
1. Report, in writing, conditions that may affect application, appearance, or performance of paint.
- B. Substrate Conditions:
1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

- a. Concrete: 12 percent.
 - b. Masonry (Clay and CMU): 12 percent.
 - c. Wood: 15 percent.
 - d. Portland Cement Plaster: 12 percent.
 - e. Gypsum Board: 12 percent.
2. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
 3. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - a. Application of coating indicates acceptance of surfaces and conditions.

3.02 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Wood Substrates:
 1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
 2. Sand surfaces that will be exposed to view, and dust off.
 3. Stain edges, ends, faces, undersides, and backsides of wood.
 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.03 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
 1. Use applicators and techniques suited for paint and substrate indicated.
 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 4. Paint entire exposed surface of window frames and sashes.
 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.04 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.05 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.06 EXTERIOR PAINTING SCHEDULE

- A. Wood Substrates: Including wood ceilings and trim , window sash and trim.
 - 1. Latex System:
 - a. Prime Coat: Primer, latex for exterior wood, MPI #6.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, flat, (Gloss Level 1), MPI #10: S-W A-100 Exterior Latex Flat, A6 Series, at 4.0 mils wet, 1.2 mils dry, per coat.
 - d. Topcoat: Latex, exterior, low-sheen, (Gloss Level 3-4), MPI #15: S-W A-100 Exterior Latex Low Sheen, A12 Series, at 4.0 mils wet, 1.5 mils dry, per coat.
 - e. Topcoat: Latex, exterior, satin, (Gloss Level 3-4), MPI #15: S-W A-100 Exterior Latex Satin, A82 Series, at 4.0 mils wet, 1.5 mils dry, per coat.
 - f. Topcoat: Latex, exterior, semi-gloss, (Gloss Level 5), MPI #11: S-W Solo Acrylic Semi-Gloss, A76 Series, at 4.0 mils wet, 1.5 mils dry, per coat.
 - g. Topcoat: Latex, exterior, gloss, (Gloss Level 6), MPI #119: S-W A-100 Exterior Latex Gloss, A8 Series, at 4.0 mils wet, 1.3 mils dry, per coat.
 - h. Topcoat: Latex, exterior semi-gloss (Gloss Level 5), MPI #11.
 - 2. Solid Color Stain System:
 - a. First Coat: Solid color stain, latex, matching topcoat.
 - b. Topcoat: Solid color stain, latex, slip-resistant, flat, interior/exterior: S-W DeckScapes Exterior Acrylic Solid Color Deck, A15-Series, (Gloss Level 1), MPI #33, at 200 to 400 sq. ft. per gal (4.9 to 9.8 sq. m per l).
 - 3. Semi-Transparent Stain System: (MPI EXT 6.2P)
 - a. First Coat: Semi-Transparent color stain, waterborne, matching topcoat.

- b. Topcoat: Semi-transparent color stain, waterborne, flat, exterior: S-W Superdeck® 2650,A15 Series, Semi-Transparent Waterborne Stain, (Gloss Level 1), MPI #33, at 150 to 250 sq. ft. per gal (4.9 to 9.8 sq. m per l).

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.
- B. Product Schedule: Provide Fire Extinguishers in locations as shown on the drawings and as required by the AHJ.

1.04 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.05 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.06 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.07 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.02 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and wall-mounted bracket as indicated.
 - 1. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Amerex Corporation.
 - b. Ansul Incorporated.
 - c. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - d. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
 - e. Potter Roemer LLC.
 - 2. Valves: Nickel-plated, polished-brass body.
 - 3. Handles and Levers: Stainless steel.
 - 4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.
- B. Carbon Dioxide Type Fire Extinguishers: Aluminum tank, with pressure gauge.
 - 1. Class: B:C type.
 - 2. Size 5 pound (2.27kg)
 - 3. Size and classification as scheduled.
 - 4. Finish: Baked Polyester Powder coat.
 - 5. Temperature Range: Minus 40 degrees F (Minus 40 degrees C) to 120 degrees F (49 degrees C).

2.03 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Amerex Corporation.
 - b. Ansul Incorporated.
 - c. JL Industries, Inc.; a division of the Activar Construction Products Group
 - d. Larsen's Manufacturing Company.
 - e. Potter Roemer LLC.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
 - 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
 - a. Orientation: Vertical.
 - b. Signage shall comply with the requirements of the authority having jurisdiction.
 - c. Signs shall be provided at each fire extinguisher location and shall be as follows:
 - 1) Enamel-coated Aluminum sign, 24" height by 5" wide, Triangle in shape and multi-angle viewable, Red background with white graphics reading "Fire Extinguisher". Sign shall be suitable for interior and exterior use.
 - 2) Signs shall be UV, chemical, abrasion and moisture resistant.
 - 3) Model No. NHE-7497 Tri as manufactured by Compliance Signs 1-800-578-1245; Allstate Sign & Plaque 1-800-240-6039 or approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General: Install fire extinguishers, fire extinguisher cabinets and mounting brackets and compliance signage in locations indicated and in compliance with requirements of authorities having jurisdiction.
 - 1. Wall Mounted Fire Extinguishers: Mount Extinguishers as indicated on the drawings.
 - 2. Cabinet Mounted Fire extinguishers: Mount cabinets as indicated on the drawings. Note: cabinet mounting height shall provide a maximum height of 42" to the top of the extinguisher handle.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated. Provide solid blocking in wall behind as required for anchorage of brackets and cabinets.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This section describes the general requirements for all mechanical items and systems required by the Contract Documents.
- B. Comply with all Contract Requirements, General Conditions, Supplementary Conditions and Division 1 Sections applying to or affecting the Work of Division 23.
- C. Unless specifically dimensioned, the Work shown on the Drawings is in diagrammatic form only to show general arrangement.
- D. Include, in the Work, all accessories and appurtenances, necessary and integral, for the intended operation of any system, component or device, as such systems, components and devices are specified.
- E. Do not install pipe or conduit through ductwork.
- F. If the pipe or duct size shown on the Drawings does not match the connection size of the equipment that it is connected to, provide the necessary transition pieces at the piece of equipment.
- G. Do not use or allow to be used asbestos or asbestos-containing materials on this project. Be rigorous in assuring that all materials, equipment, systems and components thereof do not contain asbestos. Any deviations from this requirement shall be remedied at the Contractor's expense without regard to prior submittal approvals.

1.02 RELATED DOCUMENTS

- A. The General Conditions and General Requirements Division 1 apply to the Work of this Section.

1.03 REFERENCE STANDARDS

- A. Compliance with the following codes and standards shall be required:
 - 1. Codes, Rules and Regulations of the State of New York
 - 2. USAS USA Standards Institute (Formerly ASA)
 - 3. AMCA Air Moving and Conditioning Association
 - 4. ADC Air Diffusion Council
 - 5. NEMA National Electrical Manufacturers Association
 - 6. FM Factory Mutual
 - 7. NFPA National Fire Protection Association
 - 8. ASTM American Society for Testing Materials
 - 9. UL Underwriters Laboratories, Inc.
 - 10. NEC National Electrical Code
 - 11. ASME American Society of Mechanical Engineers
 - 12. ANSI American National Standards Institute
 - 13. OSHA Occupational Safety and Health Act
 - 14. BSA Board of Standards and Appeals
 - 15. MEA Materials and Equipment Acceptance
 - 16. DEC New York State Department of Environmental Conservation - 6 NYCRR Part 613 Handling and Storage of Petroleum
 - 17. ASHRAE American Society of Heating, Refrigeration and Air Conditioning Engineers.
 - 18. AWWA American Water Works Association

19.	MSS	Manufacturer's Standardization Society of the Valve and Fitting Industry
20.	ARI	American Refrigeration Institute
21.	SMACNA	Sheet Metal and Air Conditioning Contractor's National Association
22.	TEMA	Tubular Exchanger Manufacturers Association
23.	F.S. or FED	Spec. Federal Specification
24.	ASA	Acoustical Society of America
25.	NACE	National Association of Corrosion Engineers
26.	ASSE	American Society of Sanitary Engineers
27.	IBC	2020 International Building Code
28.	IFC	2020 International Fire Code
29.	IEBC	2020 International Existing Building Code
30.	IFGC	2020 International Fuel Gas Code
31.	IPC	2020 International Plumbing Code
32.	IECC	2020 International Energy Conservation Code
33.	IMC	2020 International Mechanical Code
34.	NYC PC	2014 NYC Plumbing Code
35.	NYC MC	2014 NYC Mechanical Code
36.	NYC FGC	2014 NYC Fuel Gas Code
37.	NYC BC	2014 NYC Building Code
38.	New York State Industrial Code Rules	
39.	IRI	Industrial Risk Insurers
40.	AGA	American Gas Association
41.	AABC	American Air Balance Council
42.	NEBB	National Environmental Balancing Bureau
43.	AWS	American Welding Society

1.04 DEFINITIONS

- A. "Provide" means furnish and install, complete the specified material, equipment or other items and perform all required labor to make a finished installation.
- B. "Furnish and install" has the same meaning as given above for "Provide."
- C. Refer to General Conditions for other definitions.

1.05 ABBREVIATIONS

- A. Reference by abbreviation may be made in the Specifications and the Drawings in accordance with the following list:
 - 1. HVAC Heating, Ventilating and Air Conditioning
 - 2. CM Construction Manager
 - 3. AC Air Conditioning
 - 4. H & V Heating and Ventilating
 - 5. AWG American Wire Gauge
 - 6. BWG Birmingham Wire Gauge
 - 7. USS United States Standard
 - 8. B & S Brown & Sharpe
 - 9. OS & Y Outside Screw and Yoke
 - 10. IBBM Iron Body Brass Mounted
 - 11. WSP Working Steam Pressure
 - 12. PSIG Pounds per Square Inch Gauge
 - 13. PRV Pressure Reducing Valve
 - 14. GPM Gallons per Minute
 - 15. MBH Thousand BTU per hour

- 16. BTU British Thermal Units
 - 17. WG Water Gage
 - 18. LB Pound (Also shown as: #)
 - 19. ASME American Society of Mechanical Engineers
 - 20. ASTM American Society for Testing Materials
 - 21. ABMA American Boiler Manufacturers Association
 - 22. ASA American Standards Associates
 - 23. MER Mechanical Equipment Room
- See Drawings for additional abbreviations

1.06 REVIEW OF CONTRACT DOCUMENTS AND SITE

- A. Give written notice with the submission of bid to the Architect/Engineer of any materials or apparatus believed inadequate or unsuitable, in violation of laws, ordinances, rules or regulations of Authorities having jurisdiction, and any necessary items of work omitted. In the absence of such written notice it is mutually agreed that the Contractor has included the cost of all required items in his proposal for a complete project.
- B. Contractors shall acknowledge that they have examined the Plans, Specifications and Site, and that from his own investigations he has satisfied himself as to the nature and location of the Work; the general and local conditions, particularly those bearing upon transportation, disposal, handling and storage of materials; availability of labor, utilities, roads and uncertainties of weather; the composition and condition of the ground; the characters quality and quantity of subsurface materials to be encountered; the character of equipment and facilities needed preliminary to and during the execution of the Work; all federal, state, county, township and municipal laws, ordinances and regulations particularly those relating to employment of labor, rates of wages, and construction methods; and all other matters which can in any way affect the Work or the cost thereof under this Contract. Any failure by the Contractor to acquaint himself with the available information concerning these conditions will not relieve him from the responsibility for successfully performing the Work.
- C. Owner assumes no responsibility for any understanding or representation made during or prior to the negotiation and execution of this Contract unless such understanding or representations are expressly stated in the Contract and the Contract expressly provides that the responsibility, therefore, is assumed by the Owner.

1.07 MEASUREMENTS

- A. Base all measurements, both horizontal and vertical from established bench marks. Make all Work agree with these established lines and levels. Verify all measurements at site; and check the correctness of same as related to the Work.

1.08 LABOR AND MATERIALS

- A. Provide all materials and apparatus required for the Work of new and first-class quality. Furnish, deliver, arrange, erect, connect and finish all materials and equipment in every detail, so selected and arranged as to fit properly into the building spaces.
- B. Remove all materials delivered, or work erected, which does not comply with Drawings or Specifications, and replace with proper materials, or correct such work as directed, at no additional cost to the Owner.

1.09 COVERING OF WORK

- A. Do not cover up or hide from view any duct, piping, fitting, or other work of any kind before it has been examined or approved by the Architect/Engineer and/or other authority having jurisdiction

over the same. Remove and correct immediately any unacceptable or imperfect work or unauthorized or disapproved materials discovered immediately after being disapproved.

1.10 PROTECTION

- A. Protect the Work and material of all trades from damage and replace all damaged material with new.
- B. Protect work and equipment until the Work is finally inspected, tested, and accepted; protect the Work against theft, injury or damage; and carefully store material and equipment received on site which is not immediately installed; close open ends of work with temporary covers or plugs during construction to prevent entry of foreign material.
- C. Preserve all public and private property, along and adjacent to the Work, and use every precaution necessary to prevent damage or injury thereto. Use suitable precautions to prevent damage to pipes, conduits and other underground structures or utilities, and carefully protect from disturbance or damage all property marks until an authorized agent has witnessed or otherwise referenced their location, and do not remove them until directed.

1.11 CUTTING AND PATCHING

- A. Provide all cutting and rough patching required for the Work. Perform all finish patching.
- B. Furnish and locate all sleeves and inserts required before the floors and walls are built, pay the cost of cutting and patching required for pipes where sleeves and inserts were not installed in time, or where incorrectly located. Provide all drilling required for the installation of hangers.
- C. Punch or drill all holes cut through concrete slabs or arches from the underside. Do not cut structural members without the approval of the Architect/Engineer. Perform all cutting in a manner directed by the Architect/Engineer.
- D. Do not do any cutting that may impair strength of building construction. Do not drill any holes, except for small screws, in beams or other structural members without obtaining prior approval. All Work shall be done in a neat manner by mechanics skilled in their trades and as approved.

1.12 SUBMITTALS

- A. Submit for review, shop drawings for all materials and equipment furnished and installed under this Contract. Submissions shall include but not be limited to:
 - 1. Piping and equipment layout drawings.
 - 2. Piping materials, valves, hangers, supports and accessories
 - 3. Automatic temperature control equipment, diagrams and control sequences
 - 4. Equipment, fixtures, and appurtenances
 - 5. Insulation
 - 6. Rigging Plan - Include the name of the rigging company; a layout drawing that details the crane with its outriggers extended outward. Provide dimensions showing how rigging operations will affect the road and parking lines being used, the type of crane and its specification including crane arm height, lift capacity, crane reach.
- B. Reports
 - 1. Compliance with listings and approvals for equipment and for fire ratings.
 - 2. Acceptance certificates from inspecting agencies.
 - 3. Complete printed and illustrated operating instructions in report format.
 - 4. Manufacturer's performance tests of equipment.
 - 5. Field operating test results for equipment.
 - 6. Performance reports for vibration isolation equipment.

7. Manufacturer's reports on motorized equipment alignment and installation.
- C. Specific references to any article, device, product or material, fixture or item of equipment by name, make or catalog number shall be interpreted as establishing a basis of cost and a standard of quality. All devices shall be of the make and type listed by Special Agencies, such as the Underwriters' Laboratories, and where required, approved by the Fire Department.

1.13 SPACE ALLOTMENTS AND SUBSTITUTIONS

- A. The space allotments and equipment layouts on the Drawings are based on the manufacturer's model indicated or scheduled as the "Basis of Design". Ensure that any equipment that is submitted other than the "Basis of Design" will fit in the space allotment and will provide the necessary maintenance clearances as recommended by the manufacturer. If maintenance clearances are not met, pay for any changes such that maintenance clearances will be met.
- B. Bear all costs associated with re-layout of the equipment, changes to piping/ductwork, and other changes as required if approved equipment other than the "Basis of Design" equipment is purchased. This shall also include any structural steel modifications and structural steel design changes. Submit, at no cost to the Owner, a steel design stamped by a structural engineer licensed in the state in which the Work is to be performed for structural modifications that must be made resulting from the use of equipment other than the "Basis of Design" or not specified.

1.14 PAINTING

- A. Prime paint all bare supplemental steel, supports and hangers required for the installation of Division 23 Work in accordance with "Painting" Specification Section. Touch up welds of galvanized surfaces with galvanizing primer.

1.15 MATERIAL SAFETY DATA SHEETS

- A. Submit material safety data sheets (MSDS) for all chemicals, hydraulic fluids, seal oils, lubricating oils, glycols and any other hazardous materials used in the performance of the Work, in accordance with the US Department of Labor, Occupational Safety and Health Administration (OSHA) hazard communication and right-to-know requirements stipulated in 29 CFR 1910.1200 (g).

1.16 MOTORS AND STARTERS

- A. Provide new NEMA Standard electric motors, sized and designed to operate at full load and full speed continuously without causing noise, vibration, and temperature rise in excess of their rating. Provide motors with a service factor of at least 1.15.
- B. Equip motors for belt driven equipment with rails with adjusting screws for belt tension adjustment. Weather protect motors exposed to the weather.
- C. Install high efficiency electric motors for air handling units, relief fans, and exhaust fans.
- D. Provide all motors for use with Variable Frequency Drives with "high efficiency inverter duty" insulation class "F" with class "B" temperature rise and that conform to or exceed the International Energy Conservation Code or the Federal EP Act of 1992 requirements for efficiency.
- E. Provide stainless steel nameplates, permanently attached to the motor, and having the following information as a minimum:
 1. Manufacturer
 2. Type

3. Model
 4. Horsepower
 5. Service Factor
 6. RPM
 7. Voltage/Phase/Frequency
 8. Enclosure Type
 9. Frame Size
 10. Full-Load Current
 11. UL Label (where applicable)
 12. Lead Connection Diagram
 13. Bearing Data
 14. Efficiency at Full Load.
- F. Provide motors whose sound power levels do not exceed that recommended in NEMA MG 1-12.49.
- G. Provide motors with drive shafts long enough to extend completely through belt sheaves when sheaves are properly aligned and balanced.
- H. Protect motor starters on equipment located outdoors in weatherproof NEMA 4X enclosures.
- I. Provide weatherproof NEMA 4X disconnect switches when located outdoors.
- J. Motor Characteristics:
1. 208V/1/60 Hz: Capacitor start, open drip-proof type, ball bearing, rated 40 C. continuous rise.

1.17 ACOUSTICAL PERFORMANCE OF EQUIPMENT AND SYSTEMS

- A. Install the Work in such a manner that noise levels from operation of motor driven equipment, whether airborne or structure-borne, and noise levels created by or within air handling equipment and air distribution and control media, do not to exceed sound pressure levels determined by the noise criteria curves published in the ASHRAE guide.
- B. Acoustical Tests
1. Owner may direct the Contractor to conduct sound tests for those areas he deems too noisy.
 2. If NC level exceeds the requirements of the Contract Documents due to improper installation or operation of mechanical systems, make changes or repairs to bring noise levels to within required levels.
 3. Retest until specified criteria have been met.

1.18 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Instructions and Demonstration for Owner's Personnel
1. Provide operating and maintenance instruction to the Owner when project is completed and all HVAC equipment serving the building is ready to be turned over to the Owner.
 2. Turn over the HVAC equipment to the Owner only after the final testing and proper balancing of HVAC systems.
 3. Instruct the Owner's personnel in the use, operation and maintenance of all equipment of each system.
 4. The above instruction requirements are in addition to that specified for specific equipment or systems. Conform to specified requirements if more stringent or longer instruction is specified for specific equipment or systems.

1.19 CODES, RULES, PERMITS & FEES

- A. Give all necessary notices, obtain all permits and pay all government sales taxes, fees, and other costs, in connection with the Work. Unless indicated otherwise, fees for all utility connections, extensions, and tap fees for water, storm, sewer, gas, telephone, and electricity will be paid directly to utility companies and/or agencies by the Owner. File all necessary plans, prepare all documents and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required certificates of inspection for the Work and deliver same to the Owner's Representative before request for acceptance and final payment for the Work.
- B. Conform to the requirements of the NFPA, NEC, FM, UL and any other local or State codes which may govern.

1.20 RECORD DRAWINGS

- A. During the progress of the Work, make a record set of drawings of all changes by which the actual installation differs from the Drawings.
- B. Create all record drawings in AutoCAD version 2010 in .dwg format. Upon completion of the Work, submit to the Architect/Engineer for approval three complete sets of hard copies of the record drawings, of the same size as the Drawings for approval. Upon approval by the Architect/Engineer furnish the Owner a CD copy of the record drawings along with one hard copy for his records.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 CLEANING AND ADJUSTING

- A. Cleaning
 - 1. Blow out, clean and flush each system of piping and equipment, to thoroughly clean the systems.
 - 2. Clean all materials and equipment; leave in condition ready to operate and ready to receive final finishes where required.
 - 3. Clean the operating equipment and systems to be dust free inside and out.
 - 4. Clean concealed and unoccupied areas such as plenums, pipe and duct spaces and equipment rooms to be free of rubbish and dust.
- B. Adjusting
 - 1. Adjust and align equipment interconnected with couplings or belts.
 - 2. Adjust valves of all types and operating equipment of all types to provide proper operation.
 - 3. Clean all strainers after system cleaning and flushing and again before system startup.
- C. Lubrication
 - 1. Lubricate equipment as recommended by the manufacturer, during temporary construction use.
 - 2. Provide complete lubrication just prior to acceptance.
- D. Permanent Equipment Operating During Construction
 - 1. Use only in same service as the permanent applications.
 - 2. Use disposable filters during temporary operation.

3. Replace expendable media, including belts used for temporary operation and similar materials just prior to acceptance of the Work.
 4. Repack packing in equipment operated during construction just prior to system acceptance, using materials and methods specified by the equipment manufacturer.
- E. Retouch or repaint equipment furnished with factory finish as required to provide same appearance as new.
- F. Tools
1. Provide one set of specialized or non-standard maintenance tools and devices required for servicing the installed equipment.

3.02 EQUIPMENT BASES, PLATFORMS AND SUPPORTS

- A. Provide supporting platforms, steel supports, anchor bolts, inserts, etc., for all equipment and apparatus provided.
- B. Obtain prior approval for installation method of structural steel required to frame into building structural members for the proper support of equipment, conduit, etc. Welding will be permitted only when approved by the Architect/Engineer.
- C. Submit shop drawings of supports to the Architect/Engineer for approval before fabricating or constructing.
- D. Provide leveling channels, anchor bolts, complete with nuts and washers, for all apparatus and equipment secured to concrete pads and further supply exact information and dimensions for the location of these leveling channels, anchor bolts, inserts, concrete bases and pads.
- E. Where supports are on concrete construction, take care not to weaken concrete or penetrate waterproofing.

3.03 ACCESSIBILITY

- A. Install valves, dampers and other items requiring access conveniently and accessibly located with reference to the finished building.

3.04 USE OF EQUIPMENT

- A. The use of any equipment, or any part thereof, even with the Owner's consent, is not an indication of acceptance of the Work on the part of the Owner, nor shall it be construed to obligate the Owner in any way to accept improper work or defective materials.

3.05 MODIFICATIONS OF EXISTING WORK

- A. Coordinate the Work with all other contractors and provide necessary dimensions for all openings. Provide all cuts and openings which are necessary for the Work for passage of piping and ductwork
- B. Upon completion, remove all temporary piping and equipment, shoring, scaffolds, etc., and leave all areas clean and free from material and debris resulting from the Work performed under this Section. Provide rough patching in areas required.

3.06 EQUIPMENT INSTALLATION

- A. Locate and set equipment anchor bolts, dowels and aligning devices for equipment requiring them.

- B. Level and shim the equipment; coordinate and oversee the grouting work.
- C. Perform field assembly, installation and alignment of equipment under direct supervision provided by the manufacturer or with inspections, adjustments and approval by the manufacturer.
- D. Alignment and Lubrication Certification for Motor Driven Apparatus
 - 1. After permanent installation has been made and connections have been completed, but before the equipment is continuously operated, have a qualified representative of the equipment manufacturer inspect the installation and report in writing on the manufacturer's letterhead on the following:
 - a. Whether shaft, bearing, seal, coupling, and belt drive alignment and doweling is within the manufacturer's required tolerances so that the equipment will remain aligned in the normal service intended by the Contract Documents and that no strain or distortion will occur in normal service.
 - b. That all parts of the apparatus are properly lubricated for operation.
 - c. That the installation is in accordance with manufacturer's instructions.
 - d. That suitable maintenance and operating instructions have been provided for the Owner's use.
 - e. Make any corrections to items that are required or recommended based on the manufacturer's inspection and have the equipment re-inspected.
- E. Machinery Guards
 - 1. Protect motor drives by guards furnished by the equipment manufacturer or in accordance with the Sheet Metal and Air Conditioning Contractors National Association's Low Pressure Duct Manual. Provide guards of all types approved as acceptable under OSHA Standards.
- F. Equipment Start-up
 - 1. Require each equipment manufacturer to provide qualified personnel to inspect and approve equipment and installation and to supervise the start-up of the equipment and to supervise the operating tests of the equipment.
 - 2. If a minimum number of hours for start-up and instruction are not stated with the equipment specifications, these shall be 2 full 8-hour working days as a minimum.
 - 3. Advise Owner of start-up at least 72 hours in advance.

3.07 CLOSEOUT PROCEDURES

- A. General Operating and Maintenance Instructions: Arrange for each installer of operating equipment and other work that requires regular or continuing maintenance, to meet at the site with the Owner's personnel to provide necessary basic instructions in the proper operation and maintenance of the entire Work. Where installers are not expert in the required procedures, include instruction by the manufacturer's representatives.
- B. Where applicable, provide instruction and training, including application of special coatings systems, at manufacturer's recommendation.
- C. Provide a detailed review of the following items:
 - 1. Maintenance manuals
 - 2. Record documents and catalog cuts for each piece of equipment.
 - 3. Spare parts and materials
 - 4. Tools
 - 5. Lubricants
 - 6. Fuels
 - 7. Identification systems
 - 8. Control sequences

- 9. Hazards
 - 10. Cleaning
- D. Warranties, bonds, maintenance agreements, and similar continuing commitments.
- E. Demonstrate the following procedures:
- 1. Start-up
 - 2. Shut-down
 - 3. Emergency operations
 - 4. Noise and vibration adjustments
 - 5. Safety procedures
 - 6. Economy and efficiency adjustments
 - 7. Effective energy utilization.
- F. Prepare instruction periods to consist of approximately 50% classroom instruction and 50% "hands-on" instruction. Provide minimum instruction periods as follows:

Systems or Equipment	Training Time (Hours)
VRF Equipment	8 hrs.
Electric Heaters	4 hrs.
Exhaust Fan	4 hrs.

Note: Consult individual equipment specification sections for additional training requirements.

- G. Prepare a written agenda for each session and submit for review and approval. Include date, location, purpose, specific scope, proposed attendance and session duration.
- H. Record training sessions in digital format, format as selected by the Owner. Turn over digital files to the Owner after training has been completed.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This Section describes the draining, disconnecting, dismantling, demolition, removal, relocation, rerouting and reconnection of existing mechanical facilities, in a neat and workmanlike manner, of mechanical systems, materials and accessories as required, as shown on the Drawings and specified herein, to accomplish alteration, restoration and to accommodate the Work.

1.02 RELATED WORK

- A. General Mechanical Requirements - Section 230010

1.03 REFERENCES

- A. BOCA Building Code
- B. NFPA Fire Code
- C. ANSI A10.6 - Safety Requirements for Demolition
- D. National Association of Demolition Contractors (NADC) - Demolition Safety Manual
- E. NFPA 51B - Cutting and Welding Processes
- F. NFPA 70 - National Electrical Code
- G. NFPA 241 - Safeguarding Building Construction and Demolition Operations
- H. OSHA 29 CRF 1910 - Occupational Safety and Health Standards
- I. US EPA - Clean Air Act Amendment of 1990.

1.04 SUBMITTALS

- A. Demolition Schedule
- B. Fire Watch Procedures
- C. Inspection Report of Underground Piping Systems
- D. Welding/Burning Permit - Obtain a welding/burning permit from the local Fire Official prior to the start of any welding or burning in accordance with the local Fire Code or as required by the Owner.

1.05 QUALITY ASSURANCE

- A. Only employ workers skilled in the specific trades involved for cutting, patching and removal.
- B. Job Conditions: Prior to start of the Work, make an inspection accompanied by the Architect/Engineer to determine physical condition of adjacent construction that is to remain.

1.06 SPECIAL PRECAUTIONS

- A. Do not torch cut ductwork.

- B. Torch cutting of other mechanical equipment will be permitted only with the specific written approval of the Architect/Engineer.
- C. Include "Fire Watch" procedures as required by the Fire Code and/or Owner's Fire Insurance Carrier for any cutting work that may produce sparks. Submit fire watch procedures for approval.
- D. Perform draining operations so that damage to existing building components does not occur.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Adequately sized rubbish containers for the proper and safe disposal of all debris.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Construct temporary partitions enclosing respective work prior to any demolition work. Erect temporary fencing and signage around demolished materials.
- B. Protect existing materials and equipment which are not to be demolished.
- C. Prevent movement of structure; provide required bracing and shoring.
- D. Do not begin the work until the time schedules and manner of operations have been approved by the Architect/Engineer and Owner. Include all interruptions of existing services in schedules submitted for approval by the Architect/Engineer and Owner.

3.02 GENERAL

- A. Provide alteration and demolition of mechanical facilities as required by the Drawings and Specifications. The Drawings are diagrammatic and do not show the exact location of all existing mechanical work. Where existing equipment is to remain in service during construction, provide rerouting and reconnection of mechanical services as required to maintain continuous service.
- B. Review all equipment with the Architect/Engineer and Owner prior to disposal. Completely remove existing ductwork, piping, conduit and similar items to be abandoned that are not embedded in walls or floor slabs unless otherwise shown on the Drawings. Cap open ends at all walls and floors.
- C. Remove, store and protect all equipment or materials designated to be turned over to the Owner. Coordinate exact location of storage with the Owner.
- D. Temporarily cap ends of ductwork, piping and sanitary vent piping to avoid entry of dirt, debris, or discharge of foul odors and gases.
- E. Where existing louvers or ductwork penetrations are to remain, blank-off the opening on the inside with galvanized sheet metal on both sides of 2-inch thick, 6 pcf density rigid fiberglass board insulation. Paint side attached to the opening with weather resistant flat black paint.
- F. Do not close or obstruct egress width to exits.

- G. Do not disable or disrupt building fire or life safety systems without five (5) days prior written notice to the Architect/Engineer and Owner.
- H. Conform to procedures applicable when discovering hazardous or contaminated materials.
- I. Conduct demolition to minimize interference with adjacent building structures or Owner's operations.
- J. Cease operations immediately if structure appears to be in danger or hazardous materials are encountered. Notify Architect/Engineer. Do not resume operations until directed.
- K. Demolish in an orderly and careful manner. Do not cut or remove more than is necessary to accommodate the new construction or alteration.
- L. Remove demolished materials from site daily. Do not burn or bury materials on site. Dispose of all material at an approved disposal facility.
- M. Protect finished surfaces at all times and repair or replace, if damaged, to match existing construction to the satisfaction of the Architect/Engineer.

3.03 PIPING REMOVAL

- A. Cut off all welded piping square at the locations indicated on the Drawings. No cutting is required where the demolition ends at a flanged valve or equipment. Close off all openings of any remaining valves, piping or fittings with weld caps or blind flanges to prevent debris from entering the existing system.
- B. Disconnect all threaded piping at the location indicated on the Drawings. Close off all openings of remaining valves, piping, fittings and equipment with pipe plugs or pipe caps as required to prevent debris from entering the existing systems.
- C. Remove all pipe hangers, supports, miscellaneous steel and anchors with the piping.

3.04 PROTECTION FROM FREEZING

- A. It is intended that the building remain protected from damage due to freezing temperatures. To that end, keep in place and in operation existing equipment and systems used for heating until scheduling permits shutdown.
- B. Where the removal of equipment, etc. will leave an area unprotected from freezing, notify the Owner and Architect/Engineer at least 72 hours in advance prior to removal so appropriate steps can be taken by the Owner to protect the area. Provide temporary heating equipment sufficient to prevent freezing.
- C. It is the Contractor's responsibility to ensure that piping systems that are being worked on are completely drained from water prior to the start of demolition. If water is not drained and the water freezes it is the Contractor's responsibility to replace piping and repair all damages caused by water leakage at his own expense.

3.05 DISCONNECTION AND INTERRUPTION OF MECHANICAL SERVICES

- A. When portions of an existing piping system or ductwork system are removed, and this removal causes loss of operation to another piece of equipment due to open or disconnected piping or ductwork, cap piping or ductwork or provide temporary piping or ductwork system to retain operation of the system.

3.06 MECHANICAL EQUIPMENT REMOVAL

- A. Remove all mechanical equipment as shown on the Drawings. Remove all electrical work, including wiring between equipment, and wiring to power source or point of origin.
- B. Where equipment is supported by steel and/or structural supports, remove these supports.

3.07 REFRIGERANT REMOVAL

- A. Recover and dispose of all existing refrigerant charges in accordance with EPA regulations. Comply with all regulations applicable to the release of chlorofluorocarbon refrigerants to the atmosphere.

3.08 DUCTWORK REMOVAL

- A. Disconnect all ductwork which must be removed, at the closest joint and support the remaining ductwork.
- B. Prepare all remaining ductwork joints at the point of disconnection to receive new ducts or blank-off panels.
- C. Remove all ductwork supports and miscellaneous steel with ductwork to be demolished.

3.09 INSULATION REMOVAL

- A. Remove insulation, together with all piping, fittings, valves and equipment designated for demolition.

3.10 CONTROL WIRING REMOVAL

- A. Disconnect and remove all control wiring and tubing, including conduit, for the Automatic Temperature Control (ATC) System associated with equipment and systems to be removed.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. The Work covered under this Section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the pipe hanger and supports as described in this Specification. Size hangers and supports to fit the outside diameter of the

1.02 REFERENCES

- A. ASTM B633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel
- B. ASTM A123 - Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
- C. ASTM A653 - Specification for Steel Sheet, Zinc-Coated by the Hot-Dip Process
- D. ASTM A1011 - Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability (Formerly ASTM A570)
- E. MSS SP58 - Manufacturers Standardization Society: Pipe Hangers and Supports- Materials, Design, and Manufacture
- F. MSS SP69 - Manufacturers Standardization Society: Pipe Hangers and Supports- Selection and Application
- G. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices

1.03 QUALITY ASSURANCE

- A. Provide hangers and supports used in fire protection piping systems listed and labeled by Underwriters Laboratories.
- B. Steel pipe hangers and supports shall have the manufacturer's name, part number, and applicable size stamped in the part itself for identification.
- C. Design and manufacture hangers and supports in conformance with MSS SP 58.

1.04 SUBMITTALS

- A. Submit product data on all hanger and support devices, including shields and attachment methods. Include as a minimum as part of product data materials, finishes, approvals, load ratings, and dimensional information.
- B. Submit Pipe Hanger and Support Application Schedule.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with these specifications, provide pipe hanger and support systems manufactured by:
 - 1. Cooper B-Line, Inc.
 - 2. Carpenter and Patterson

3. Grinnell

2.02 PIPE HANGERS AND SUPPORTS

A. Hangers

1. Uninsulated pipes 2 inch and smaller:
 - a. Adjustable steel swivel ring (band type) hanger, B-Line B3170.
 - b. Adjustable steel swivel J-hanger, B-Line B3690.
 - c. Malleable iron ring hanger, B-Line B3198R or hinged ring hanger, B3198H.
 - d. Malleable iron split-ring hanger with eye socket, B-Line B3173 with B3222.
 - e. Adjustable steel clevis hanger, B-Line B3104 or B3100.

B. Pipe Clamps

1. When flexibility in the hanger assembly is required due to horizontal movement, use pipe clamps with weldless eye nuts, B-Line B3140 or B3142 with B3200. For insulated lines use double bolted pipe clamps, B-Line B3144 or B3146 with B3200.

C. Multiple or Trapeze Hanger

1. Construct trapeze hangers from 12 gauge roll formed ASTM A1011 SS Grade 33 structural steel channel, 1-5/8 inch by 1-5/8 inch minimum, B-Line B22 strut or stronger as required.
2. Mount pipes to trapeze with 2 piece pipe straps sized for outside diameter of pipe, B-Line B2000 Series.
3. For pipes subjected to axial movement:
 - a. Strut mounted roller support, B-Line B3126. Use pipe protection shield or saddles on insulated lines.
 - b. Strut mounted pipe guide, B-Line B2417.

D. Wall Supports

1. Pipes 4 inch and smaller:
 - a. Carbon steel hook, B-Line B3191.
 - b. Carbon steel J-hanger, B-Line B3690.

E. Vertical Supports

1. Steel riser clamp sized to fit outside diameter of pipe, B-Line B3373.
2. Copper Tubing Supports
 - a. Size hangers to fit copper tubing outside diameters.
 - 1) Adjustable steel swivel ring (band type) hanger, B-Line B3170CT.
 - 2) Malleable iron ring hanger, B-Line B3198RCT or hinged ring hanger B3198HCT.
 - 3) Malleable iron split-ring hanger with eye socket, B-Line B3173CT with B3222.
 - 4) Adjustable steel clevis hanger, B-Line B3104CT.
 - b. For supporting vertical runs use epoxy painted or plastic coated riser clamps, B-Line B3373CT or B3373CTC.
 - c. For supporting copper tube to strut use epoxy painted pipe straps sized for copper tubing, B-Line B2000 series, or plastic inserted vibration isolation clamps, B-Line BVT series.

F. Plastic Pipe Supports

1. V-Bottom clevis hanger with galvanized 18-gauge continuous support channel, B-Line B3106 and B3106V, to form a continuous support system for plastic pipe or flexible tubing.
2. Supplementary Structural Supports
 - a. Design and fabricate supports using structural quality steel bolted framing materials as manufactured by Cooper B-Line. Provide roll formed channels, 12 gauge ASTM A1011 SS Grade 33 steel, 1-5/8 inch by 1-5/8 inch or greater as required by loading

conditions. Submit designs for pipe tunnels, pipe galleries, etc., to Architect/Engineer for approval. Use clamps and fittings designed for use with the strut system.

- G. Pipe Supports Between Anchors and Pipe Expansion Loops
 - 1. Provide supports between pipe anchors designed to cause minimal resistance to piping movement. Provide roller hanger supports or slide plates between anchors.
 - 2. Provide supports near the L bends of pipe thermal expansion loops. No more than 12 inches from either side of the horizontal elbow.

2.03 UPPER ATTACHMENTS

- A. Beam Clamps
 - 1. Use beam clamps where piping is to be suspended from building steel. Select clamp type on the basis of load to be supported, and load configuration.
 - 2. Use center loaded beam clamps where specified. For steel clamps provide B-Line B3050, or B3055. For malleable iron or forged steel beam clamps with cross bolt provide B-Line B3054 or B3291-B3297 Series as required to fit beams.
- B. Concrete Inserts
 - 1. Use cast in place spot concrete inserts where applicable; either steel or malleable iron body, B-Line B2500 or B3014. Select spot inserts to allow for lateral adjustment and to have means for attachment to forms. Select inserts to suit threaded hanger rod sizes, B-Line N2500 or B3014N series.
 - 2. Use continuous concrete inserts where applicable. Provide 12 gauge channels, ASTM A1011 SS Grade 33 structural quality carbon steel, complete with Styrofoam inserts and end caps with nail holes for attachment to forms. Provide continuous concrete inserts with a load rating of 2,000 lbs/ft. in concrete, B-Line B22I, 32I, or 52I. Select channel nuts suitable for strut and rod sizes.
 - 3. Provide Drop-In, shell type anchors with an internally threaded, all-steel shell with expansion cone insert and flush embedment lip. Manufacture anchors from plated carbon steel, 18-8 stainless steel and 316 stainless steel. Install anchors with carbide tipped hammer drill bits made in accordance to ANSI B212.15-1994 specifications. Test anchors to ASTM E488 criteria and listed by ICC (formerly ICBO) and SBCCI. Provide anchors listed by the following agencies as required by the local building code: UL, FM. Select inserts to suit threaded hanger rod sizes, Redhead Multi-Set.

2.04 ACCESSORIES

- A. Hanger Rods shall be threaded both ends or continuous threaded rods of circular cross section. Use adjusting locknuts at upper attachments and hangers. No wire, chain, or perforated straps are allowed.
- B. Provide shields that are 180 degree galvanized sheet metal, 12 inch minimum length, 18 gauge minimum thickness, designed to match outside diameter of the insulated pipe, B-Line B3151.
- C. Pipe protection saddles shall be formed from carbon steel, 1/8 inch minimum thickness, sized for insulation thickness. Saddles for pipe sizes greater than 12 inch shall have a center support rib.

2.05 FINISHES

- A. Indoor Finishes
 - 1. Coat hangers and clamps for support of bare copper piping with copper colored epoxy paint, B-Line Dura-Copper®. Use additional PVC coating of the epoxy painted hanger where necessary.

2. Zinc plate hangers for other than bare copper pipe in accordance with ASTM B633 OR provide an electro-deposited green epoxy finish, B-Line Dura-Green®.
 3. Provide pre-galvanized strut channels in accordance with ASTM A653 SS Grade 33 G90 or provide an electro-deposited green epoxy finish, B-Line Dura-Green®.
- B. Outdoor and Corrosive Area Finishes
1. Hot dip galvanize hangers and struts located outdoors after fabrication in accordance with ASTM A123. Provide all hanger hardware as hot dip galvanized or stainless steel. Zinc plated hardware is not acceptable for outdoor or corrosive use.
 2. Provide hangers and strut manufactured of type 304 stainless steel with stainless steel hardware where located in corrosive areas.

PART 3 - EXECUTION

3.01 PIPE HANGERS AND SUPPORTS

- A. Adequately support pipe by pipe hanger and supports specified in PART 2 PRODUCTS. Allow for forces imposed by expansion joints, satisfy structural requirements and maintain proper clearances with respect to adjacent piping, equipment and structures. Size hangers for insulated pipes sized to accommodate insulation thickness.
- B. Keep the different types of hangers to a minimum and provide hangers that are neat, without complicated bolting and with the number of parts of each hanger and its anchor kept to a minimum.
- C. Make accurate weight balance calculations to determine the required supporting forces at each hanger or support location and the pipe weight load at each equipment connection.
- D. Provide pipe hangers capable of supporting the pipe in all conditions of operation selected to allow free expansion and contraction of the piping, and prevent excessive stress resulting from transferred weight being induced into the pipe or connected equipment.
- E. Painted or shop prime all hangers and supports that are not galvanized.
- F. Support horizontal copper tubing in accordance with MSS SP-69 Tables 3 and 4, excerpts of which follow below:

NOMINAL PIPE SIZE (INCHES)	ROD DIAMETER (INCHES)	MAXIMUM SPACING (FEET)
1/2 to 3/4	3/8	5
1	3/8	6
1-1/4	3/8	6
1-1/2	3/8	8

Do not leave any pipe length unsupported between any two coupling joints.

- G. Provide means of preventing dissimilar metal contact such as plastic coated hangers, copper colored epoxy paint, or non adhesive isolation tape- B-Line Iso-pipe. Galvanized felt isolators sized for copper tubing may also be used, B-Line B3195CT.
- H. Install hangers to provide a minimum of 1/2 inch space between finished covering and adjacent work.
- I. Place a hanger within 12 inches of each horizontal elbow.

- J. Support vertical piping independently of connected horizontal piping. Support vertical pipes at every floor. Wherever possible, locate riser clamps directly below pipe couplings or shear lugs.
- K. Where several pipes can be installed in parallel and at the same elevation, provide trapeze hangers as specified in section 2.02 C. Space trapeze hangers according to the smallest pipe size, or install intermediate supports according to schedules in this Section.
- L. Do not support piping from other pipes, ductwork or other equipment that is not building structure.
- M. Where horizontal piping movements are greater than ½ inch, or where the hanger rod angularity from the vertical is greater than four degrees from the cold to hot position of the pipe, offset the hanger pipe and structural attachments in such a manner that the rod is vertical in the hot position.
- N. In any part of the building which is steel-framed, attach hangers to the building structural steel beams. Where hangers do not correspond with the building structural steel beams, provide supplemental steel members continuously welded or bolted to the building structural steel beams. Provide two (2) coats of primer on the supplemental steel. In any parts of the building which is a concrete structure, attach hangers to the concrete structure by installing anchors into the concrete.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This Section describes the marking and identification materials for identifying mechanical equipment, ductwork and piping systems.
- B. Mark and identify all mechanical equipment, ductwork and piping systems described herein, and as shown and specified in the Contract Documents.

1.02 REFERENCES

- A. ANSI A13.1 - Scheme for the Identification of Piping Systems.
- B. Z53.1 - Safety Color Code for Marking Physical Hazards.
- C. OSHA 29 CFR 1910 - Subpart J, General Environmental Controls

1.03 SUBMITTALS

- A. Identification Scheme - Submit scheme of identification codes.
- B. Valve Schedules - Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Samples - Submit samples of tags, attachments, labeled and identified.
- D. Equipment Schedules - Submit mechanical equipment schedules, listing proposed equipment numbers, and their location and function.
- E. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS

- A. Seton
- B. Bunting
- C. W.H. Brady Company

2.02 VALVE TAGS

- A. Provide valve tags for all valves installed for this project. Valve tags shall be constructed of brass with stamped letters and service designation tag size minimum 1-1/2 inches (38 mm) diameter with smooth edges, brass S hook.
- B. Valve tags shall be permanently stamped and marked with a service designation, normal valve position, and an identifying number as large as possible. Each valve shall have a separate and distinct number coordinated with the service designations shown on the Drawings and the Owners existing valve numbering system. Coordinate with the Architect/Engineer and Owner before finalizing the valve tag numbering system.

2.03 PIPE MARKERS

- A. All accessible piping installed indoors for this project, insulated and uninsulated shall be identified with wraparound pipe markers. Pipe markers shall be factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. "Accessible" piping shall include exposed piping, and piping located above lay-in ceilings. Markers shall include system name, flow arrow, and color code and pipe diameter.
- B. All piping installed outdoors for this project, insulated and uninsulated, shall be identified with wraparound pipe markers. Pipe markers shall be factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. The marker shall be printed with weather-resistant ink.
- C. Where pipes are too small or not readily accessible for application of pipe markers, a brass identification tag at least 1 ½ inches in diameter, with depressed ½ inch high black letters and numerals, shall be securely fastened at locations specified for pipe markers.
- D. See pipe marker schedule for size requirements of pipe markers.

2.04 MECHANICAL EQUIPMENT MARKERS

- A. Identify all mechanical equipment, bare or insulated, installed in the rooms or on the roof, by means of lettered and numbered nameplate (not stenciled) identifying the equipment and service. Refer to the Drawings for equipment identifications. Nameplates shall be aluminum with permanent 1 ½ inch high white letters on a black background, mechanically affixed and installed in a readily visible location on the equipment. Coordinate the final equipment designation with the Owner.
- B. In addition to markers, all mechanical equipment shall be furnished with the manufacturer's identification plate showing the name of equipment, manufacturer's name and address, date of purchase, model number and performance data.

2.05 DUCT WORK IDENTIFICATION

- A. Provide full air distribution system identification at each side of a wall penetration, in a mechanical room, at all changes in direction and at no more than 50 foot intervals. Provide arrows identifying direction of flow.
- B. Identification shall be preprinted labels.
- C. Letter Size: 1-1/2 inches in height.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Apply piping system markers and valve tags in the following locations:
 - 1. Adjacent to each valve and fitting.
 - 2. At each branch location and riser take-off
 - 3. At each side of a pipe passage through floors, walls, ceiling and partitions.
 - 4. At each pipe passage to and from underground areas.
 - 5. Every 20 feet on all horizontal and vertical pipe runs.
- B. Provide arrow markers showing direction of flow incorporated into or adjacent to each piping system marker. Use double-headed arrows if flow is in both directions.

- C. Apply all piping system markers where view is unobstructed; markers and legends shall be clearly visible from operating positions.
- D. Apply all tags and piping system markers in accordance with the manufacturer's instructions. Do not attach tags to valve handle such that the normal or emergency operation of the valve will be hindered.

3.02 SCHEDULES

- A. Pipe Marker Letter Size Schedule:

Outside diameter of insulation or pipe Inches	Letter height Inches	Color field Inches
3/4 to 1-1/4	1/2	8
1-1/2 to 2	3/4	8

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This section specifies requirements for testing, adjusting, and balancing of all air distribution systems, including the equipment and devices associated with each system.
- B. The work includes setting speed and flow, adjusting equipment and devices installed for systems, recording data, conducting tests, preparing and submitting reports, and recommending modifications to the mechanical installations specified in other Sections of the Specifications.

1.02 RELATED WORK

- A. Drawings and general provisions of the Contract, including General Conditions, any Supplemental Conditions and Division 1 Specification Sections, govern the work of this section.

1.03 SUBMITTALS

- A. Submit proof that the testing, adjusting and balancing agency meets the requirements of Section 1.04 "Quality Assurance", and all other specified requirements.
- B. Prior to performing the work, submit sample blank forms of the test reports that will be submitted by the entity performing work of this Section, indicating all data and parameters included.
- C. Submit certified test reports, signed by the authorized representative of the testing and balancing agency. Certify the reports to be proof that the systems have been tested, adjusted and balanced in accordance with the selected reference standards (NEBB or AABC); are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at completion of the testing, adjusting and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Submittal of test report shall be in the following format:
 - 1. Draft Report: Upon completion of testing, adjusting and balancing procedures, prepare draft reports on the approved forms. Draft report may be handwritten, but must be complete, factual, accurate and legible. Organize and format draft reports in the same manner specified herein for the final reports. Submit two complete sets of draft reports. Only one complete set of draft reports will be returned.
 - 2. Final Report: Upon verification and approval of draft reports, prepare final reports, type written and organized and formatted as described herein. Submit two complete sets of final reports.
 - a. Report Format: Submit reports using the standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted and balanced. Include schematic systems diagrams. Enclose the report contents in a 3-ring binder. Divide the contents into the below listed divisions, separating them by divider tabs with titles descriptive of the contents:
 - 1) General Information and Summary.
 - 2) Air Systems.
 - b. Report Contents: Provide the following minimum information, forms and data:
 - 1) General Information and Summary: Identify the testing, adjusting and balancing Agency, Contractor, Owner, Architect/Engineer, and Project on the inside cover sheet. Include addresses, and contact names and telephone numbers. Include a certification sheet containing the seal and name, address, telephone number and signature of the Agency's responsible certified Test and Balance Engineer. Include in this division a listing of the instrumentation used for the procedures, along with the proof of calibrations.

- 2) Include in the remainder of the reports the appropriate forms containing, as a minimum, the information indicated on the standard report forms prepared by AABC or NEBB, for each item of equipment and system. Prepare a schematic diagram for each item of equipment and system, to accompany each respective report form.
- c. Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards within a period not exceeding six months prior to conducting the test procedures.

1.04 QUALITY ASSURANCE

- A. Test, adjust and balance systems and equipment by using competent mechanics regularly employed by a testing, adjusting and balancing Subcontractor whose primary business is the testing, adjusting and balancing of building mechanical systems. The testing, adjusting and balancing Subcontractor shall be a business established for a minimum of 10 years.
- B. The testing, adjusting, and balancing Subcontractor shall be certified by the Associated Air Balance Council (AABC) or the National Environmental Balancing Bureau (NEBB).
- C. Instrumentation type, quantity, and accuracy shall be as described in AABC's "National Standards for Field Measurement and Instrumentation, or Total System Balance, or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."
- D. All instrumentation shall be calibrated at least every 6 months or more frequently if required by the instrument manufacturer.

1.05 PERFORMANCE REQUIREMENTS

- A. Comply with all applicable Federal, State and Local laws, ordinances, regulations and codes, and the latest industry standards including, but not limited to the entities listed below for procedures, measurements, instruments and test reports for testing, adjusting and balancing work:
 1. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
 2. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
 3. National Environmental Balancing Bureau (NEBB)
 4. Associated Air Balance Council (AABC)
- B. Set the air delivery or intake of each diffuser, grille and register to be as designed or within five percent of the air flow rates shown on the Drawings.
- C. Set the fan air flow rate and static pressure rise across the fan to be within 10 percent above the design value at design speed.

1.06 JOB CONDITIONS

- A. Require the testing and balancing specialist to review his work with the respective manufacturers of the equipment and devices involved, and coordinate and schedule all work.
- B. Furnish and install balancing dampers, pressure taps, gauges, and other components as required for a properly balanced system, whether or not specified herein or shown on the Drawings, all at no additional cost to the Owner. Make all adjustment or replacement parts recommended by the testing and balancing specialist in strict accordance with the respective equipment manufacturer's recommendations.
- C. Coordinate with the control manufacturer's representative to set the adjustment of the automatically operated dampers to operate as required.

1.07 GENERAL

- A. The Owner will occupy the building during the entire testing, adjusting, and balancing period. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.
- B. Complete all tests specified herein to the satisfaction of the Architect/Engineer before final acceptance.
- C. The Architect/Engineer, or his representative, is the sole judge of the acceptability of the tests. The Architect/Engineer may direct the performance of any such additional tests, as he deems necessary in order to determine the acceptability of the systems, equipment, material and workmanship. No additional payment will be made for any test required by the Architect/Engineer.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Obtain design drawings and specifications and become thoroughly acquainted with the design intent.
- B. Obtain copies of approved shop drawings of all air handling equipment, air outlets (supply, return and exhaust), and the temperature control diagrams, including intended sequence of operations.
- C. Examine installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned, and is operable. Do not proceed with testing, adjusting and balancing until unsatisfactory conditions have been corrected in a manner approved by the testing and balancing specialist.
- D. Examine the air systems to see that they are free from obstructions. Determine that all dampers and registers are open, moving equipment is lubricated, clean filters are installed, and automatic controls are functioning; and perform other inspections and maintenance activities necessary for proper operation of the systems.

3.02 TESTING, ADJUSTING AND BALANCING

- A. Notify the Owner 48 hours in advance of starting any tests. Do not perform any tests until acknowledgment of notification and approval has been received from the Owner.
- B. Provide all necessary instruments and personnel for the tests. If, in the opinion of the Architect/Engineer, the results of such tests show that the Work has not complied with the requirements of the Contract Documents, make all additions or changes necessary to put the system in proper working condition and pay all expenses for all subsequent tests which are necessary to determine whether the Work is satisfactory. Any additional work or subsequent tests shall be carried out at the convenience of the Architect/Engineer.
- C. Test all packaged equipment in strict accordance with the equipment manufacturer's requirements.

- D. Perform any and all other tests that may be required by the local municipality or other governing body, board or agency having jurisdiction.
- E. Perform testing, adjusting, and balancing after leakage and pressure tests on air distribution systems have been satisfactorily completed.
- F. Actuate all safety devices in a manner that clearly demonstrates their workability and operation.
- G. Cut insulation and ductwork for installation of test probes to the minimum extent necessary to allow adequate performance of test procedure.
- H. Perform tests and compile test data for all air systems.
- I. Include a schematic diagram locating the air inlets, outlets, fans, equipment, dampers and regulating devices for air systems.
- J. All instruments used shall be provided by the entity performing the Work of this Section, and shall be accurately calibrated and maintained in good working order.
- K. Air Systems
- L. Perform the testing, adjusting and balancing of air systems in accordance with the detailed procedures outlined in the referenced standards; including but not be limited to the following:
 - 1. Test, record and adjust fan rpm to design requirements.
 - 2. Test and record motor full load amperes.
 - 3. Make a pitot tube traverse of main exhaust ducts and obtain design flow rate at fans.
 - 4. Test and record system static pressure, velocity pressure and total pressure.
 - 5. Test and adjust system for design exhaust air flow rate.
 - 6. Permanently mark all dampers after air balance is complete so that they can be restored to their correct position, if disturbed later.
 - 7. Seal openings in ductwork for pitot tube insertion with snap-in plugs after air balance is complete.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This section describes the insulation, jackets and accessories for piping as scheduled in Part 3 of this Section and as shown on the Drawings.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping
- B. Section 078413 - Through Penetration Firestopping for HVAC Systems
- C. Section 079201 - Non Fire Rated Sleeves and Seals
- D. Section 232000 - Pipe, Valves, and Fittings
- E. Section 232300 - Refrigerant Piping

1.03 REFERENCES

- A. National Fire Protection Association (NFPA):
 - 1. NFPA 255 - Surface Burning Characteristics of Building Materials.
- B. Greenguard
- C. 2015 International Energy Conservation Code
- D. 2015 International Mechanical Code
- E. Underwriters Laboratories, Inc. (UL):
 - 1. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.
- F. American Society for Testing and Materials (ASTM):
 - 1. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 3. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
 - 4. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
 - 5. ASTM C335 - Standard Test Method for Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.
 - 6. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - 7. ASTM C518 - Standard Test Method for Steady-State Heat Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 8. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
 - 9. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
 - 10. ASTM C547 - Standard Specification for Mineral Fiber Preformed Pipe Insulation.
 - 11. ASTM C 552 - Standard Specification for Cellular Glass Thermal Insulation
 - 12. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 - 13. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

14. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing.
15. ASTM C 591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
16. ASTM C 610 - Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation.
17. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
18. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
19. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
20. ASTM D1056 - Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
21. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.
22. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
23. ASTM E96 - Standard Test Method for Water Vapor Transmission of Materials.

1.04 DEFINITIONS

- A. Greenguard: Greenguard Environmental Institute
- B. IAQ: Indoor Air Quality
- C. EPA: Environmental Protection Agency
- D. WHO: World Health Organization
- E. ASJ: All Service Jacket
- F. SSL: Self-Sealing Lap
- G. FSK: Foil-Scrim-Kraft; jacketing
- H. PSK: Poly-Scrim-Kraft; jacketing
- I. PVC: Polyvinyl Chloride
- J. FRP: Fiberglass Reinforced Plastic
- K. Cold Service Piping/ Surfaces: Pipes or surfaces where the normal operating temperature is 60 degrees F or lower.
- L. Hot Service Piping/ Surfaces: Pipes or surfaces where the normal operating temperature is 105 degrees F or higher.

1.05 SUBMITTALS

- A. Product data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- B. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.06 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer: Company specializing in manufacturing products specified with minimum 3 years documented experience.
 - 2. Installer: Company specializing in performing the Work of this Section with minimum 3 years documented experience.
- B. Materials:
 - 1. Flame spread/smoke developed rating of 25/50 or less in accordance with ASTM E84, NFPA 255 and UL 723.
 - 2. Insulation for duct, pipe and equipment for above grade exposed to weather outside building shall be certified as being self-extinguishing for 1" thickness in less than 53 seconds when tested in accordance with ASTM D1692.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.
- B. Follow manufacturer's recommended storage and handling practices.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient conditions required by manufacturers of each product (tapes, adhesives, mastics, cements, insulation, etc.).
- B. Maintain temperature before, during, and after installation for a minimum of 24 hours.
- C. Supply fiberglass products that assure excellent IAQ (Indoor Air Quality) performance through Greenguard Certification.
- D. Mold: Carefully inspect any insulation that has been exposed to water. If it shows any sign of mold growth remove it from the Site. If the material is wet but shows no sign of mold, dry rapidly and thoroughly. If it shows signs of facing degradation from wetting remove it from the Site.

PART 2 - PRODUCTS

2.01 ELASTOMERIC INSULATION

- A. Approved Manufacturers:
 - 1. Armacell LLC
 - 2. K-Flex USA, Inc.
- B. Flexible, tubular (Type 1) or sheet/roll form (Type 2) closed-cell elastomeric insulation complying with ASTM C534 <<Grade 1 - Standard (temperature range -297°F to 220°F); Grade 2 - High Temperature (to 350°F); Grade 3 - Contains no halogens>>; use molded tubular material wherever possible.

2.02 ELASTOMERIC INSULATION ACCESSORIES

- A. Adhesives:
 - 1. Air dried, waterproof vapor barrier contact adhesive, compatible with insulation for joining of seams and butt joints.

B. Finishes:

1. Provide a weather and UV resistant protective finish for outdoor applications in accordance with the manufacturer's recommendations.

2.03 HIGH DENSITY JACKETED INSULATION INSERTS FOR HANGERS AND SUPPORTS

- A. For Use with Flexible Elastomeric Foam Insulation: Hardwood dowels and blocks, length or thickness equal to insulation thickness, other dimensions as specified or required.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that all piping is tested and approved prior to insulation installation.
- B. Verify that all surfaces are clean, dry and without foreign material before applying insulation materials.

3.02 INSTALLATION (GENERAL)

- A. Install all materials using skilled labor regularly engaged in this type of work. Install all materials in strict accordance with manufacturer's recommendations, building codes, and industry standards.
- B. Locate insulation and cover seams in the least visible location. Extend all surface finishes in such a manner as to protect all raw edges, ends and surfaces of insulation.
- C. On cold surfaces where a vapor retarder must be maintained, apply insulation with a continuous, unbroken moisture and vapor seal. Insulate and vapor seal all hangers, supports, anchors, or other projections secured to cold surfaces to prevent condensation.
- D. Insulated pipes conveying fluids below ambient temperature; insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. For hot piping conveying fluids <<140°F>> or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- F. For hot piping conveying fluids over <<140°F>>, insulate flanges and unions at equipment.
- G. Maintain continuous pipe insulation through walls, ceiling or floor openings, or sleeves except where firestop or firesafing materials are required.
- H. Install insulation neatly, accurately and without voids, in accordance with manufacturer's instructions and NIAC National Commercial and Industrial Insulation Standards.
- I. Insulate fittings, valves and flanges using premolded covers with precut insulation inserts.
- J. Insulate piping using insulation of type and thickness scheduled in this Section.
- K. Install metal shields between hangers or supports and the piping insulation. Install rigid insulation inserts as required between the pipe and the insulation shields. Fabricate inserts to be of equal thickness to the adjacent insulation and vapor seal as required. Insulation inserts shall be no less than the following lengths:

1½" to 2½" IPS	10" long
3" to 6" IPS	12" long
8" to 10" IPS	16" long
12" and over IPS	22" long

- L. Pipe exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor) to be finished with PVC jacket and fitting covers, aluminum jacket, or stainless steel jacket.

3.03 INSTALLATION (ELASTOMERIC)

A. Piping:

1. Install pipe insulation by slitting tubular sections and applying onto piping or tubing. Alternately, slide unslit sections over the open ends of piping or tubing. Adhere and seal all seams and butt joints using adhesive.
2. Push insulation onto the pipe, never pull. Stretching of insulation may result in open seams and joints.
3. Tape the ends of the tubing before slipping the insulation over the new pipes to prevent dust from entering the pipe.
4. Clean cut all edges. Do not leave rough or jagged edges of the insulation. Use proper tools such as sharp non-serrated knives.
5. On cold piping, adhere insulation directly to the piping at the high end of the run using a two-inch strip of adhesive on the inner diameter of the insulation and on the pipe. Coat all exposed end cuts of the insulation with adhesive. Adhere all penetrations through the insulation and termination to the substrate to prevent condensation migration.
6. Use sheet insulation on all pipes larger than 6-inch diameter. Do not stretch insulation around the pipe. On pipes larger than 12-inch diameter, adhere insulation directly to the pipe on the lower 1/3 of the pipe. On pipes greater than 24-inch diameter, completely adhere insulation.
7. Stagger seams when applying multiple layers of insulation.

B. Valves, Flanges and Fittings:

1. Insulate all fittings with the same insulation thickness as the adjacent piping. Adhere all seams and mitered joints with adhesive. Sleeve screwed fittings and adhere with a minimum 1" overlap onto the adjacent insulation.
2. Insulate valves, flanges, strainers, and Victaulic couplings using donuts covered with sheet or oversized tubular insulation.

C. Hangers:

1. Support piping system using high density inserts with sufficient compressive strength. Apply elastomeric foam insulation with the same or greater thickness than the pipe insulation to pipe supports. Seal all joints with adhesive.
2. Standard and split hangers - Insulate piping supported by ring hangers with the same insulation thickness as the adjacent pipe. Seal all seams and butt joints with adhesive. Sleeve ring hangers using oversized tubular insulation. On cold piping, extend insulation up the hanger rod a distance equal to four times the insulation thickness. Insulation tape may be used to a thickness equal to the adjacent insulation thickness.
3. Clevis hangers or other pipe support systems - Install saddles under all insulated lines at unistrut clamps, clevis hangers, or locations where insulation may be compressed due to the weight of the pipe. Insert and adhere wooden dowels or blocks of a thickness equal to the insulation to the insulation between the pipe and the saddle.
4. Pre-insulated pipe hangers can be used to prevent compression of insulation at standard split, clevis hangers or other pipe support systems. Adhere a pair of non-skid pads to the

clamps to minimize the movement. In addition, to prevent loosening of the clamps, use an antivibratory fastener, such as a nylon-locking nut.

D. Exterior Applications:

1. Paint all outdoor exposed piping with two coats of UV resistant finish. Prior to applying the finish, wipe the insulation with denatured alcohol. Do not tint the finish.
2. Locate seams for all outdoor exposed piping on the lower half of the pipe.

3.04 PIPING INSULATION MATERIAL SCHEDULE

SYSTEM OR SERVICE	LOCATION	INSULATION TYPE	JACKET
HVAC REFRIGERANT LINES	INSIDE	ELASTOMERIC	
HVAC REFRIGERANT LINES	OUTSIDE	ELASTOMERIC	EXTERIOR COATING

3.05 MINIMUM PIPING INSULATION THICKNESS (IN.)

FLUID OPERATING TEMP RANGE (°F)	SYSTEMS IN TEMP RANGE	INSULATION CONDUCTIVITY		NOMINAL PIPE OR TUBE SIZE (IN.)				
		CONDUCTIVITY BTU*IN./(H*SQ. FT.*°F)	MEAN RATING TEMP (°F)	<1	1 TO < 1-1/2	1-1/2 TO < 4	4 TO < 8	=8
> 350		0.32-0.34	250	4.5	5.0	5.0	5.0	5.0
251-350		0.29-0.32	200	3.0	4.0	4.5	4.5	4.5
201-250		0.27-0.30	150	2.5	2.5	2.5	3.0	3.0
141-200		0.25-0.29	125	1.5	1.5	2.0	2.0	2.0
105-140		0.21-0.28	100	1.0	1.0	1.5	1.5	1.5
40-60		0.21-0.27	75	0.5	0.5	1.0	1.0	1.0
< 40		0.20-0.26	50	0.5	1.0	1.0	1.0	1.5

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. The Work specified as part of this Section consists of the work required to achieve operational and coordinated Sequences of Operation as described. Work includes coordination of functions of controllers supplied as part of equipment packages, sizing of control valves, interconnection of systems, provision and installation of all accessory devices required for complete system operation including devices not provided as part of equipment, coordination of start up and testing and demonstration of the operation of Sequences of Operation to the Owner and his representatives.
- B. The control system operation of all equipment shall be subject to the operational modes, conditions and logic described in this Section and the controlled equipment manufacturer's recommendations.
- C. Training of the Owner's personnel in the operation, trouble shooting, adjustment and repair of all system controls.

1.02 RELATED SECTIONS AND WORK

- A. Section 230923 - Automatic Temperature Controls and Building Automation System
- B. Division 26
- C. Owner's Building Management System (BMS)
- D. Owner's Fire Alarm System (FAS)

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

3.01 GENERAL

- A. General
 - 1. Conform to the requirements of the Owner's standards for all electrical work and devices.
 - 2. All VRF equipment space sensors and thermostats shall have an lcd display indicating their set point, the condition sensed and the mode of operation they are responding to. Electric unit heaters shall have built-in thermostats.

3.02 SEQUENCE OF OPERATION - DUCTLESS SPLIT SYSTEM, DSEU-1,-2/DSCU-1, DSEU-3,-4/DSCU-2

- A. General:
 - 1. Each ductless split system shall be provided with a wall mounted digital thermostat. See floor plan drawings and schedule for outdoor condensing units that serve multiple indoor units.
- B. Cooling:
 - 1. The cooling set point temperature shall be 85 degrees F (adjustable). Upon a demand for mechanical cooling, the associated condensing unit shall be energized and the cooling coil shall be controlled to maintain space temperature.

C. Heating:

1. The heating set point temperature shall be 55 degrees F (adjustable). When the space temperature falls below the set point temperature the heating unit shall stage on in order to maintain the set point temperature.

3.03 SEQUENCE OF OPERATION - ELECTRIC UNIT HEATER, EUH-1, EUH-2, EUH-3, EUH-4

A. General:

1. The unit heater shall be provided with a built-in double pole thermostat.

B. Heating:

1. The heating set point temperature shall be 55 degrees (adj.). When the space temperature falls below the set point temperature, the unit heater shall turn on in order to maintain the set point temperature.

3.04 SEQUENCE OF OPERATION - EXHAUST FANS, EF-1

A. General:

1. The exhaust fan shall be interlocked with the Armstrong hydrogen detection system.
2. Upon detection of hydrogen concentration of 1.0% of the total volume of the room by the hydrogen sensors, EF-1 shall start. After the hydrogen concentration drops below 0.2%, fan shall stop. In case of the hydrogen sensor detecting hydrogen concentration of 2.0% of the total volume of the room, the audible/visual alarm shall be triggered.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, valves, and connections for piping systems.
- B. Condensate Drain.

1.02 RELATED SECTIONS

- A. Section 230529 - Pipe Hangers and Supports
- B. Section 230555 - Mechanical System Identification
- C. Section 230700 - Piping Insulation.

1.03 REFERENCES

- A. Section 014500 - Quality Control: Requirements for references and standards.
- B. ASTM D 1784 - Rigid Vinyl Compounds.
- C. ASTM D 1785 - PVC Plastic Pipe, Schedule 40
- D. ASTM D 2466 - PVC Plastic Fittings, Schedule 40
- E. ASTM D 2665 - PVC Drain, Waste, and Vent Pipe and Fittings
- F. ASTM D 2564 - Solvent Cements for PVC Pipe and Fittings
- G. ASTM D 2321 - Underground Installation of Thermoplastic Pipe (non-pressure applications)
- H. ASTM F 1668 - Procedures for Buried Plastic Pipe
- I. ASTM F 1866 - Fabricated PVC DWV Fittings
- J. NSF Standard 14 - Plastic Piping Components and Related Materials.
- K. NSF Standard 61 - Drinking Water System Components - Health Effects.

1.04 SUBMITTALS FOR REVIEW

- A. Section 013300 - Submittals: Procedures for submittals.
- B. Product Data: Provide data on pipe materials, pipe fittings, and accessories. Provide manufacturers catalog information.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with State of New York and City code.
- B. Identify pipe with marking including size, ASTM material classification and ASTM specification.

1.06 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with the State of New York and the City code.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 - PRODUCTS

2.01 CONDENSATE DRAIN PIPING (DIAMETER LESS THAN OR EQUAL TO 1")

- A. PVC Schedule 40 Pressure Pipe and Fitting System.
- B. Pipe and fittings shall be manufactured from virgin rigid PVC (polyvinyl chloride) vinyl compounds with a Cell Class of 12454 per ASTM D 1784.
- C. PVC Schedule 40 pipe shall be iron pipe size (IPS) conforming to ASTM D 1785.
- D. PVC Schedule 40 fittings shall conform to ASTM D 2466.
- E. Pipe and fittings shall be manufactured as a system and be the product of one manufacturer.
- F. Pipe and fittings shall conform to National Sanitation Foundation (NSF) Standard 61 or the health effects portion of NSF Standard 14.
- G. Testing with or transport/storage of compressed air or gas in PVC pipe or fittings shall not be permitted.
- H. Buried pipe shall be installed in accordance with ASTM F 1668 and ASTM D 2774.
- I. Solvent cement joints shall be made in a two step process with primer manufactured for thermoplastic piping systems and solvent cement conforming to ASTM D 2564.
- J. Primer shall conform to ASTM F 656.
- K. The system shall be protected from chemical agents, fire stopping materials, thread sealant, plasticized vinyl products, or other aggressive chemical agents not compatible with PVC compounds.
- L. The system is intended for pressure drainage applications where the temperature will not exceed 140°F.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Section 013100 - Project Management and Coordination: Verification of existing conditions before starting work.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.

- C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and the requirements of the Plumbing Code of New York City.
- B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls. Effect changes in size with reducing fittings.
- C. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- D. Group piping whenever practical at common elevations.
- E. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to fittings.
- F. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- G. Sleeve pipes passing through partitions, walls and floors.
- H. Identify piping under provisions of Section 230555.
- I. Piping routed outdoors to be painted to match the color of the facade and be provided with protection from UV degradation.

3.04 APPLICATION

- A. Install unions downstream at equipment or apparatus connections.

3.05 ERECTION TOLERANCES

- A. Section 014500 - Quality Control: Tolerances.
- B. Establish invert elevations, slopes for drainage to ¼ inch per foot minimum. Maintain gradients.

3.06 FIELD QUALITY CONTROL

- A. Drainage System: Test plug all system openings with the exception of the system's highest point. Fill system with water to the point of overflow and subject the highest point to 10-foot head of water. The system shall be considered tight if the pressure is held for not less than 30 minutes without signs of leakage.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Requirements of the following Division 23 Sections apply to this section:
 - 1. Section 230010 - General Mechanical Requirements.
 - 2. Section 230529 - Pipe Hangers And Supports
 - 3. Section 230555 - Mechanical System Identification
 - 4. Section 230700 - Pipe Insulation

1.02 SUMMARY

- A. This Section includes refrigerant piping used for air conditioning applications. This Section includes:
 - 1. Piping, tubing, fittings, and specialties.
 - 2. Special duty valves.
 - 3. Refrigerants.
- B. Products installed but not furnished under this Section include pre-charged tubing, refrigerant specialties, and refrigerant accessories furnished as an integral part of or separately with packaged air conditioning equipment.

1.03 SUBMITTALS

- A. Product data for the following products:
 - 1. Each type of valve specified.
 - 2. Each type of refrigerant piping specialty specified.
- B. Shop Drawings showing layout of refrigerant piping, specialties, and fittings including, but not necessarily limited to, pipe and tube sizes, valve arrangements and locations, slopes of horizontal runs, wall and floor penetrations, and equipment connection details. Show interface and spatial relationship between piping and proximity to equipment.
- C. Brazer's Certificates signed by Contractor certifying that brazers comply with requirements specified under "Quality Assurance" below.
- D. Maintenance data for refrigerant valves and piping specialties, for inclusion in Operating and Maintenance Manual specified in Division 01 and Division 23.

1.04 QUALITY ASSURANCE

- A. Qualify brazing processes and brazing operators in accordance with ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications".
- B. Regulatory Requirements: Comply with provisions of the following codes:
 - 1. ANSI B31.5: ASME Code for Pressure Piping - Refrigerant Piping.
 - 2. ANSI/ASHRAE Standard 15: Safety Code for Mechanical Refrigeration.
- C. Mechanical Code of New York State

1.05 SEQUENCING AND SCHEDULING

- A. Coordinate the installation of roof piping supports, and roof penetrations.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
- B. Refrigerant Valves and Specialties:
 - 1. Alco Controls Div, Emerson Electric
 - 2. Danfoss Electronics, Inc
 - 3. EATON Corporation, Control Div
 - 4. Henry Valve Company
 - 5. Parker-Hannifin Corporation, Refrigeration and Air Conditioning Division
 - 6. Sporlan Valve Company

2.02 PIPE AND TUBING MATERIALS

- A. General: Refer to Part 3, Article "PIPE APPLICATIONS" for identification of systems where the below specified pipe and fitting materials are used.
- B. Copper Tubing: ASTM B 280, Type ACR, hard-drawn straight lengths, and soft-annealed coils, seamless copper tubing. Tubing shall be factory cleaned, ready for installation, and have ends capped to protect cleanliness of pipe interiors prior to shipping.
- C. Copper Tubing: ASTM B 88, Type L, hard-drawn straight lengths, and soft-annealed coils, seamless copper tubing.

2.03 FITTINGS

- A. Wrought-Copper Fittings: ANSI B16.22, streamlined pattern for hard drawn and soft copper.

2.04 JOINING MATERIALS

- A. Brazing Filler Metals: AWS A5.8, Classification BAg-1 (Silver)

2.05 VALVES

- A. General: Complete valve assembly shall be UL-listed and designed to conform to ARI 760.
- B. Globe: 450 psig maximum operating pressure, 275 deg. F maximum operating temperature; cast bronze body, with cast bronze or forged brass wing cap and bolted bonnet; replaceable resilient seat disc; plated steel stem. Valve shall be capable of being repacked under pressure. Valve shall be straight through or angle pattern, with solder-end connections.

2.06 REFRIGERANT

- A. Refrigerant No. 410A, in accordance with ASHRAE Standard 34.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine rough-in for refrigerant piping systems to verify actual locations of piping connections prior to installation.

3.02 PIPE APPLICATIONS

- A. Use Type L, or Type ACR drawn copper tubing with wrought copper fittings and brazed joints above ground, within building. Use Type K, annealed temper copper tubing for 2 inch and smaller without joints, below ground and within slabs. Mechanical fittings (crimp or flair) are not permitted.
- B. Install annealed temper tubing in pipe duct. Vent pipe duct to the outside.
- C. If other than Type ACR tubing is used, clean and protect inside of tubing as specified in Article "CLEANING" below.

3.03 PIPING INSTALLATIONS

- A. General: Install refrigerant piping in accordance with ASHRAE Standard 15 - "The Safety Code for Mechanical Refrigeration."
- B. Install piping in as short and direct arrangement as possible to minimize pressure drop.
- C. Install piping for minimum number of joints using as few elbows and other fitting as possible.
- D. Arrange piping to allow normal inspection and servicing of compressor and other equipment. Install valves and specialties in accessible locations to allow for servicing and inspection.
- E. Provide adequate clearance between pipe and adjacent walls and hanger, or between pipes for insulation installation. Use sleeves through floors, walls, or ceilings, sized to permit installation of full thickness insulation.
- F. Insulate suction lines. Liquid line are not required to be insulated, except where they are installed adjacent and clamped to suction lines, where both liquid and suction lines shall be insulated as a unit.
- G. Do not install insulation until system testing has been completed and all leaks have been eliminated.
- H. Install branch tie-in lines to parallel compressors equal length, and pipe identically and symmetrically.
- I. Install copper tubing in rigid or flexible conduit in locations where copper tubing will be exposed to mechanical injury.
- J. Slope refrigerant piping as follows:
 - 1. Install horizontal hot gas discharge piping with 1/2" per 10 feet downward slope away from the compressor.
 - 2. Install horizontal suction lines with 1/2 inch per 10 feet downward slope to the compressor, with no long traps or dead ends which may cause oil to separate from the suction gas and return to the compressor in damaging slugs.
 - 3. Liquid lines may be installed level.
- K. Install traps and double risers where indicated, and where required to entrain oil in vertical runs.
- L. Use fittings for all changes in direction and all branch connections.
- M. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.

- N. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.
- O. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.
- P. Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Provide space to permit insulation applications, with 1 inch clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.
- Q. Locate groups of pipe parallel to each other, spaced to permit applying insulation and servicing of valves.
- R. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls using sleeves and mechanical sleeve seals. Pipe sleeves smaller than 6 inch shall be steel; pipe sleeves 6 inch and larger shall be sheet metal.
- S. Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings, and floors, maintain the fire rated integrity. Refer to Division 7 for special sealers and materials.
- T. Make reductions in pipe sizes using eccentric reducer fittings installed with the level side down.
- U. Install flexible connectors at the inlet and discharge connection of compressors.

3.04 HANGERS AND SUPPORTS

- A. General: Hanger, supports, and anchors are specified in Division 23 Section "PIPE HANGERS AND SUPPORTS." Conform to the table below for maximum spacing of supports:
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet in length.
- C. Support horizontal copper tubing in accordance with MSS SP-69 Tables 3 and 4, excerpts of which follow below:

NOMINAL PIPE SIZE (Inches)	ROD DIAMETER (Inches)	MAXIMUM SPACING (Feet)
1/2 to 3/4	3/8	5
1	3/8	6
1-1/4	3/8	6
1-1/2	3/8	8
2	3/8	8

- D. Support vertical runs at each floor.

3.05 PIPE JOINT CONSTRUCTION

- A. Brazed Joints: Comply with the procedures contained in the AWS "Brazing Manual."
- B. WARNING: Some filler metals contain compounds which produce highly toxic fumes when heated. Avoid breathing fumes. Provide adequate ventilation.

- C. CAUTION: When solenoid valves are being installed, remove the coil to prevent damage. When sight glasses are being installed, remove the glass. Remove stems, seats, and packing of valves, and accessible internal parts of refrigerant specialties before brazing. Do not apply heat near the bulb of the expansion valve.
- D. Fill the pipe and fittings during brazing, with an inert gas (i.e., nitrogen or carbon dioxide) to prevent formation of scale.
- E. Heat joints using oxy-acetylene torch. Heat to proper and uniform brazing temperature.

3.06 VALVE INSTALLATIONS

- A. General: Install refrigerant valves where indicated, and in accordance with manufacturer's instructions.
- B. Install pressure regulating and relieving valves as required by ASHRAE Standard 15.

3.07 EQUIPMENT CONNECTIONS

- A. The Drawings indicate the general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow servicing and maintenance.

3.08 FIELD QUALITY CONTROL

- A. Inspect, test, and perform corrective action of refrigerant piping in accordance with ASME Code B31.5, Chapter VI.
- B. Repair leaking joints using new materials, and retest for leaks.

3.09 CLEANING

- A. Before installation of copper tubing other than Type ACR tubing, clean the tubing and fitting using following cleaning procedure:
 1. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through the tubing by means of a wire or an electrician's tape.
 2. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.
 3. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
 4. Finally, draw a clean, dry, lintless cloth through the tube or pipe.

3.10 ADJUSTING AND CLEANING

- A. Verify actual evaporator applications and operating conditions, and adjust thermostatic expansion valve to obtain proper evaporator superheat requirements.
- B. Clean and inspect refrigerant piping systems in accordance with requirements of Division-23 General Mechanical Requirements
- C. Adjust controls and safeties. Replace damaged or malfunctioning controls and equipment with new materials and products.

3.11 COMMISSIONING

- A. Charge system using the following procedure:
 - 1. Install core in filter dryer after leak test but before evacuation.
 - 2. Evacuate refrigerant system with vacuum pump; until temperature of 35 deg F is indicated on vacuum dehydration indicator.
 - 3. During evacuation, apply heat to pockets, elbows, and low spots in piping.
 - 4. Maintain vacuum on system for minimum of 5 hours after closing valve between vacuum pump and system.
 - 5. Break vacuum with refrigerant gas, allow pressure to build up to 2 psi.
 - 6. Complete charging of system, using new filter dryer core in charging line. Provide full operating charge.
 - 7. Train Owner's maintenance personnel on procedures and schedules related to start-up and shut-down, troubleshooting, servicing, and preventative maintenance of refrigerant piping valves and refrigerant piping specialties.
- B. Review data in Operating and Maintenance Manuals. Refer to Division 01 section "Project Closeout."
- C. Schedule training with Owner with at least 7 days advance notice.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This Section describes the galvanized steel ductwork for HVAC duct systems in accordance with SMACNA Duct Construction Standards, except as otherwise specified.
- B. The construction material for each ductwork system shall be as listed in the "Ductwork Material Schedule" at the end of this Section.
- C. This Section also describes the fittings, access doors, hangers and supports, manual volume dampers and sealants for each ductwork system as required.

1.02 RELATED WORK

- A. Section 230594 - Balancing of Air Systems

1.03 REFERENCES

- A. ASHRAE - Handbook Fundamentals; Latest Edition.
- B. SMACNA - HVAC Duct Construction Standards Metal And Flexible (latest issue)
- C. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- D. ASTM B 209 - Specifications for Aluminum and Aluminum-Alloy Sheet and Plate.
- E. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
- F. UL 555 S - Fire Dampers & Smoke Dampers.
- G. NFPA 96 - Standard for Commercial Cooking Operations
- H. New York State Mechanical Code.

1.04 REGULATORY REQUIREMENTS

- A. Construct ductwork to NFPA 90A and New York State Mechanical Code standards.

1.05 SUBMITTALS

- A. Ductwork shop drawings for approval:
 - 1. Coordinate layout duct drawings that differ from ductwork shown on the Drawings.
 - 2. The review of deviations will be for pressure drop only. The review will not address clearances or accessibility to maintain or balance the air systems. No dimensional or coordination check of the shop drawings will be made. The Contractor has the sole responsibility to review the Drawings, coordinate ductwork fabrication, and provide clearances and access for installation, maintenance and balancing of this work, and work of other trades. Unless specifically dimensioned, Drawings indicate approximate locations only. The Contractor has the sole responsibility to locate and route the ductwork.
 - 3. Deviations such as changing direction or transforming or dividing ductwork must maintain ductwork cross-sectional area and not exceed transformation taper of 15 degrees.
 - 4. Plans and section showing all equipment and accessories.
 - 5. Minimum 3/8 in. scale, double line, showing sizes, transverse joints, transitions, elevations, clearances and accessories; sections where required.

- B. Shop details and catalog cuts of:
 - 1. Ductwork construction, including gauge and bracing schedule
 - 2. Supports
 - 3. Dampers
 - 4. Turning vanes
 - 5. Access doors
 - 6. Flexible connections
 - 7. Other accessories

1.06 QUALITY ASSURANCE

- A. Construct all ductwork in accordance with referenced SMACNA Standards, except as otherwise stated. Ductwork pressure classifications shall be in accordance with referenced SMACNA Standards, except as otherwise specified.
- B. For all uninsulated ductwork casings and plenums located outdoors, the reinforcement members shall be galvanized steel or stainless steel.
- C. Construction pressure classification of ductwork are shown on the Drawings. If not shown, the pressure classification shall be greater than or equal to the maximum operating static pressure (minimum 2" w.c. pressure classification).
- D. All ductwork shall be free from pulsation, chatter, vibration and objectionable noise. If any of these defects appear after a system is in operation, correct by removing and replacing, or reinforcing the ductwork, at no additional cost to the Owner.
- E. For all galvanized steel ductwork, zinc coating shall be minimum G90 per ASTM A 653.

PART 2 - PRODUCTS

2.01 ACCESS DOORS

- A. For HVAC duct systems, construct doors of the same material as the ductwork. Minimum size of access doors shall be 8 inches by 8 inches, unless shown otherwise.
- B. Access doors shall be insulated same as duct.
- C. Provide with continuous neoprene gaskets around perimeter of access doors for airtight seal.
- D. Provide all access doors with cam lock latches.
- E. Provide access doors in following locations:
 - 1. Automatic dampers: linkage side.
 - 2. On both sides of ducts where necessary to provide maintenance accessibility to equipment on either side.
 - 3. In-Line Fans (suction and discharge sides)
 - 4. Other items requiring access for service/maintenance
- F. Where duct access doors are concealed the Contractor shall furnish and pay for installation of access doors to be mounted in the fire rated walls and ductwork enclosures. The access doors must be fire resistive and minimum 6" larger on each side than the duct access door for the above mentioned applications.

2.02 MANUAL VOLUME DAMPER

- A. Fabricate in accordance with SMACNA Duct Construction Standards Metal And Flexible, and as indicated.
- B. Fabricate single blade dampers for duct sizes up to 6 inches in height.
- C. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes of 4 inches for ducts above 6 inches in height. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- D. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- E. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30 inches, provide regulator at both ends.
- F. Volume damper shall be provided at each duct branch and also where shown on the Drawings. Volume dampers must be installed at each branch even if they are not shown on the Drawing.
- G. Approved Manufacturers:
 - 1. Ruskin Mfr. Co.
 - 2. Arrow Damper & Louver.
 - 3. Imperial Damper Co.

2.03 BACKDRAFT DAMPERS

- A. Dampers shall be low-leakage, parallel-blade type. Damper sizes shall be suitable for duct sizes noted on the Drawings. The dampers shall be suitable for a minimum 4000 fpm velocity.
- B. Damper frames shall be minimum No. 12 gauge galvanized steel blades shall be minimum No. 16 gauge galvanized steel or Type 6063-T5 aluminum with press-fit ball bearings.
- C. Dampers shall be complete with adjustable counterweights and linkage for duty at .20 inches w.g. and 3500 fpm.
- D. Provide neoprene or silicone rubber blade seals.
- E. Approved manufacturers - Ruskin Manufacturing Company.

2.04 DUCT TEST HOLES

- A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.05 DUCT HANGERS AND SUPPORTS

- A. Provide trapeze, strap or angle iron hangers meeting SMACNA HVAC Duct Construction Standards Metal and Flexible.
- B. Materials of hangers, supports and fasteners shall conform to the manufacturer's load ratings.

- C. Hangers, supports, upper attachments and inserts shall be hot-dip galvanized steel or stainless steel.
- D. Fasteners for HVAC duct systems shall be hot-dip galvanized steel, cadmium-plated steel or stainless steel.
- E. Secure ductwork hangers attached to concrete structures and slabs with embedded inserts, anchor bolts or concrete fasteners. A safety factor of 5 should be used in selection of all inserts and expansion bolts (if applicable safety factor shall be determined by analysis of seismic loads and the greater safety factor shall be used).
- F. Provide hangers and supports not more than 12 inches from each face of a horizontal elbow.
- G. Plenums shall be supported to permit personnel to enter the plenum. If no structural steel design is shown on the Drawings, it is the responsibility of the Contractor to provide the services of a licensed structural engineer in the in which the project is to be constructed to submit a structural design for review.

2.06 SEALANTS

- A. Where ducts are not continuously welded or soldered, provide sealants and gaskets as required to meet the specified duct leakage allowance.
- B. Provide Gaskets, Sealers, Mastics and Tapes as manufactured by Ductmate.

2.07 STANDARD FLEXIBLE CONNECTIONS

- A. Provide fabric flexible duct connections.
- B. Fabric shall be UL approved, fire-retardant, closely-woven glass, double coated with neoprene, and a minimum of 4 inches wide.
- C. Shall be installed at duct connections to all ceiling hung fans and where vibration will be transmitted through ductwork.
- D. Approved Manufacturers:
 - 1. "Ventglas" by Vent Fabrics, Inc.

2.08 GALVANIZED STEEL ROUND DUCTS AND FITTINGS

- A. Construct ducts of galvanized sheet steel meeting ASTM A 653 with G90 coating designation, and in accordance with the latest SMACNA HVAC Duct Construction Standards Metal and Flexible (Latest Edition), and pressure classifications as stated on the Drawings (minimum 2" w.c. pressure classification). When the ductwork pressure classification of these standards is exceeded, construct galvanized steel round exhaust ductwork in accordance with SMACNA Round Industrial Duct Construction Standards.
- B. For ductwork through 60 inches in diameter, provide ducts of spiral lock-seam construction.
- C. For ductwork over 60 inches in diameter, provide ducts of welded longitudinal seam construction.
- D. For ductwork through 36 inches in diameter, use beaded sleeve transverse joints.
- E. For ductwork over 36 inches in diameter, use gasketed-flanged Van Stone transverse joints. Gasket shall be "440 Gasket Tape" by Ductmate Industries, Inc.

- F. For ductwork under a positive pressure through 96 in. diameter and 10 in. w. g. no reinforcing is required. For ductwork under a negative pressure in exposed areas use duct gauge that will minimize the use of reinforcing as appropriate for the pressures involved.
- G. Draw band joints will not be permitted.
- H. All elbows shall be constructed with a centerline radius equal to 1.5 times the duct diameter.
- I. Provide matching galvanized steel fittings with continuously welded seams and joints.
- J. All take-off connections to duct headers shall be made using tee (90 degrees), lateral (45 degrees), tee cross, lateral cross and "Y" branch fittings of the conical type. All fittings fabricated as separate fittings shall have continuous welds along all seams and joints.
- K. The use of two-piece mitered, vaned elbows will be permitted only with specific written approval from the Architect/Engineer. Provide turning vanes as per SMACNA HVAC Duct Construction Standards Metal and Flexible.

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

- A. Install ductwork in accordance with applicable SMACNA Duct Construction Standards Metal And Flexible and approved submittals, and as shown on the Drawings. Duct sizes shown are inside clear dimensions. Where internal duct liners are used, duct sizes shown are inside clear of liner. For ductwork located outside, provide reinforcing sufficient to support wind and snow loads.
- B. The Drawings indicate general locations of ducts. Make additional offsets or changes in direction as required at no additional cost to the Owner.
- C. Wherever ductwork is divided, maintain the cross-sectional area.
- D. Do not exceed 15-degree taper when constructing duct transitions.
- E. Close the open ends of ducts during construction to prevent debris and dirt from entering.
- F. Secure casings and plenums to curbs according to the requirements of the SMACNA HVAC Duct Construction Standards Metal and Flexible.
- G. Make changes in direction with long radius bends.
- H. All welded and scratched galvanized steel surfaces shall be touched up with zinc-rich paint.
- I. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- J. Patch and repair all wall penetrations.

3.02 FITTING INSTALLATION

- A. Use minimum of four sheet metal screws per joint.
- B. Apply approved sealant on duct-to-duct joint before assembly. Apply additional sealant after assembly to make joint airtight.

3.03 HANGER AND SUPPORT INSTALLATION

- A. Support ductwork hung from building structure using trapeze, strap or angle iron hangers conforming to SMACNA HVAC Duct Construction Standards Metal and Flexible. Provide supplemental structural steel to span joists where required.
- B. Do not support ductwork from furring, hung ceilings, metal floor deck, metal roof deck or from another duct or pipe.
- C. Do not hang lighting fixtures or piping from ductwork.
- D. Do not use perforated band iron.
- E. Support ductwork at each change in direction.
- F. Where duct connects to or terminates at masonry openings or at floors where concrete curbs are not used, provide a continuous 1 ½ inch by 1 ½ inch by 3/16 inch galvanized steel angle support around the ductwork. Bolt and seal the supports to the building construction using expansion bolts and caulking compound. Seal shall be watertight at floor or wall and duct such that a spill will no pass down through the opening.
- G. Fasten plenums and casings connected to concrete curbs using continuous 1 ½ inch by 1 ½ inch by ¼ inch galvanized steel angle support. Set the angle support in a continuous bead of caulking compound and anchor it to the curb with 3/8 inch diameter anchors on 16 inch centers. Terminate sheet metal at curb and bolt to angle support. Seal sheet metal to curb with a continuous bead of caulking.
- H. For insulated ductwork, install hangers on the outside of the insulation. To maintain the insulation value, inset a piece of 1 inch thick, 6 pcf fiberglass board with a foil/scrim/kraft (FSK) jacket at these supports.

3.04 SEALING

- A. Where ductwork is not continuously welded, soldered or gasketed, make seams and joints airtight with sealants.
- B. Install the sealants in accordance with the sealant manufacturer's instructions and recommendations.
- C. Seal all ductwork seams, joints, fastener penetrations and fittings connections with sealants in accordance with SMACNA Seal Classifications as required by SMACNA Duct Pressure Classification. All ductwork, regardless of pressure classification, shall have a minimum Seal Class B.
- D. Completely fill all voids when liquid sealing ductwork. Several applications may be necessary to fill voids caused by shrinkage or runout of sealant.

3.05 DUCT-MOUNTED DEVICES AND ACCESS DOORS

- A. Install all dampers, coils, airflow measuring stations, humidifiers and other duct-mounted devices, specified in other sections of the specifications or as shown and provide transformations to dimensions as required. Install devices in accordance with manufacturer's recommendations. Install dampers and coils a minimum of 4 feet away from changes indirection or transitions. Allow five (5) equivalent diameters of straight ductwork upstream and one (1) equivalent diameter of straight ductwork downstream of airflow measuring devices.

- B. Install access doors in ductwork, plenums and where specified and as shown. Provide access doors for inspection and cleaning automatic dampers, at fire dampers, and elsewhere as indicated. Provide minimum 18 x 18 inch size for shoulder access and as indicated. Install access doors in the bottom of the ductwork unless they are inaccessible in this location; then install the access doors in either the side or top of the ductwork, whichever is more accessible.
- C. Provide flexible connections immediately adjacent to equipment in ducts associated with motorized equipment. Cover connections to medium pressure fans with leaded vinyl sheet, held in place with metal straps.
- D. Pilot Ports: Locate pilot ports for measuring airflow in each main supply duct at the downstream end of the straightest run of the main and before the first branch take-off. Form pilot ports by drilling 7/16 inches holes in the duct, lined up perpendicular to airflow on maximum 8-inch centers and at least three to a duct, evenly spaced. Holes to be plugged with plastic plugs. Provide access to these for future rebalancing.

3.06 CONTROL DAMPER INSTALLATION

- A. Duct openings shall be free of any obstruction or irregularities that might interfere with blade or linkage rotation or actuator mounting. Duct openings shall measure 1/4" larger than damper dimensions and shall be square, straight, and level.
- B. Individual damper sections, as well as entire multiple section assemblies, must be completely square and free from racking, twisting, or bending. Measure diagonally from upper corners to opposite lower corners of each damper section. Both dimensions must be equal $\pm 1/8$ ".
- C. Follow manufacturer's instructions for field installation of control dampers. Unless specifically designed for vertical blade application, dampers must be mounted with blade axis horizontal.
- D. Install extended shaft or jackshaft per manufacturer's instructions. (Typically, a sticker on the damper face shows recommended extended shaft location. Attach shaft on labeled side of damper to that blade.)
- E. Damper blades, axles, and linkage must operate without binding. Before system operation, cycle damper after installation to assure proper operation. On multiple section assemblies, all sections must open and close simultaneously.
- F. Provide a visible and accessible indication of damper position on the drive shaft end.
- G. Support ductwork in area of damper when required to prevent sagging due to damper weight.
- H. After installation of low-leakage dampers with seals, caulk between frame and duct or opening to prevent leakage around perimeter of damper.
- I. Dampers that are to be installed with air flow measuring stations shall be installed in duct runs with a minimum amount of straight duct upstream and downstream of the damper to allow accurate flow readings by the air flow measuring station. The Contractor shall verify with the manufacturer the length of straight duct runs required.

3.07 DUCTWORK AND EQUIPMENT LEAK TESTING

- A. Leak test each ductwork system within ten working days of ductwork installation and before ductwork is insulated and concealed.
- B. All HVAC ductwork shall be tested. Follow general procedures and use apparatus as outlined in the SMACNA HVAC Air Duct Leakage Test Manual.

- C. Test all ductwork at 100 percent of the pressure classifications indicated.
- D. Air testing during erection shall include separate leakage air tests of air riser, horizontal distribution system, and, after all ductwork is installed and the central stations apparatus is erected, leakage testing of the whole system.
- E. Use Appendix C in the SMACNA HVAC Air Duct Leakage Test Manual to determine allowable leakage rates for each duct section tested.
- F. All devices, including access doors, airflow measuring devices, sound attenuators, damper casings, sensors, test ports, etc. that are furnished and/or installed in duct systems shall be included as part of the duct system leakage allowance. All joints shall be inspected and checked for audible leakage, repaired, if necessary, and retested. Duct leakage shall be limited to the following:

Average Size of Run Diameter or Equivalent	*A/100 ft. Run
12 inches or less	10
20 inches or less	15
30 inches or less	25
40 inches or less	30
50 inches or less	30
* (A) = Permissible loss in cfm	

- G. Total system leakage shall not exceed 10 percent of the scheduled design capacity of the system when tested as per SMACNA testing methods.

3.08 PAINTING

- A. Upon completion of the installation, remove all protecting materials, thoroughly remove all scale and grease and leave in a clean condition for painting. Ductwork to be painted shall be as shown on the Drawings. Painting shall be in accordance with the requirements of the "Painting" Specification Section.

3.09 DUCTWORK MATERIAL SCHEDULE

AIR SYSTEM	DUCTWORK MATERIAL
Exhaust Ductwork	Galvanized Steel

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide exhaust fans, as specified herein, with accessories and of sizes and capacities as noted here-in, and as scheduled and in locations shown on drawings.
- B. Products listed in Part 2 of this Section include:
 - 1. Centrifugal In Line Fans

1.02 ACCESSORIES:

- A. Provide accessories as scheduled. Refer to controls diagrams and specifications, sequence of operations specifications and electrical drawings for detailed requirements.
 - 1. Back draft dampers
 - 2. Motor speed controls, interlock and control and monitoring devices
 - 3. Disconnect switches

1.03 RELATED WORK

- A. Section 061000: Rough Carpentry
- B. Section 076200: Flashing and Sheet Metal
- C. Section 079200: Joint Sealants
- D. Section 230010: General Mechanical Requirements
- E. Section 230594: Balancing of Air Systems
- F. Section 230993: Sequence of Operations

1.04 REFERENCE CODES AND STANDARDS

- A. AMCA 99 - Standards Handbook
- B. AMCA 210 - Laboratory Methods of Testing Fans for Rating
- C. AMCA 300 - Reverberant Room Method for Sound Testing of Fans
- D. ASHRAE Handbook, HVAC Applications Volume "Sound and Vibration Control"
- E. UL listed and labeled.

1.05 SUBMITTALS

- A. Shop Drawings - Show fan layout, housing, materials, gauges, dimensions, weights and installation details
- B. Product data - Manufacturer's fan performance (data includes cfm, rpm, bhp, motor nameplate data, tip speed, outlet velocity and static pressure) and sound performance (data includes sound power level ratings by octave bands) as tested in accordance with AMCA Standards 210 and 300.

- C. Fan performance curves - Submit curves for all fans with system performance shown, and for plus or minus 10 percent and plus or minus 20 percent change in fan rpm. Curves shall include plotted rpm, horsepower, cfm, static pressure, and fan surge line and operating point.
- D. Certified AMCA Ratings - Submit ratings for air and sound performance.
- E. UL Listing - Submit listing if specified.

1.06 QUALITY ASSURANCE

- A. Factory balance each fan statically and dynamically, test run before shipment, and key fan wheel to fan shaft. Fans shall operate quietly and without pulsation or vibration. Conduct sound power level tests for each type fan at the factory in accordance with AMCA 300.
- B. Fans shall operate in the stable range of their performance curves.
- C. The fan external static pressures shown in the schedules are those required by the ductwork and apparatus, and do not include the internal and intake fan losses, inlet vanes or integral outlet dampers, inlet screens, outlet velocity heads or drive losses.
- D. Factory performance test each fan assembled in or as part of apparatus specified to be performance tested. Test shall display scheduled performance characteristics, using certified, calibrated testing instruments provided by the manufacturer of the apparatus.
- E. All fan performance ratings shall be based up on factory tests performed in accordance with AMCA 210 and 300. One fan of each type specified shall have actual factory performance tests performed prior to shipment. All fans shall be certified by AMCA and carry its seal.

PART 2 - PRODUCTS

2.01 DIRECT DRIVEN CENTRIFUGAL IN-LINE EXHAUST FANS

- A. General Description:
 - 1. Base fan performance at standard conditions (density 0.075 Lb/ft³)
 - 2. Performance capabilities up to 5,000 cubic feet per minute (cfm) and static pressure to 1.75 inches of water gauge
 - 3. Fans are available in thirteen sizes with nominal wheel diameters ranging from 8 inches through 16 inches (60 - 160 unit sizes)
 - 4. Normal operating temperature up to 130 Fahrenheit (54.4 Celsius)
 - 5. Applications include: intake, exhaust, return, or make-up air systems
 - 6. Each fan shall bear a permanently affixed manufacturer's engraved metal nameplate containing the model number and individual serial number
- B. Wheel:
 - 1. Non-overloading, backward inclined centrifugal wheel
 - 2. Composite construction
 - 3. Statically and dynamically balanced in accordance to AMCA Standard 204-05
 - 4. The wheel cone and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency
 - 5. Single thickness blades are securely riveted or welded to a heavy gauge back plate and wheel cone.
- C. Motors:
 - 1. AC Induction Motor
 - a. Motor enclosures: TENV

- b. Motors are permanently lubricated, heavy duty ball bearing type to match with the fan load and pre-wired to the specific voltage and phase
- D. Housing/Cabinet Construction
 - 1. Construction material: Aluminum
 - 2. Square design constructed of aluminum and shall include square duct mounting collars
 - 3. Housing and bearing supports shall be constructed of heavy gauge bolted and welded steel construction to prevent vibration and to rigidly support the shaft and bearing assembly.
- E. Housing Supports and Drive Frame:
 - 1. Housing supports are constructed of structural steel with formed flanges
 - 2. Drive frame is welded steel which supports the motor
- F. Disconnect Switches:
 - 1. NEMA rated: 1
 - 2. Positive electrical shut-off
 - 3. Wired from fan motor to junction box
- G. Duct Collars:
 - 1. Square design to provide a large discharge area
 - 2. Inlet and discharge collars provide easy duct connection
- H. Access Panel:
 - 1. Two sided access panels, permit easy access to all internal components
 - 2. Located perpendicular to the motor mounting panel
- I. Options/Accessories:
 - 1. Dampers:
 - a. Types: Gravity
 - b. Galvanized frames with prepunched mounting holes
 - c. Balanced for minimal resistance to flow
 - 2. Isolation:
 - a. Type: Neoprene/Rubber Mount
 - b. Sized to match the weight of each fan
 - 3. Motor Cover:
 - a. Constructed of aluminum
 - b. Covers motor and drives for safety
 - c. Standard on unit specified with UL
- J. Fans shall be Model SQ as manufactured by Greenheck or approved equal.

PART 3 - EXECUTION

3.01 GENERAL

- A. Install fans, including all necessary structural supports and bracing as scheduled and located on the contract drawings in accordance with manufacturer's instructions and approved submittals.
- B. Connect duct to fans to allow for straight and smooth air flow.
- C. Provide flexible connections (minimum of 4") between fan and duct.
- D. Install fan level: +/- 5 degrees vertical. Final installation shall be free of all leaks from both fan and associated ductwork.

3.02 START-UP, TESTING, DEMONSTRATION

- A. Start-up fans after checkout to insure proper alignment and phased electrical connections.
- B. Test fans individually and as part of system.
- C. Insure supply / exhaust fans and dampers are properly interlocked, operate with control system as required to maintain building pressurization and exhaust per design documents and for proper building operation.
- D. Provide all associated start-up and testing reports.
- E. Demonstrate operation to Owner and instruct maintenance personnel in operation of equipment.

END OF SECTION

PART 1 - GENERAL

1.01 SYSTEM DESCRIPTION

- A. The heat pump system shall be a Carrier Electric split system with Variable Speed Inverter Compressor technology. The system shall consist of a horizontal discharge, single phase outdoor unit, a matched capacity indoor section that shall be equipped with a wired wall mounted, and/or wireless wall mounted controller.

1.02 QUALITY ASSURANCE

- A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the ETL label.
- B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).
- C. The units shall be rated in accordance with Air-conditioning Refrigeration Institute's (ARI) Standard 210 and bear the ARI Certification label.
- D. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001.
- E. A dry air holding charge shall be provided in the indoor section.
- F. A pressure charge of R410A refrigerant sufficient for up to twenty-five (25) feet of refrigerant tubing shall be provided in the outdoor condensing unit during shipping. Additional refrigerant charge shall be added during installation based on total line length, as per manufacturer's requirements.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Unit shall be stored and handled according to the manufacturer's recommendations.
- B. The wireless controller shall be shipped inside the carton with the indoor unit able to withstand 105 degree F storage temperatures and 95% relative humidity without adverse effect.

1.04 WARRANTY

- A. The units shall have a manufacturer's parts and defects warranty for a period five (5) year from date of installation. The compressor shall have a warranty of seven (7) years from date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty does not include labor.
- B. Manufacturer shall have over 30 years of continuous experience in the U.S. market.

1.05 SUBMITTALS

- A. Submit manufacturer's product data including capacity of unit, electrical requirements, airflow, sound pressure data, indoor and outdoor unit measurements, weight, control schematics, and wiring diagrams.

PART 2 - PRODUCTS

2.01 WALL MOUNTED INDOOR UNIT

- A. General

1. The indoor unit shall be factory assembled, wired and tested. Contained within the unit shall be all factory wiring and internal piping, control circuit board and fan motor. The unit, in conjunction with the wired wall-mounted, wireless wall-mounted or wireless handheld controller, shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be purged with dry air before shipment from the factory.
- B. Unit Cabinet
1. The cabinet shall be formed from high strength molded plastic with smooth finish, flat front panel design with access for filter. Cabinet color shall be white. The unit shall be wall mounted by means of a factory supplied, pre-drilled, mounting plate.
- C. Fan
1. The indoor unit fan shall be high performance, double inlet, forward curve, direct drive type fan with a single motor. The fans shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings. The indoor fan shall consist of three (3) speeds. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and space temperature.
- D. Vane
1. There shall be a motorized horizontal vane to automatically direct air flow in a horizontal and downward direction for uniform air distribution. The horizontal vane shall close the outlet port when operation is stopped. There shall also be a set of vertical vanes to provide horizontal swing airflow movement.
- E. Filter
1. Return air shall be filtered by means of a removable washable filter.
- F. Coil
1. The evaporator coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing. All tube joints shall be brazed. The coils shall be pressure tested at the factory. A condensate pan and drain shall be provided under the coil.
 2. A drain pan level switch, designed to connect to the control board, shall be provided and installed on the condensate pan to prevent condensate from overflowing.
 3. A condensate mini-pump shall be provided to provide a means of condensate disposal.

2.02 OUTDOOR UNIT

- A. General
1. The outdoor unit shall be compatible with the associated indoor unit. The connected indoor unit shall be of the same capacity as the outdoor unit.
 2. The outdoor unit shall be equipped with an electronic control board that interfaces with the indoor unit to perform all necessary operation functions.
 3. The outdoor unit shall be capable of cooling operation down to 0°F ambient temperature without additional low ambient controls. A wind baffle shall be provided with the unit.
 4. The outdoor unit shall be completely factory assembled, piped, wired, and tested.
- B. Cabinet
1. The casing shall be constructed from galvanized steel plate, finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection.
 2. Mounting feet shall be provided and shall be welded to the base of the cabinet and be of sufficient size to afford reliable equipment mount and stability.
 3. Easy access shall be afforded to all serviceable parts by means of removable panel sections.
 4. The fan grill shall be of ABS plastic.

- C. Fan
 1. Unit shall be furnished with a DC fan motor.
 2. The fan motor bearings shall be permanently lubricated.
 3. The outdoor unit shall have horizontal discharge airflow. The fan shall be mounted in front of the coil, pulling air across it from the rear and dispelling it through the front. The fan shall be provided with a raised guard to prevent external contact with moving parts.

- D. Coil
 1. The condenser coil shall be of copper tubing with aluminum fins. The coil shall be protected with an integral metal guard.
 2. Refrigerant flow from the condenser shall be controlled by means of an electronic linear expansion valve (LEV) metering device. The LEV shall be control by a microprocessor controlled step motor.
 3. All refrigerant lines between outdoor and indoor units shall be of annealed, refrigeration grade copper tubing, ARC Type, meeting 2 requirements, individually insulated in twin-tube, flexible, closed-cell, CFC-free (ozone depletion potential of zero), elastomeric material for the insulation of refrigerant pipes and tubes with thermal conductivity equal to or better than 0.27 BTU-inch/hour per Sq Ft / °F, a water vapor transmission equal to or better than 0.08 Perm-inch and superior fire ratings such that insulation will not contribute significantly to fire and up to 1" thick insulation shall have a Flame-Spread Index of less than 25 and a Smoke-development Index of less than 50 as tested by 1 and CAN / ULC S-102.

- E. Compressor
 1. The compressor for wall mounted units shall be a Frame Compliant Scroll compressor with Variable Speed Inverter Drive Technology. The compressor recessed units shall be a DC twin-rotor rotary compressor with Variable Speed Inverter Drive Technology.
 2. The compressor shall be driven by inverter circuit to control compressor speed. The compressor speed shall dynamically vary to match the room load for significantly increasing the efficiency of the system which shall result in significant energy savings.
 3. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be automatically, intermittently applied to the compressor motor windings to maintain sufficient heat to vaporize any refrigerant. No crankcase heater is to be used.
 4. The outdoor unit shall have an accumulator and high pressure safety switch. The compressor shall be mounted to avoid the transmission of vibration.

PART 3 - EXECUTION

3.01 GENERAL

- A. Install all equipment, piping, and controls in accordance with manufacturer's installation instructions.
- B. Install refrigerant piping as per manufacturer's instructions and specification.
- C. Mount the outdoor condensing unit on a concrete equipment pad.
- D. Support the indoor unit as per the manufacturer's instructions.
- E. Mount the controller. Coordinate exact location with the owner.
- F. Install the drain line. Pitch drain line in the direction of flow.
- G. Install new filter on indoor unit.

H. Clean all equipment after installation.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Electric Unit Heaters.

1.02 REFERENCES

- A. Electric unit heaters shall meet the requirements of the National Electric Code (NEC) and shall be UL listed.

1.03 SUBMITTALS

- A. Submit under provisions of Section 013300 - SUBMITTALS.
- B. Submit manufacturer's product data and installation instructions to Engineer.
- C. Submittal data shall include capacity and size of each heater and wiring instructions.

PART 2 - PRODUCTS

2.01 ELECTRIC UNIT HEATERS

- A. Electric unit heater shall be Model ASHU as manufactured by Stelpro, or approved equal. Heater shall be suitable for horizontal or vertical mount. Refer to equipment schedule for mounting type.
- B. Heater to be of the KW rating, voltage and phase specified in the schedule.
- C. Unit Casing: Unit shall have heavy gauge die-formed steel casing with a corrosion resistant finish. Top of casing shall have two threaded holes for threaded rod suspension. Bottom of casing shall have a hinged panel for service access to wiring and controls.
- D. Heating Elements: Aluminum-finned, copper clad steel sheath heating element. Elements shall have kilowatt rating as specified. Provide automatic reset linear thermal cut-out, capillary type, to provide protection over entire length of element areas.
- E. Fan Delay Control: Fan control shall delay fan start up of the fan motor until the heating elements have warmed up. It shall maintain motor operation air heating elements have been de-energized to dissipate residual heat.
- F. Motor and Fan: The motor shall be totally enclosed, continuous duty, with automatic resetting, thermal-overload protection. Propeller fan shall be directly connected to the motor shaft and be statically balanced. Motor mounted with rubber vibration absorbing material.
- G. Electrical: All units shall have built-in contactors and low voltage control circuit transformers to provide single-source power connection. Built-in fuse blocks and factory supplied fuses shall be installed on all models with a 208-volt single-phase power supply. Factory mounted disconnect switches shall be provided. A wiring diagram and grounding lug shall be included in each control compartment.
- H. Air Deflectors: Removable and adjustable horizontal air deflectors shall be furnished on all models.
- I. Thermostat: Each unit shall be furnished with a built-in double pole thermostat, range 40°F to 80°F.

- J. Supports: Stainless steel hanger rods, double nuts, and ceiling/wall bracket.
- K. Provide other accessories as described on the contract drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install unit in accordance with manufacturer's published installation instructions.
- B. Do not install horizontal unit heaters closer than 12 inches to combustible materials in any direction.
- C. Do not install vertical unit heaters closer than 18 inches from ceiling and 24 inches horizontally from combustible materials in any direction. The bottom of the unit must be a minimum of 8 feet above the floor.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Excavation and backfill for electrical work.
- B. Demolition of existing electrical systems.
- C. Primary power wiring and distribution system.
- D. Secondary power wiring and distribution system.
- E. Lighting, including lamps.
- F. Wiring devices.
- G. Electrical control systems and interlock wiring.
- H. Wiring for built-in equipment.
- I. Switchboards and switchgear.
- J. Distribution panels and switches.
- K. Automatic transfer switches.
- L. Instrumentation and Controls.

1.02 RELATED WORK

- A. Foundations and pads required for equipment furnished under this division of specifications.
- B. Field painting, except such painting as is required to maintain shop coat painting and factory finish painting.
- C. Flashing and sealing of conduits through outside walls.
- D. Cutting and patching for electrical work, except for errors and omissions under this Division.

1.03 QUALITY ASSURANCE

- A. It is understood that the rights and benefits given the Owner by the guarantees found in the technical specifications are in addition to and not in derogation of any rights or benefits found in the special and general provisions of the contract.
- B. Electrical equipment provided under this Division shall be turned over in operating condition. Instruction on further operation and maintenance shall be included in the operating and maintenance instructions.

1.04 REFERENCES

- A. Perform work in accordance with standards listed below. Where these specifications are more stringent, they take precedence. In case of conflict, obtain a decision from the Engineer.
 - 1. New York City Electrical Code (NYCEC)
 - 2. New York City Fire Code
 - 3. New York City Energy Conservation Code (NYCECC)

4. New York City Building Code
5. New York City Administrative Code
6. Applicable New York City Ordinances.

1.05 PERMITS AND FEES

- A. The Contractor shall obtain and pay for all permits, construction charges, fees, licenses, certificates, inspections and other use charges required in connection with the work.
- B. Such permits include, but are not limited to:
 1. Transportation and disposal of debris.
 2. New York City Department of Buildings (DOB), or a pre-approved electrical inspection agency.
 3. Road opening permits.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. All materials and equipment used in carrying out these specifications shall have UL listing and label. Specifications and drawings indicate name, type, or catalog numbers of materials and equipment to be used as standards. Proposals shall be based on these standards. Contractor may use materials and equipment equivalent to those specified, subject to Engineer's approval.

PART 3 - EXECUTION

3.01 COORDINATION

- A. Carefully examine specifications, drawings and project site to be thoroughly familiar with items which require electrical connections and coordination. Electrical drawings are diagrammatic and shall not be scaled for exact sizes.
- B. Notify other Contractors of any deviations or special conditions necessary for the installation of work. Interferences between work of various contractors to be resolved prior to installation. Work installed not in compliance with specifications and drawings and without properly checking and coordinating as specified above shall, if necessary, be removed and properly reinstalled without additional cost to the Owner. Engineer to be mediating authority in all disputes arising on project.
- C. Equipment shall be installed in accordance with manufacturer's recommendation. Where conflicts occur between contract documents and these recommendations, a clarification shall be requested of the Engineer for decision before preceding with such work.
- D. Insofar as it is possible to determine in advance, advise masonry tradesmen to leave proper chases and openings. Place all outlets, anchors, sleeves, and supports prior to pouring concrete or installation of masonry work. Should the Contractor neglect doing this, any cutting and/or patching required to be done is at this Contractor's expense.
- E. FIRE ALARM – For any facilities that utilize an existing fire alarm system, the contractor shall coordinate with the owner and fire alarm monitoring company prior to removing or disabling any devices. It shall be the contractor's responsibility to provide fire watch as per the latest addition of the New York City Fire Code. The contractor shall provide fire watch for all areas of a facility while occupied and unoccupied when any device or part of the fire alarm system is de-activated or put into "test mode".

3.02 CUTTING AND PATCHING

- A. Repair or replace routine damage caused by cutting in performance of work under this Division.
- B. Correct unnecessary damage caused due to installation of electrical work, brought about through carelessness or lack of coordination.
- C. Holes cut through floor slabs to be core drilled with drill designed for this purpose. All openings, sleeves, and holes in slabs to be properly sealed, fire proofed and waterproofed.
- D. Repairs to be performed with materials which match existing materials and to be installed in accordance with appropriate sections of these specifications.

3.03 TESTS

- A. On completion of work, installation shall be completely operational and entirely free from ground, short circuits, and open circuits. Perform a thorough operational test in presence of the Engineer. Balance all circuits so that feeders to panels are not more than 10% out of balance between phases with all available load energized and operating. Furnish all labor, materials and instruments for above tests.
- B. Furnish Engineer with a copy of such tests including identification of each circuit and readings recorded, as well as the main service ground resistance test as described in Section 260526 of these specifications. Test information to include ampere readings of all panels and major circuit breakers, isolation resistance reading of motors and transformers.

3.04 IDENTIFICATION OF EQUIPMENT

- A. Properly identify the following:
 - 1. Switchgear and switchboards, including all individual devices.
 - 2. Distribution panels.
 - 3. Disconnect switches.
 - 4. Transfer switches.
 - 5. Individually mounted circuit breakers.
 - 6. Relays.
 - 7. Pilot lights and control switches.
 - 8. Service entrance equipment and main circuit breaker.
 - 9. Transformers.
- B. Use permanently attached black phenolic plates with 1/4-inch white engraved lettering on the face of each, attached with two sheet metal screws.
- C. Panelboard identification plates shall indicate panel by name.

3.05 INSTALLATION

- A. The Contractor shall carefully move and replace existing equipment, appliances and all related items, as required to conduct proposed work.
- B. Install and conduct all work per applicable NEC, State and local codes.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Electrical demolition.

1.02 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Shop Drawings: Indicate demolition and removal sequence and location of salvageable items; location and construction of temporary work.

1.03 REGULATORY REQUIREMENTS

- A. Conform to applicable code for demolition work, safety of structure and dust control.
- B. Obtain required permits from authorities.
- C. Notify affected utility companies before starting work and comply with their requirements.
- D. Do not close or obstruct egress width to exits.
- E. Do not turn off electric equipment without authorization from Owner.
- F. Conform to procedures applicable when discovering hazardous or contaminated materials.
- G. Obtain a utilities mark-out of all buried underground utilities for telephone, electric, gas, sewer and water, including all customer owned utilities.

1.04 SCHEDULING

- A. Schedule Work to coincide with new construction.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify field circuiting arrangements at Building 386.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition drawings are based on visual field observation. Report discrepancies to the Engineer before disturbing existing installation.
- D. Beginning of demolition means installer accepts existing condition.

3.02 PREPARATION

- A. Coordinate service outages with Owner and Owner's Representative.

- B. Provide power, wiring and connections to maintain all existing power, control and telemetry systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Remove, relocate, and extend existing installations to accommodate new construction, as indicated on drawings.
- B. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.
- D. Repair adjacent construction and finishes damaged during demolition and extension work.
- E. Provide caps and filler plates/plugs for all openings in equipment and enclosures after removal of conduits.
- F. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.
- G. Remove demolished materials from site as work progresses.
- H. Completely remove and dispose of all electrical power, control, and telemetry feeds including conduits, conductors, boxes and supports not scheduled to remain after new construction is tested and operational.
- I. Where existing devices and equipment are called to be removed, Contractor shall maintain circuit continuity to all existing devices and equipment remaining on that circuit. Contractor shall provide all required conduit, conductors and boxes as required.

3.04 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment which remain or are to be reused.
- B. Remove temporary work.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Medium voltage cable.
- B. Cable accessories.

1.02 REFERENCE STANDARDS

- A. NYCEC - New York City Electrical Code.
- B. IEEE 48 - IEEE Standard for Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV; 2009.
- C. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Include cable in conduit routing and box location submittal.
- C. Product Data: Provide for cable, terminations, and accessories.
- D. Sustainable Design Documentation: Submit manufacturer's product data on conductor and cable showing compliance with specified lead content requirements.
- E. Samples: Submit two samples of each size cable, 24 inches (600 mm) in length.
 - 1. Select each length to include complete set of manufacturer markings.
 - 2. Attach tag indicating cable size and application information.
- F. Test Reports: Indicate results of cable test in tabular form and in plots of current versus voltage for incremental voltage steps, and current versus time at 30 second intervals at maximum voltage.
- G. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- H. Project Record Documents: Record actual sizes, locations, and routing of cables.
- I. Certificate of Compliance: Indicate approval of installation by authority having jurisdiction.
- J. Maintenance Data: Include instructions for testing and cleaning cable and accessories.

1.04 QUALITY ASSURANCE

- A. Comply with NFPA 70, NEC, and NYCEC.

- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 50 miles (80 km) of Project.
- C. Installer Qualifications: Authorized installer of specified manufacturer with service facilities within 50 miles (80 km) of Project.
- D. Products: Listed, classified, and labeled as suitable for the purpose intended.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MEDIUM-VOLTAGE CABLE

- A. Manufacturers:
 - 1. General Cable Technologies Corporation
 - 2. Okonite
 - 3. Southwire Company
 - 4. Approved equal..
- B. Medium voltage insulated wire and cable shall be Type EPR rated for an insulation level of 133 percent at the system nominal phase voltage. Cable insulation shall be thermosetting rubber based suitable for normal installation, indoors or outdoors, in conduit, in air, and intermittent or continuous submersion in water. Cable shall be single conductor bearing UL label "MV 90" and comply with or exceed ICEA S-68-516 and AEIC CS6-87.
- C. The size and quantity of medium voltage insulated wire and cable shall be as indicated in the cable and conduit schedule. Medium voltage insulated wire and cable shall be in accordance with the following:
 - 1. Conductors shall be soft or annealed tinned coated copper with concentric-lay Class B round stranding in accordance with the current ASTM Standard B 8 and B 33.
 - 2. The cable insulation system shall include two separate shield layers and the primary insulation.
 - a. Conductor Shield: The conductor shield shall consist of an extruded inner layer of non-conducting energy suppression or semiconducting material.
 - b. Primary insulation: The primary insulation shall be a high quality ozone resistant ethylene-propylene rubber based compound. The insulation system shall be suitable for use at conductor temperatures not exceeding 90 C for normal operation, 130 C for emergency overload conditions, and 250 C for short circuit conditions. Minimum average thickness of the insulation system at any point of the cable shall not be less than 115 mils for 5 kV systems, 220 mils for 15 kV systems and 345 mils for 25 kV systems. The minimum thickness at any part of the cable shall not be less than 90 percent of the specified average.
 - c. Insulation Shield: The insulation shield shall be an outer layer of semi-conducting material consisting of a 5 mil copper tape applied helically with a minimum 12-1/2 percent overlap.
 - 3. Jacket: A continuous jacket of moisture, heat, oil resistant chlorosulfonated polyethylene base compound shall be applied over the insulation and shielding system. The average minimum thickness of the jacket at any point of the cable shall be in accordance with ICEA S-97-682.

2.02 CABLE ACCESSORIES

- A. Manufacturers:
1. 3M
 2. Ideal Industries
 3. Thomas and Betts
 4. Burndy
 5. TE Connectivity Raychem
 6. Approved equal.
- B. Cable connectors shall be provided for connecting medium voltage wire and cable. Connectors shall be in accordance with the following:
1. Connectors shall be copper, tin-plated, long barrel compression type, UL listed. Suitable for voltage applications up to 35KV. Connectors shall be Power-Connect type as manufactured by Ideal or equal approved by the Engineer.
 2. For sizes 250MCM and larger connectors shall be two-hole mount type with provisions for two bolts for joining to apparatus terminal.
- C. Cable terminators shall be provided for terminating medium voltage wire and cable. Terminations shall be in accordance with the following:
1. Cable terminations shall meet Class 1 requirements and be design-proof tested per IEEE 48.
 2. Terminations shall be of the molded elastomer, wet-process porcelain or heat-shrinkable types with grounding provisions for the cable shielding.
- D. Cable splices shall be provided for splicing medium voltage wire and cable, splicing shall be in accordance with the following:
1. For Dry Locations:
 - a. Cable splices shall be made using standard splice kits which reinstate the cable's insulation and jacket and continue the metallic shielding through the entire cable joint.
 - b. Splices shall be of the premolded splice, conventional tape or heat-shrinkable type.
 2. For Wet Locations:
 - a. Splices shall be submersible rated for underwater use. Underwater splices shall be rated for 10,000 psig. The splices shall be precision precast polyurethane compression dams, waterblock solder pins and an amber polyurethane overmold to prevent all water from entering the cable and keeping seawater outside the cable from passing through the splice to the electrical connection. Underwater splices shall be UL listed. All underwater splices shall be manufactured by PMI Industries or approved equal.
- E. Pulling compound shall be provided to facilitate wire pulling. Pulling compound shall be in accordance with the requirements specified under Paragraph 2.4 D.

2.03 SHOP TESTS

- A. Certified Shop Tests:
1. Shop testing shall be performed on the wire and cable at the manufacturer's plant prior to shipment. Shop test shall be in accordance with the latest revisions of ICEA and UL and shall demonstrate that the wire and cable tested conforms to the requirements specified.
 2. The Contractor shall provide a shop test report. The report shall identify the tests performed and the results obtained.
 3. All medium voltage wires and cables shall be shop tested in accordance with the following:
 - a. Conductors shall meet the electrical resistance requirements of ICEA-S-68-516, Part 2.5.

- b. Insulation Resistance test shall be performed in accordance with the requirements of ICEA S-68-516, Part 6.28. Each cable shall have an insulation resistance not less than that corresponding to the insulation resistance constant of 20,000 megohms - 1000 ft. at 15.6 degrees C.
 - c. A high voltage AC and DC test shall be performed in accordance with the requirements of ICEA S-68-516, Part 6.27. The AC and DC test voltages shall be in accordance with Section B of AEIC CS6.
 - d. Shield resistance shall be measured and recorded from end to end on the completed cable.
 - e. Each reel of completed shielded power cable shall be partial discharge tested in accordance with Section E and F of AEIC CS6.
- B. Witnessed Shop Tests:
- 1. The Contractor shall perform witnessed shop tests in accordance with the Specifications.
 - 2. The Engineer shall have access during working hours for inspection purposes to all parts of the works where material and cable are being manufactured, and all reasonable inspection and testing facilities shall be provided to him without increase in price. The Engineer may request that dielectric strength tests and measurements be made to verify the cable data furnished by the Contractor. For this purpose the Contractor shall furnish without increase in price, a length of cable, not to exceed 3 feet for each size to be cut from one or more reels as directed by the Engineer. Each sample shall be marked with a tag bearing full description of cable insulation and number of reel from which it is cut.

PART 3 EXECUTION

3.01 GENERAL

- A. All cables and wires shall be installed within the raceways as shown on the Contract Drawings. They shall be carefully handled so as to avoid twists or kinks in the conductors or damage to the insulation.
- B. The Contractor shall ensure that the manufacturer's recommended cable bending radii and pulling are not exceeded and that the number of conductors permitted in a conduit are in accordance with the latest applicable section of NFPA 70 National Electrical Code.
- C. No splices shall be permitted between terminals except at approved junction or terminal boxes. Boxes shall be provided as shown on the Contract Drawings or as required by Code for the pull lengths. No more than two terminations shall be made at each terminal point. Cable and wire runs shall be looped through pull boxes without cutting and splicing where possible. All splices below grade, in manholes, hand holes and wet locations shall be water proofed.

3.02 EXAMINATION

- A. Verify that conduit, duct, trench, or manholes are ready to receive cable.
- B. Verify that field measurements are as indicated.
- C. Verify routing and termination locations of cable bank prior to rough-in.
- D. Cable routing is shown in approximate locations. Route as required to complete wiring system.

3.03 PREPARATION

- A. Use swab sized for specific conduit size to clean conduits before pulling cables.

3.04 INSTALLATION

- A. Cables shall be installed complete with proper terminations at both ends.
- B. Wire and cable contained within a single conduit shall be pulled simultaneously using insulating pulling compounds containing no mineral oil.
- C. Pulling tension on medium voltage cables shall be continuously monitored using a calibrated Dynamometer type device, having a calibration label within six months of its use.
- D. Cables shall be installed with maximum slack at all terminal points, boxes, and manholes.
- E. Avoid abrasion and other damage to cables during installation.
- F. Use suitable lubricants and pulling equipment.
- G. Sustain cable pulling tensions and bending radii below recommended limits.
- H. Ground cable shield at each termination and splice.
 - 1. Install cables in manholes along wall providing longest route.
 - 2. Arrange cable in manholes to avoid interference with duct entrances.
 - 3. Medium voltage cables located within manholes, handholes and boxes shall be wrapped with fireproofing tape for their entire length on an individual cable basis. Tape shall be 30 mills thick of self-extinguishing material which will not support combustion. Tape shall not deteriorate when subjected to water, salt, sewage or fungus and shall be secured with glass cloth tape. Medium voltage cables shall be fireproofed in accordance with the cable manufacturer's recommendations and then covered with tape extending at least one inch into any duct.

3.05 CONDUCTOR IDENTIFICATION

- A. Each wire shall be labeled at each termination point and each splice location. Carry individual conductor or circuit identification throughout, with circuit numbers or other identification stamped on terminal boards when provided or the cable so it is visible around the cable's circumference.
- B. Each wire shall be identified in junction boxes, cabinets, and terminal boxes. Where no termination is made, use a plastic-coated, self-adhesive, wire marker. Where termination is made, use a plastic, pre-printed sleeve wire marker. Paper, self-adhesive wire markers shall not be used.
- C. Medium voltage cables greater than 2000 volts shall be color coded by a bright yellow colored tape band. Conductor identification shall be marked by a single wrap for Phase A, a double band for Phase B and three bands for Phase C.

3.06 FIELD TESTING

- A. The Contractor shall provide acceptance testing of the medium voltage wire and cable. The acceptance testing shall be witnessed by the Engineer and certified by the Contractor.
- B. Each medium voltage wire and cable circuit shall be acceptance tested on an individual per phase basis, all testing and inspection shall be performed by the testing firm.
- C. Visual and mechanical inspection shall be performed for all splices and terminations.

- D. Electrical tests shall be performed for each power cable. Testing shall include the shield continuity test and the DC high potential test and shall be in accordance with the following:
1. The following procedures shall be adhered to before performing dc over potential tests:
 - a. All equipment transformers, switches, motors, circuit breakers, surge arrestors, etc. shall be disconnected from cable circuit to prevent test interruptions due to flashovers or trip outs resulting from excessive leakage current.
 - b. Adequate clearance shall be established between the circuit test ends and any grounded object and to other equipment not under test.
 - c. Circuit conductors not under test shall be grounded including all cables shields and nearby equipment.
 - d. Insulation surfaces shall be cleaned.
 - e. Cable ends shall be keep dry.
 2. High-potential shall be applied slowly in 8 to 10 equal steps to 80 percent of the NETA test value or manufacturer's shop production test value, whichever is smaller. Record the leakage current at each test voltage and plot the curve on graph paper.
 3. The test shall be stopped, if the leakage current increases excessively or a "knee" appears in the curve before reaching maximum test voltage.
 4. Upon reaching the specified maximum test voltage, the voltage shall be maintained for 15 minutes, record the leakage current at 30 seconds and one minute and at one-minute intervals thereafter. Plot leakage current versus time on the same graph as the step voltage curve.
 5. Conductor test potential shall be reduced to zero and measure residual voltage at discrete intervals.
 6. Grounds shall be applied to drain all insulation stored charge. Conductors shall be connected to ground through a suitable discharge resistor for one minute and then subsequently grounded directly.
 7. New cable failing the test shall be replaced and retested.
 8. The test curves shall be signed by the tester and initialed by the Engineer.
- E. All tests and values for wire and cable shall be in accordance with the manufacturer's recommendations and NETA, ATS Acceptance Testing Specification.
- F. The Contractor shall provide an acceptance testing report. The report shall be in accordance with NETA, ATS Acceptance Testing Specification.

3.07 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
1. Inspect exposed cable sections for physical damage.
 - a. Inspect cable for proper connections as indicated.
 - b. Inspect shield grounding, cable supports, and terminations for proper installation.
 - c. Inspect and test in accordance with NETA ATS, except Section 4.
 - d. Perform inspections and tests listed in NETA ATS, Section 7.3.3. The cable time domain reflectometer (TDR) measurements on each conductor listed as optional are not required.
- B. PROTECTION
1. Protect installed cables from entrance of moisture.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Wires and cables.
- B. In general, the wires and cables included under this Section shall include, but not be limited to, the following:
 - 1. 600V power and control cable
 - 2. Communication cables
- C. All conductors to be continuous from origin to panel or equipment termination without splices.

1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electric Code.
- B. NYCEC - New York City Electrical Code.
- C. NECA Standard of Installations.
- D. ANSI / UL 2196 "Tests for Fire Resistive Cables" .
- E. CSA C22.2#124.
- F. UL Fire Resistance Directory.

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.

1.04 QUALITY ASSURANCE

- A. Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacturing, installing and servicing of similar items with a history of successful production acceptable to the Engineer as specified herein and in accordance with the General Conditions.
- B. Contractor shall submit the following information pertaining to the manufacturer(s):
 - 1. Complete literature, performance, and technical data describing the proposed equipment and listing of items made by the manufacturer.
 - 2. Location of closest service office from which this equipment shall be serviced.
 - 3. Location of closest parts inventory for item installation.

1.05 COORDINATION

- A. Coordination:
 - 1. Coordinate wire and cable required with the equipment being furnished by others for the satisfactory operation of the equipment or system.
 - 2. Review installation procedures under other sections and contracts and coordinate them with the work specified herein.
 - 3. Notify other Contractors in advance of the installation of the work included to provide them with sufficient time for installation and coordination of interrelated items that are included in their contracts and that must be installed in conjunction with the work included in this Section.

1.06 PROJECT CONDITIONS

- A. Verify that embedded conduit, in masonry and concrete, is installed as shown on the Drawings prior to the work being enclosed by others.
- B. The Contractor shall be present at all concrete pours made by the General Contractor.
- C. In general, conductor sizes are based on copper at 75°C.
- D. Wire and cable routing shown on Drawings is approximate unless dimensioned or specifically called for such as where conduit is to be embedded in concrete or masonry. Route wire and cable as required to meet project conditions and shall be routed above ceilings, directly under joists, in pipe trenches, where available, and in masonry. Where exposed conduit is permitted, it shall be run to maximize wall space.
- E. Field verify destination location to determine cable routing.
- F. Where wire and cable routing is not shown for proposed destination, determine exact routing and lengths required. Routing shall be reviewed with the Engineer.

PART 2 - PRODUCTS

2.01 GENERAL USE LOW VOLTAGE CONDUCTORS

- A. Install products in accordance with manufacturer's recommendations.
- B. Single copper conductors with 600-volt insulation.
- C. Minimum size of feeder and branch conductors and grounds shall be No. 12 AWG.
- D. Insulation: Provide ANSI/NFPA 70, Type THWN-2 for conductors installed on interior of building in conduit. Provide ANSI/NFPA 70, Type XHHW-2 for conductors installed on exterior in conduit. Provide Type G-GC 90°C 600/2000V three conductor round for conductors installed on interior and exterior of building not indicated in conduit.
- E. Use solid conductor for feeder and branch circuits, 10 AWG and smaller.
- F. All conductors shall include complete set of manufacturer's markings for insulation and conductor size.
- G. Manufacturers shall be GENERAL CABLE, SOUTHWIRE, OKONITE, or approved equal.
- H. Provide white colored neutral conductors; provide black, color coded phase conductors; provide green colored ground conductors.

2.02 MINING RATE CABLE TYPE G-GC (LOW VOLTAGE)

- A. Manufacturers:
 - 1. SSG Cable
 - 2. Southwire
 - 3. OMNI Cable
 - 4. Or approved equal
- B. Three conductor round, two ground wire and ground check

- C. Insulation: 90°C EPDM E insulation and CPE jacket
- D. Temperature Rating
 - 1. Dry: -40°C to + 90°C
 - 2. Wet: -40°C to + 75°C
- E. MSHA Approved, ICEA5-75-381

2.03 4-PAIR CATEGORY 6 UNSHIELDED TWISTED PAIR CABLE

- A. Manufacturers: Subject to compliance with project requirements, manufacturers offering Products which may be incorporated in the Work include the following:
 - 1. Belden Corporation, Carmel, IN (800) 246-2673.
 - 2. Avaya, Basking Ridge, NJ (800) 344-02232.
 - 3. Berk-Tek, Incorporated, New Holland, PA (800) 237-5835.
- B. Conductors: 4 twisted pair - 24 AWG, solid copper w/ RJ-45 connector ends
 - 1. Individually insulated plenum rated conductors under common plenum rated sheath unless entire cable is installed within conduit/EMT or if area where cable is installed is not considered a return air plenum according to any applicable codes.
 - 2. Complies with individual characteristics established in ANSI/TIA/EIA-568-B, and all addendums for Category 6 cable performance specification.
 - 3. Overall Nominal Diameter: .365 x .165 in.
 - 4. Nominal Impedance: 100 ohms plus or minus 15 percent.
 - 5. Certified capable of performing to minimum 350 MHz.
- C. Mechanical Characteristics
 - 1. Operating temperature: -20°C to +80°C
 - 2. Bulk cable weight: 29 lbs./1000 ft.
 - 3. Maximum recommended pulling tension: 45 lbs.
 - 4. Minimum bend radius: 1 in.
- D. Flame test: UL1666 Riser
- E. Electrical Characteristics:
 - 1. Nom. Mutual Capacitance @ 1 KHz 15.0 pF/ft
 - 2. Maximum Capacitance Unbalance (pF/100 m) 49.2 pF/100 m
 - 3. Nominal Velocity of Propagation 70 %
 - 4. Maximum Delay (ns/100 m) 510 @ 100MHz ns/100 m
 - 5. Maximum Delay Skew (ns/100m) 25 ns/100 m
 - 6. Maximum Conductor DC Resistance @ 20 Deg. C 9 Ohms/100 m
 - 7. Maximum DCR Unbalance @ 20 Deg. C 3 %
 - 8. Max. Operating Voltage - UL 300 V RMS

2.04 MECHANICAL CONNECTORS

- A. Conductor tapping connectors shall be BURNDY Servit split bolt, Series KS and KS3, or approved equal.
- B. Split bolt connectors shall use BURNDY Type SC Servit cover on indoor applications.
- C. Terminal lugs shall be BURNDY Universal Terminal Series. Terminal lugs shall be sized for proper ampacity and proper number of conductor holes. Each conductor shall occupy only one hole on a terminal lug.

- D. Conductor tapping connectors for multiple conductors shall be BURNDY Series V-Tap with V-Tap covers, and V-Blok mounting platforms.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General:
 - 1. Make terminations in accordance with cable manufacturers instructions for the particular type of wire and cable.
 - 2. Splices are not allowed in the underground duct and manhole systems. If splices are required, the Contractor shall obtain approval in writing from the Engineer prior to splicing.
 - 3. All splices shall be in made in terminal boxes.
- B. Wire and Cable Sizes: The sizes of wire and cable shall be as shown on the Contract Drawings, or if not shown, as approved by the Engineer. Minimum size wire shall be No. 12 AWG for all power, lighting and receptacle circuits. Wires for control circuits shall be No. 14 AWG minimum. Wire for instrumentation circuits shall not be smaller than No. 16 AWG. If due to field routing the voltage drop exceeds 2.5%, the size of conductors shall be increased such that 2.5% is the maximum voltage drop incurred.
- C. Number of Wires: The number of wires indicated on the Contract Drawings for the various control, indications, and metering circuits were determined for general schemes of control and for particular indication and metering systems. Coordinate wiring schemes with equipment schematics.
- D. Wiring Identification: All wiring shall have a unique wire number and be labeled at both ends. Wire numbers shall correspond with the equipment terminal wire numbers. Where no wire numbers are indicated, the Contractor shall assign wire numbers. Wire numbers shall not be duplicated.
- E. Cable Identification Tags: The Contractor shall furnish all labor and materials and affix in a permanent way to each cable in manholes, cable compartments and vaults, junction boxes, pull boxes and points of termination, a laminated plastic tag, bearing clearly printed, the cable number indicated on the Contract Drawings or other approved identification number or symbol. All cables shall be temporarily tagged with its full ID number immediately after it has been pulled.
- F. Wiring Supplies: Only electrical wiring supplies manufactured under high standards of production and meeting the approval of the Engineer shall be used. Friction tape shall be in accordance with ASTM D69.
- G. Training of Cable: Furnish all labor and material required to train cables around cable vaults within buildings and in manholes in any outdoor underground duct system. Sufficient length of cable shall be provided in each manhole and vault so that the cable can be trained and racked in an approved manner. In training or racking, the radius of bend of any cable shall be not less than the manufacturer's recommendation. All manhole cables shall be arc and fireproofed.
- H. Pulling Temperature: Cable shall not be flexed or pulled when the temperature of the insulation or of the jacket is such that damage will occur due to low temperature embrittlement. When cable will be pulled with an ambient temperature within a three day period prior to pulling of 40°F or lower, cable reels shall be stored during the three day period prior to pulling in a protected storage with an ambient temperature not lower than 55 degrees F and pulling shall be completed during the work day for which the cable is removed from the protected storage.

- I. All cables and wires shall be installed within the raceways as shown on the Contract Drawings. They shall be carefully handled so as to avoid twists or kinks in the conductors or damage to the insulation.
- J. All cables with multiple sets shall be provided with cable limiters within the respective equipment section.
- K. The Contractor shall ensure that the manufacturer's recommended cable bending radii and pulling are not exceeded and that the number of conductors permitted in a conduit are in accordance with the latest applicable section of NFPA 70 National Electrical Code.
- L. No splices shall be permitted between terminals except at approved junction or terminal boxes. Boxes shall be provided as shown on the Contract Drawings or as required by Code for the pull lengths. No more than two terminations shall be made at each terminal point. Cable and wire runs shall be looped through pull boxes without cutting and splicing where possible. All splices below grade, in manholes, hand holes and wet locations shall be water proofed.
- M. No splicing of instrument wiring shall be permitted. Instrument wiring shall be extended by use of field termination boxes employing labeled terminal strips. Shield continuity shall be maintained. Ultimate shield termination (ground) shall be at one end only.
- N. Cables shall be installed complete with proper terminations at both ends. For each motor circuit, Contractor shall ensure proper phase sequence and motor rotation.
- O. Wire and cable contained within a single conduit shall be pulled simultaneously using insulating pulling compounds containing no mineral oil.
- P. Pulling tension on medium voltage cables shall be continuously monitored using a calibrated Dynamometer type device, having a calibration label within six months of its use.
- Q. Cables shall be installed with maximum slack at all terminal points, boxes, and manholes.
- R. Color Coding:
1. Conductor jacket shall be color coded as follows:

AC POWER

480V/277 Volt 3 phase	208Y/120 Volt 3 phase (NEC)	240/120 Volt 3 phase (NEC)
Phase A Brown	Phase A Black	Phase A Black
Phase B Orange	Phase B Red	Phase B Orange (HiLeg)
Phase C Yellow	Phase C Blue	Phase C Blue
Neutral White	Neutral White	Neutral White
Ground Green	Ground Green	Ground Green

2. Control (Per ICEA Method 1, K-2):

WIRE NUMBER	COLOR
1	Black
2	Red
3	Blue
4	Orange
5	Yellow
6	Brown
7	Red With Black
8	Blue With Black
9	Orange With Black
10	Yellow With Black
11	Brown With Black
12	Black With Red
13	Blue With Red
14	Orange With Red
15	Yellow With Red
16	Brown With Red
17	Black With Blue
18	Red With Blue
19	Orange With Blue

3. DC Power
 - a. Positive Lead - RED
 - b. Negative Lead - BLACK
4. Equipment Ground - GREEN

S. Communication Cable Installation:

1. Where instrumentation cables are installed in panels, etc., arrange wiring to provide maximum clearance between cables and other conductors. Communication cables shall not be installed in same bundle with conductors of other circuits.
2. Special communication cable shall be as specified or recommended by the vendor of the equipment or instruments requiring such wiring. Installation, storage, terminations, etc., shall be per manufacturer's recommendations.

3.02 IDENTIFICATION

- A. Each wire shall be labeled at each termination point and each splice location. Carry individual conductor or circuit identification throughout, with circuit numbers or other identification stamped on terminal boards when provided or the cable so it is visible around the cable's circumference.
- B. Each wire shall be identified in junction boxes, cabinets, and terminal boxes. Where no termination is made, use a plastic-coated, self-adhesive, wire marker. Where termination is made, use a plastic, pre-printed sleeve wire marker. Paper, self-adhesive wire markers shall not be used.
- C. In manholes, each power wire shall be identified by a laminated plastic tag located so that it can be seen from center of manhole without moving adjoining wires. Bundle and mark control wires as listed in cable and conduit schedule.

3.03 FIELD TESTING

- A. After installation, all 600 volt and below wire and cable shall be field tested. The field tests shall be performed by the Contractor who shall furnish all testing equipment. The field tests shall be

witnessed by the Engineer and certified by the Contractor. The Contractor shall provide a report identifying the tests performed and the results obtained.

- B. Each electrical circuit shall be tested after permanent cables are in place to demonstrate that the circuit and equipment are connected properly and will perform satisfactorily and that they are free from improper grounds and short circuits. The tests shall consist of the following:
 - 1. 600 volt wire and cable mechanical connections shall be individually tested after installation and before they are put in service with a calibrated torque wrench. Values shall be in accordance with manufacturer's recommendations.
 - 2. 600 volt and below wire and cables shall be individually tested for insulation resistance between phase and from each phase to ground. Test after cables are installed and before they are put in service with a Megger for one minute at a voltage rating recommended by the cable manufacturer or in accordance with NEMA and ICEA standards.
 - 3. The insulation resistance for any given conductor shall not be less than the value recommended by the cable manufacturer or in accordance with NEMA and ICEA standards. Any cable not meeting the recommended value or which fails when tested under full load conditions shall be replaced with a new cable for the full length.
 - 4. Shielded instrumentation cable shields shall be tested with an ohmmeter for continuity along the full length of the cable and for shield continuity to ground.
 - 5. Connect Shielded instrumentation cables to a calibrated 4-20 milliamp DC signal transmitter and receiver. Test at 4, 12, and 20 milliamp transmitter settings.

3.04 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014500.
- B. Inspect wire and cable for physical damage and proper connection.
- C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values. Adjust accordingly to meet recommended values.
- D. Field Testing:
 - 1. Wires and cables shall be tested before being connected to motors, devices or terminal blocks.
 - 2. If tests reveal defects or deficiencies, the Contractor shall make the required repairs or shall replace the cable as directed by the Engineer, without additional cost to the Owner.
 - 3. All tests shall be made by and at the expense of the Contractor who shall supply all testing equipment.
- E. Continuity Tests: All cables, wires and shields shall be tested for continuity. Testing for continuity shall be by test light or buzzer.
- F. Insulation-Resistance Tests:
 - 1. 600V power and control cables and wires shall be tested for their insulation-resistance values. Test shall utilize a megohmmeter with applied voltage to be 1000VDC for one (1) minute. Insulation-resistance test shall be performed on each conductor with all other conductors grounded. The resistance value shall be 20 megohms or greater.

3.05 TYPE MI CABLE EXECUTION

- A. EXAMINATION
 - 1. Verify that the factory installed temporary end seals are intact.
 - 2. Verify that no moisture has entered cable insulation.
- B. STORAGE
 - 1. Cables shall be shipped from the manufacturer with ends sealed against moisture.

2. Protect the exposed cable ends with shrinkable, molded polyolefin end caps or other suitable means such as standard conduit sealing compound and PVC tape.
3. Cable shall be stored in a clean dry location.

C. HANDLING

1. Cable shall be uncoiled by rolling or rotating supply reel.
2. Take precautions necessary to prevent damage to cable from contact with sharp objects, such as when pulled over foreign material on sheaves.

D. INSTALLATION

1. The wiring cable shall be installed according to the manufacturer's recommendations, the instructions in the Installation Specification or Manual and the requirements of the UL Fire resistance Directory listing.

E. FIELD QUALITY CONTROL

1. Inspect cable for physical damage and proper connection.
2. Measure tightness of any bolted connections and compare torque measurements with manufacturer's recommended values.
3. Verify continuity of each conductor.
4. Prior to energizing cables, measure insulation resistance of each cable. Tabulate and submit for approval.
5. Provide certification from cable manufacturer that installation is in accordance with their requirements.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Grounding electrodes and conductors.
- B. Equipment grounding conductors.
- C. Bonding.

1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electric Code.
- B. NYCEC - New York City Electrical Code.

1.03 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70 and NYCEC.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc.

PART 2 - PRODUCTS

2.01 COMPONENTS

- A. Ground clamps: OZ ELECTRICAL MANUFACTURING COMPANY, Type "CG", or equal by STEEL CITY or APPLETON.
- B. Raceways, conductors, outlet boxes, pull and junction boxes to be furnished in accordance with applicable sections of these specifications.
- C. Rod Electrode: Copper, 3/4-inch diameter, 10 feet long.
- D. Wire: Copper, sized to meet NFPA 70 requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General:
 - 1. Clean all conductive surfaces on equipment to be grounded, to assure good electrical continuity.
 - 2. Effectively bond all grounding conductors to grounding rod electrodes, equipment enclosures and ground busses.
 - 3. Locate all grounding attachments away from areas subject to physical damage. Provide protective covering as required.
 - 4. Install service entrance building ground as per NYCEC requirements.
 - 5. Service entrance shall be bonded to street side of first flange or coupling of incoming main water line with heavy duty ground clamp. Bonding conductor to be sized in accordance with NYCEC.
 - 6. Building steel shall be bonded to ground bus on main service with a conductor the same size as in B.1 below.
 - 7. Install new service grounds and grounding systems for new service as per NYCEC requirements.

8. Generators shall have a dedicated grounding system for a separately derived system for switching neutrals.
- B. Feeder/Branch Circuits:
1. All circuits shall have a separate green grounding conductor in conduit sized in accordance with NYCEC. Minimum size of conductor shall be No. 12 AWG.
 2. Flexible conduit will not be approved as achieving continuity of ground. All flexible conduit to have a jumper wire sized to ampacity of branch breaker and to be connected to conduit system on both ends; this applies to fixtures, motors, controls, etc.
- C. Transformers:
1. Transformers shall be grounded and grounding conductors and conduits sized in accordance with NYCEC.

3.02 TEST

- A. Test ground on main service. Ground system resistance shall be no greater than 10 ohms using test equipment similar to a "Biddle" test. Test data to be submitted to the Engineer for approval and such approved test data to become a part of the Record Documents.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. System of supporting devices and hangers for support or bracing for conduit, electrical equipment, safety switches, fixtures, panelboards, outlet boxes, junction boxes and cabinets.

1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electric Code.
- B. NYCEC - New York City Electrical Code.

1.03 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70 and NYCEC.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc.

PART 2 - PRODUCTS

2.01 EQUIPMENT REQUIREMENTS

- A. Provide appropriate corrosion-resistant supporting devices and hangers for electrical equipment, as manufactured by ERICO PRODUCTS, INC., CADDY FASTENERS, STEEL CITY, MINERALLAC or equivalent.
 - 1. "Z" purlin clips.
 - 2. Conduit clips.
 - 3. Beam clamps (universal and vertical flange).
 - 4. Beam clamps (set screw type).
 - 5. Combination push-in conduit clips.
 - 6. Combination conduit hanger clamps.
 - 7. Flexible conduit clips.
 - 8. Special combination conduit clips.
 - 9. One hole steel straps.
 - 10. Conduit hangers.
- B. Provide materials, sizes and types of anchors, fasteners and supports to carry the loads of equipment, wire in conduit and conduit.

2.02 CHANNEL SUPPORT SYSTEM

- A. Channel systems and supports shall be manufactured by KINDORF/THOMAS & BETTS, or approved equal.
- B. Channels shall be 1-1/2" x 1-1/2".
- C. Channels and all associated accessories and bolts shall be hot dipped galvanized.
- D. Channels shall have 9/16" bolt holes on 1-1/2" centers.
- E. Provide end caps for all channels.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Secure conduits to within 3 feet of each outlet box, junction box, cabinet, fitting, etc., and at intervals not to exceed 10 feet in accordance with currently effective edition of the National Electric Code.
- B. In seismic zones, support conduits 1 inch and smaller at 6 foot intervals.
- C. Install clamps secured to structure for feeder and other conduits routed against structure. Use drop rods and hangers to support conduits run apart from the structure.
- D. Provide and install suitable angle iron, channel iron or steel metal framing with accessories to support or brace electrical equipment including safety switches, fixtures, panelboards, etc.
- E. Provide concrete anchors and associated accessories where indicated on drawings and where required to securely mount supporting devices and equipment to existing and new concrete structure.
- F. Paint all supporting metal not otherwise protected, with rust inhibiting primer and then with a finish coat if appropriate to match the surrounding metal surfaces. Prepainted or galvanized support material is not required to be painted or repainted, unless cut to specific size in field in which case exposed edge(s) shall be painted.
- G. Do not use chains, perforated iron, baling wire or tie wire for supporting conduit runs. Use of clips to support conduit to top of t-bar ceiling grid will not be permit-ted.
- H. Obtain permission from Engineer before drilling or cutting structural members.
- I. Install surface mounted cabinets and panelboards with a minimum of four anchors, or as recommended by equipment manufacturer.
- J. Do not fasten supports to pipes, ducts, mechanical equipment and conduit.
- K. Install products in accordance with manufacturer's instructions.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Conduit system with associated couplings, connectors and fittings. Conduits to be mechanically and electrically continuous from outlet to outlet and from outlets to cabinets, pull or junction boxes.
 - 1. Conduit Use - Rigid Galvanized Conduit:
 - a. All interior circuits including concrete encased duct banks within the interior of the building.
 - 2. Conduit Use - PVC Sch. 40:
 - a. For use within exterior concrete encased duct banks only.
 - 3. Conduit Use - Flexible Liquid-tight Metal Conduit:
 - a. Connecting motors, generators and other equipment subject to vibration, maximum length - 3 feet.
 - b. Passing through building expansion joints.
- B. Device Boxes: Provide each fixture switch, receptacle and other wiring device with a box of appropriate size and depth for its particular location use unless indicated otherwise.
- C. Pull boxes, junction boxes and wire troughs

1.02 REFERENCES

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
- B. ANSI/NFPA 70 - National Electric Code.
- C. NYCEC - New York City Electrical Code.
- D. NECA Standard of Installation.
- E. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- F. NEMA TC 3 - PVC Fittings for use with Rigid PVC conduit and tubing.
- G. ANSI/NEMA OS1 - Sheet-steel outlet boxes, device boxes, covers and box supports.
- H. NEMA 250 - Enclosures for electrical equipment (1000 volts maximum).

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Conduit routing and box locations:
 - 1. Submit for review and comment scaled working drawings showing proposed routing of all conduits, inclusive of conduits routed above and/or below grade on interior and/or exterior, and embedded in structural concrete. Drawings shall show locations of all pull and junction boxes and all penetrations in walls and floor slabs.
 - 2. Contractor shall not proceed with installation of any cable, conduit, raceway, boxes, etc. until written approval is received from Owner and Engineer.
- C. Structural Design Calculations:

1. Submit for review and comment construction details of conduit racks and other conduit support systems with seismic restraint details and calculations signed and sealed by a NYS Licensed Professional Engineer.
2. Perform structural design calculations for all conduit and boxes supported from existing and new structure. Submit proposed mounting and attachment methods signed and sealed by NYS Licensed Professional Engineer for review and approval.
3. Structural design calculations sealed by a P.E. registered in the State of New York. Design calculations for manholes shall include confirmation structures adequately resist flotation when they are totally empty and subjected to groundwater full height of structure.

1.04 REGULATORY REQUIREMENTS

- A. Furnish products listed and classified by Underwriters Laboratories, Inc.
- B. Conform to requirements of ANSI/NFPA 70, NEC, NYCEC.

1.05 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 017839.
- B. Accurately record actual routing of all conduits.

1.06 FIELD SAMPLES

- A. Provide under provisions of Section 014500.
- B. Provide field sample of conduit two each at 2 feet in length.
- C. Provide field sample of expansion/deflection fitting, two each.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect, and handle products in accordance with manufacturers' recommendations.
- B. Accept conduit on site. Inspect for damage.
- C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

1.08 PROJECT CONDITIONS

- A. Verify all conduit routings by field measurements.
- B. Verify routing and termination locations of conduit prior to rough-in.
- C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system. Provide all required sweeps, boxes and fittings.

PART 2 - PRODUCTS

2.01 RIGID GALVANIZED CONDUIT

- A. Rigid conduit shall be hot dipped, galvanized, or electro-galvanized steel by WHEATLAND, ALLIED, O-Z/GEDNEY or approved equal.

- B. Associated couplings, connectors and fittings shall be as manufactured by THOMAS & BETTS CORP., ALLIED, O.Z. GEDNEY CO., WHEATLAND, or approved equal. Catalog numbers used below are those of THOMAS & BETTS CORP. based on 3/4-inch size and are considered standards by which equivalents are to be judged.
- C. ERICKSON couplings, Series 676 or approved equal, shall be used where neither length of conduit can be rotated.
- D. Conduit connectors shall be threaded type. Set screw and compression type connections ARE NOT acceptable.
- E. Sealing fitting locknuts shall be Series 142SL.
- F. Steel or malleable iron insulated bullet hub, Series 370-379, complete with sealing "O" ring. DO NOT use "die cast" material.
- G. Entrance ells shall be Series 1491 or approved equal.
- H. Combination coupling shall be Series 531 for connecting rigid galvanized conduit to electrical metallic tubing.

2.02 EXPANSION AND DEFLECTION FITTINGS:

- A. Expansion and deflection fittings shall be made up of non-corrodible parts and shall provide for ample longitudinal and lateral movement. A suitable bond shall provide a low resistance, continuous longitudinal path for ground currents.
- B. Expansion and deflection fittings shall be watertight cast iron, malleable iron or hot dipped galvanized. Fittings shall be corrosion-resistant, UL listed and compatible with the conduit system.
- C. Expansion /deflection fittings shall provide both expansion and deflection in a single fitting in accordance with the following:
 - 1. Axial expansion or contraction up to 3/4-inch.
 - 2. Angular misalignment up to 30 degrees.
 - 3. Parallel misalignment up to 3/4-inch.
- D. Expansion fittings shall provide expansion /contraction with eight inch total movement.
- E. Expansion and deflection fittings shall be by Crouse Hinds, Appleton Electric or equal to be approved by the Engineer.

2.03 CONDUIT BUSHINGS:

- A. Conduit bushings shall be insulated, grounding type with lay-in-lug connection. Two locknuts shall be provided for each bushing.
- B. The conduit bushing and locknuts shall be steel, malleable iron or zinc. The bushing shall include a 90 degree C insulating surface.
- C. Conduit bushings and locknuts shall be by O-Z Gedney, Thomas and Betts or equal to be approved by the Engineer.

2.04 PVC CONDUIT

- A. PVC conduit shall be manufactured by ALLIED, CANTEX, CARLON or approved equal.
- B. Description: NEMA TC 2; Schedule 40 PVC. For installation within concrete encased duct bank only.
- C. Fittings and Conduit Bodies: NEMA TC3.

2.05 DUCT SEAL

- A. Duct seal shall be a soft, fibrous non-hardening sealing compound for sealing between cables and conduits.
- B. Duct seal shall be by O-Z Gedney, Ideal Industries or equal to be approved by the Engineer.

2.06 THRUWALL SEALS AND BUSHINGS:

- A. Thruwall seals and bushings shall be in accordance with the following:
 - 1. For conduits and cables in new construction and passing through exterior subsurface walls and exterior concrete walls, thruwall seals shall be used. Thruwall seals shall be Type WSK and WSCS manufactured by O-Z/Gedney or equal to be approved by the Engineer.
 - 2. For conduits and cables in new construction and passing through concrete floors and floor slabs, floor seals shall be used. Floor seals shall be type SK and FSCS manufactured by O-Z/Gedney or equal to be approved by the Engineer.
 - 3. For conduits passing through exterior block walls or installed in existing construction passing through exterior subsurface walls, exterior concrete walls, floor slabs and roof slabs for use in core bit-drilled holes sealing bushings shall be used. Sealing bushings shall be Type CSMI at the inside of the structure and Type CSMC at the outside of the structure, within the same core drilled hole. Sealing bushings shall be manufactured by O-Z/Gedney or equal to be approved by the Engineer.
 - 4. For conduits passing through existing interior concrete walls or floors and interior block walls sealing bushings shall also be used. Sealing bushings shall be CSMC or CSMI type as manufactured by O-Z/Gedney or equal to be approved by the Engineer.
 - 5. For conduits passing through fire rated floors and walls fire stop fittings shall be used. Fire stop fittings shall be CFS and/or CFSI type as manufactured by O-Z/ Gedney or equal to be approved by the Engineer.
 - 6. For multiple conduit runs passing through interior or exterior and fire rated walls thru- wall barriers shall be used. Thru- wall barriers shall be TW series by Crouse-Hinds or equal to be approved by the Engineer.

2.07 FLEXIBLE LIQUID-TIGHT METAL CONDUITS AND FITTINGS

- A. Liquid-tight flexible metal conduit shall be ANACONDA or approved equal.
- B. Description: Interlocked steel construction with PVC jacket.
- C. Provide flexible liquid-tight conduits and fittings as manufactured by THOMAS & BETTS CORP., O.Z. GEDNEY CO. or approved equal. Catalog numbers used below are those of the THOMAS & BETTS CORP., based on 3/4" size and are to be considered as standards by which equivalents are to be judged. All conduit shall be liquid-tight flexible type, UL type UA, or suitable for exposure to continuous or intermittent moisture.
- D. Flexible liquid-tight connectors shall be Series 5333 or approved equal.

2.08 OUTLET AND DEVICE BOXES

- A. Acceptable Manufacturers: Raco, O-Z/Gedney, Cooper, Appleton, or approved equal.
- B. Sheet Metal Outlet Boxes - All concealed boxes shall be NEMA OSI, galvanized steel:
 - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported. Provide 1/2" male fixture stubs where required.
- C. Concrete Ceiling Boxes: Concrete type.
- D. Cast Boxes: All exposed surface mounted boxes shall be NEMA FB1, Type FD, cast fer alloy. Provide gasketed cover by box manufacturer.

2.09 ELECTRICAL MANHOLES

- A. Manholes shall be pre-cast type of reinforced concrete.
- B. Concrete for manholes shall be Class 40 concrete in accordance with related sections of these specifications. Manholes shall be constructed to withstand ground water pressure when completely submerged by rising water table.
- C. Steel reinforcement shall be as shown on the details on the Contract Drawings and in accordance with related sections of these specifications.
- D. Manholes shall have dimensions as shown on the Contract Drawings, as required by the current applicable edition of the National Electrical Code (NEC) and New York City Electrical Code (NYCEC), and shall be provided with all duct entrances sized and located to suit duct banks.
- E. Concrete floor shall be sloped towards the drain sump at the center of each manhole.
- F. All manhole hardware shall be hot dipped galvanized steel.
- G. Minimum structural design loading for manholes shall be as indicated in ASTM C857, unless otherwise noted herein.
- H. Walls of manholes shall be designed for a minimum vertical surcharge of 100 psf.
- I. Manholes shall be designed to resist floatation when totally empty and subjected to groundwater full height of manhole.
- J. Manholes shall be waterproofed using waterproofing membrane sealant: ConSeal or approved equal.
- K. Manhole Covers:
 - 1. Manholes shall be designed for H-20 traffic loading and be provided with H-20 Cast-Iron Watertight Traffic Load Cover. Covers shall be annealed, high quality, gray cast iron, free from blowholes, sandholes, scabs, fins, scales and other defects. They shall be uniform in form and dimensions, and shall be approved by the Engineer.
 - 2. The frames of the covers shall be set so that the completed installation will provide a proper alignment of the outside covers with the roadways or other surrounding areas. Manhole covers shall fit the frame without undue play.
 - 3. The following words shall be cast in the top of all manhole covers: "ELECTRIC POWER - LO", "ELECTRIC POWER - MEDIUM VOLTAGE".
 - a. "ELECTRIC POWER - LOW VOLTAGE"
 - b. "ELECTRIC POWER - MEDIUM VOLTAGE"

L. Cables Supports:

1. Manholes shall be furnished with cable racks, cable hooks, and insulators to effectively support all cables indicated for present and future installation. Cable racks shall be non-metallic fiberglass channels with ample strength to support cables. Racks shall be firmly anchored to walls with stainless steel hardware. Cable hooks shall be made from stainless steel. Insulators shall be made of high-grade dry-process porcelain with smooth glazed surfaces and shall fit hooks in such manner as to prevent wobbling and insecure minimum movement.

M. Pulling Irons:

1. Stainless steel pulling irons shall be provided for each manhole. Pulling irons shall be cast in the wall opposite to the centerline of each incoming duct bank and 12 inches below centerline of bottom line of ducts.

N. Grounding:

1. Each manhole shall be provided with a grounding system. The grounding system shall consist of grounding rod and cable in accordance with the details shown on the Contract Drawings.
2. Ground rod and cable shall be in accordance with the requirements of specification 260526.

2.10 JUNCTION BOXES

- A. Acceptable Manufacturers: RACO, THOMAS & BETTS, APPLETON, or approved equal.
- B. Sheet metal boxes: NEMA OS1, galvanized steel.
- C. Covers: Galvanized steel.

2.11 WIRE TROUGH

- A. Wireways shall be manufactured by Square D, Class 526, rain tight trough or approved equal.
- B. Wireway shall be completely enclosed with removable covers.
- C. Construction: 16 Gauge Galvanized Steel. 8-inch and 12-inch wire trough shall be 14-gauge galvanized steel.
- D. Finish: ANSI-49 epoxy paint applied by cathodic electro-deposition paint process over a corrosion resistant phosphate preparation.
- E. UL listed.

2.12 EXTERIOR WIRE TROUGH

- A. Wire troughs shall be manufactured by SQUARE D, COOPER B-LINE, HOFFMAN, or approved equal.
- B. Wire troughs shall be completely enclosed with removable covers.
- C. Construction: Wire trough shall be constructed of Type 304 stainless and shall have stainless steel screw clamps, and oil resistant gaskets.
- D. All hardware, bolts, brackets, and supports shall be constructed of Type 304 stainless steel.

- E. Wire troughs shall be rain tight for exterior applications.

2.13 ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT THREAD COMPOUND

- A. KOPR-SHIELD or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION OF CONDUITS

- A. Minimum size of conduits shall be 3/4-inch.
- B. Minimum below grade conduit depth shall be 24" below grade, measured to the top of the conduit on exterior underground installations.
- C. Conduit joints shall be cut square, threaded, reamed smooth, and drawn up tight so conduit ends will butt in couplings, connectors and fittings.
- D. All threaded conduits and fittings shall have KOPR-SHIELD compound applied to all threads prior to assembly.
- E. Make bends or offsets with standard ells or field bends with an approved bender.
- F. Run concealed conduits in direct line with long sweep bends or offsets. Run exposed conduits parallel to and at right angles to building lines. Group multiple conduit runs in banks.
- G. Secure conduits to all boxes and cabinets with double locknuts and bushings so system will be electrically continuous from service to all outlets.
- H. Install conduit in accordance with NECA Standard of Installation.
- I. Cap ends of conduits to prevent entrance of water and other foreign material during construction.
- J. Complete all conduit systems before pulling conductors.
- K. Support conduits under provisions of Section 260529.
- L. Provide approved expansion joints or fittings and bonding jumpers where conduits in concrete pass through building expansion joints.
- M. Provide cable supports in conduits rising vertically in accordance with the National Electric Code, Article 300-19, and any applicable NYCEC amendments.
- N. Provide No. 12 AWG copper pull wires or nylon cord in all empty spare conduits. Steel wire not acceptable as pull wire.
- O. Install conduit in a manner which preserves fire resistance rating of partitions and other elements.
- P. Ground and bond conduit under provisions of Section 260526.
- Q. Where neither length of conduit can be rotated, ERICKSON couplings Series 676 shall be used.
- R. In areas where enclosed and gasketed fixtures and weatherproof devices are specified, where rigid conduit enters a sheet metal enclosure, junction box and outlet box, and not terminated in

a threaded hub, a steel, or malleable iron nylon insulated bullet hub, complete with recessed sealing "O" ring, shall be used, Series 370-379 . DO NOT use die cast material.

- S. In concrete slabs block up conduit from forms and securely fasten in place. All conduits in slabs shall be installed below concrete slab.
- T. Where conduits running overhead pass through building expansion joints, install flexible liquid tight conduit of same size with sufficient slack to allow conduits on either side of expansion joint to move a minimum of 3-inches in any direction. Provide supports as required on each side of expansion joint, all in accordance with seismic requirements of specific area.
- U. Failure to route conduit through building without interfering with other equipment and construction shall not constitute a reason for an extra charge. Equipment, conduit and fixtures shall fit into available spaces in building and shall not be introduced into building at such times and manner as to cause damage to structure. Equipment requiring servicing shall be readily accessible.
- V. Arrange supports to prevent misalignment during wiring installation.
- W. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers; unless otherwise noted on drawings and/or in specifications.
- X. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
- Y. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- Z. Do not attach conduit to ceiling support wires.
- AA. Arrange conduit to maintain headroom and present neat appearance.
- AB. Route exposed conduit parallel and perpendicular to walls.
- AC. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- AD. Route conduit in and under slab from point-to-point.
- AE. Do not cross conduits in slab.
- AF. Maintain adequate clearance between conduit and piping.
- AG. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104°F (40°C).
- AH. Bring conduit to shoulder of fittings; fasten securely.
- AI. Use conduit hubs with sealing locknuts to fasten conduit in damp and wet locations.
- AJ. Install no more than equivalent of three 90-degree bends on interior locations between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2-inch size.
- AK. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- AL. Do not use dissimilar strap or clamp supports. Provide dielectric tape, fittings, straps, and bushings where dissimilar metals are used.

- AM. Where fittings for liquid-tight flexible conduit are brought into an enclosure with a knockout, a gasket assembly, consisting of one piece "O" ring, with a Buna-R sealing material, Series 5200, shall be installed on outside of box. Fittings shall be made of either steel or malleable iron only, and shall have insulated throats or insulated bushings.
- AN. A copper ground wire sized in accordance with NEC shall be installed on the inside of the conduit as a jumper around flexible conduit to assure a continuity of ground.
- AO. Install a copper jumper across all flexible conduit including lighting fixtures, controls and other utilization equipment.
- AP. Install liquid-tight flexible conduit in such a manner as to prevent liquids from running on surface toward fittings.
- AQ. Allow sufficient slack conduit to reduce the effect of vibration.
- AR. Complete all conduit systems before pulling the conductors.
- AS. Support in accordance with requirements of National Electric Code.

3.02 INSTALLATION OF BOXES

- A. Install boxes concealed in finished walls, where applicable.
- B. Locate boxes to prevent moisture from entering or accumulating within them.
- C. Support boxes independently of conduit, as required by the National Electric Code.
- D. Provide 4" x 1-1/2" octagonal, 4" x 1-1/2" square or 4" x 2-1/8" square ceiling outlet boxes.
- E. Where required to hang a specific fixture, provide a fixture stud of the no-bolt, self-locking type on ceiling outlets.
- F. Provide 2-1/2" x 3-3/4" one gang masonry boxes for switches and receptacles installed concealed in concrete block walls. For increased cubic capacity, provide 3-1/2" x 3-3/4" one gang masonry boxes. Where more than two conduits enter the box from one direction, provide 4" square boxes with square cut device covers not less than 1" deep specifically designed for this purpose. Use round edge plaster rings only if the block walls are to be plastered. Use sectional or gang-type outlet boxes only in drywall construction.
- G. Provide 4-11/16" square outlet boxes with square cut device corners for block walls or round edge plaster rings for plastered walls for telephone outlets. Single gang device boxes are not acceptable.
- H. Provide fittings with threaded hubs for screw connections and with the proper type covers for switches and receptacles served by exposed conduit. Use pressed steel outlet only for ceiling fixture outlets.
- I. Provide condulets with threaded hubs and covers and with proper configurations for all changes of direction of exposed conduits. Standard conduit ells may be used if they do not interfere or damage or mar the appearance of the installation.
- J. Use boxes of sufficient cubic capacity to accommodate the number of conductors to be installed, in accordance with the National Electric Code.
- K. Effectively close unused openings in boxes with metal plugs or plates.

- L. Set boxes so that front edges are flush with finished surfaces.
- M. Support boxes from structural members with approved braces.
- N. Install blank device plates on outlet boxes left for future use.
- O. Provide bushings in holes through which cords or conductors pass.
- P. Install boxes so that the covers will be accessible at all times.
- Q. Electrical boxes may be installed in vertical fire resistive assemblies classified as fire/smoke and smoke partitions without affecting the fire classification, provided such openings occur on one side only in each framing space and that openings do not exceed 16 square inches. All clearance between such boxes and the gypsum board shall be completely filled with joint compound or approved fire-resistive compound. The wall shall be built around outlet boxes larger than 16 square inches so as not to interfere with the wall rating.

3.03 INSTALLATION OF PULL BOXES, JUNCTION BOXES AND WIRE TROUGHS

- A. Provide junction boxes as shown on Drawings and otherwise where required, sized according to number of conductors in box or type of service to be provided. Minimum junction box size 4-inch square and 2-1/8-inches deep. Provide screw covers for junction boxes.
- B. Install boxes in conduit runs wherever necessary to avoid long runs or too many bends. Do not exceed 100-foot runs without pull boxes. Install pull boxes at all 90-degree bends.
- C. Rigidly secure boxes to walls or ceilings. Conduit runs will not be considered adequate support.
- D. Install boxes with covers in accessible locations. Size boxes in accordance with the National Electric Code and New York City Electrical Code.
- E. Do not install pull boxes or junction boxes for joint use of line voltage and signal or low voltage controls unless all conductors are insulated for the highest voltage being used in the same box, and permitted as per the cable manufacturer's installation instructions.
- F. Coordinate installation of exterior pull boxes with General contractor to establish elevations of finished grades and pavements. All castings shall have chimney adjustment of + 6".

3.04 INSTALLATION OF ELECTRICAL MANHOLES AND HANDHOLES

- A. Manholes and handholes shall be installed where shown on the Contract Drawings. Except where handholes are directly supported by utility supports, place each manhole and handhole on a 12-inch select fill base and make level.
- B. Manhole and handhole installation shall be completed so that structure is watertight. Two coats of bituminous waterproofing material shall be applied to exterior surface of each manhole and handhole. A waterproof gasket shall be provided all around removable precast manhole cap.
- C. Cable racks shall be installed within each manhole for the support of cables. Cable racks shall be in accordance with the following:
 - 1. Attach racks with 3-inch by 3/8-inch diameter "tamp-in" studs mounted in 1-inch holes drilled into walls of manholes in the absence of inserts. Apply PVC coating to all racks.
 - 2. Provide cable hooks to support each cable on each rack along the cable run within the manholes. Apply PVC coating to all hooks.

3. Individually support each cable at each hook on porcelain insulators. Provide sufficient slack for each cable.
 4. In the manhole securely tie each cable in place at each insulator block to prevent excessive movement of insulators, cables, or fireproof tape. Tie cables with non-metallic 3/4-inch strapping tape as manufactured by 3M or tie down with nylon straps.
- D. A grounding system shall be installed for each manhole. All exposed metal, manhole frame and cover, accessories and the concrete reinforcing rods shall be bonded with No. 4 AWG minimum bare copper wire and connected to the duct bank ground in accordance with the details shown on the Contract Drawings.
- E. Concrete curb shall be provided for manholes when required to adjust manhole cover to proper grade. Curb shall be constructed on the roof slab or cone section on which the manhole frame and cover shall be placed. The height of the curb shall be such as is necessary to bring the manhole frame to the proper grade.
- F. For cast in placetype manholes and handholes, pulling irons shall be set and other built-in items shall be in place before placing concrete.

3.05 CONDUIT LOCATIONS

- A. Route all conduit concealed in walls or above finished ceilings in all finished spaces. Provide boxes and conduits concealed in walls for all power and controls in finished spaces.
- B. Surface mounted conduits will only be allowed in unfinished spaces.
- C. Contractor shall not route conduits over pump motors, roof hatches and trolley beams which would prevent removal of equipment, access to hatches, movement of trolley, etc.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Requirements for providing underground ducts. Underground ducts shall be provided in accordance with the requirements specified under this section, the Specifications and the Contract Drawings.
- B. Underground ducts shall be concrete encased. The Contractor shall provide reinforced concrete encasement for the duct system.
- C. The Contractor shall perform all excavations, backfilling and restoration, as required, unless specifically shown otherwise on the Contract Drawings or stated in the Specifications.

1.02 REFERENCES

- A. Underground ducts shall comply with the latest applicable provisions and recommendations of the following:
 - 1. NFPA 70, National Electrical Code.
 - 2. NYCEC, New York City Electrical Code
 - 3. National Electrical Safety Code.
 - 4. UL No. 651, Schedule 40 and 80 PVC conduit.
 - 5. NEMA TC2, Electrical Plastic Tubing, Conduit and Fittings.
 - 6. UL No. 1684, Reinforced Thermosetting Resin conduit.

1.03 SUBMITTALS

- A. Contractor shall submit working drawings, shop drawings and material specifications for the approval of the Engineer as specified under Division 1 of the Specifications.
- B. Working Drawings:
 - 1. Prior to equipment submission, submit a list of proposed manufacturers with the products they produce proposed for the contract.
 - 2. Manufacturer's Literature with manufacturer's name, designation and catalog number for all products proposed for the underground duct system.
 - 3. Scaled Working Drawings showing the routing of the duct banks and the location of manholes and the principal outline of buildings and structures. Reference duct banks dimensionally from fixed objects or structures. Include profiles of duct banks showing crossings with piping and other underground systems existing and new.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Underground ducts shall be delivered, stored and handled in accordance with the Specifications and the manufacturer's instructions.

PART 2 - PRODUCTS

2.01 RIGID STEEL CONDUIT

- A. Steel conduit for ducts shall be in accordance with the requirements of Specification 260533. Steel conduit shall be used for installation of conduit within concrete encased duct banks from the new substation to the extents of Building 386. Schedule 40 PVC conduit shall be required for all other straight lengths of underground concrete ducts banks, unless otherwise noted. All conduit elbows and turns shall be rigid galvanized steel. Upon exiting a duct bank conduit shall transition to conduit type that is listed in the "CABLE AND CONDUIT SCHEDULE".

2.02 NON-METALLIC CONDUIT AND FITTINGS

- A. Non-metallic conduit for ducts shall be PVC plastic for all 600V systems.
 - 1. PVC plastic conduit shall be Schedule 40 for installation within duct banks. NEMA type EPC-40-PVC, rated 90 degrees C, conforming to UL No. 651.
- B. All non-metallic fittings, elbows, bodies, terminations, expansions and fasteners shall be the same material and manufacturer as the conduit.
- C. PVC conduit shall be in accordance with requirements of Specification 260533.

2.03 CONDUIT SPACERS

- A. Conduit spacers shall be nonmetallic, interlocking type to maintain spacing between conduits. Spacers shall be suitable for all types of conduit in multiple sizes.

2.04 WARNING RIBBON

- A. Warning ribbon shall be in accordance with Specification 260553.
- B. Warning tape shall be by Seton, Ideal Industries or approved equal.

2.05 DUCT SEAL

- A. Duct seal for conduits shall be in accordance with the requirements of Specification 260533 - Electric Conduit System.

2.06 REINFORCED CONCRETE

- A. Unless indicated otherwise on the Drawings, concrete for envelope shall be Class B concrete in accordance with the requirements of Specification 033000. Steel reinforcement shall be in accordance with the requirements of Specification 051200.

2.07 EXPANSION AND DEFLECTION FITTINGS

- A. Where specifically shown on the Contract Drawings, expansion and deflection fittings shall be provided at the structural joints of the underground duct system.
- B. Expansion and deflection fittings shall be in accordance with Specification 260533.

2.08 CONDUIT BUSHINGS/BELLS

- A. Conduit bushings shall be provided for the termination of rigid steel conduits at each manhole.
- B. PVC conduit bells shall be provided for the terminations of PVC conduit at each man hole.
- C. Conduit bushings shall be in accordance with Specification 260533.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. The duct system shall be installed to avoid interferences with structures, piping and other underground systems. Terminate ducts with insulated grounding bushings at manholes.

Conduit ducts shall be sized, arranged and installed in a reinforced concrete envelope as shown on the Contract Drawings.

- B. Trenches for duct banks shall be in accordance with the requirements of the Specifications. Duct bank trenches shall have the bottom tamped firm and even, and suitably braced side forms shall be employed in forming the envelope.
- C. Duct banks shall follow straight lines as far as possible. Where deviation from a straight line becomes necessary, offsets shall be made using 5 degree angle coupling or make bend with sweeps. The sweep radius shall be 36 inch for 90 and 45 degree bends and 30 inch for 30 degree bends. Where directed by the Engineer, bends shall be made up with standard factory bends or other approved curved sections.
- D. Duct bank installations and penetrations through foundation walls shall be made watertight.
- E. Duct banks shall be assembled using non-magnetic saddles, spacers and separators. Separators shall be positioned to provide 3-inch minimum concrete separation between the outer surfaces of the ducts.
- F. Concrete covering shall be provided on both sides, top and bottom of the concrete envelopes around conduits. Concrete covering shall be in accordance with the detail shown on the Contract Drawings. Top of concrete encasement shall not be less than thirty inches below finish grade. Add red dye to concrete used for envelopes or trowel a coloring on the concrete for easy identification during subsequent excavation.
- G. Before pouring concrete, written approval shall be obtained from the inspecting engineer.
- H. Ducts shall be firmly fixed in place during pouring of concrete. Concrete shall be carefully spaded and vibrated to insure filling of all spaces between ducts.
- I. A transition shall be made from non-metallic PVC Schedule 40 conduit to PVC coated rigid steel conduit where duct banks enter structures or turn upward for continuation above grade. PVC coated rigid steel ducts shall be terminated using insulated grounding bushings. Ducts inside buildings shall be continued using PVC coated rigid steel or rigid steel conduits as required for the area.
- J. Ducts entering manholes and hand holes shall be terminated using suitable end bells. Rigid steel ducts shall be terminated using insulated grounding bushings.
- K. Backfilling for duct banks shall be in accordance with the requirements of the Specifications. Backfilling shall be permitted when directed by the engineer to proceed. Backfilling shall not be with material containing large rock, paving materials, cinders, large or sharply angular substances, corrosive material or other materials which can damage or contribute to corrosion of ducts or cables or prevent adequate compaction of fill.
- L. Duct runs shall be sloped for drainage toward manholes and away from buildings with a slope of approximately 3 inches per 100 feet.
- M. A ground cable shall be installed in each duct bank envelope. Cable shall be in accordance with the requirements of Specification 260526. The ground shall be made electrically continuous throughout the entire duct bank system. Ground cable shall be connected to the building, ground grid, equipment ground buses and to each conduit grounding bushing of the underground duct system. The ground cable shall be terminated at the last manhole for outlying structures.
- N. After installation each conduit in each duct bank shall be cleaned and cleared of obstructions and foreign matter by rodding and by the passage of cleaning brushes or cutting mandrels.

After cleaning, the clearance of each conduit shall be checked by passing a 12 inch long mandrel, of diameter 1/2 inch less than the nominal duct diameter, through the entire length of duct run. Ducts which do not permit passage of the mandrel shall be cleared, cut out and replaced or sealed and replaced by additional construction. The duct bank conduit cleaning shall be included in the electric conduit system field test report specified in Specification 250533.

- O. A warning ribbon shall be installed approximately 12 inches below finished grade over all underground duct banks.
- P. All ducts entering buildings and structures shall be sealed. All empty spare ducts shall be sealed and plugged.
- Q. An expansion and deflection fitting shall be installed on each conduit at each of the structural expansion joints when shown on the Contract Drawings. Joints shall be located as defined by the criteria noted on the Contract Drawings.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal cable tray systems:
 - 1. Metal ladder cable tray.
- B. Cable tray systems are defined to include, but not limited to straight sections of ladder type cable trays, bends, tees, elboes, drop-outs, supports and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2019a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- E. NEMA VE 1 - Metal Cable Tray Systems; 2017.
- F. NEMA VE 2 - Cable Tray Installation Guidelines; 2013, with Errata (2016).
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Drawings
 - 1. The drawings, which constitute a part of these specifications, indicate the general route of the cable tray systems. Data presented on these drawings are as accurate as preliminary surveys and planning can determine until final equipment selection is made. Accuracy is not guaranteed and field verification, of all dimensions, routing, etc., is directed.
 - 2. Specifications and drawings are for assistance and guidance, but exact routing, locations, distances and levels will be governed by actual field conditions. Contractor is directed to make field surveys as part of his work prior to submitting system layout drawings.
- B. Coordination:
 - 1. Coordinate the arrangement of cable tray with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others. Coordinate the work with other trades to avoid installation of obstructions within cable tray required clearances.
 - 2. Coordinate arrangement of cable tray with the dimensions and clearance requirements of the actual products to be installed.
 - 3. Coordinate the work with placement of supports, anchors, etc. required for mounting.

4. Notify Architect/Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- C. Preinstallation Meeting: Convene one week prior to commencing work of this section; require attendance of all affected installers. Review proposed routing, sequence of installation, and protection requirements for installed cable tray.
- D. Sequencing:
 1. Do not begin installation of cables until installation of associated cable tray run is complete.

1.05 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Product Data: Submit manufacturer's data on cable tray including, but not limited to, types, materials, finishes, rung spacings, inside depths and fitting radii. For side rails and rungs, submit cross sectional properties including Section Modulus (Sx) and Moment of Inertia (Ix).
- C. Shop Drawings: Submit drawings of cable tray and accessories including clamps, brackets, hanger rods, splice plate connectors, expansion joint assemblies, and fittings, showing accurately scaled components.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company regularly engaged in manufacture of cable trays and fittings of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- C. NEMA Compliance: Comply with NEMA Standards Publication Number VE1, "Cable Tray Systems".
- D. NEC Compliance: Comply with NEC, as applicable to construction and installation of cable tray and cable channel systems (Article 318, NEC).
- E. UL Compliance: Provide products that are UL-classified and labeled.
- F. NFPA Compliance: Comply with NFPA 70B, "Recommended Practice for Electrical Equipment Maintenance" pertaining to installation of cable tray systems.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NEMA VE 2, except do not store cable tray outdoors without cover as permitted in NEMA VE 2.
- B. Deliver cable tray systems and components carefully to avoid breakage, denting and scoring finishes. Do not install damaged equipment.
- C. Store cable trays and accessories in original cartons and in clean dry space; protect from weather and construction traffic. Wet materials should be unpacked and dried before storage.

PART 2 PRODUCTS

2.01 CABLE TRAY SYSTEM - GENERAL REQUIREMENTS

- A. Provide new cable tray system consisting of all required components, fittings, supports, accessories, etc. as necessary for a complete system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Do not use cable tray for applications other than as permitted by NFPA 70 and product listing/classification.
- D. Provide cable tray system and associated components suitable for use at indicated span/load ratings under the service conditions at the installed location.

2.02 METAL CABLE TRAY SYSTEMS

- A. Comply with NEMA VE 1.
- B. General: Except as otherwise indicated, provide metal cable trays, of types, classes and sizes indicated; with splice plates, bolts, nuts and washers for connecting units. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards; and with the following additional construction features.
- C. Finishes:
 - 1. Stainless Steel: Straight section and fitting side rails and rungs shall be made of AISI Type 304 or Type 316 stainless steel. Transverse members (rungs) or corrugated bottoms shall be welded to the side rails with Type 316 stainless steel welding wire.
 - 2. Stainless Steel: Type 304 or Type 316.
- D. Metal Ladder Cable Tray:
 - 1. Material: Stainless steel.
 - 2. Load/Fill Depth: 4 inches (102 mm).
 - 3.
 - 4. Rung Spacing: 9 inches (229 mm) on center for straight lengths.
 - 5. Inside Width: 18 inches (457 mm).
 - 6. Inside Radius of Fittings: 12 inches (305 mm).
 - 7. Accessories: Special accessories shall be furnished as required to protect, support, and install a cable tray system. Accessories shall consist of but are not limited to; section splice plates, expansion plates, blind-end plates, specially designed ladder dropouts, barriers, etc.
- E. Cable Tray Supports
 - 1. Cable Tray Supports: Shall be placed so that the support spans do not exceed maximum span indicated on drawings. Supports shall be constructed from 12 gauge steel formed shape channel members 1-5/8 inch by 1-5/8 inch with necessary hardware such as Trapeze Support Kits (9G-55XX-22SH) as manufactured by Eaton B-Line, Inc. [or engineer approved equal]. Cable trays installed adjacent to walls shall be supported on wall mounted brackets such as B409 as manufactured by Eaton B-Line, Inc. [or engineer approved equal].
 - 2. Center hung supports shall be manufactured of 12 gauge, 1-5/8 inch by 1-5/8 inch B-Line B22 steel strut with a pipe welded at the middle of the support to provide eccentric loading stability. Support shall withstand 700 pounds in a 60 percent vs. 40 percent eccentric loading condition with a safety factor of 3.

3. Trapeze hangers and center-hung supports shall be supported by 1/2 inch (minimum) diameter rods.

2.03 SOURCE QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Metal Cable Tray: Perform factory design tests in accordance with NEMA VE 1, including electrical continuity and load testing.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that work likely to damage cable tray system has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that the dimensions and span/load ratings of cable tray system components are consistent with the indicated requirements.
- D. Verify that mounting surfaces are ready to receive cable tray and associated supports.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install cable tray in accordance with NECA 1 (general workmanship), and NEMA VE 2.
- C. Coordinate cable tray with other electrical work as necessary to properly integrate installation of cable tray work with other work.
- D. Unless otherwise indicated, arrange cable tray to be parallel or perpendicular to building lines.
- E. Arrange cable tray to provide required clearances and maintain cable access.
- F. Install cable tray plumb and level, with sections aligned and with horizontal runs at the proper elevation.
- G. Cable Tray Movement Provisions:
 1. Provide suitable expansion fittings where cable tray is subject to movement, including but not limited to:
 - a. Where cable tray crosses structural joints intended for expansion.
 - b. Long straight cable tray runs in accordance with NEMA VE 2.
 2. Use expansion guides in lieu of hold-down clamps where prescribed in NEMA VE 2.
 3. Set gaps for expansion fittings in accordance with NEMA VE 2.
- H. Provide end closures at unconnected ends of cable tray runs.
- I. Cable Tray Support:
 1. Use manufacturer's recommended hangers and supports, located in accordance with NEMA VE 2 and manufacturer's requirements, but not exceeding specified span unless otherwise approved by Engineer. Provide required support and attachment in accordance with Section 260529, where not furnished by cable tray manufacturer.

2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- J. Grounding and Bonding Requirements, in Addition to Requirements of Section 260526:
 1. Comply with grounding and bonding requirements of NEMA VE 2.
 2. Metal Cable Tray Systems: Use suitable bonding jumpers or classified connectors to provide electrical continuity.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect cable tray system for damage and defects.
- C. Correct deficiencies and replace damaged or defective cable tray system components.

3.04 TESTING

- A. Test cable trays to ensure electrical continuity of bonding and grounding connections, and to demonstrate compliance with specified maximum grounding resistance. See NFPA 70B, Chapter 18, for testing and test methods.
- B. Manufacturer shall provide test reports witnessed by an independent testing laboratory of the "worst case" loading conditions outlined in this specification and performed in accordance with the latest revision of NEMA VE-1; including test reports verifying rung load capacity in accordance with NEMA VE-1 Section 5.4.

3.05 ADJUSTING

- A. Adjust tightness of mechanical connections to manufacturer's recommended torque settings.

3.06 CLEANING

- A. Remove dirt and debris from cable tray.
- B. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 PROTECTION

- A. Protect cable tray system from subsequent construction operations.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit markers.

1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.
- B. NYCEC - New York City Electrical Code.

1.03 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Provide catalog data for nameplates, labels and markers.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Underwriters Laboratories, Inc. Include instructions for storage, handling, protection, examination, preparation and installation of product.
- D. Provide physical sample of each type of nameplate, label, marker, etc. that is to be provided in accordance with this specification for review and approval of Engineer and Owner.
- E. Provide two laminated copies of final cable and conduit schedule for Building 127 at completion of project. One copy shall be permanently affixed to wall in location selected by BNY, provided binding rings as required for multiple pages. The second copy shall be provided to BNY for their records.

1.04 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70, NEC, and NYCEC.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.01 NAMEPLATES AND LABELS

- A. Nameplates: Engraved three-layer laminated plastic, white letters on black background. Punched or drilled for screw mounting.
- B. Locations:
 - 1. Substations.
 - 2. Switchgear and Switchboards.
 - 3. Enclosed switches and circuit breakers.
 - 4. Mimic panel and control panels.
 - 5. Junction boxes, pull boxes, and electrical enclosures.
 - 6. Distribution panelboards.
 - 7. All control switches and pilot light devices.

8. Transfer Switches.

C. Letter Size:

1. Use 1/4 inch (6 mm) letters for identifying all control pilot lights.

2.02 WIRE MARKERS

A. Manufacturers:

1. 3M ELECTRICAL SPECIALTY DIV., Product Scotch Code.
2. THOMAS & BETTS CORP., Product E-Z Code.
3. Substitutions shall be permitted only after receiving written approval from the Engineer.

B. Description: Epoxy film tape type wire markers.

C. Locations: Each conductor at each source and each load connection.

D. Legend:

1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings and cable & conduit schedule.
2. Control Circuits: Control wire number indicated on interconnection diagrams on drawings.

2.03 CONDUIT MARKERS

A. Manufacturers:

1. SETON SETMARK PIPE MARKERS
2. Substitutions shall be permitted only after receiving written approval from the Engineer.

B. Description: Snap around conduit markers.

C. Colors:

1. 600V or less: black letters on white background.
2. More than 600V: black letters on orange background.

D. Content:

1. 600V or less: Conduit name/number indicated on drawings and cable & conduit schedule.
2. More than 600V: Conduit name/number indicated on drawings and cable & conduit schedule plus separate label with warning reading "DANGER CONCEALED HIGH VOLTAGE WIRING".

E. Location: Furnish markers for each conduit longer than 6 feet (1.8 m).

F. Spacing: 20 feet (6 m) on center, minimum of one in each space that conduit passes through.

2.04 UNDERGROUND WARNING TAPE

A. Manufacturers:

1. THOMAS & BETTS CORP., Model NAF-0700.
2. Seton
3. Ideal
4. Substitutions shall be permitted only after receiving written approval from the Engineer.

B. Description: 6 inch (150 mm) wide plastic tape, detectable type, colored red with suitable warning legend describing buried electrical lines.

2.05 FLOOR MARKING TAPE

- A. 2-inch wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

2.06 WARNING LABELS AND SIGNS

- A. Comply with NYCEC, NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- C. Baked-Enamel Warning Signs:
 - 1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
 - 2. 1/4-inch (6.4-mm) grommets in corners for mounting.
 - 3. Nominal size, 7 by 10 inches (180 by 250 mm).
- D. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."
Modify working clearance based on applicable code sections.
 - 3. Other warning labels required for arc-flash, multiple services, etc. Refer to applicable specification section(s) for additional detail.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive nameplates and labels.

3.02 APPLICATION

- A. Install nameplate and label parallel to equipment lines.
- B. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Secure nameplate to equipment front using screws, rivets or adhesive in accordance with manufacturer's instructions.
- D. Apply conduit markers at 20 foot (6 m) intervals, minimum of one in each space that conduit passes through.
- E. Identify underground conduits in duct bank(s) using underground warning tape. Install one tape per trench at 3 inches (75 mm) below finished grade or as identified on drawings.

3.03 ELECTRICAL EQUIPMENT IDENTIFICATION

- A. The Contractor shall identify all existing circuits in existing distribution panels, switchboards and disconnect switches to remain.

- B. Label all circuits identifying the load served including all individual circuit breakers in accordance with Cable & Conduit Schedule.
- C. Label all new circuit breakers and switches used for new feeder and branch circuits.
- D. Contractor shall furnish a minimum of 5 custom engrave three-layer laminated plastic labels with up to 20 words per label as directed by the engineer/owner in addition to the required labels.

END OF SECTION

SECTION 260574 - ARC FLASH HAZARD ANALYSIS AND SHORT CIRCUIT COORDINATION STUDY H2M

PART 1 - GENERAL

1.01 SCOPE

- A. The contractor shall furnish short-circuit and protective device coordination studies as prepared by a qualified specialist.
- B. The contractor shall furnish an Arc Flash Hazard Analysis Study per the requirements set forth in the current version of NFPA 70E - Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according to the IEEE Standard 1584-2002, the IEEE Guide for Performing Arc-Flash Calculations.
- C. The scope of the studies shall include new distribution equipment supplied under this contract.

1.02 REFERENCES

- A. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - 1. IEEE 141 - Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems
 - 2. IEEE 242 -Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
 - 3. IEEE 399 - Recommended Practice for Industrial and Commercial Power System Analysis
 - 4. IEEE 241 -Recommended Practice for Electric Power Systems in Commercial Buildings
 - 5. IEEE 1015 - Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.
 - 6. IEEE 1584 -Guide for Performing Arc-Flash Hazard Calculations
- B. American National Standards Institute (ANSI):
 - 1. ANSI C37.13- Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures
 - 2. ANSI C37.010- Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis
 - 3. ANSI C 37.41- Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories.
- C. The National Fire Protection Association (NFPA)
 - 1. NFPA 70 -National Electrical Code, latest edition
 - 2. NFPA 70E- Standard for Electrical Safety in the Workplace
 - 3. NYCEC - New York City Electrical Code

1.03 SUBMITTALS FOR REVIEW/APPROVAL

- A. The studies shall be submitted to the design engineer prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment drawings for manufacturing. If formal completion of the study may cause delays in equipment shipments, approval from the Engineer may be obtained for a preliminary submittal of data to ensure that the selection of device ratings and characteristics will be satisfactory to properly select the distribution equipment. The formal study will be provided to verify preliminary findings.

1.04 SUBMITTALS FOR CONSTRUCTION

- A. The results of the short-circuit, protective device coordination and arc flash hazard analysis studies shall be summarized in a final report. Electronic PDF copies of the report shall be provided.
- B. The report shall include the following sections:

SECTION 260574 - ARC FLASH HAZARD ANALYSIS AND SHORT CIRCUIT COORDINATION STUDY H2M

1. Executive Summary including Introduction, Scope of Work and Results/Recommendations.
2. Short-Circuit Methodology Analysis Results and Recommendations
3. Short-Circuit Device Evaluation Table
4. Protective Device Coordination Methodology Analysis Results and Recommendations
5. Protective Device Settings Table
6. Time-Current Coordination Graphs and Recommendations
7. Arc Flash Hazard Methodology Analysis Results and Recommendations including the details of the incident energy and flash protection boundary calculations, along with Arc Flash boundary distances, working distances, Incident Energy levels and Personal Protection Equipment levels.
8. Arc Flash Labeling section showing types of labels to be provided. Section will contain descriptive information as well as typical label images.
9. One-line system diagram that shall be computer generated and will clearly identify individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location, device numbers used in the time-current coordination analysis, and other information pertinent to the computer analysis.

1.05 QUALIFICATIONS

- A. The short-circuit, protective device coordination and arc flash hazard analysis studies shall be conducted under the responsible charge and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies.
- B. The Registered Professional Electrical Engineer shall be an employee of an approved engineering firm specializing in power system studies.
- C. The Registered Professional Electrical Engineer shall have a minimum of five (5) years of experience in performing power system studies.
- D. The approved engineering firm shall demonstrate experience with Arc Flash Hazard Analysis by submitting names of at least ten actual arc flash hazard analyses it has performed in the past year.
- E. The engineering firm shall have a minimum of twenty-five (25) years of experience in performing power system studies.

1.06 COMPUTER ANALYSIS SOFTWARE

- A. The studies shall be performed using SKM Systems Analysis Power*Tools or EasyPower software programs for Windows.

PART 2 - PRODUCT

2.01 STUDIES

- A. The contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E -Standard for Electrical Safety in the Workplace, reference Article 130.3 and Annex D. This study shall also include short-circuit and protective device coordination studies.

2.02 DATA

- A. Contractor shall furnish all data as required for the power system studies. The Engineer performing the short circuit, protective device coordination and arc flash hazard analysis studies shall furnish the Contractor with a listing of required data immediately after award of the

SECTION 260574 - ARC FLASH HAZARD ANALYSIS AND SHORT CIRCUIT COORDINATION STUDY H2M

contract. The Contractor shall expedite collection of the data to assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.

- B. Source combination may include present and future motors and generators.
- C. Load data utilized may include existing and proposed loads obtained from Contract Documents provided by Owner, Owner's Representative, or Contractor. Confirm all data with Owner's Representative prior to performing study and submitting report.
- D. Include fault contribution of existing motors and other loads in the study. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

2.03 SHORT-CIRCUIT ANALYSIS

- A. Transformer design impedances shall be used when test impedances are not available.
- B. Provide the following:
 - 1. Calculation methods and assumptions
 - 2. Selected base per unit quantities
 - 3. One-line diagram of the system being evaluated that clearly identifies individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location and other information pertinent to the computer analysis
 - 4. The study shall include input circuit data including electric utility system characteristics, source impedance data, conductor lengths, number of conductors per phase, conductor impedance values, insulation types, transformer impedances and X/R ratios, motor contributions, and other circuit information as related to the short-circuit calculations.
 - 5. Tabulations of calculated quantities including short-circuit currents, X/R ratios, equipment short-circuit interrupting or withstand current ratings and notes regarding adequacy or inadequacy of the equipment rating.
 - 6. Results, conclusions, and recommendations. A comprehensive discussion section evaluating the adequacy or inadequacy of the equipment must be provided and include recommendations as appropriate for improvements to the system.
- C. For solidly-grounded systems, provide a bolted line-to-ground fault current study for applicable buses as determined by the engineer performing the study.
- D. Protective Device Evaluation:
 - 1. Evaluate equipment and protective devices and compare to short circuit ratings
 - 2. Adequacy of switchgear, switchboards, and panelboard bus bars to withstand short circuit stresses
 - 3. Contractor notify Owner and Owner's Representative in writing, of any circuit protective devices improperly rated for the calculated available fault current.

2.04 PROTECTIVE DEVICE TIME-CURRENT COORDINATION ANALYSIS

- A. Protective device coordination time-current curves (TCC) shall be displayed on log-log scale graphs.
- B. Include on each TCC graph, a complete title with descriptive device names.
- C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.

SECTION 260574 - ARC FLASH HAZARD ANALYSIS AND SHORT CIRCUIT COORDINATION STUDY
H2M

- D. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
- E. Plot the following characteristics on the TCC graphs, where applicable:
 - 1. Electric utility's overcurrent protective device
 - 2. Medium voltage equipment overcurrent relays
 - 3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands
 - 4. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands
 - 5. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves
 - 6. Medium voltage conductor damage curves
 - 7. Ground fault protective devices, as applicable
 - 8. Pertinent motor starting characteristics and motor damage points, where applicable
 - 9. Pertinent generator short-circuit decrement curve and generator damage point
 - 10. The largest feeder circuit breaker in each motor control center and applicable panelboard.
- F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.
- G. Provide the following:
 - 1. A One-line diagram shall be provided which clearly identifies individual equipment buses, bus numbers, device identification numbers and the maximum available short-circuit current at each bus when known.
 - 2. A sufficient number of log-log plots shall be provided to indicate the degree of system protection and coordination by displaying the time-current characteristics of series connected overcurrent devices and other pertinent system parameters.
 - 3. Computer printouts shall accompany the log-log plots and will contain descriptions for each of the devices shown, settings of the adjustable devices, and device identification numbers to aid in locating the devices on the log-log plots and the system one-line diagram.
 - 4. The study shall include a separate, tabular printout containing the recommended settings of all adjustable overcurrent protective devices, the equipment designation where the device is located, and the device number corresponding to the device on the system one-line diagram
 - 5. A discussion section which evaluates the degree of system protection and service continuity with overcurrent devices, along with recommendations as required for addressing system protection or device coordination deficiencies.
 - 6. Contractor shall notify Owner in writing of any significant deficiencies in protection and/or coordination. Provide recommendations for improvements.

2.05 ARC FLASH HAZARD ANALYSIS

- A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2009, Annex D. The arc flash hazard analysis shall be performed in conjunction with the short-circuit analysis (Section 2.03) and the protective device time-current coordination analysis (Section 2.04)
- B. The flash protection boundary and the incident energy shall be calculated at significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.
- C. Circuits 240V or less fed by single transformer rated less than 125 kVA may be omitted from the computer model and will be assumed to have a hazard risk category 0 per NFPA 70E.

SECTION 260574 - ARC FLASH HAZARD ANALYSIS AND SHORT CIRCUIT COORDINATION STUDY
H2M

- D. Working distances shall be based on IEEE 1584. The calculated arc flash protection boundary shall be determined using those working distances.
- E. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short circuit and coordination study model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations
- F. The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios must be compared and the greatest incident energy must be uniquely reported for each equipment location in a single table. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum. Conversely, the maximum calculation will assume a maximum contribution from the utility. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable as well as any stand-by generator applications.
 - 1. The Arc-Flash Hazard Analysis shall be performed utilizing mutually agreed upon facility operational conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.
- G. The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors should be decremented as follows:
 - 1. Fault contribution from induction motors should not be considered beyond 5 cycles.
- H. For each piece of ANSI rated equipment with an enclosed main device, two calculations shall be made. A calculation shall be made for the main cubicle, sides, or rear; and shall be based on a device located upstream of the equipment to clear the arcing fault. A second calculation shall be made for the front cubicles and shall be based on the equipment's main device to clear the arcing fault. For all other non-ANSI rated equipment, only one calculation shall be required and it shall be based on a device located upstream of the equipment to clear the arcing fault.
- I. When performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions must be included in the fault calculation.
- J. Mis-coordination should be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy for the corresponding location.
- K. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. A maximum clearing time of 2 seconds will be used based on IEEE 1584-2002 section B.1.2. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, a maximum clearing time based on the specific location shall be utilized.
- L. Provide the following:
 - 1. Results of the Arc-Flash Hazard Analysis shall be submitted in tabular form, and shall include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, working distances, personal-protective equipment classes and AFIE (Arc Flash Incident Energy) levels.
 - 2. The Arc-Flash Hazard Analysis shall report incident energy values based on recommended device settings for equipment within the scope of the study.

SECTION 260574 - ARC FLASH HAZARD ANALYSIS AND SHORT CIRCUIT COORDINATION STUDY
H2M

3. The Arc-Flash Hazard Analysis may include recommendations to reduce AFIE levels and enhance worker safety.

PART 3 - EXECUTION

3.01 FIELD ADJUSTMENT

- A. Contractor shall adjust relay and protective device settings according to the recommended settings table provided by the coordination study.
- B. Contractor shall make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.
- C. Contractor shall notify Owner in writing of any required major equipment modifications.

3.02 ARC FLASH LABELS

- A. Contractor shall provide a 4.0 in. x 4.0 in. (or larger if required) Brady thermal transfer type label of high adhesion polyester for each work location analyzed.
- B. The labels shall be designed according to the following standards:
 1. UL969 - Standard for Marking and Labeling Systems
 2. ANSI Z535.4- Product Safety Signs and Labels
 3. NFPA 70 (National Electric Code)- Article 110.16
 4. NYCEC
- C. The label shall include the following information:
 1. System Voltage
 2. Flash protection boundary
 3. Personal Protective Equipment category
 4. Arc Flash Incident energy value (cal/cm²)
 5. Limited, restricted, and prohibited Approach Boundaries
 6. Study report number and issue date
- D. Labels shall be printed by a thermal transfer type printer, with no field markings.
- E. Arc flash labels shall be provided for equipment as identified in the study and the respective equipment access areas per the following:
 1. Floor Standing Equipment - Labels shall be provided on the front of each individual section. Equipment requiring rear and/or side access shall have labels provided on each individual section access area. Equipment line-ups containing sections with multiple incident energy and flash protection boundaries shall be labeled as identified in the Arc Flash Analysis table.
 2. Wall Mounted Equipment- Labels shall be provided on the front cover or a nearby adjacent surface, depending upon equipment configuration.
 3. General Use Safety labels shall be installed on equipment in coordination with the Arc Flash labels. The General Use Safety labels shall warn of general electrical hazards associated with shock, arc flash, and explosions, and instruct workers to turn off power prior to work.
- F. Labels shall be field installed by Contractor. The technician providing the installation shall have completed an 8-Hour instructor led Electrical Safety Training Course with includes NFPA 70E material including the selection of personal protective equipment.

SECTION 260574 - ARC FLASH HAZARD ANALYSIS AND SHORT CIRCUIT COORDINATION STUDY
H2M

3.03 ARC FLASH TRAINING

- A. The Firm supplying the Arc Flash Hazard Analysis shall train the owner's qualified electrical personnel of the potential arc flash hazards, associated with working on energized equipment (minimum of 4 hours). The training shall be certified for continuing education units (CEUs) by the International Association for Continuing Education Training (IACET) or equivalent. The trainer shall be an authorized OSHA Outreach instructor.

- B. The Firm supplying the Arc Flash Hazard Analysis shall offer instructor led and online NFPA 70E training classes.

END OF SECTION

PART 1 - GENERAL

1.01 SCOPE

- A. The Contractor shall furnish and install the primary and/or secondary substation transformers as specified herein and as shown on the contract drawings.

1.02 REFERENCES

- A. The substation transformers shall be designed, manufactured and tested in accordance with the latest applicable standards of NEMA and ANSI. ANSI C57
- B. NFPA 70 - National Electrical Code
- C. NYCEC - New York City Electrical Code

1.03 SUBMITTALS - FOR REVIEW/APPROVAL

- A. The following information shall be submitted to the Engineer:
 - 1. Master drawing index
 - 2. Front view elevation and weight
 - 3. Plan view
 - 4. Schematic diagrams
 - 5. Nameplate diagram
 - 6. Component list
 - 7. Conduit entry/exit locations
 - 8. Ratings including:
 - a. kVA
 - b. Primary and secondary voltage
 - c. Taps
 - d. Primary and secondary continuous current
 - e. Basic Impulse Level
 - f. Impedance
 - g. Insulation class and temperature rise
 - 9. Cable terminal sizes
 - 10. Product data sheets
- B. Where applicable, the following additional information shall be submitted to the Engineer:
 - 1. Busway and Bus Duct connection
 - 2. Connection details between close-coupled assemblies
 - 3. Composite floor plan of close-coupled assemblies
 - 4. Key interlock scheme drawing and sequence of operations

1.04 SUBMITTALS - FOR CONSTRUCTION

- A. The following information shall be submitted for record purposes:
 - 1. Final as-built drawings and information for items listed in Section 1.04, and shall incorporate all changes made during the manufacturing process
 - 2. Wiring diagrams
 - 3. Certified production test reports
 - 4. Installation information
 - 5. Seismic certification as specified

1.05 QUALIFICATIONS

- A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.
- B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.
- C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- D. Provide Seismic tested equipment as follows:
 - 1. The equipment and major components shall be suitable for and certified by actual seismic testing to meet all applicable seismic requirements of the 2006 International Building Code (IBC). Guidelines for the installation consistent with these requirements shall be provided by the equipment manufacturer and based upon testing of representative equipment. Equipment certification acceptance criteria shall be based upon the ability for the equipment to be returned to service immediately after a seismic event within the above requirements without the need for repairs.
 - 2. The following minimum mounting and installation guidelines shall be met, unless specifically modified by the above referenced standards.
 - a. The Contractor shall provide equipment anchorage details, coordinated with the equipment mounting provision, prepared and stamped by a licensed qualified engineer in New York State. Mounting recommendations shall be provided by the manufacturer based upon the above criteria to verify the seismic design of the equipment.
 - b. The equipment manufacturer shall certify that the equipment can withstand, that is, function following the seismic event, including both vertical and lateral required response spectra as specified in above codes.
 - c. The equipment manufacturer shall document the requirements necessary for proper seismic mounting of the equipment. Seismic qualification shall be considered achieved when the capability of the equipment, meets or exceeds the specified response spectra.
 - d. Provide NYS licensed professional engineer signed and sealed drawings indicating seismic requirements are met.

1.06 REGULATORY REQUIREMENTS

- A. UL label required.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.08 OPERATION AND MAINTENANCE MANUALS

- A. Equipment operation and maintenance manuals shall be provided with each assembly shipped and shall include instruction leaflets, instruction bulletins and renewal parts lists where applicable, for the complete assembly and each major component.

1.09 FIELD MEASUREMENTS

- A. Measure primary and secondary voltages and make appropriate Tap adjustments.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Eaton
- B. Square D
- C. General Electric
- D. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.
- E. Manufacturer of Substation Transformers shall match that of Medium Voltage Load Interruper Switchgear, and Low Voltage Metal-Enclosed Drawout Switchgear.

2.02 RATINGS

- A. The ratings of the transformer shall be as follows or as shown on the drawings:
- B. Transformer T1 and T2:
 - 1. kVA Rating: 4500/5175 AA/FA
 - 2. Temperature Rise: 80/115 °C
 - 3. Impedance: 5.75%
 - 4. HV: 13.8kV Delta
 - 5. HV BIL: 95kV
 - 6. HV De-energized Taps: +/- 2 - 2-1/2% full capacity
 - 7. LV: 4160Y/2400 Volts
 - 8. LV BIL: 60kV
- C. Transformer T3 through T6:
 - 1. kVA Rating: 2000/2667 AA/FA
 - 2. Temperature Rise: 115/115 °C
 - 3. Impedance: 5.75%
 - 4. HV: 4160V Delta
 - 5. HV BIL: 60kV
 - 6. HV De-energized Taps: +/- 2 - 2-1/2% full capacity
 - 7. LV: 480Y/277 Volts
 - 8. LV BIL: 10kV

2.03 CONSTRUCTION

- A. Forced air (FA) units shall contain all necessary components and wiring, including fans, for automatically increasing the kVA rating by 33%. The package shall include a TC-50 Transformer Temperature Controller that monitors up to three (3) ventilated Dry Type transformer windings and (1) ambient temperature. The unit shall provide Fans, Alarm, and Trip output relays. Form C contacts shall be provided to trip the transformer off-line if any of the winding temperatures exceeds the trip setting. A 4-20 mA analog signal shall be provided for remote indication or for use with SCADA/BMS systems. Control power shall be provided from a control power transformer in the secondary equipment.

- B. The electrical insulation system shall utilize Class 220 material in a fully rated 155 degrees C system. Transformer design temperature rise of 105 degrees C shall be based on a 30 degrees C average ambient over a 24-hour period with a maximum of 40 degrees C. Solid insulation in the transformer shall consist of inorganic materials such as glass fiber, electrical grade epoxy and Nomex. All insulating materials must be rated for continuous 185 degrees C duty.
- C. For enhanced environmental protection and improved withstand to thermal shock and short-circuit stresses, the primary and secondary coil assemblies shall be of cast coil design. Each cast-coil shall be cast under vacuum to ensure complete, void-free epoxy resin impregnation throughout the entire insulation system.
- D. The average temperature rise of the transformer windings shall not exceed 100 degrees C when the transformer is operated at full nameplate rating. The transformer(s) shall be capable of carrying 100% of nameplate kVA rating in a 40 degrees C maximum
- E. 30 degrees C average ambient as defined by ANSI C57.12.00.
- F. High- and low-voltage windings shall be copper.
- G. The transformer shall be supplied in a knockdown case design, for ease in fitting through limited openings, and shall be of heavy gauge sheet steel construction, equipped with removable panels for access to the core and coils. Front and rear panels shall incorporate ventilating grills.
- H. The transformer shall be designed to meet the sound level standards for dry transformers as defined in NEMA TR1. The measurement procedure shall be as specified in ANSI C57.12.90.
- I. Enclosure Shall be NEMA Type 3R for outdoor applications (T1 and T2) and shall be NEMA Type 1 for indoor applications (T3 through T6).

2.04 ACCESSORIES

- A. Transformer shall include:
 - 1. Diagram instruction plate
 - 2. Provisions for lifting and jacking
 - 3. Removable center panel for access to high-voltage strap-type connector taps for de-energized tap changing
 - 4. Two ground pads with continuous ground bus

2.05 FINISH

- A. The paint shall be applied using an electrostatically deposited dry powder system to a minimum of three (3) mils average thickness. Outdoor cast-coil transformer units shall include suitable outdoor paint finish. Units shall be painted ANSI 61 for indoor service or outdoor service and shall match the primary and secondary equipment.

2.06 COORDINATION

- A. The transformer unit supplied shall include a HV close-coupled flange for connection to medium voltage load interrupter switchgear as shown on contract drawings. Connections between the primary device and transformer shall be cable.
- B. The transformer unit supplied shall have LV close-coupled flange as shown on drawings. Connections between the transformer & secondary shall be via flexible bus braid.

- C. Transformer, medium voltage load interrupter switch, metal enclosed switchgear shall be of the same manufacturer to ensure proper coordination.

PART 3 - EXECUTION

3.01 FACTORY TESTING

- A. The following standard factory tests shall be performed on all equipment provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.
 - 1. Resistance measurements of all windings on the rated voltage connection of each unit and at the tap extremes of one unit only of a given rating on this project
 - 2. Ratio tests on the rated voltage connection and on all tap connections
 - 3. Polarity and phase-relation tests on the rated voltage connections
 - 4. No-load loss at rated voltage on the rated voltage connection
 - 5. Exciting current at rated voltage on the rated voltage connection
 - 6. Impedance and load loss at rated current on the rated voltage connection of each unit and on the tap extremes of one unit only of a given rating on this project
 - 7. Applied potential test
 - 8. Induced potential tests
 - 9. For dry-type and cast-coil units, the manufacturer shall perform additional 100% quality control impulse test on the primary windings of each unit
 - 10. Partial Discharge tests
- B. The manufacturer shall provide three (3) certified copies of factory test reports.
- C. The following special factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest revision of ANSI and NEMA standards.
 - 1. Temperature test(s) shall be made on one unit. Tests shall not be required when there is an available record of a temperature test on an essentially duplicate unit. When a transformer is supplied with auxiliary cooling equipment to provide more than one rating, temperature tests as listed above shall be made on the lowest kVA OA or AA rating and the highest kVA FA rating
- D. Factory tests as outlined above shall be witnessed by the owner's representative.
 - 1. The manufacturer shall notify the owner a minimum of four (4) weeks prior to the date the tests are to be performed.
 - 2. The Contractor shall include the cost of airfare, food, hotel, and transportation for up to three (3) owner's representatives to attend and witness all factory testing.

3.02 INSTALLATION

- A. The Contractors shall install all equipment per the manufacturer's recommendations and the contract drawings.
- B. All necessary hardware to secure the assembly in place shall be provided by the Contractor in accordance with manufacturer's requirements.
- C. Equipment shall be installed so that sufficient access and working space is provided for ready and safe operation and maintenance.
- D. Steel channels shall be provided for support of equipment in accordance with manufacturer's installation recommendations. Equipment shall be securely mounted to surface with anchor bolts. Anchor substation to satisfy the specified seismic requirements of equipment.

- E. Install Substation nameplates for identification of equipment in accordance with specification 260553.
- F. The equipment shall be installed and checked in accordance with the manufacturer's recommendations. This shall include but not limited to:
 - 1. Checking to ensure that the floor/pad is level to within 0.125 inches per three feet of distance in any direction
 - 2. Checking to ensure that all bus bars are torqued to the manufacturer's recommendations
 - 3. Assembling all shipping sections, removing all shipping braces and connecting all shipping split mechanical and electrical connections
 - 4. Securing assemblies to foundation or floor channels
 - 5. Measuring and recording Megger readings phase-to-phase, phase-to-ground, and neutral-to-ground (four wire systems only)

3.03 FIELD ADJUSTMENTS

- A. Adjust taps to deliver appropriate secondary voltage.

3.04 FIELD TESTING

- A. After installation, transformers shall be field tested for operation and performance. The Contractor shall perform field testing in accordance with Specifications. The field tests shall be witnessed by Engineer and certified by the Contractor.
- B. The transformer testing shall be performed by the manufacturer's representative, prior to energizing equipment. The testing shall be in accordance with the manufacturer's representative. Equipment shall not be energized or de-energized without the permission of the Engineer.
- C. Measure primary and secondary voltages for proper tap settings.
- D. Megger primary and secondary windings.

3.05 FIELD QUALITY CONTROL

- A. Provide the services of a qualified factory-trained manufacturer's representative to assist the contractor in installation and startup of the equipment specified under this section for a period of two (2) working days per transformer. The manufacturer's representative shall provide technical direction and assistance to the Contractor in general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained herein.
- B. The Contractor shall provide three (3) copies of the manufacturer's field startup report.

3.06 ACCEPTANCE TESTING

- A. The Contractor shall provide acceptance testing of the transformer. All acceptance testing shall be performed by the testing firm, after the completion of the field tests. The acceptance testing shall be witnessed by the Engineer and certified by the Contractor.
- B. Acceptance testing inspection shall be performed on each transformer. Inspection shall include the following:
 - 1. Physical, electrical and mechanical condition shall be inspected.
 - 2. Proper anchorage, required area clearances, physical damage and proper alignment shall be checked.
 - 3. All connections shall be inspected for high resistance.

4. Electrical and mechanical interlock systems shall be checked for proper operation.
 5. Insulators shall be inspected for evidence of damage or contamination.
 6. Equipment shall be cleaned and lubricated.
- C. Acceptance electrical testing shall be performed on each transformer. Testing shall include the following:
1. Ground-resistance tests shall be performed.
 2. Insulation-resistance tests shall be performed on each bus section, on each switch, transformer and circuit breaker, phase-to-phase and phase-to-ground.
 3. Test each pole with other poles grounded. An over potential test shall be performed.
 4. Contact-resistance test shall be performed.
 5. Control and metering wiring performance test shall be performed
 6. Circuit breaker trip characteristics shall be determined by primary current injection.
- D. All tests and values shall be in accordance with the manufacturer's recommendations and NETA, ATS Acceptance Testing Specification.
- E. The Contractor shall provide an acceptance testing report. The report shall be in accordance with NETA, ATS Acceptance Testing Specification.

3.07 MANUFACTURER'S CERTIFICATION

- A. A qualified manufacturer's representative shall assist in the installation of the transformers, including but not limited to the following:
1. Check the transformer's installation before it is place into operation
 2. Assist in the performance of field tests
 3. Observe and assist initial operations
 4. Train the plant operations and maintenance staff in the care, operation and maintenance of the transformers
- B. A qualified factory-trained manufacturer's representative shall review the installation and certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.
- C. The Contractor shall provide a field report from the manufacturer's representative for each visit to the site. The report shall include complete information on time, schedule, tasks performed, persons contacted, problems corrected, test results, training, instruction and all other pertinent information.
- D. The Contractor shall provide three (3) copies of the manufacturer's representative's final certification upon approval of installation and completion of all start-up and testing services.

3.08 TRAINING

- A. The contractor shall provide a training session for up to five (5) owner's representatives for 1 normal workday at a job site location determined by the owner.
- B. The training session shall be conducted by a manufacturer's qualified representative. Training program shall include instructions on the transformer, auxiliary devices and other major components.

END OF SECTION

PART 1 - GENERAL

1.01 SCOPE

- A. The Contractor shall furnish and install the medium voltage load interrupter switchgear as specified herein and as shown on the contract drawings.

1.02 REFERENCES

- A. NFPA 70 - National Electrical Code (NEC)
- B. NYCEC - New York City Electrical Code
- C. The medium voltage load interrupter switchgear and all components shall be designed, manufactured and tested in accordance with the latest applicable standards as follows:
 - 1. ANSI/IEEE C37.20.3
 - 2. ANSI/IEEE C37.20.4
 - 3. ANSI C37.22
 - 4. ANSI C37.57, C37.58
 - 5. NEMA SG5
 - 6. NEMA SG6
 - 7. CSA 22.2 No.31-M89 (5/15 kV ratings only)
 - 8. EEMAC G8-3.3
- D. Listing by Underwriters Laboratories (UL) or Canadian Standards Association (CSA) shall be provided for 5 kV or 15 kV class medium voltage load interrupter switchgear.

1.03 SUBMITTALS - FOR REVIEW/APPROVAL

- A. The following information shall be submitted to the Engineer:
 - 1. Master drawing index
 - 2. Front view elevation
 - 3. Floor plan
 - 4. Top view
 - 5. Single line
 - 6. Nameplate schedule
 - 7. Component list
 - 8. Conduit entry/exit locations
 - 9. Assembly ratings including:
 - a. Short-circuit rating
 - b. Voltage
 - c. Continuous current
 - d. Basic Impulse Level
 - 10. Major component ratings including:
 - a. Voltage
 - b. Continuous current
 - c. Interrupting ratings
 - 11. Cable terminal sizes
 - 12. Bus duct connection
 - 13. Connection details between close-coupled assemblies
 - 14. Composite floor plan of close-coupled assemblies
 - 15. Electrical schematic diagram
 - 16. Key interlock scheme drawing and sequence of operations
 - 17. Descriptive bulletins
 - 18. Product data sheets

1.04 SUBMITTALS - FOR CONSTRUCTION

- A. The following information shall be submitted for record purposes:
 - 1. Final as-built drawings and information for items listed in Paragraph 1.03, and shall incorporate all changes made during the manufacturing process
 - 2. Wiring diagrams
 - 3. Certified production test reports
 - 4. Installation information including equipment anchorage provisions
 - 5. Seismic certification signed and sealed by NYS Licensed Professional Engineer.

1.05 QUALIFICATIONS

- A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.
- B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.
- C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- D. Provide Seismic tested equipment as follows:
 - 1. The equipment and major components shall be suitable for and certified by actual seismic testing to meet all applicable seismic requirements of the latest International Building Code (IBC)
 - 2. The IP rating of the equipment shall be 1.5
 - 3. The following minimum mounting and installation guidelines shall be met, unless specifically modified by the above referenced standards.
 - a. The Contractor shall provide equipment anchorage details, coordinated with the equipment mounting provision, prepared and stamped by a licensed qualified engineer in the state of New York. Mounting recommendations shall be provided by the manufacturer based upon the above criteria to verify the seismic design of the equipment.
 - b. The equipment manufacturer shall certify that the equipment can withstand, that is, function following the seismic event, including both vertical and lateral required response spectra as specified in above codes.
 - c. The equipment manufacturer shall document the requirements necessary for proper seismic mounting of the equipment. Seismic qualification shall be considered achieved when the capability of the equipment, meets or exceeds the specified response spectra.
 - d. Provide NYS licensed professional engineer signed and sealed drawings indicating seismic requirements are met.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.
- B. Each switchgear assembly shall be split into shipping groups for handling as indicated on the drawings or per the manufacturer's recommendations. Shipping groups shall be designed to be shipped by truck, rail or ship. Shipping groups shall be bolted to skids. Accessories shall be packaged and shipped separately. Each switchgear shipping group shall be equipped with lifting eyes for handling solely by crane.

1.07 OPERATION AND MAINTENANCE MANUALS

- A. Equipment operation and maintenance manuals shall be provided with each assembly shipped, and shall include instruction leaflets and instruction bulletins for the complete assembly and each major component.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Eaton
- B. Square D
- C. General Electric
- D. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.
- E. Manufacturer of Medium Voltage Load Interrupter Switchgear shall match that of Substation Transformers, Low Voltage Metal-Enclosed Drawout Switchgear, and Low Voltage Bus Duct System.

2.02 RATINGS

- A. Switchgear assembly ratings shall be as follows:
 - 1. Nominal System Voltage: 13.8 kV
 - 2. System Grounding: Resistive
 - 3. Main Cross Bus Continuous Current: None
 - 4. Maximum Design Voltage: 15 kV
 - 5. BIL: 95 kV
 - 6. Switch Rating (Continuous and Load Break): 600 Amperes
 - 7. Momentary withstand: 40 kA Asym rms
 - 8. Switch Fault close: 40 kA Asymmetrical
 - 9. Switch 2-Second Short Circuit Current: 25 kA Sym RMS
 - 10. Type of Fuse: CLE
 - 11. Fuse Interrupting Rating: 63 kA Sym RMS
 - 12. Fuse Rating: As shown on Drawings
 - 13. Fused Switch Fault close: 101 kA Asym RMS

2.03 CONSTRUCTION

- A. The metal-enclosed load interrupter switchgear shall consist of deadfront, completely metal-enclosed vertical sections containing load interrupter switches and fuses (where shown) of the number, rating and type noted on the drawings or specified herein.
- B. The following features shall be supplied on every vertical section containing a three-pole, two-position open-closed switch:
 - 1. A minimum 8-inch x 16-inch high-impact viewing window that permits full view of the position of all three switch blades through the closed door. The window shall not be more than 58 inches above the switch pad level to allow ease of inspection.
 - 2. The door shall be interlocked with the switch so that:

- a. The switch must be opened before the door can be opened
 - b. The door must be closed before the switch can be closed
 3. A hinged grounded metal barrier that is bolted closed in front of every switch to prevent inadvertent contact with any live part, yet allows for a full-view inspection on the switch blade position
 4. Provision for padlocking the switch in the open or closed position
 5. Green OPEN, Red CLOSED switch position indicators with the words "Open" and "Closed" in French, Spanish and English
 6. A hinged cover with rustproof quarter turn nylon latches over the switch operating mechanism to discourage casual tampering
 7. The switch shall be removable from the structure as a complete operational component
- C. Vertical section construction shall be of the universal frame type using die-formed and bolted parts. All enclosing covers and doors shall be fabricated from steel whose thickness shall be equal to or greater than those specified in ANSI/IEEE C37.20.3. No owner removable hardware for covers or doors shall be thread-forming type. To facilitate installation and maintenance of cables and bus in each vertical section, a split removable top cover and padlockable hinged rear door shall be provided. A G90 grade galvanized base shall isolate equipment from contact with the concrete pad providing protection from rust. Heavy-duty hot dipped galvanized anchor clips shall be provided to anchor the switchgear to the concrete pad.
- D. Each vertical section containing a switch shall have a single, full-length, flanged front door and shall be equipped with two (2) rotary latch-type padlockable handles. Provision shall be made for operating the switch and storing the removable handle without opening the full length door.
- E. Each load interrupter switch shall have the following features:
1. Three-pole gang-operated mechanism
 2. Manual quick-make, quick-break over-toggle-type mechanism that does not require the use of a chain or a cable for operation, and utilizes a heavy-duty coil spring to provide opening and closing energy
 3. The speed of opening and closing the switch shall be independent of the operator, and it shall be impossible to tease the switch into any intermediate position under normal operation
 4. Separate main and break contacts to provide maximum endurance for fault close and load interrupting duty
 5. Insulating barriers between each phase and between the outer phases and the enclosure
 6. A maintenance provision for slow closing the switch to check switch blade engagement and slow opening the switch to check operation of the arc interrupting contacts.

2.04 BUS

- A. All phase bus conductors shall be tin-plated copper.
- B. Ground bus shall be silver-plated copper and be directly fastened to a galvanized metal surface of each vertical section, and be of a size sufficient to carry the rated
- C. (2-second) current of the switchgear assembly.

2.05 BUS INSULATION SYSTEM

- A. All bus shall be supported utilizing a high strength and high creep, support providing 10.5-inch of creep distance between phases and ground. The molded fins shall be constructed of high track resistant aramid nylon
- B. All standoff insulators on switches and fuse mountings shall be glass polyester.

2.06 FUSES

- A. Provide three (3) spare fuses for each fused switch.

2.07 ENCLOSURES

- A. Enclosures shall be constructed per IEEE/ANSI C37.20.3 indoor specifications. (Meets or exceeds NEMA 1.)
- B. Each vertical section shall be ventilated at the top and bottom, both front and rear, to allow airflow to provide cooling and to help prevent buildup of moisture within the structure.

2.08 NAMEPLATES

- A. A nameplate shall be mounted on the front door of each switch vertical section in accordance with the drawings.

2.09 COORDINATION

- A. Medium Voltage Load Interrupter Switchgear shall be coordinated with additional equipment on site to ensure proper installation and operation of the system
 1. Switch must be coordinated with Medium Voltage Cast Coil transformer to ensure proper installation.
 2. Connection between Medium Voltage Load Interrupter Switchgear and Medium Voltage Cast Coil transformer shall be made via the use of flexible MV cable provided by transformer manufacturer.
 3. Medium Voltage Load Interrupter Switchgear and Medium Voltage Cast Coil transformer shall be of the same manufacturer to ensure proper coordination.

PART 3 - EXECUTION

3.01 FACTORY TESTING

- A. Standard factory tests shall be performed on the equipment under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.
- B. Factory tests as outlined above shall be witnessed by the owner's representative.
 1. The manufacturer shall notify the owner a minimum of four (4) weeks prior to the date the tests are to be performed.
 2. The Contractor shall include the cost of airfare, food, hotel, and transportation for up to three (3) owner's representatives to attend and witness all factory testing.
- C. The manufacturer shall provide three (3) certified copies of factory test reports.

3.02 INSTALLATION

- A. The Contractors shall install all equipment per the manufacturer's recommendations and the contract drawings.
- B. Equipment shall be installed so that sufficient access and working space is provided for ready and safe operation and maintenance.
- C. Steel channels shall be provided for support of equipment. Equipment shall be securely mounted to surface with anchor bolts. Anchor substation to satisfy the specified seismic requirements of equipment.

- D. Install Substation nameplates for identification of equipment.

3.03 FIELD TESTING

- A. After installation, load interrupter switch shall be field tested for operation and performance. The Contractor shall perform field testing in accordance with Specifications. The field tests shall be witnessed by the Engineer and certified by the Contractor.
- B. Substation testing shall be performed by the manufacturer's representative, prior to energizing equipment. The testing shall be in accordance with the recommendations of the manufacturer's representative. Equipment shall not be energized without the permission of the Engineer.

3.04 FIELD QUALITY CONTROL

- A. Provide the services of a qualified factory-trained manufacturer's representative to assist the Contractor in installation and startup of the equipment specified under this section for a period of one (1) working day per switch. The manufacturer's representative shall provide technical direction and assistance to the Contractor in general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained therein.
- B. The Contractor shall provide three (3) copies of the manufacturer's fieldstartup report.

3.05 ACCEPTANCE TESTING

- A. The Contractor shall provide acceptance testing of the load interrupter switch. All acceptance testing shall be performed by the testing firm, after the completion of the field tests. The acceptance testing shall be witnessed by the Engineer and certified by the Contractor.
- B. Acceptance testing inspection shall be performed on each load interrupter switch. Inspection shall include the following:
 - 1. Physical, electrical and mechanical condition shall be inspected.
 - 2. Proper anchorage, required area clearances, physical damage and proper alignment shall be checked.
 - 3. All connections shall be inspected for high resistance.
 - 4. Electrical and mechanical interlock systems shall be checked for proper operation.
 - 5. Insulators shall be inspected for evidence of damage or contamination.
 - 6. Equipment shall be cleaned and lubricated as required.
- C. Acceptance electrical testing shall be performed on each load interrupter switch. Testing shall include the following:
 - 1. Ground-resistance tests shall be performed.
 - 2. Insulation-resistance tests shall be performed on each bus section, on each switch, transformer and circuit breaker, phase-to-phase and phase-to-ground.
 - 3. Test each pole with other poles grounded. An over potential test shall be performed.
 - 4. Contact-resistance test shall be performed.
 - 5. Control and metering wiring performance test shall be performed
 - 6. Circuit breaker trip characteristics shall be determined by primary current injection.
- D. All tests and values shall be in accordance with the manufacturer's recommendations and NETA, ATS Acceptance Testing Specification.
- E. The Contractor shall provide an acceptance testing report. The report shall be in accordance with NETA, ATS Acceptance Testing Specification.

3.06 MANUFACTURER'S CERTIFICATION

- A. A qualified manufacturer's representative shall assist in the installation of the load interrupter switches, including but not limited to the following:
 - 1. Check the switch's installation before it is place into operation
 - 2. Assist in the performance of field tests
 - 3. Observe and assist initial operations
 - 4. Train the plant operations and maintenance staff in the care, operation and maintenance of the switches
- B. A qualified factory-trained manufacturer's representative shall review the installation and certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.
- C. The Contractor shall provide a field report from the manufacturer's representative for each visit to the site. The report shall include complete information on time, schedule, tasks performed, persons contacted, problems corrected, test results, training, instruction and all other pertinent information.
- D. The Contractor shall provide three (3) copies of the manufacturer's representative's certification.

3.07 TRAINING

- A. The Contractor shall provide a training session for up to five (5) owner's representatives for 1 normal workday at a job site location determined by the owner.
- B. The training session shall be conducted by a manufacturer's qualified representative and consist of instruction on the assembly, switches and major components.

END OF SECTION

GENERAL

1.01 SCOPE

- A. The Contractor shall furnish and install the equipment as specified herein and as shown on the contract drawings.

1.02 REFERENCES

- A. The metal-clad switchgear and all components shall be designed, manufactured and tested in accordance with the latest applicable standards of ANSI/IEEE C37.20.2 and CSA C22.2 No. 31-04. 15 switchgear shall be UL listed and supplied with UL labels

1.03 SUBMITTALS – FOR REVIEW/APPROVAL

- A. The following information shall be submitted to the Engineer:
 - 1. Master drawing index
 - 2. Front view elevation
 - 3. Floor plan
 - 4. Top view
 - 5. Single line diagram
 - 6. Nameplate schedule
 - 7. Component list
 - 8. Conduit entry/exit locations
 - 9. Assembly ratings including:
 - a. Short-circuit rating
 - b. Voltage
 - c. Continuous current
 - d. Basic impulse level for equipment over 600 volts
 - 10. Major component ratings including:
 - a. Voltage
 - b. Continuous current
 - c. Interrupting ratings
 - 11. Cable terminal sizes
 - 12. Product data sheets
- B. Where applicable, the following additional information shall be submitted to the Engineer:
 - 1. Busway connection
 - 2. Connection details between close-coupled assemblies
 - 3. Composite floor plan of close-coupled assemblies
 - 4. Key interlock scheme drawing and sequence of operations
 - 5. Descriptive bulletins

1.04 SUBMITTALS – FOR CONSTRUCTION

- A. The following information shall be submitted for record purposes:
 - 1. Final as-built drawings and information for items listed in Paragraph 1.03, and shall incorporate all changes made during the manufacturing process.
 - 2. Wiring diagrams
 - 3. Certified production test reports
 - 4. Installation information including equipment anchorage provisions
 - 5. Seismic certification as specified

1.05 QUALIFICATIONS

- A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.
- B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.
- C. Provide Seismic qualified equipment as follows:
 - 1. The equipment and major components shall be suitable for and certified by actual seismic testing to meet all applicable seismic requirements of the latest International Building Code (IBC).
 - 2. The Project Structural Engineer will provide site specific ground motion criteria for use by the manufacturer to establish Sds values required.
 - 3. The Ip rating of the equipment shall be 1.5
 - 4. The Structural Engineer for the Site will evaluate the Sds values published on the Manufacturer's website to ascertain that they are "equal to" or "greater than" those required for the Project Site.
 - 5. The following minimum mounting and installation guidelines shall be met, unless specifically modified by the above referenced standards.
 - a. The Contractor shall provide equipment anchorage details, coordinated with the equipment mounting provision, prepared and stamped by a licensed civil engineer in the state. Mounting recommendations shall be provided by the manufacturer based upon the above criteria to verify the seismic design of the equipment.
 - b. The equipment manufacturer shall certify that the equipment can withstand, that is, function following the seismic event, including both vertical and lateral required response spectra as specified in above codes.
 - c. The equipment manufacturer shall document the requirements necessary for proper seismic mounting of the equipment. Seismic qualification shall be considered achieved when the capability of the equipment, meets or exceeds the specified response spectra.

1.06 REGULATORY REQUIREMENTS

1.07 DELIVERY, STORAGE AND HANDLING

- A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.
- B. Shipping groups shall be designed to be shipped by truck, rail, or ship. Breakers and accessories shall be packaged and shipped separately.
- C. Switchgear shall be equipped to be handled by crane. Where cranes are not available, switchgear shall be suitable for skidding in place on rollers using jacks to raise and lower the groups.
- D. Switchgear being stored prior to installation shall be stored so as to maintain the equipment in a clean and dry condition. If stored outdoors, indoor gear shall be covered and heated, and outdoor gear shall be heated.

1.08 OPERATION AND MAINTENANCE MANUALS

- A. Equipment operation and maintenance manuals shall be provided with each assembly shipped, and shall include instruction leaflets and instruction bulletins for the complete assembly and each major component.

1.09 PRODUCTS

1.10 MANUFACTURERS

- A. Eaton
- B. Square D
- C. ABB/General Electric
- D. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.

1.11 RATINGS

- A. 5kV Switchgear
 - 1. The switchgear described in this specification shall be designed for operation on a 4.16 kV, three-phase, three wire, solidly grounded 60 hertz system. The switchgear assembly shall be rated for 60 kV BIL.
 - 2. Each circuit breaker shall have the following ratings:
 - a. Rated Maximum Voltage: 5 kV
 - b. Lightning Impulse Withstand Voltage (BIL): 60 kV peak
 - c. Continuous Current (5/15 kV): 1200 Ampere
 - d. Short-Circuit Current at rated Maximum Voltage: 40 kA rms sym
 - e. Rated Voltage Range Factor K: 1.0
 - f. Closing and Latching Capability: 104 kA peak
 - g. Maximum Symmetrical Interrupting and short-time Rating: 40 kA rms sym
2 sec
 - h. Rated Interrupting Time: 3 cycle
 - 3. Note: When a circuit breaker is used for switching a capacitor bank, it shall be rated for switching an isolated or back-to-back capacitor bank. Refer to drawings for identification of circuit breakers that are used for capacitor bank switching.

1.12 CONSTRUCTION

- A. The switchgear assembly shall consist of individual vertical sections housing various combinations of circuit breakers and auxiliaries, bolted to form a rigid metal-clad switchgear assembly. Metal side sheets shall provide grounded barriers between adjacent structures and solid removable metal barriers shall isolate the major primary sections of each circuit. The 15kV switchgear shall be arranged in 2-high configuration. Hinged rear doors, complete with provisions for padlocking, shall be provided.
- B. Each breaker compartment door shall include a viewing window to allow the operator to visually confirm the breaker position inside of the compartment.
- C. The stationary primary contacts shall be silver-plated and recessed within insulating tubes. A steel shutter shall automatically cover the stationary primary disconnecting contacts when the breaker is in the disconnected position or out of the cell. Provide rails to allow withdrawal of each 5, 15 and 27 kV circuit breaker for inspection and maintenance without the use of a separate lifting device

1.13 BUS

- A. The main bus shall be copper, insulated with fluidized bed epoxy, flame-retardant and track-resistant insulation. The bus supports between units shall be flame-retardant, track-resistant, glass polyester for 5- and 15-kV class. The switchgear shall be constructed so that all buses, bus supports and connections shall withstand stresses that would be produced by currents equal to the momentary ratings of the circuit breakers. Main bus for 15 kV shall be rated 1200 amperes. Insulated copper main bus shall be provided and have provisions for future extension. All bus joints shall be silver-plated, bolted and insulated with easily installed boots. The bus shall be braced to withstand fault currents equal to the close and latch rating of the breakers. The temperature rise of the bus and connections shall be in accordance with IEEE standards and documented by design tests.
- B. A copper ground bus shall extend the entire length of the switchgear and shall meet section 408.60 of the NYC 2011 Electrical Code Technical Provisions.

1.14 WIRING/TERMINATIONS

- A. The switchgear manufacturer shall provide suitable terminal blocks for secondary wire terminations, with a minimum of 10% spare terminals. One control circuit cutout device shall be provided for each circuit breaker. Switchgear secondary wire shall be #14 AWG, type SIS rated 600 volt, 90 degrees C, furnished with wire markers at each termination. Wires shall terminate on terminal blocks with marker strips numbered in agreement with detailed connection diagrams. Wire markers shall be marked with To-From designations and wire ID at each end.
- B. Incoming line and feeder cable lugs of the type and size indicated elsewhere shall be furnished. The design shall meet section 408.60 of the New York City Electrical Code.

1.15 CIRCUIT BREAKERS

- A. The circuit breakers shall be horizontal drawout type, capable of being withdrawn on rails. The breakers shall be operated by a motor-charged stored energy spring mechanism, charged normally by a universal electric motor and in an emergency by a manual handle. The primary disconnecting contacts shall be silver-plated copper.
- B. Each circuit breaker shall contain three vacuum interrupters separately mounted in a self-contained, removable self-aligning pole unit. The vacuum interrupter pole unit shall be mounted on glass polyester supports for 5 and 15 kV class A contact wear gap indicator for each vacuum interrupter, which requires no tools to indicate available contact life, shall be easily visible when the breaker is removed from its compartment. The current transfer from the vacuum interrupter moving stem to the breaker main conductor shall be a non-sliding design. The breaker front panel shall be removable when the breaker is withdrawn for ease of inspection and maintenance.
- C. The secondary contacts shall be silver-plated and shall automatically engage in the breaker operating position. For 5/15 kV switchgear, there shall be a distinct test position, which shall be automatically engaged.
- D. Interlocks shall be provided to prevent closing of a breaker between operating and test positions, to trip breakers upon insertion or removal from stationary structure, and to discharge stored energy mechanisms upon insertion or removal from the stationary structure. The breaker shall be secured positively in the stationary structure between and including the operating and test positions.

- E. Provide capability for manual levering of the breaker to and from the connected position with the door closed.
- F. The breakers shall be electrically operated by the following control voltages:
 - 1. 125 volt DC close and 125 volt DC trip.
 - 2. For each breaker, provide green and red LED lights to indicate breaker open and closed status.
- G. DC control voltage shall be supplied by purchaser
- H. Each circuit breaker compartment shall be provided with an integral motorized racking device accessory, equal to Eaton VC-W MR2, with the following features:
 - 1. Allow moving the breaker between the connect, test and disconnect positions (applicable to 5 and 15 kV) from a distance of up to 30 feet via a hand held pendant, with the breaker compartment door closed.
 - 2. Breaker position shall be indicated on the pendant by LED lights. A blinking light indicates that the circuit breaker is in the motion through the selected position. A solid (non-blinking) light indicates that the circuit breaker has reached and stopped in the selected position. In case normal operation fails, the appropriate error code is displayed on the pendant in a separate 2 character LED display window.
 - 3. The system shall be designed such that it allows manual racking of the circuit breaker using the levering crank accessory. Manual racking operation shall disable the motorized racking accessory.
 - 4. It shall be possible to enable/disable operation of the motorized racking accessory via purchaser's external interlocking/permissive contacts.
 - 5. 120 V AC power for the motorized racking accessory shall be supplied by a control power transformer integral to the switchgear.
 - 6. The hand held pendant shall also include "Open" and "Close" pushbuttons to allow remote operation of the circuit breaker.
 - 7. Provide a discrete I/O interface module mounted in each circuit breaker control compartment, daisy chained, for control of the motorized racking accessory via Purchaser's remote control system using a Modbus interface. Whenever the hand held pendant is in use, the pendant becomes the master and will override the Modbus interface.

1.16 PROTECTIVE RELAYS

- A. The switchgear manufacturer shall furnish and install, in the metal-clad switchgear, the quantity, type and rating of protection relays as indicated on the drawings and described hereafter in this specification.
 - 1. Main and Tie Circuit Breakers:
 - a. SEL751A Microprocessor-based multi-function overcurrent protection relay, ANSI device function 51/50, 51/50N, or 51/50G, and 86.
 - 2. Feeder Circuit Breakers:
 - a. SEL 751A Microprocessor-based multi-function protective relay, ANSI device function 51/50, 51N/50N, 50BF, 25, 32, 46, 55, 67, 27, 59, 59N, 47, 79, 81O,81U and 86. Also includes metering functions.

1.17 AUXILIARY DEVICES

- A. Ring type current transformers shall be furnished as indicated on the contract drawings. The thermal and mechanical ratings of the current transformers shall be coordinated with the circuit breakers. Their accuracy rating shall be equal to or higher than those specified in IEEE C37.20.2. The standard location for the current transformers on the bus side and line side of the 5, 15, 27 and 150 kV BIL 38 kV breaker units shall be front accessible to permit adding or

changing current transformers without removing high-voltage insulation connections. Shorting terminal blocks shall be furnished on the secondary of all the current transformers.

- B. Voltage transformers or resistive voltage dividers shall be supplied as shown on the one-line diagram.
 - 1. The voltage transformers shall be mounted on tilt-out trunnions or drawout drawer assemblies and equipped with current limiting primary fuses. In the withdrawn position, the fuses and the potential transformers shall be disconnected and grounded to permit safe inspection and/or replacement of the fuses. The trunnion frame shall be connected to ground by a flexible copper cable that is attached directly to the frame. The mechanism shall be arranged so that full access to potential transformers or fuses cannot be accomplished until they are disconnected from high voltage and grounded. Live parts shall be isolated when the voltage transformers are in the withdrawn position to prevent accidental contact by operating or maintenance personnel. Stationary contacts shall be silver plated copper and mounted on porcelain or glass polyester supports. Cables connected to voltage transformer primaries shall be rated for the full voltage and BIL rating of the switchgear.
 - 2. Resistive voltage dividers can be used in place of voltage transformers. Resistive voltage dividers shall carry the same rating as the specified voltage transformers. They are to be mounted in the cable compartment of the switchgear assembly. Resistive voltage dividers must consist of 4 total non-inductive resistors (two paralleled medium voltage resistors and two paralleled low voltage resistors). When the nominal service voltage is applied, the resistive voltage divider system shall provide a 120 V signal to the auxiliary devices for protection and controls. The resistive voltage divider system shall be agnostic of the auxiliary devices to which they connect.
- C. A mechanical interlock shall be provided to require the secondary breaker to be open before the CPT drawer or CPT primary fuse drawer can be withdrawn.
- D. Where indicated on the drawings, provide surge protection.

1.18 METERING, MONITORING AND CONTROL

- A. Provide owner metering devices where shown on the drawings.
- B. Provide current transformers for metering as shown on the drawings. Current transformers shall be wired to shorting type terminal blocks.
- C. Provide potential transformers including primary and secondary fuses with disconnecting means for metering as shown on the drawings.
- D. Microprocessor-based metering system.
 - 1. Where indicated on the drawings, provide a separate customer metering compartment with a front facing hinged door and a UL listed microprocessor based multifunction power meter equal to Eaton PXM1200. Include current transformers wired to shorting-type terminal blocks for each meter. Provide fused potential taps as the potential source for metering as shown on the drawings.
 - 2. The meter surge withstand shall conform to IEEE C37.90.1 and ANSI C62.41.
 - 3. The meter shall be user programmable for voltage range to any PT ratio.
 - 4. The meter shall accept a direct voltage input range of up to 400 Volts Line to Neutral, and a range of up to 690 Volts Line to Line.
 - 5. Meter shall accept the following current sensor types:
 - a. 5A
 - b. 1A
 - c. 333mV
 - d. 100mV Rogowski Coil

6. The meter shall have the following additional ratings and features:
 7. Meter current input withstand rated for 20A continuous. Fault Current Withstand shall be 100 Amps for 1 seconds
 8. Meter shall be programmable for current to any CT ratio. The use of DIP switches for selecting fixed ratios shall not be acceptable
 9. All inputs and outputs shall be galvanically isolated to 2500 Volts AC.
 10. The meter shall have an accuracy of +/- 0.2% or better for volts and amps, and 0.2% for power and energy functions. The meter shall meet the accuracy requirements of IEC62053-22 (class 0.2S) and ANSI C 12.20 (Class 0.2).
 - a. The meter shall sample the current and voltage inputs at 512 samples per cycle for high accuracy metering.
 - 1) Meter shall provide the following measurements with a 100ms update rate:
 - (a) Volts (phase to phase and phase to neutral; per phase and average)
 - (b) Amps (per phase, neutral, and average)
 - (c) KW (per phase, and total)
 - (d) KVAR (per phase and total)
 - (e) KVA (per phase and total)
 - (f) PF (apparent power factor)
 - (g) Frequency
 - 2) Type MM1000 meters shall provide the following measurements with a 1 s update rate:
 - (a) kWh (forward, reverse, total, net)
 - (b) kVARh , (forward, reverse, total, net)
 - (c) kVAh (total)
 - (d) kWh per phase (forward, reverse)
 - (e) kVARh per phase (forward, reverse)
 - (f) kVAh per phase (total)
 - (g) % THD (Total Harmonic Distortion) monitoring to the 63rd harmonic order for currents and L-N voltage in 4 wire wye and L-L voltage in 3 Wire Delta
 11. The meter shall provide user configured fixed window or sliding window demand. This shall allow the user to set up the particular utility demand profile.
 12. Demand Readings shall be available for kW, kVAR and kVA.
 13. The meter shall include independent communication option modules that can be mounted on the back of the meter supporting multiple protocols, including the following minimum capability:
 - a. Serial Communication Format (standard – included on base meter)
 - 1) Connection Type: RS-485
 - 2) Protocols: Modbus RTU, DNP 3.0
 - 3) Baud rates shall be from 1200 to 38,400 baud
 - b. Network Communication Format
 - 1) Connection Type: RJ-45 10/100 Base-T Ethernet Network port
 - 2) Protocols: Ethernet TCP/IP, Modbus TCP, BACnet/IP SMTP (email), HTTP, HTTPS, NTP
- E. Remote Switchgear Control
1. Switchgear shall be provided with dedicated microprocessor control system, Eaton Power Xpert Dashboard or approved equal.
 2. Dashboard System will utilized a minimum 15.6" HMI for the control of the switchgear. The HMI shall be mounted in an enclosure mounted on the wall and wired by the contractor. The enclosure shall include a disconnect and power supply to power the HMI. The enclosure shall be located near the switchgear but outside the arc flash boundary.
 3. The HMI shall use Ethernet CAT6 as physical media to communicate with the Power Xpert Dashboard Processor located in the switchgear either directly or via an Ethernet switch.
 4. Security

- a. Local viewing of the Dashboard on the HMI shall not require a login. All other access will require a username and password subject to configurable password rules.
 - b. The Dashboard shall support multiple security levels that can be assigned as roles to simplify creating user accounts. Role-Based Access Control (RBAC) shall be used to create the set of users and role-based permissions. A comprehensive set of password management features shall be available to allow compliance with security policies in effect at the site.
 - c. Control access points shall be strictly controlled through pairing of the HMI, with the processor. Additional security shall be provided by limiting access to the communication ports by authorized trusted hosts' IP addresses
 - d. SSL Encryption shall be available to ensure that information and passwords exchanged with the Dashboard cannot be intercepted on the LAN.
 - e. The Dashboard Processor shall be certified to the UL 2900-2-2 cybersecurity standard.
5. Remote access to view information on the Power Xpert Dashboard Processor shall be available through a web interface. The web interface shall be accessible on personal computers, tablets or phones. All remote breaker control through the web interface shall be disabled unless the user enables this access for specific users.
6. Arc Flash
- a. The Dashboard shall display the appropriate PPE level and ARMS status based on data provided from an arc flash study and status of the main breaker's Arc Flash Reduction Mode on all the screens.
 - b. Touching the PPE level indicator shall display customizable diagrams of relevant PPE that meet site requirements for the incident energy levels shown in the switchgear. This page shall also display the arc flash boundary distance and calculated incident energy level at this distance.
 - c. Arc flash incident energy levels shall be shown for each switchgear bus both on the one line and elevation screens.
 - d. Changes in ARMS status will cause the energy levels to update based on the arc flash study data.
7. The Dashboard shall have following tabs:
- a. One-line
 - b. Elevation
 - c. Timeline
 - d. Documents
 - e. Settings
8. Tapping each device shall open a new window on the HMI screen showing the details as follows:
- a. Protective Relays: maintenance mode status, total trip, last trip, device alarm conditions, metering trends, sequence of events and cause of trip
 - b. Meters: basic metering information not limited to currents, voltages, frequency, power factor, power, energy, THD, harmonics, trends, waveforms, alarms and I/O status.
9. Under the One-line tab the Dashboard shall display the switchgear one line diagram. The one line diagrams shall include the following, but not limited to:
- a. Source, and bus status indicated by different colors
 - b. Breaker status (open/closed/tripped/ARMS/racked in & racked out)
 - c. Breaker control, such as open/close and ARMS activation
 - d. Basic values from trip units and meters
 - e. Alarm conditions
 - f. Arc flash energy levels for each bus.
10. Under the Elevation tab the graphics shall mimic the physical switchgear elevation or front view. The view shall include the following, but not limited to:
- a. Representation of the switchgear including appropriate number of structures, breaker counts and breaker locations.

- b. Breaker status (open, closed, tripped, racked in and racked out) shall be displayed on the elevation view, relative to physical location of the breaker.
 - c. Breaker control such as open, close, Arc Flash Reduction Maintenance Mode activation and MV remote breaker rack in-out when the switchgear is so equipped.
 - d. The structure and breaker locations shall be clearly identified in this mode.
 - e. A color coded mimic bus shall be displayed, bus and breaker status shall be indicated by different colors depending on energized/de-energized conditions.
 - f. Alarm conditions in red, further information on the type of alarm shall be available by tapping the device.
11. Under the Timeline tab, time stamped alarm or fault conditions as well as user operations and login information shall be displayed identifying user names.
 12. Under the Settings tab with the appropriate password level, users will be able to:
 - a. Update systems settings like colors, date and time and screen defaults
 - b. Add and modify devices
 - c. Add additional switchgear structures
 - d. Configure alarms
 - e. Update safety information such as PPE requirements.
 - f. Modify network settings
 - g. Configure user accounts and passwords
 13. Under the Docs tab, the following documents shall be available:
 - a. O&M Manual for the switchgear
 - b. Project Specific Drawings (Elevation, three-line, BOM, wiring diagrams, etc.)
 - c. User Manuals for Electronic components such as Protective Relays/ Trip Units, Meters and any other devices as seemed suitable by the end user.
 - d. Breaker Manuals
 - e. Coordination studies
 14. One Remote Control System shall be able to control all medium voltage and low voltage switchgear lineups at this location.

1.19 ENCLOSURES

- A. The switchgear described in these specifications shall be indoor construction, with devices arranged as shown on contract drawings.

1.20 NAMEPLATES

- A. Engraved nameplates, mounted on the face of the assembly, shall be furnished for all main and feeder circuits as indicated on the drawings. Nameplates shall be laminated plastic, black characters on white background, and secured with screws. Characters shall be 3/16-inch high, minimum. Furnish master nameplate for each switchgear lineup giving information in accordance with IEEE Std. C37.20.2-1999, Section 7.4.1. Circuit nameplates shall be provided with circuit designations as shown on purchaser's single-line diagrams.
- B. Control components mounted within the assembly, such as fuse blocks, relays, pushbuttons, switches, etc., shall be suitably marked for identification corresponding to appropriate designations on manufacturer's wiring diagrams.

1.21 FULLY EQUIPPED SPACE FOR FUTURE BREAKER

- A. Spaces indicated for future breakers shall be provided with complete wiring, terminal blocks, and mounting provisions for future breakers, current transformers, metering, including all outgoing wiring for future remote breaker control, alarm, and indication. Two (2) 12-point terminal blocks shall be provided as spares. Drilling provisions for switches, meterings, etc. on compartment doors are not required.

- B. Spare breakers shown without current transformers and metering shall have complete wiring the same as defined for fully-equipped spaces.

1.22 DC CONTROL VOLTAGE SYSTEM

- A. The switchgear control voltage shall be 125 VDC consisting of batteries, battery charger, battery racks, DC distribution panels and DC automatic transfer switches.
- B. The Vendor shall provide a 100% redundant system consisting of two sets of batteries with two sets of chargers for the 125 volt DC power system for the electrical equipment as indicated on the Drawings. Each battery shall be sized to simultaneously energize all the switchgear spring charge motors plus the continuous loads on the switchgear requiring 125 VDC power.
- C. Each battery shall be a pocket plate electrode industrial nickel cadmium type. The battery shall be sized in accordance with IEEE 1115-2000 procedures for operation at 32 degrees F. The battery shall be suitable for simultaneously energizing all the circuit breaker spring charge motors in the switchgear to a minimum battery voltage of 105 volts (1.14 volts/cell) at the battery terminals in addition to all the 125 VDC electrical equipment continuous loads. An aging factor of 1.25 shall also be applied. The Vendor shall submit sizing calculations for approval by the Engineer. Battery cell container material shall be translucent polypropylene. The battery shall be supplied wet and discharged, with all necessary intercell connectors, plastic covers and flame arrestor vent caps. Battery shall be SAFT Model SBL/SBM/SBH (model to be determined at time of sizing) and shall have a 25 year warranty (5 Years Full / 20 Years Pro-rata) in float service. Battery terminals shall be provided with protective covers. The battery rack shall be suitable for the sites seismic earthquake requirements. The steel battery rack shall be painted with ANSI 61 gray (JS011462) alkali and acid resistant paint. Battery supplier shall provide a layout drawing showing the detailed inter-cell connectors, inter-row and inter-tier cabling as appropriate.
- D. Each battery charger shall be powered from a single phase 120/208/240VAC or three phase 208/480 VAC source, 60 Hz. The battery charger shall be a SAFT Model filtered battery eliminator power supply type. The unit shall be equipped with an input circuit breaker, two pole 10,000 ampere interrupting rating and a two pole output DC circuit breaker. It shall be electronically current limited and shall automatically regulate voltage to plus or minus 0.5% for 0-100 percent load and plus or minus 10% input line voltage variation. The charger shall have a DC voltmeter and DC ammeter, analog type, 2% accuracy, and shall be housed in a front access wall or floor mounting NEMA 1 enclosure. It shall have an alarm board which has latching LED lights and auto reset relays with dry form C contacts for the following:
 - 1. Low DC voltage (red)
 - 2. High DC voltage (red)
 - 3. AC input voltage failure (red)
 - 4. Rectifier failure (red)
 - 5. Float mode (green)
 - 6. High rate (amber)
 - 7. DC output failure with contacts for remote alarm (red)
 - 8. Ground detection alarm (red)
 - 9. Summary alarm
- E. The charger shall have a 0-24 hour fully automatic equalize charge timer. After an outage of about 30 seconds or more, the charger shall automatically go into a boost charge voltage mode for a preset interval. At the end of this period, the charger shall automatically return to float. The charger shall restore the batteries after a complete discharge in twelve (12) hours.
- F. Spill Control and Accessories: Containment System shall be 4" high and shall extend 1" beyond the furthest point of the rack. System shall be liquid tight. The barrier must have checkerboard

yellow/black markings indicating caution, to alert employees or service personnel to potential hazards in the Battery Room. Markings must meet OSHA safety color code requirements. Provide absorption and neutralization mats in the quantity necessary to cover the entire area inside the system plus 10%. Spill containment and neutralization equipment must be supplied by the original manufacturer. Approved Vendor for spill containment and safety accessories shall be Acran.

1.23 5KV MIMIC PANELS

- A. Each 5 kV switchgear line-up shall have a mimic panel mounted on the side of the switchgear. Each mimic panel shall have the switchgear single line diagram shown graphically in blue plastic. The graphic display shall include the bus and each breaker. Nameplates shall identify each breaker number, the load it feeds, etc.
- B. Each switchgear breaker shall be controlled from the mimic panel and shall include a breaker control switch, green, red and amber indicating lights to display that the breaker is open, closed or tripped, respectively.
- C. The Contractor shall submit all details of the mimic panels including the display, equipment layout, wiring, and materials, for Engineer approval.
- D. Each mimic panel shall have analog meters for voltage, current, and kW. Meters shall be manufactured by Yokogowa.

1.24 FINISH

- A. The finish shall consist of a coat of gray (ANSI-61), thermosetting, polyester powder paint applied electrostatically to pre-cleaned and phosphatized steel and aluminum for internal and external parts. The coating shall have corrosion resistance of 600 hours to 5% salt spray.

1.25 ACCESSORIES

- A. The switchgear manufacturer shall furnish accessories for test, inspection, maintenance and operation, including:
 - 1. One – Maintenance tool for manually charging the breaker closing spring and manually opening the shutter
 - 2. One – Levering crank for moving the breaker between test and connected positions
 - 3. One – Test jumper for electrically operating the breaker while out of its compartment
 - 4. One – Breaker lifting yoke used for attachment to breaker for lifting breaker on or off compartment rails, when applicable
 - 5. One – Set of rail extensions and rail clamps, when applicable
 - 6. One – Portable lifting device for lifting the breaker on or off the rails
 - 7. One – Test cabinet for testing electrically operated breakers outside housing

1.26 EXECUTION

1.27 FACTORY TESTING

- A. The following standard factory tests shall be performed on the circuit breaker element provided under this section. All tests shall be in accordance with the latest version of ANSI/IEEE standards.
 - 1. Alignment test with master cell to verify all interfaces and interchangeability
 - 2. Circuit breakers operated over the range of minimum to maximum control voltage
 - 3. Factory setting of contact gap
 - 4. One-minute dielectric test per ANSI/IEEE standards
 - 5. Final inspections and quality checks

- B. The following production test shall be performed on each breaker housing:
 - 1. Alignment test with master breaker to verify interfaces
 - 2. One-minute dielectric test per ANSI/IEEE standards on primary and secondary circuits
 - 3. Operation of wiring, relays and other devices verified by an operational sequence test
 - 4. Final inspection and quality check
- C. The manufacturer shall provide three (3) certified copies of factory test reports.
- D. Factory tests as outlined above under 3.01.B shall be witnessed by the owner's representative.
 - 1. The manufacturer shall notify the owner two (2) weeks prior to the date the tests are to be performed

1.28 FIELD QUALITY CONTROL

- A. Provide the services of a qualified factory-trained manufacturer's representative to assist the Contractor in installation and startup of the equipment specified under this section for a period of 10 working days. The manufacturer's representative shall provide technical direction and assistance to the contractor in general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained therein.
- B. The Contractor shall provide three (3) copies of the manufacturer's field startup report.

1.29 MANUFACTURER'S CERTIFICATION

- A. A qualified factory-trained manufacturer's representative shall certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.
- B. The Contractor shall provide three (3) copies of the manufacturer's representative's certification.

1.30 TRAINING

- A. The Contractor shall provide a training session for up to five (5) owner's representatives for 1 normal workdays at a job site location determined by the owner.
- B. The training session shall be conducted by a manufacturer's qualified representative. Training program shall include instructions on the assembly, circuit breaker, protective devices, and other major components.

1.31 INSTALLATION

- A. The Contractor shall install all equipment per the manufacturer's recommendations and contract drawings.
- B. All necessary hardware to secure the assembly in place shall be provided by the Contractor.

1.32 FIELD ADJUSTMENTS

- A. The relays shall be set in the field by:
 - 1. The Contractor in accordance with settings designated in a coordination study of the system as required elsewhere in the contract documents.
 - 2. coordinated study of the system as required elsewhere in the contract documents.

1.33 FIELD TESTING

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Dry type transformers.

1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electric Code.
- B. NEMA ST20 - Dry Type Transformers for General Applications.

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Provide outline and support point dimensions of enclosures and accessories, unit weight, voltage, KVA and impedance ratings and characteristics, tap configurations, insulation system type and rated temperature rise.

1.04 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Dry type transformers shall be manufactured by General Electric Type QL.
- B. Approved equal.

2.02 EQUIPMENT REQUIREMENTS

- A. Three-phase and Single-phase general purpose dry type transformers be self-cooled, with ratings (KVA) as indicated on the drawings.
- B. Shall meet or exceed DOE 2016 efficiency requirements.
- C. Copper windings.
- D. Sound levels not to exceed the following:
 - 1. 0-9 KVA: 40 db.
 - 2. 10-50 KVA: 45 db.
 - 3. 51-150 KVA: 50 db.
 - 4. 151-300 KVA: 55 db.
 - 5. 301-500 KVA: 60 db.
 - 6. 501-700 KVA: 62 db.
- E. Three-phase transformers rated above 15 KVA to be insulated with UL listed Class 220 rated materials; and have a maximum average full load temperature rise of 115 degrees C.

- F. Transformers to have voltage ratios as indicated on drawings. Transformers between 15 KVA and 300 KVA to be provided with six 2-1/2% full capacity taps, two above and four below primary rated voltage.
- G. Nameplate: Include transformer connection data.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install transformers in accordance with manufacturer's recommendations.
- B. Provide both primary and secondary protection as shown on drawings.
- C. Set transformer plumb and level.
- D. Provide grounding and bonding in accordance with provisions of Section 260526.
- E. Transformers shall be factory installed in the Motor Control Center by the manufacturer of Motor Control Center where indicated on drawings.

3.02 FIELD QUALITY CONTROL

- A. Check for damage and tight connections prior to energizing transformer.
- B. Measure primary and secondary voltage and make appropriate tap adjustments.

END OF SECTION

PART 1 - GENERAL

1.01 SCOPE

- A. The Contractor shall furnish and install, where indicated on the drawings, a deadfront type, low voltage metal-enclosed switchgear assembly utilizing drawout power circuit breakers, as specified herein and shown on the contract drawings.

1.02 REFERENCES

- A. The low voltage metal-enclosed switchgear assembly and all components shall be designed, manufactured and tested in accordance with the following latest applicable standards:
 1. NFPA 70 - National Electric Code
 2. NYCEC - New York City Electrical Code
 3. ANSI-C37.20 - Switchgear assemblies
 4. ANSI-C37.13 - Low voltage power circuit breakers
 5. ANSI-C37.17 - Trip devices
 6. UL 1558 Low Voltage Switchgear
 7. UL 1066 Low Voltage Power Circuit Breakers

1.03 SUBMITTALS - FOR REVIEW/APPROVAL

- A. The following information shall be submitted to the Engineer:
 1. Master drawing index
 2. Front view and plan view of the assembly
 3. Three-line diagram
 4. Schematic diagram
 5. Nameplate schedule
 6. Component list
 7. Conduit space locations within the assembly
 8. Assembly ratings including:
 - a. Short-circuit rating
 - b. Voltage
 - c. Continuous current rating
 - 1) Major component ratings including:
 - (a) Voltage
 - (1) Continuous current rating
 - (2) Interrupting ratings
 - (b) Cable terminal sizes
 - (c) Product data sheets
 9. Busway connection
 10. Composite front view and plan view of close-coupled assemblies
 11. Key interlock scheme drawing and sequence of operations
 12. Mimic bus size and color

1.04 SUBMITTALS - FOR CONSTRUCTION

- A. The following information shall be submitted for record purposes:
 1. Final as-built drawings and information for items listed in Paragraph 1.03, and shall incorporate all changes made during the manufacturing process
 2. Wiring diagrams
 3. Certified production test reports
 4. Installation information
 5. Seismic certification as specified

1.05 QUALIFICATIONS

- A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.
- B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.
- C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- D. Provide Seismic tested equipment as follows:
 - 1. The equipment and major components shall be suitable for and certified by actual seismic testing to meet all applicable seismic requirements of the latest International Building Code (IBC).
 - 2. The IP rating of the equipment shall be 1.5
 - 3. The following minimum mounting and installation guidelines shall be met, unless specifically modified by the above referenced standards.
 - a. The Contractor shall provide equipment anchorage details, coordinated with the equipment mounting provision, prepared and stamped by a licensed qualified engineer in New York State. Mounting recommendations shall be provided by the manufacturer based upon the above criteria to verify the seismic design of the equipment.
 - b. The equipment manufacturer shall certify that the equipment can withstand, that is, function following the seismic event, including both vertical and lateral required response spectra as specified in above codes.
 - c. The equipment manufacturer shall document the requirements necessary for proper seismic mounting of the equipment. Seismic qualification shall be considered achieved when the capability of the equipment, meets or exceeds the specified response spectra.
 - d. Provide NYS licensed professional engineer signed and sealed drawings indicating seismic requirements are met.

1.06 REGULATORY REQUIREMENTS

- A. The switchgear shall bear a UL 1558 label.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.08 OPERATION AND MAINTENANCE MANUALS

- A. Equipment operation and maintenance manuals shall be provided with each assembly shipped, and shall include instruction leaflets and instruction bulletins for the complete assembly and each major component.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Eaton

- B. Square D
- C. ABB/General Electric
- D. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety.
- E. Manufacturer of Low Voltage Metal-Enclosed Drawout Switchgear shall match that of Substation Transformers, Medium Voltage Load Interrupter Switchgear, and Low Voltage Bus Duct System.

2.02 RATINGS

- A. Voltage rating shall be as indicated on the drawings. The entire assembly shall be suitable for 600 Volts maximum AC service.
- B. The assembly shall be rated to withstand mechanical forces exerted during short-circuit conditions when connected directly to a power source having available fault current of 65,000 amperes symmetrical at rated voltage as shown on the drawings.
- C. The bus system shall have a minimum ANSI short-circuit withstand rating of 100,000 amperes symmetrical tested in accordance with ANSI C37.20.1 and UL1558.
- D. All circuit breakers shall have a minimum symmetrical interrupting capacity of 65,000 amperes. To ensure a fully selective system, all circuit breakers shall have 30 cycle short-time withstand ratings equal to their symmetrical interrupting ratings through 85,000 amperes, regardless of whether equipped with instantaneous trip protection or not.
- E. All ratings shall be tested to the requirements of ANSI C37.20.1, C37.50 and C37.51 and UL 1558 witnessed and approved.

2.03 CONSTRUCTION

- A. The switchgear shall consist of the required number of vertical sections bolted together to form a rigid assembly. The sides shall be covered with removable bolt-on covers. All edges of front covers or hinged front panels shall be formed. Provide ventilators located on the top of the switchgear over the breaker and bus compartments to ensure adequate ventilation within the enclosure. Cable compartment access shall be provided by hinged rear doors, complete with provisions for padlocking.
- B. The assembly shall be provided with adequate lifting means and shall be capable of being moved into installation position and bolted directly to the floor without the required use of floor sills providing the floor is level to 1/8 inch per 3-foot distance in any direction. Provisions shall be made for jacking of shipping groups, for removal of skids or insertion of equipment rollers. Base of assembly shall be suitable for rolling directly on pipes without skids. The base shall be equipped with slots in the base frame members to accommodate the use of pry bars for moving the equipment to its final position.
- C. Each vertical steel unit forming part of the switchgear line-up shall be a self-contained housing having one or more individual breaker or instrument compartments, a centralized bus compartment and a rear cable compartment. Each individual circuit breaker compartment, or cell, shall be segregated from adjacent compartments and sections by means of steel barriers to the maximum extent possible. It shall be equipped with drawout rails and primary and secondary disconnecting contacts. Removable hinge pins shall be provided on the breaker compartment door hinges. Current transformers for feeder instrumentation, where shown on the

plans, shall be located within the appropriate breaker cells and be front accessible, removable, and provided with shorting terminal blocks in the front wireway. Circuit breaker doors shall not be ventilated.

- D. The stationary part of the primary disconnecting devices for each power circuit breaker shall be breaker mounted and consist of a set of contacts extending to the rear through a glass polyester insulating support barrier; corresponding moving finger contacts, suitably spaced, shall be furnished on the power circuit breaker studs which engage in only the connected position. The assembly shall provide multiple silver-to-silver full floating high pressure point contacts with uniform pressure on each finger maintained by springs. Each circuit shall include the necessary three-phase bus connections between the section bus and the breaker line side studs. Bus extensions shall be plated similar to the main bus where outgoing terminals are attached.
- E. The circuit breaker door design shall be such that the following functions may be performed without the need to open the circuit breaker door: lever circuit breaker between positions, operate manual charging system, close and open circuit breaker, examine and adjust trip unit, and read circuit breaker rating nameplate.
- F. The secondary disconnecting devices shall consist of floating terminals mounted on the stationary unit and engaging mating contacts at the front of the breaker. The breaker secondary disconnecting devices shall be maintained in the "connected" and "test" positions.
- G. The removable power circuit breaker element shall be equipped with disconnecting contacts and interlocks for drawout application. It shall have four positions, "connected," "test," "disconnected" and "removed." The breaker drawout element shall contain a worm gear levering "in" and "out" mechanism with removable lever crank. Levering shall be accomplished via the use of conventional tools. Mechanical interlocking shall be provided so that the breaker is in the tripped position before levering "in" or "out" of the cell. Interlocking that trips the breaker will not be accepted. The breaker cell shall include an optional provision for key locking open to prevent manual or electric closing. Padlocking shall provide for securing the breaker in the connected, test, or disconnected position by preventing levering. Breaker shall be ready to accept connection of remote racking device without modification of breaker, cell or door.
- H. An insulating flash shield shall be mounted above each circuit breaker to prevent flashover from the arc chutes to ground.
- I. Provide a glass polyester full height and depth barrier between adjacent vertical structures in the bus compartment with appropriate slots for main bus.
- J. The switchgear shall be suitable for use as service entrance equipment and be labeled in accordance with UL requirements.
- K. Provide a rear compartment barrier between the cable compartment and the main bus to protect against inadvertent contact with main or vertical bus bars. Barrier shall be solid grounded steel.
- L. Provide a metal barrier full height and depth between adjacent vertical structures in the cable compartment.

2.04 BUS

- A. All bus bars shall be silver-plated copper. Main horizontal bus bars shall be mounted with all three phases arranged in the same vertical plane. Bus sizing shall be based on the electrical code of the City of New York (NYCEC).
- B. Provide a full capacity neutral bus where a neutral bus is indicated on the drawings.

- C. A copper ground bus shall be furnished firmly secured to each vertical section structure and shall extend the entire length of the switchgear. The ground bus short-time withstand rating shall meet that of the largest circuit breaker within the assembly. The ground bus plating shall match main bus plating.
- D. All hardware used on conductors shall be high-tensile strength and zinc-plated. All bus joints shall be provided with Belleville-type washers.
- E. The primary means of insulation and isolation of main and vertical bus shall be by air gap. Minimal use of insulating material in addition to air gap shall be provided.

2.05 WIRING/TERMINATIONS

- A. Small wiring, necessary fuse blocks and terminal blocks within the switchgear shall be furnished as required. Control components mounted within the assembly shall be suitably marked for identification corresponding to the appropriate designations on manufacturer's wiring diagrams.
- B. Provide a front accessible, isolated vertical wireway for routing of factory and field wiring. Factory provisions shall be made for securing field wiring without the need for adhesive wire anchors.
- C. Front access to all circuit breaker secondary connection points shall be provided for ease of troubleshooting and connection to external field connections without the need of removing the circuit breaker for access.
- D. All control wire shall be type SIS. Control wiring shall be 16 ga for control circuits and 12 ga for current transformer circuits. Wire bundles shall be secured with nylon ties and anchored to the assembly with the use of pre-punched wire lances or nylon non-adhesive anchors. All current transformer secondary leads shall first be connected to conveniently accessible shorting terminal blocks before connecting to any other device. Shorting screws with provisions for storage shall be provided. All groups of control wires leaving the switchgear shall be provided with terminal blocks with suitable numbering strips and provisions for #10 AWG field connections. Each control wire shall be marked to the origin zone/wire name/destination zone over the entire length of the wire using a cured ink process. Plug-in terminal blocks shall be provided for all shipping split control wires. Terminal connections to remote devices or sources shall be front accessible via doors above each circuit breaker.
- E. NEMA 2-hole mechanical-type lugs shall be provided for all line and load terminations suitable for copper or aluminum cable rated for 75 degrees C of the size indicated on the drawings.
- F. Lugs shall be provided in the incoming line section for connection of the main grounding conductor and at each end of the ground bus for connection to system ground. Additional lugs for connection of other grounding conductors shall be provided as indicated on the drawings.

2.06 CIRCUIT BREAKERS

- A. All protective devices shall be low voltage power circuit breakers, Eaton type Magnum DS or approved equal. All breakers shall be UL listed for application in their intended enclosures for 100% of their continuous ampere rating.
- B. All power circuit breakers shall be constructed and tested in accordance with ANSI C37.13, C37.16, C37.17, C37.50, and UL 1066. The breaker shall carry a UL label.
- C. Breakers shall be provided in drawout configuration. All breaker cell sizes shall have a common height and depth. Breaker frames of the same size shall be fully interchangeable.

- D. Power circuit breakers shall utilize a two-step stored-energy mechanism to charge the closing springs. The closing of the breaker contacts shall automatically charge the opening springs to ensure quick-break operation. Slow closing speed shall not be required to properly maintain the breaker contacts.
- E. Breakers shall be electrically operated (EO).
- F. Electrically operated breakers shall be complete with 120 Vac motor operators. The charging time of the motor shall not exceed 6 seconds.
- G. To facilitate lifting, the power circuit breaker shall have integral handles on the side of the breaker.
- H. The power circuit breaker shall have a closing time of not more than 3 cycles.
- I. The primary contacts shall have an easily accessible wear indicator to indicate contact erosion.
- J. The power circuit breaker shall have three windows in the front cover to clearly indicate any electrical accessories that are mounted in the breaker. The accessory shall have a label that will indicate its function and voltage. The accessories shall be plug and lock type and UL listed for easy field installation. They shall be modular in design and shall be common to all frame sizes and ratings.
- K. The breaker control interface shall have color-coded visual indicators to indicate contact open or closed positions, as well as mechanism charged and discharged positions. Manual control pushbuttons on the breaker face shall be provided for opening and closing the breaker. The power circuit breaker shall have a "Positive On" feature. The breaker flag will read "Closed" if the contacts are welded and the breaker is tripped or opened.
- L. The current sensors shall have a back cover window that will permit viewing the sensor rating on the back of the breaker. A rating plug will offer indication of the rating on the front of the trip unit. The current sensor and rating plug shall be of the same current rating.
- M. A position indicator shall be located on the faceplate of the breaker. This indicator shall provide color indication of the breaker position in the cell. These positions shall be Connect (Red), Test (Yellow), and Disconnect (Green). The levering door shall be interlocked so that when the breaker is in the closed position, the breaker levering-in door shall not open.
- N. Each power circuit breaker cell shall offer sixty (60) front-mounted dedicated secondary wiring points. Each wiring point shall have finger safe contacts, which will accommodate #10 AWG maximum field connections with ring tongue, spade terminals or bare wire.

2.07 TRIP UNITS

- A. Each low voltage power circuit breaker shall be equipped with a solid-state tripping system consisting of three current sensors, microprocessor-based trip device and flux-transfer shunt trip. Current sensors shall provide operation and signal function. The trip unit shall use microprocessor-based technology to provide the basic adjustable time-current protection functions. True rms sensing circuit protection shall be achieved by analyzing the secondary current signals received from the circuit breaker current sensors and initiating trip signals to the circuit breaker trip actuators when predetermined trip levels and time delay settings are reached. Interchangeable current sensors with their associated rating plug shall establish the continuous trip rating of each circuit breaker. The trip unit shall be Eaton type Digitrip RMS 1150, or approved equal.

- B. The trip unit shall have an information system that utilizes battery backup LEDs to indicate mode of trip following an automatic trip operation. The indication of the mode of trip shall be retained after an automatic trip. A reset button shall be provided to turn off the LED indication after an automatic trip. A test pushbutton shall energize a LED to indicate the battery status.
- C. The trip unit shall be provided with a display panel, including a representation of the time/current curve that will indicate the protection functions. The unit shall be continuously self-checking and provide a visual indication that the internal circuitry is being monitored and is fully operational.
- D. The trip unit shall be provided with a making-current release circuit. The circuit shall be armed for approximately two cycles after breaker closing and shall operate for all peak fault levels above 25 times the ampere value of the rating plug.
- E. Trip unit shall have selectable powered and unpowered thermal memory for enhanced circuit protection.
- F. Complete system selective coordination shall be provided by the addition of the following individually adjustable time/current curve shaping solid-state elements:
 - 1. All circuit breakers shall have adjustments for long delay pickup and time
 - 2. All circuit breakers shall have individual adjustments for short delay pickup and time, and include I²t settings
 - 3. All circuit breakers shall have an adjustable instantaneous pickup
 - 4. Circuit breakers, where indicated on the drawings, shall have individually adjustable ground fault current pickup and time, and include I²t settings or ground alarm only
 - 5. The trip unit shall have provisions for a single test kit to test each of the trip functions.
 - 6. The trip unit shall be capable of providing zone interlocking for the short-time delay and ground fault delay trip functions for improved system coordination. The zone interlocking system shall restrain the tripping of an upstream breaker and allow the breaker closest to the fault to trip with no intentional time delay. In the event that the downstream breaker does not trip, the upstream breaker shall trip after the present time delay. Switchgear shall be wired for zone interlocking for the power circuit breakers within the switchgear.
 - 7. Circuit breakers, where indicated on the drawings, shall have individually adjustable ground fault alarm only.
 - 8. The trip unit shall be equipped to permit communication via a network twisted pair for remote monitoring
 - 9. The trip unit shall utilize ARMS (Arcflash Reduction Maintenance System). ARMs shall be provided in a system that shall reduce the trip unit Instantaneous pickup value when activated. ARMS device shall not compromise breaker phase protection even when enabled. Once the ARMs unit is disabled, the recalibration of trip unit phase protection shall not be required. Activation and deactivation of ARMS setting shall be accomplished without opening the circuit breaker door and exposing operators to energized parts. ARMS shall provide a clearing time of 0.04 seconds, adjustable with a minimum of five settings ranging from 2.5X to 10X of the sensor value.
 - a. ARMS shall be provided with a switchgear panel mounted enable padlockable selector switch and indication via Blue LED pilot light.
 - 10. The trip unit shall be equipped to permit communication for remote monitoring and control.
 - 11. The trip unit shall include a power/relay module which shall supply control to the readout display. Following an automatic trip operation of the circuit breaker, the trip unit shall maintain the cause of trip history and the mode of trip LED indication as long as its internal power supply is available. An internal relay shall be programmable to provide contacts for remote ground alarm indication.
 - 12. The trip unit shall include a voltage transformer module, suitable for operation up to 600V, 50/60 Hz. The primary of the voltage transformer module shall be connected internally to the line side of the circuit breaker through a dielectric test disconnect plug.

13. The display for the trip units shall be a 24-character LED display. Metering display accuracy of the complete system, including current sensors, auxiliary CTs, and the trip unit, shall be +/- 1% of full scale for current values. Metering display accuracy of the complete system shall be +/- 2% of full scale for power and energy values.
14. The unit shall be capable of monitoring the following data:
 - a. Instantaneous value of phase, neutral and ground current
 - b. Instantaneous value of line-to-line voltage
 - c. Minimum and maximum current values
 - d. Watts, vars, VA, wathours, varhours and VA hours
15. The energy-monitoring parameter values (peak demand, present demand, and energy consumption) shall be indicated in the trip unit's alphanumeric display panel.
16. The trip unit shall display the following power quality values: crest factor, power factor, percent total harmonic distortion, and harmonic values of all phases through the 31st harmonic.
17. An adjustable high load alarm shall be provided, adjustable from 50 to 100% of the long delay pickup setting.
18. The trip unit shall contain an integral test pushbutton. A keypad shall be provided to enable the user to select the values of test currents within a range of available settings. The protection functions shall not be affected during test operations. The breaker may be tested in the TRIP or NO TRIP test mode.
19. Programming may be done via a keypad at the faceplate of the unit or via the communication network.
20. System coordination shall be provided by the following microprocessor-based programmable time-current curve shaping adjustments. The short-time pickup adjustment shall be dependant on the long delay setting.
 - a. Programmable long-time setting
 - b. Programmable long-time delay with selectable I2t or I4t curve shaping
 - c. Programmable short-time setting
 - d. Programmable short-time delay with selectable flat or I2t curve shaping, and zone selective interlocking
 - e. Programmable instantaneous setting
 - f. Programmable ground fault setting trip or ground fault setting alarm
 - g. Programmable ground fault delay with selectable flat or I2t curve shaping and zone selective interlocking
21. The trip unit shall offer a three-event trip log that will store the trip data, and shall time and date stamp the event.
22. The trip unit shall have the following advanced features integral to the trip unit:
 - a. Adjustable undervoltage release
 - b. Adjustable overvoltage release
 - c. Reverse load and fault current
 - d. Reverse sequence voltage alarm
 - e. Underfrequency
 - f. Overfrequency
 - g. Voltage phase unbalance and phase loss during current detection
23. The trip unit shall offer information on the circuit breaker's health. The data available shall include total number of all Instantaneous and Short Delay trips seen by the circuit breaker, an additional count of all the overloads and ground fault trips seen by the circuit breaker, an operation counter, a time stamp of the last breaker operation, and the maximum temperature seen by the trip unit. All these data points will be stored in non volatile memory and available for remote communications.

2.08 METERING, MONITORING AND CONTROL

- A. Microprocessor-Based Metering System as indicated on drawings.

1. Where indicated on the drawings, provide a separate owner metering compartment with front hinged door
2. Provide current transformers for each meter. Current transformers shall be wired to shorting-type terminal blocks.
3. Provide potential transformers including primary and secondary fuses with disconnecting means for metering as shown on the drawings.
4. Metering shall be Eaton PXM2280 or approved equal
5. Remote Switchgear Control (Mimic Panel)
 - a. Switchgear shall be provided with dedicated microprocessor control system, Eaton Power Xpert Dashboard or approved equal.
 - b. Dashboard System will utilize a minimum 15.6" HMI for the control of the switchgear. The HMI shall be mounted in an enclosure mounted on the wall and wired by the contractor. The enclosure shall include a disconnect and power supply to power the HMI. The enclosure shall be located near the switchgear but outside the arc flash boundary.
6. Remote switchgear control mimic panel shall be provided with UPS properly sized to provide standby power for all components of the mimic panel for a minimum of 15 minutes.
7. The HMI shall use Ethernet CAT6 as physical media to communicate with the Power Xpert Dashboard Processor located in the switchgear either directly or via an Ethernet switch.
8. Security
 - a. Local viewing of the Dashboard on the HMI shall not require a login. All other access will require a username and password subject to configurable password rules.
 - b. The Dashboard shall support multiple security levels that can be assigned as roles to simplify creating user accounts. Role-Based Access Control (RBAC) shall be used to create the set of users and role-based permissions. A comprehensive set of password management features shall be available to allow compliance with security policies in effect at the site.
 - c. Control access points shall be strictly controlled through pairing of the HMI, with the processor. Additional security shall be provided by limiting access to the communication ports by authorized trusted hosts' IP addresses
 - d. SSL Encryption shall be available to ensure that information and passwords exchanged with the Dashboard cannot be intercepted on the LAN.
 - e. The Dashboard Processor shall be certified to the UL 2900-2-2 cybersecurity standard.
9. Remote access to view information on the Power Xpert Dashboard Processor shall be available through a web interface. The web interface shall be accessible on personal computers, tablets or phones. All remote breaker control through the web interface shall be disabled unless the user enables this access for specific users.
10. Arc Flash
 - a. The Dashboard shall display the appropriate PPE level and ARMS status based on data provided from an arc flash study and status of the main breaker's Arc Flash Reduction Mode on all the screens.
 - b. Touching the PPE level indicator shall display customizable diagrams of relevant PPE that meet site requirements for the incident energy levels shown in the switchgear. This page shall also display the arc flash boundary distance and calculated incident energy level at this distance.
 - c. Arc flash incident energy levels shall be shown for each switchgear bus both on the one line and elevation screens.
 - d. Changes in ARMS status will cause the energy levels to update based on the arc flash study data.
11. The Dashboard shall have following tabs:
 - a. One-line
 - b. Elevation
 - c. Timeline

- d. Documents
- e. Settings
- 12. Tapping each device shall open a new window on the HMI screen showing the details as follows:
 - a. Trip Units: maintenance mode status, total trip, last trip, device alarm conditions, metering trends if supported by the device, sequence of events and cause of trip, waveform and set points.
 - b. Meters: basic metering information not limited to currents, voltages, frequency, power factor, power, energy, THD, harmonics, trends, waveforms, alarms and I/O status.
- 13. Under the One-line tab the Dashboard shall display the switchgear one line diagram. The one line diagrams shall include the following, but not limited to:
 - a. Source, and bus status indicated by different colors
 - b. Breaker status (open/closed/tripped/ARMS/racked in & racked out)
 - c. Breaker control, such as open/close and ARMS activation
 - d. Basic values from trip units and meters
 - e. Alarm conditions
 - f. Arc flash energy levels for each bus.
- 14. Under the Elevation tab the graphics shall mimic the physical switchgear elevation or front view. The view shall include the following, but not limited to:
 - a. Representation of the switchgear including appropriate number of structures, breaker counts and breaker locations.
 - b. Breaker status (open, closed, tripped, racked in and racked out) shall be displayed on the elevation view, relative to physical location of the breaker.
 - c. Breaker control such as open, close, Arc Flash Reduction Maintenance Mode activation and MV remote breaker rack in-out when the switchgear is so equipped.
 - d. The structure and breaker locations shall be clearly identified in this mode.
 - e. A color coded mimic bus shall be displayed, bus and breaker status shall be indicated by different colors depending on energized/de-energized conditions.
 - f. Alarm conditions in red, further information on the type of alarm shall be available by tapping the device.
- 15. Under the Timeline tab, time stamped alarm or fault conditions as well as user operations and login information shall be displayed identifying user names.
- 16. Under the Settings tab with the appropriate password level, users will be able to:
 - a. Update systems settings like colors, date and time and screen defaults
 - b. Add and modify devices
 - c. Add additional switchgear structures
 - d. Configure alarms
 - e. Update safety information such as PPE requirements.
 - f. Modify network settings
 - g. Configure user accounts and passwords
- 17. Under the Docs tab, the following documents shall be available:
 - a. O&M Manual for the switchgear
 - b. Project Specific Drawings (Elevation, three-line, BOM, wiring diagrams, etc.)
 - c. User Manuals for Electronic components such as Protective Relays/ Trip Units, Meters and any other devices as seemed suitable by the end user.
 - d. Breaker Manuals
 - e. Coordination studies

2.09 CABLE LIMITER

- A. Manufacturers:
 - 1. Eaton/Cooper Bussmann
 - 2. Ferraz Shawmut
 - 3. Approved equal

- B. Ratings
 - 1. Voltage: 600V
 - 2. Interrupting Rating: 200kA, RMS SYM.
 - 3. Terminate Configuration: Coordinated in field
 - 4. Cable size as per drawings.

C. Conductor Material: Copper

2.10 COORDINATION

- A. Switchgear shall be coordinated with additional equipment on-site to ensure proper install and operation of the system.
- B. Bus size & location of switchgear must be coordinated with Cast-coil transformer to ensure proper alignment of busses for installation of substation.
- C. Connection between cast-coil transformer and Switchgear shall be accomplished using flexible copper braids.
- D. Low-voltage switchgear and transformer shall all be of the same manufacturer to ensure proper coordination.

2.11 ENCLOSURES

- A. NEMA 1 Enclosure.

2.12 NAMEPLATES

- A. Engraved nameplates, mounted on the face of the assembly, shall be furnished for all main and feeder circuits as indicated on the drawings. Nameplates shall be laminated plastic, white characters on black background, and secured with screws. Characters shall be 1/4-inch high, minimum.
- B. Furnish master nameplate giving switchgear designation, voltage ampere rating, short-circuit rating, and manufacturer's name.
- C. Control components mounted within the assembly, such as fuse blocks, relays, pushbuttons, switches, etc., shall be suitably marked for identification corresponding to appropriate designations on manufacturer's drawings.

2.13 FINISH

- A. All exterior and interior steel surfaces of the switchgear shall be properly cleaned and provided with a rust-inhibiting phosphatized coating. Color and finish of the switchgear shall be ANSI 61.

2.14 SURGE PROTECTIVE DEVICES

- A. Surge protective device shall be factory installed within the main breaker section of the Low Voltage Metal-Enclosed Drawout Switchgear.
- B. Electrical Requirements
 - 1. The maximum surge current rating shall be based on testing of a complete SPD unit including fuses and all components that make up the SPD system. Devices that derive a maximum surge current rating by adding test results of individual components are not acceptable.

2. The SPD device repetitive surge current capacity shall be tested utilizing an 8x20us, 10kA short circuit Category C High test waveform (as defined by ANSI/IEEE C62.41.2-2002) at one-minute intervals. A failure is defined as either performance degradation or more than 10% deviation of clamping voltage at the specified surge current.
3. The device shall have a minimum surge current rating of 125kA per mode / 250kA per phase with a minimum of 20,000 category C3 impulses (10kA, 20kV) per mode.
4. The Voltage Protection Ratings (VPR)(Assigned UL Rating) shall be tested in accordance with UL-1449, Third Edition. Where an integral disconnect is provided, the SPD VPR shall be determined with the integral disconnect. The VPR values shall not exceed the values shown in the following table.

Models	Nominal Voltage	Configuration	L-N	L-G	N-G	L-L
Wye	120/208	Grounded Wye	900	800	700	1200
Wye	277/480	Grounded Wye	1500	1200	1200	2000
Wye	347/600	Grounded Wye	1500	1500	1500	2500
Delta	240	Delta		1200		1800
Delta	480	Delta		1800		3000

C. Internally Generated Environmental Influences

1. Audible Noise: No Audible Noise.
2. Surface Temperature: less than 55 degrees Celsius.
3. EMI/RFI Noise Suppression: -50 dB voltage attenuation at 100 kHz, per NEMA LS-1/MIL 220B

D. Protection and Filtering Elements

1. The SPD shall be UL witness tested to a fault current rating equal to or greater than the fault current rating of the distribution equipment. The SPD fault current rating shall be marked on the SPD in accordance with the requirements of UL1449 and NEC Article 285.
2. The use of electronic grade MOV's is not acceptable and will be technically rejected. Systems using gas tubes, silicon avalanche diodes, selenium rectifiers, or printed circuit board technology in surge current path are not acceptable and will be technically rejected.
3. The SPD shall provide protection in each of the following modes: L-N, L-G, N-G, and L-L for WYE Systems. L-G and L-L for Delta Systems.
4. The Maximum Continuous Operating Voltage (MCOV) for all voltage configurations shall be at least 320% of nominal on 480/277 volt systems and 150% of nominal on 240-208/120 volt systems.
5. The fusing system shall be capable of allowing the rated maximum surge current to pass through without fuse operation. Systems utilizing a fusing system that opens below the maximum surge current level are unacceptable and will be technically rejected. The complete SPD fusing system shall be included in the surge current testing.
6. SPD systems shall include integral fusing for all suppression components. SPD designs that rely solely on an electrical panel's main breaker to interrupt phase currents resulting from a shorted suppression component are not allowed and will be technically rejected.
7. Use of plug-in modules, gas discharge devices or selenium rectifiers is unacceptable and will be technically rejected .

E. Standard Monitoring Features

1. One operational status indicating light per each protected phase shall be provided.
2. An audible alarm, alarm indicating light and test switch, enabled via a front panel pushbutton switch shall also be provided.

3. For remote monitoring purposes the following dry contacts shall be supplied as a minimum. 1NO & 1NC contact indicating a change in state for MOV failure.
4. A transient voltage surge counter with battery backup shall also be incorporated into the unit.

PART 3 - EXECUTION

3.01 FACTORY TESTING

- A. The switchgear shall be completely assembled, wired, adjusted and tested at the factory. After assembly, the complete switchgear shall be tested to ensure the accuracy of the wiring and the functioning of all equipment. The main bus system shall be given a dielectric test of 2200 volts for one minute between live parts and ground and between opposite polarities.
- B. The wiring and control circuits shall be given a dielectric test of 1500 volts for one minute, or 1800 volts for one second, between live parts and ground, in accordance with ANSI C37.20.1.
- C. A certified test report of all standard production tests shall be shipped with each assembly.
- D. Factory test as outlined above shall be witnessed by the owner's representative.
 1. The manufacturer shall notify the owner a minimum of four (4) weeks prior to the date the tests are to be performed.
 2. The Contractor shall include the cost of airfare, food, hotel, and transportation for up to three (3) owner's representatives to attend and witness all factory testing.

3.02 INSTALLATION

- A. The Contractors shall install all equipment per the manufacturer's recommendations and the contract drawings.
- B. Equipment shall be installed so that sufficient access and working space is provided for ready and safe operation and maintenance.
- C. All necessary hardware to secure the assembly in place shall be provided by the Contractor.
- D. Install Substation nameplates for identification of equipment.
- E. The equipment shall be installed and checked in accordance with the manufacturer's recommendations. This shall include but not limited to:
 1. Checking to ensure that the pad location is level to within 0.125 inches per three feet of distance in any direction
 2. Measuring and recording Megger readings phase-to-phase, phase-to-ground, and neutral-to-ground (four wire systems only)
 3. Checking to ensure that all bus bars are torqued to the manufacturer's recommendations
 4. Assembling all shipping sections, removing all shipping braces and connecting all shipping split mechanical and electrical connections
 5. Securing assemblies to foundation or floor channels
 6. Inspecting and installing all circuit breakers in their proper compartments

3.03

- A. After installation, switchgear shall be field tested for operation and performance. The Contractor shall perform field testing in accordance with Specifications. The field tests shall be witnessed by Engineer and certified by the Contractor.

- B. The switchgear testing shall be performed by the manufacturer's representative, prior to energizing equipment. The testing shall be in accordance with the manufacturer's representative. Equipment shall not be energized or de-energized without the permission of the Engineer.

3.04 FIELD QUALITY CONTROL

- A. Provide the services of a qualified factory-trained manufacturer's representative to provide start-up of the equipment specified under this section for a period of five (5) working days.
- B. The Contractor shall provide three (3) copies of the manufacturer's field startup report.

3.05 ACCEPTANCE TESTING

- A. The Contractor shall provide acceptance testing of the switchgear. All acceptance testing shall be performed by the testing firm, after the completion of the field tests. The acceptance testing shall be witnessed by the Engineer and certified by the Contractor.
- B. Acceptance testing inspection shall be performed on each switchgear lineup. Inspection shall include the following:
 - 1. Physical, electrical and mechanical condition shall be inspected.
 - 2. Proper anchorage, required area clearances, physical damage and proper alignment shall be checked.
 - 3. All connections shall be inspected for high resistance.
 - 4. Electrical and mechanical interlock systems shall be checked for proper operation.
 - 5. Insulators shall be inspected for evidence of damage or contamination.
 - 6. Equipment shall be cleaned and lubricated.
- C. Acceptance electrical testing shall be performed on each switchgear lineup. Testing shall include the following:
 - 1. Ground-resistance tests shall be performed.
 - 2. Insulation-resistance tests shall be performed on each bus section, on each switch, transformer and circuit breaker, phase-to-phase and phase-to-ground.
 - 3. Test each pole with other poles grounded. An over potential test shall be performed.
 - 4. Contact-resistance test shall be performed.
 - 5. Control and metering wiring performance test shall be performed
 - 6. Circuit breaker trip characteristics shall be determined by primary current injection.
- D. All tests and values shall be in accordance with the manufacturer's recommendations and NETA, ATS Acceptance Testing Specification.
- E. The Contractor shall provide an acceptance testing report. The report shall be in accordance with NETA, ATS Acceptance Testing Specification.

3.06 MANUFACTURER'S CERTIFICATION

- A. A qualified manufacturer's representative shall assist in the installation of the switchgear, including but not limited to the following:
 - 1. Check the switchgear's installation before it is placed into operation
 - 2. Assist in the performance of field tests
 - 3. Observe and assist initial operations
 - 4. Train the plant operations and maintenance staff in the care, operation and maintenance of the switchgear

- B. A qualified factory-trained manufacturer's representative shall review the installation and certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.
- C. The Contractor shall provide a field report from the manufacturer's representative for each visit to the site. The report shall include complete information on time, schedule, tasks performed, persons contacted, problems corrected, test results, training, instruction and all other pertinent information.
- D. The Contractor shall provide three (3) copies of the manufacturer's representative's final certification upon approval of installation and completion of all start-up and testing services.

3.07 TRAINING

- A. The Contractor shall provide a training session for up to five (5) owner's representatives for two (2) normal workdays at a job site location determined by the owner.
- B. The training session shall be conducted by a manufacturer's qualified representative. The training program shall consist of the instruction on the operation of the assembly, circuit breakers, and major components within the assembly.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Distribution panelboards.

1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electric Code.
- B. NECA Standard of Installation.
- C. NEMA AB1 - Molded Case Circuit Breakers.
- D. NEMA PB1 - Panelboards.
- E. NEMA PB1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
- F. NEMA ICS2 - Industrial Control Devices, Controllers and Assemblies.
- G. NEMA KS1 - Enclosed Switches.

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, and circuit breaker arrangement and sizes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. New Panelboards
 - 1. Panelboards shall be manufactured by Siemens.
 - 2. Approved equal.
- B. Retrofit Panelboards
 - 1. Retrofit Panelboards shall be manufactured by Eaton.
 - 2. Approved equal.

2.02 PANELBOARD REQUIREMENTS

- A. Provide panelboards of circuit breaker, dead-front safety type, UL labeled, and meeting all applicable requirements of the National Electrical Manufacturers Association.
- B. Provide panelboards with lugs (both main lugs and branch circuit lugs) suitable and UL approved for both aluminum and copper conductors.
- C. Provide electrically isolated neutral bars.
- D. Provide separate ground bars complete with lugs or connectors on bar.
- E. Provide key operated door and door lock. Door shall prevent access to operate circuit breakers.

- F. Provide panelboards with sequence phased bus bars or distributed phase bussing for voltage and phase as indicated on drawings.
- G. Refer to drawings for numbers of branch circuits, their ratings, number of poles, arrangements, etc.
- H. Provide typed circuit directory cards.
- I. Provide front filler plates for unused breaker knockouts.
- J. Refer to drawings for Ratings and Features.
- K. All bus bars, including ground bars shall be tin-plated copper.
- L. All circuit breakers shall be bolt-on type.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Ground separate ground bars to panel boxes and to the main service entrance ground bus with a code-sized grounding conductor installed in the same conduit as the phase and neutral conductors under provisions of Section 260526.
- B. Install all circuits using a common neutral bus bay in accordance with the National Electric Code. Balance all circuits to achieve not greater than 7% unbalanced neutral current in panel feeders.
- C. Provide six circuit breaker handle lock-on devices for each lighting and miscellaneous power panelboard for installation by the contractor on circuits as directed by the Engineer to prevent unauthorized personnel from turning off circuits to controls, unit heaters, autodial alarm system, etc. Provide spare lock-on devices over to the Engineer.
- D. Install panelboards in accordance with NEMA PB 1.1.
- E. Install panelboards plumb.
- F. Height: 6 feet (2 m) to top of panel board.
- G. Provide typed circuit directory for each branch circuit panelboard. Handwritten circuit directory cards will not be accepted. Revise directory to reflect circuiting changes required to balance phase loads.
- H. Provide a typed circuit directory in accordance with NEC sections 110.22 and 408.4. Circuits shall be labeled with detailed information describing the switches function and equipment location.
- I. For all existing circuits terminated to a new panelboard, contractor shall trace out and update the circuit directory in accordance with NEC sections 110.22 and 408.4. Include all costs for this work in base bid.
- J. Revise directory to reflect circuiting changes required to balance phase loads.
- K. Provide engraved plastic nameplates under the provisions of Section 260553.

- L. Panelboards shall be factory installed in the motor control center by the manufacturer of Motor Control Center where indicated on drawings.

3.02 FIELD QUALITY CONTROL

- A. Maintain proper phasing for multi-wire branch circuits.
- B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Switches, receptacles, thermostats, device plates and other wiring devices as indicated on Drawings.

1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electric Code.
- B. NYCEC - New York City Electrical Code.
- C. NEMA WD1 - General Purpose Wiring Devices.

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Include device locations in conduit routing and box location submittal.
- C. Provide manufacturer's catalog information showing dimensions, colors and configuration.

1.04 REGULATORY REQUIREMENTS

- A. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.01 SWITCHES

- A. Manufacturers: HUBBELL, LEVITON, PASS & SEYMOUR.
- B. Single pole, 20 amp, 120/277 VAC, NEMA WD-1, heavy duty, UL20.
- C. Device Plate: Stainless steel.

2.02 RECEPTACLES

- A. Manufacturers: HUBBELL, LEVITON, PASS & SEYMOUR.
- B. 20 amp, 125 VAC, NEMA WD-1, heavy duty.
- C. 20 amp, 125 VAC, NEMA WD-1, heavy duty, ground fault circuit interrupter.
- D. Duplex type.
- E. Device Plate: Stainless steel.

2.03 MANUAL MOTOR RATED THERMAL SWITCH

- A. Acceptable Manufacturers: SQUARE D, Class 2510, Type KG1A, Type KG2C (3-pole, 600V) or approved equal.
- B. Contractor shall coordinate voltage, phase and current rating with equipment.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Mounting:
 - 1. Mount all switches 46-inches above finished floor to center line of switch unless noted otherwise.
 - 2. Mount all receptacles 18-inches above finished floor to center line of receptacle unless noted otherwise.
 - 3. Install switches with OFF position down.
- B. Polarity: Properly wire all receptacles so that the hot wire, the neutral wire and the ground wire connect to the proper terminal on all receptacles.
- C. Grounding: Install all devices in boxes specified under Section 260533 and install a No. 12 green ground wire from device grounding terminal to the outlet box in accordance with the National Electric Code.
- D. Install device plates on switch, receptacle and blank outlets in full contact with wall surface.
- E. Provide new SO cord for all chemical pumps and install plug end to match receptacle.

3.02 FIELD QUALITY CONTROL

- A. Inspect each wiring device for defects.
- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify that each receptacle device is energized.
- D. Test each receptacle device for proper polarity.
- E. Test each GFCI receptacle device for proper operation.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Disconnect switches.
- B. Fuses.
- C. Enclosed Circuit Breakers.

1.02 REFERENCES

- A. NEMA KS-1 - Enclosed Switches.
- B. ANSI/UL 198C - High Intensity Capacity Fuses, Current Limiting Types.
- C. ANSI/UL 198E - Class R Fuses.
- D. FS W-S 865 - Switch, Box (Enclosed), Surface Mounted.
- E. NEMA AB1 - Molded Case Circuit Breakers.
- F. NYCEC - New York City Electrical Code.
- G. ANSI/NFPA 70 - National Electric Code.

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Include equipment locations in conduit routing and box location submittal.
- C. Include outlet drawings with dimensions and equipment ratings for voltage, capacity, horsepower and short circuit current ratings.

1.04 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.01 DISCONNECT SWITCHES

- A. Disconnect switches shall be GENERAL ELECTRIC, heavy-duty Type TH or approved equal.
- B. 75°C conductor ratings.
- C. Ratings: 600VAC
- D. Quick-break, quick-make, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
- E. Suitable for use as service entrance equipment.

- F. UL listed for Class R 200,000 RMS amps, symmetrical IC.
- G. Class R fusing kit.
- H. Enclosures: Refer to drawings.

2.02 FUSES

- A. Fuses shall be Littlefuse KLNK Class RK1 or approved equal.
- B. Fuses shall be rated for 600 volts AC.
- C. Interrupting Rating: 200,000 RMS amps.

2.03 EXTRA MATERIALS

- A. Provide one complete set based on number of poles of spare fuses for each fused disconnect switch. Provide to Owner.

PART 3 - EXECUTION

3.01 INSTALLATION REQUIREMENTS

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Temporary Lifting Provisions: Removed temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Provide switches/enclosed circuit breakers at locations as indicated on drawings.
- D. Refer to disconnect switch schedule on drawings for ampacity ratings, fuse sizes, number of poles and enclosure ratings.
- E. Install fuses in fusible devices.
- F. Install engraved nameplates on each switch and enclosed circuit breaker identifying the following:
 - 1. Switch designated.
 - 2. Load served.
 - 3. Power origination.
 - 4. Fuse size as indicated on drawings.

3.02 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit breaker trip ranges.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Automatic transfer switch.

1.02 REFERENCES

- A. NFPA 70 - National Electrical Code.
- B. NEMA ICS 1 - General Standards for Industrial Control and Systems.
- C. NEMA ICS 2 - Standards for Industrial Control Devices, Controllers, and Assemblies.
- D. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Submit product data for transfer switches showing overall dimensions, electrical connections, electrical ratings, environmental restrictions, voltage, short circuit ratings, enclosure details and all accessories.
- C. Submit manufacturer's installation instructions. Include instructions for storage, handling, protection, examination, preparation, installation and starting of product.
- D. Submit manufacturer's operation and maintenance manual as part of shop drawing submittal.

1.04 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Section 017823.
- B. Include instructions for operating equipment.
- C. Include instructions for operating equipment under emergency conditions.
- D. Identify operating limits which may result in hazardous or unsafe conditions, whether switch is being operated automatically or manually.
- E. Document ratings of equipment and each major component.
- F. Include manufacturer's recommended routine preventative maintenance schedule.
- G. List any special tools, maintenance materials and recommended spare parts.

1.05 EXTRA SERVICES

- A. The supplier shall include as a part of the package a 5-year warranty and 5-year planned maintenance agreement at no additional cost to the Owner. The agreement shall include, as a minimum, one service call per year. The services must be performed by the authorized distributor of the equipment furnished and may not be subcontracted. The following services shall be performed once a year.
 - 1. Check switches for loose, bare or broken wiring (replace as needed).
 - 2. Test transfer switch operation, time delays and manual operators.
 - 3. Test transfer switch operations and plant exerciser.

- B. Manufacturer's Instructions: The manufacturer's instructions shall indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation, installation and starting of product.

1.06 REGULATORY REQUIREMENTS

- A. Conform to all applicable national, state, city or local codes for standby electrical systems.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Transfer switch shall be ONAN Model X-Series.
- B. Transfer switch shall be supplied and warranted for 5 years, including a five-year planned maintenance agreement by the single system source supplier. No exceptions.
- C. Proposal for any substitute equipment shall provide complete submittal data, as specified to the Engineer for approval or disapproval. Physical dimensions of transfer switches are based on ONAN Model X-Series. Substitute equipment shall be field verified for adequate equipment spacing relative to other equipment to be installed in the same locations.
- D. It is intended that all products specified herein be of standard ratings, therefore, the ampere ratings, withstand and closing ratings, etc., shall be the manufacturer's next available larger size of rating until the specifications are exactly met.

2.02 AUTOMATIC TRANSFER

- A. Description: NEMA ICS 2; automatic transfer switches.
- B. The switches shall be mechanically held, electrically operated and shall be interlocked mechanically and electrically to insure that normal power and emergency power mixing is impossible. The automatic transfer switches shall be suitable for use with emergency sources.

2.03 AUTOMATIC TRANSFER SWITCH

- A. Sequence of Operation: Automatic switching shall occur from normal power to emergency power when there is a phase reversal or when any phase of the normal power drops between an adjustable voltage range of 75 to 98% voltage and to automatically restore the load to normal when all phases are between an adjustable voltage range of 75 to 98% normal voltage or phase rotation is corrected.
- B. Main switch contacts shall be high-pressure silver alloy in order to improve interrupting and withstand capabilities. Main contacts shall be rated for 600 volts AC minimum. Contact assemblies shall have arc chutes for positive arc extinguishment. Arc chutes shall have insulating covers to prevent interphase flashover.
- C. Transfer switches shall be equipped with transparent protective covers over all live parts of the switch. These covers are to serve as protection to operators or service personnel from contact with live parts, and from contact with arcing by-products if the switches operate with the door open. Barriers shall be transparent to allow for visual inspection for contact position and for damage.
- D. Automatic transfer switches utilizing components of molded case circuit breakers are not acceptable.

- E. All transfer switches and accessories shall be UL listed and labeled, tested per UL Standard 1008 and CSA approved.
- F. Solid state undervoltage sensors shall simultaneously monitor all phases of both sources. Pick-up and drop-out setting shall be adjustable between 75 and 98% of system voltage. Voltage sensors shall allow for adjustment to sense partial loss of voltage on any phase. Voltage sensors shall have field calibration of actual supply voltage to nominal system voltage. Switches that do not monitor all three phases of both normal and emergency sources will not be acceptable.
- G. Provide frequency sensing relay which will not permit transfer to emergency power until the generator set is operating at 60 Hz.
- H. Control wiring shall be terminated interlocking, plug-type connectors. Operating current for the transfer shall be obtained from the source to which the load is to be transferred.
- I. The controls shall include latching diagnostic indicators to pinpoint the last successful step in the sequence of control functions, and to indicate the present status of the control functions in real time, as follows:
 - 1. Source 1 OK.
 - 2. Start Generator Set.
 - 3. Source 2 OK.
 - 4. Transfer Timing.
 - 5. Transfer Complete.
 - 6. Retransfer Timing.
 - 7. Retransfer Complete.
 - 8. Timing for Stop.

2.04 RATINGS

- A. Ratings shall be as follows:
 - 1. Voltage: 120/208 volts, three phase, four wire, 60 Hz.
 - 2. Switched Poles: 4, (overlapping neutral not acceptable).
 - 3. Load Inrush Rating: Combination Load.
- B. All automatic transfer switches shall meet the following withstand ratings as a minimum. In order to protect the system under current or possible future conditions, whether protected by circuit breakers or current limiting fuses, the transfer switches must meet both of the following molded case circuit breaker and current limiting fuse withstand and closing ratings as a minimum. Ratings are stated in symmetrical RMS amperes for three phase faults.
 - 1. Transfer Amperage: 400 and 60
 - 2. WCR @ 208 Volts W/Molded Case C/B'S: 30,000
- C. Transfer switches shall be continuously rated in ambient temperatures of -40 to +50 degrees C, relative humidity up to 95% (non-condensing), and altitudes up to 10,000 feet.

2.05 AUTOMATIC SEQUENCE OF OPERATION

- A. Initiate Time Delay to Start Alternate Source: Upon initiation by normal source monitor.
- B. Time Delay to Start Alternate Source Engine Generator: 0 to 15 seconds, adjustable.
- C. Initiate Transfer Load to Alternate Source: Upon initiation by normal source monitor and permission by alternate source monitor.

- D. Time Delay Before Transfer to Alternate Power Source: 2 to 120 seconds, adjustable.
- E. Initiate Retransfer Load to Normal Source: Upon permission by normal source monitor.
- F. Time Delay Before Retransfer to Normal Power: 0 to 30 minutes, adjustable; bypass time delay in the event of the alternate source failing.
- G. Time Delay Before Engine Shut Down: 0 to 10 minutes, adjustable, of unloaded operation; factory set at 5 minutes.

2.06 ENCLOSURE

- A. Enclosures: Transfer switch enclosure shall be NEMA 1. All controls which will be located on cabinets shall be key operated. Manual operating handles and all control switches, (other than key-operated switches) shall be accessible to authorized personnel only by opening the key-locking cabinet doors. Transfer switches with manual operating handles and/or non key-operated control switches located on the outside of the cabinet do not meet this specification and are not acceptable.

2.07 ACCESSORIES

- A. Indicating Lights: Mounted in cover of enclosure to indicate the following.
 - 1. NORMAL SOURCE 1 AVAILABLE.
 - 2. NORMAL SOURCE 2 AVAILABLE.
 - 3. NORMAL SOURCE 1 SWITCH POSITION.
 - 4. NORMAL SOURCE 2 SWITCH POSITION..
 - 5. AC POWER FAILURE.
- B. Test Switches: Switches to be keyed operated. Provide TEST/NORMAL/RETRANSFER positions. Retransfer position to provide immediate Retransfer to normal, bypassing time delay. The test switch shall be capable of receiving a remote signal. The transfer switch shall retransfer to the normal source and go into engine cool down mode 0-10 minutes adjustable.
- C. Transfer Switch Main Shaft Auxiliary Contacts: Two normally open; two normally closed. Wired to terminal block for easy access for indication of switch position. Rated at 10 Amps continuous and 250 VAC maximum.
- D. Transfer switches are to be equipped with permanently attached operating handles and quick-break, quick-make mechanisms suitable for normal operation under load. Loose manual operating handles that need to be field attached for operation will not be acceptable.
- E. All transfer switches shall be provided with a field adjustable time delay during the switching in both directions, during which time the load is isolated from both power sources, to allow load residual voltage to decay before closure to opposite source. The delay feature shall have an adjustable range of 0 to 7.5 seconds. Phase angle monitor/inphase type monitors are not acceptable.
- F. Provide a voltage monitoring relay and pneumatic time delay relay control circuit to energize a relay contact when power to the load terminals of the transfer switch is lost for a pre-selected time interval. The voltage phase monitor relay shall monitor 3-phase voltage, phase failure, phase reversal and voltage imbalance. The phase monitor shall have a normally closed contact in Series with a time delay relay. The pneumatic time delay relay shall have a 0-5 minute timer with automatic reset when power is restored to the coil.

- G. Provide a Signal Module Option: Provides relay output contacts for sending information to the building monitoring and control system. Relay outputs include: source 1 connected/available, source 2 connected/available, not in auto, test/exercise active, failed to disconnect, failed to synchronize, failed to transfer/retransfer, and elevator control pre-transfer signal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installation of transfer switches shall be in accordance with manufacture requirements. Provide applicable U.L. labeling for installed system.

3.02 POWER OUTAGE

- A. After the transfer switch is installed, the Contractor shall be responsible to inspect the installation and field verify that the switch has been installed per manufacturer's recommendations. Owner's operating personnel shall be instructed on the use and service requirements of the transfer switch by the manufacturer. A minimum of two (2) hours manufacturers training is required.

3.03 DEMONSTRATION

- A. Demonstrate operation of transfer switch under provisions.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Interior and exterior luminaires and accessories.
- B. Emergency lighting and units.

1.02 REFERENCES

- A. NEMA WD 6 - Wiring Devices - Dimensional Requirements.
- B. NFPA 70 - National Electric Code.
- C. NYCEC - New York City Electrical Code.
- D. NFPA 101 - Life Safety Code.
- E. LM-79-08, IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products
- F. LM-80-08, IESNA Approved Method for Measuring Lumen Maintenance of LED Light Sources

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Shop Drawings: Indicate dimensions and components for each luminaire.
- C. Product Data: Provide dimensions, ratings, performance data and installation instructions.
- D. Submit manufacturer's installation instructions. Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.
- E. All foot candle calculations and photometrics must be provided with substitute products. Photometrics shall include a room by room analysis showing walls, room names and room numbers. Calculation points shall be 2 feet on center, measured at 30" above the floor. Maintained foot candle levels shall meet or exceed IES recommended light levels for the type of space. On each drawing, provide a table showing the Room Name, Room Number, Maximum Light Level, Minimum Light Level, Average Light Level, Min:Max Ratio and, IES File Model Number, and IES recommended light level with specific references.
- F. All substitute LED light fixtures and LED retrofit lighting kits must be Design Lights Consortium (DLC) qualified.
- G. All substitute LED replacement lamps must be listed by Energy Star as Certified Light Bulbs.

1.04 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70 and NYCEC.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc.

1.05 EXTRA PRODUCTS

- A. Section 017800 - Closeout Submittals.
- B. LED Fixtures: At completion of installation, deliver to Owner.
 - 1. Four (4) additional fixtures for each type specified listed on the light fixture schedule.

PART 2 - PRODUCTS

2.01 LIGHTING UNITS

- A. Refer to LIGHTING FIXTURE SCHEDULE on drawings for fixture manufacturer, catalog number, and fixture description.
- B. All fixtures equipped with emergency battery packs shall have label, test light, and switch accessible and visible from the room floor.

2.02 LIGHTING FIXTURE NOTES

- A. MOUNTING: Electrical Contractor is responsible for reviewing all mounting arrangements prior to ordering any products. Electrical Contractor is responsible for ordering all of the proper fixtures, mounting hardware and miscellaneous fasteners to complete project. Fixtures to be secured to the structure from a minimum of two points, at opposing ends of the fixture when ceiling recessed or surface mounted. Four points shall be secured where necessary for the fixture to be parallel and tight to underside of ceiling. All recessed fixtures to fit tight to ceiling to eliminate all light leaks. Trim kits, when not secured internally to fixture, shall be secured to structure at a minimum of two points.
- B. MOUNTING: Prior to submitting and ordering any light fixture, Contractor is responsible for verifying adequate mounting clearances for all light fixtures that are to be recessed into a grid type ceiling. Where new ceilings are to be installed, contractor shall coordinate with ceiling installers for exact mounting heights and required mounting spaces.
- C. FINISHES: All exposed portions (permanent or adjustable) of fixtures to be finished by the manufacturer in a finish as specified.
- D. Fixtures shall come pre-assembled and complete with all sockets (incandescent to be spring supported), lamp ends, ballasts, transformers, fixture ends, trim rings, plates, and low density mounting kits (as required) for a complete installation.
- E. LAMPS: SYLVANIA, PHILLIPS or GENERAL ELECTRIC, as selected by the Electrical Contractor. Note, all lamps for one project to be furnished by the same manufacturer unless otherwise specified. At the end of the project, the Electrical Contractor shall turn over to the Owner one lamp envelope from each type installed. The Contractor shall be responsible for replacing all lamps which burn out during construction and up to ninety (90) days after Owner occupancy of the building.
- F. VOLTAGE: As noted on the LIGHTING FIXTURE SCHEDULE. Contractor is responsible for field verifying available voltage(s) and ordering fixtures, ballasts, and transformers accordingly.
- G. ORDERING: It is solely the responsibility of the Contractor to order fixtures, lamps, mounting brackets and accessories so that the fixtures will be installed and operating upon Owner Occupancy opening. Contractor is responsible for all delays because of his/her lack of effort to order the products in a timely manner.

- H. SHIPPING: The light fixture manufacturer shall mark the fixture type as indicated on the contract drawings and/or shop drawings on the respective carton when shipping luminaries. The Contractor shall be responsible for checking each carton immediately upon receipt for verification that fixtures are undamaged and no contents are missing. All discrepancies must be reported to shipper and manufacturer immediately; otherwise the Contractor shall be responsible for items which are lacking or damaged.

2.03 WARRANTY

- A. All light fixtures shall have a 5-year manufacturer's warranty. Warranty shall begin on date of substantial completion.

2.04 SUBSTITUTIONS

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install fixtures in accordance with manufacturer's instructions.
- B. Mount fixtures in locations as shown on drawings and as called for in schedule on electrical drawings. Determine type of ceiling to be installed in each space from drawings and schedules and furnish fixtures suitable for the exact type.
- C. Joints in fixture wiring shall be made using wire nuts, pre-insulated Scotch locks, or other approved mechanical means of connection.
- D. Adjustable type fixtures shall be adjusted by the Contractor to illuminate intended area to satisfaction of the Engineer.
- E. Surface fixtures in or on plastered or drywall ceilings shall be supported from pieces of support channel spanning across main support channels and shall not depend on ceilings for support.
- F. Coordinate fixture locations to clear diffusers, ductwork, piping, etc.
- G. Maintain integrity of enclosures on all enclosed and gasketed fixtures. Minimize number of enclosure penetrations and make such penetrations water and dust tight with appropriate gasketing and fittings.
- H. Fixtures are to fit tight against construction to eliminate light leaks.
- I. Recessed downlights are to be provided with adjustable mounting bars/frames for drywall or lay-in ceilings as required. Fixtures shall be securely fastened to the ceiling framing member by mechanical means such as bolts, screws, rivets, or listed clips identified for use with the type of ceiling framing members and fixtures.
- J. Support recessed fixtures 2 foot x 2 foot and larger using a minimum of four independent wire hangers, one on each corner, of same gauge as ceiling suspension system supported from building structure independent of ceiling framing. Install earthquake clips to secure recessed grid-suspended luminaries in place.
- K. Wall-mounted fixtures shall be mounted plumb with building lines and installed with proper box and cover hardware.
- L. Surface-mounted fixtures are to cover mounting hardware. Use a canopy that is no longer than the length and width of the fixture and at a height that is no higher than required to mount the

fixture absolutely vertical. Fixtures shall be plumb and shall align with building lines and with each other. Support surface mounted luminaries on grid ceiling directly from building structure. Secure to prevent movement.

- M. Stem-mounted fixtures are to be mounted to be absolutely vertical or horizontal. Install suspended luminaries using pendants supported from swivel hangers or in accordance with details shown in drawings. Provide pendant length required to suspend luminaire at indicated height. Support stem-mounted fixtures directly from the building structure.
- N. Install recessed luminaries using accessories and firestopping materials to meet regulatory requirements for fire rating. In fire rated ceilings, recessed luminaries must carry one-hour UL fire rating classification.
- O. Install all accessories specified with each fixture. Install recessed luminaries to permit removal from below.
- P. Bond products and metal accessories to branch circuit equipment grounding conductor.
- Q. At completion of installation and before turning over to owner, clean and remove all dirt and smudges from all lighting fixtures including lenses, louvers and reflectors.
- R. Relamp luminaries that have failed at completion of project.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. The cable and conduit schedule lists conduit number, size and type, cable quantity and size from/to destinations, circuit purpose and remarks.
- B. All conduits and wiring shall be furnished and installed under this Contract, unless specifically noted otherwise.
- C. The conduit numbering system consists of two parts separated by hyphen. First part is the equipment identification number. The second part is the individual conduit identification number. The individual conduit identification number may be presented in a 2? or 3?digit format (for example, 01 and 001) and represents the same conduit.
- D. The definition of the term conduit shall include all types of raceway provided under this Contract.
- E. In all cases where the word install or installed refers to conduit it shall mean install all conduit, raceways, fittings, supports, boxes and appurtenances. In addition it shall include all grounding and bonding. Drag lines are to be pulled upon completion of each raceway.
- F. Where install or installed refers to cable it shall include pulling the cable and testing the cable for insulation resistance, continuity and absence from grounds, as well as terminating all conductors and testing for proper connection.
- G. In general, the conduit and cable schedules do not indicate lighting and receptacle circuits, as well as some of the other cable and conduit to be provided under this Contract. The Contractor is advised to refer to the Specifications and Drawings for the additional conduit and cable requirements.
- H. Conform to the specifications requirements for Conduit and Cable Sections 260513 - Medium Voltage Cables, Section 260519 Low-Voltage Electrical Power Conductors, and 260533 - Raceways and Supports for Electrical Systems.
- I. The conduit and cable schedule begins on the following page.
- J. Refer to the Contract Drawings for specific type of conduit installed. Should there be a conflict between the type of conduit indicated on the Drawings and the following specifications schedule type, the Drawings shall take precedence.

PART 2 PRODUCTS

END OF SECTION

SECTION 260553 - CABLE AND CONDUIT SCHEDULE - BROOKLYN NAVY YARD BUILDING 386

CONDUIT NO.	SIZE	TYPE	FROM	TO	CABLE & SIZE	PURPOSE	REMARKS
XE2T-001	4"	PVC SCH 40RGS	EXISTING	T1	3 #1 AWG	13800V POWER	PVC SCH 40 FROM EXISTING MANHOLE TO NEW MANHOLE. RGS FROM NEW MANHOLE INTO BUILDING 386 AND UP TO NEW SUBSTATION ON SECOND FLOOR
XE2T-002	4"	PVC SCH 40RGS	EXISTING	T1	N/A	13800V POWER	
XPG	4"	PVC SCH 40RGS	EXISTING	T2	3 #1 AWG	13800V POWER	
XPG	4"	PVC SCH 40RGS	EXISTING	T2	N/A	13800V POWER	
T1-SG386-001	4"	PVC SCH 40RGS	T1	S386-1	4 #600 MCM +1/0 AWG GND	4160 POWER	
T1-SG386-002	4"	PVC SCH 40RGS	T1	S386-1	4 #600 MCM +1/0 AWG GND	4160 POWER	
T2-SG386-001	4"	PVC SCH 40RGS	T2	S386-10	4 #600 MCM +1/0 AWG GND	4160 POWER	
T2-SG386-002	4"	PVC SCH 40RGS	T2	S386-10	4 #600 MCM +1/0 AWG GND	4160 POWER	
SG386-02-001	4"	RGS	SG386-2	N/A	N/A	4160 POWER	
SG386-02-002	4"	RGS	SG386-2	N/A	N/A	4160 POWER	
SG386-02-003	4"	RGS	SG386-2	N/A	N/A	4160 POWER	
SG386-02-004	4"	RGS	SG386-2	N/A	N/A	4160 POWER	
SG386-03-001	4"	RGS	SG386-3	N/A	N/A	4160 POWER	
SG386-03-002	4"	RGS	SG386-3	N/A	N/A	4160 POWER	
SG386-03-003	4"	RGS	SG386-3	N/A	N/A	4160 POWER	
SG386-03-004	4"	RGS	SG386-3	N/A	N/A	4160 POWER	
SG386-04-001	3.5"	RGS	SG386-4	T3	3-600KCMIL & 1#3 GND	480V POWER	
SG386-04-002	3.5"	RGS	SG386-4	T5	3-600KCMIL & 1#3 GND	480V POWER	
SG386-05-001	4"	RGS	SG386-5	N/A	N/A	4160 POWER	
SG386-05-002	4"	RGS	SG386-5	N/A	N/A	4160 POWER	
SG386-05-003	4"	RGS	SG386-5	N/A	N/A	4160 POWER	
SG386-05-004	4"	RGS	SG386-5	N/A	N/A	4160 POWER	
SG386-07-001	3.5"	RGS	SG386-6	T4	3-600KCMIL & 1#3 GND	480V POWER	
SG386-07-002	4"	RGS	SG386-6	N/A	N/A	4160 POWER	
SG386-07-003	4"	RGS	SG386-6	N/A	N/A	4160 POWER	
SG386-08-001	3.5"	RGS	SG386-7	T6	3-600KCMIL & 1#3 GND	480V POWER	
SG386-08-002	4"	RGS	SG386-7	N/A	N/A	4160 POWER	
SG386-08-003	4"	RGS	SG386-7	N/A	N/A	4160 POWER	
SG386-09-001	4"	RGS	SG386-8	N/A	N/A	4160 POWER	
SG386-09-002	4"	RGS	SG386-8	N/A	N/A	4160 POWER	
SG386-09-003	4"	RGS	SG386-8	N/A	N/A	4160 POWER	
SG386-09-004	4"	RGS	SG386-8	N/A	N/A	4160 POWER	
SS386A-02-001	4"	RGS	SS386A-2	N/A	N/A	480 POWER	
SS386A-02-002	4"	RGS	SS386A-2	N/A	N/A	480 POWER	
SS386A-02-003	4"	RGS	SS386A-2	N/A	N/A	480 POWER	
SS386A-02-004	4"	RGS	SS386A-2	N/A	N/A	480 POWER	
SS386A-02-005	4"	RGS	SS386A-2	N/A	N/A	480 POWER	
SS386A-02-006	4"	RGS	SS386A-2	N/A	N/A	480 POWER	
SS386A-02-007	4"	RGS	SS386A-2	N/A	N/A	480 POWER	
SS386A-02-008	4"	RGS	SS386A-2	N/A	N/A	480 POWER	
SS386A-03-001	4"	RGS	SS386A-3	N/A	N/A	480 POWER	
SS386A-03-002	4"	RGS	SS386A-3	N/A	N/A	480 POWER	
SS386A-03-003	4"	RGS	SS386A-3	N/A	N/A	480 POWER	
SS386A-03-004	4"	RGS	SS386A-3	N/A	N/A	480 POWER	
SS386A-03-005	4"	RGS	SS386A-3	N/A	N/A	480 POWER	
SS386A-03-006	4"	RGS	SS386A-3	N/A	N/A	480 POWER	
SS386A-03-007	4"	RGS	SS386A-3	N/A	N/A	480 POWER	
SS386A-03-008	4"	RGS	SS386A-3	N/A	N/A	480 POWER	
SS386A-05-001	3"	RGS	S386A-SECTION 5	T7	3 #4/0 AWG + #2 AWG GND	120V/208 POWER	
SS386A-05-002	3"	RGS	S386A-SECTION 5	T7	3 #4/0 AWG + #2 AWG GND	120V/208 POWER	

SS386A-05-003	4"	RGS		SS386A-5	N/A	N/A		480 POWER
SS386A-05-004	4"	RGS		SS386A-5	N/A	N/A		480 POWER
SS386A-05-005	4"	RGS		SS386A-5	N/A	N/A		480 POWER
SS386A-05-006	4"	RGS		SS386A-5	N/A	N/A		480 POWER
SS386A-05-007	4"	RGS		SS386A-5	N/A	N/A		480 POWER
SS386A-05-008	4"	RGS		SS386A-5	N/A	N/A		480 POWER
SS386A-05-009	4"	RGS		SS386A-5	N/A	N/A		480 POWER
SS386A-05-010	4"	RGS		SS386A-5	N/A	N/A		480 POWER
SS386A-06-001	4"	RGS		SS386A-6	N/A	N/A		480 POWER
SS386A-06-002	4"	RGS		SS386A-6	N/A	N/A		480 POWER
SS386A-06-003	4"	RGS		SS386A-6	N/A	N/A		480 POWER
SS386A-06-004	4"	RGS		SS386A-6	N/A	N/A		480 POWER
SS386A-06-005	4"	RGS		SS386A-6	N/A	N/A		480 POWER
SS386A-06-006	4"	RGS		SS386A-6	N/A	N/A		480 POWER
SS386A-06-007	4"	RGS		SS386A-6	N/A	N/A		480 POWER
SS386A-06-008	4"	RGS		SS386A-6	N/A	N/A		480 POWER
SS386A-07-001	4"	RGS		SS386A-7	N/A	N/A		480 POWER
SS386A-07-002	4"	RGS		SS386A-7	N/A	N/A		480 POWER
SS386A-07-003	4"	RGS		SS386A-7	N/A	N/A		480 POWER
SS386A-07-004	4"	RGS		SS386A-7	N/A	N/A		480 POWER
SS386A-07-005	4"	RGS		SS386A-7	N/A	N/A		480 POWER
SS386A-07-006	4"	RGS		SS386A-7	N/A	N/A		480 POWER
SS386A-07-007	4"	RGS		SS386A-7	N/A	N/A		480 POWER
SS386A-07-008	4"	RGS		SS386A-7	N/A	N/A		480 POWER
SS386B-02-001	4"	RGS		SS386B-2	N/A	N/A		480 POWER
SS386B-02-002	4"	RGS		SS386B-2	N/A	N/A		480 POWER
SS386B-02-003	4"	RGS		SS386B-2	N/A	N/A		480 POWER
SS386B-02-004	4"	RGS		SS386B-2	N/A	N/A		480 POWER
SS386B-02-005	4"	RGS		SS386B-2	N/A	N/A		480 POWER
SS386B-02-006	4"	RGS		SS386B-2	N/A	N/A		480 POWER
SS386B-02-007	4"	RGS		SS386B-2	N/A	N/A		480 POWER
SS386B-02-008	4"	RGS		SS386B-2	N/A	N/A		480 POWER
SS386B-03-001	4"	RGS		SS386B-3	N/A	N/A		480 POWER
SS386B-03-002	4"	RGS		SS386B-3	N/A	N/A		480 POWER
SS386B-03-003	4"	RGS		SS386B-3	N/A	N/A		480 POWER
SS386B-03-004	4"	RGS		SS386B-3	N/A	N/A		480 POWER
SS386B-03-005	4"	RGS		SS386B-3	N/A	N/A		480 POWER
SS386B-03-006	4"	RGS		SS386B-3	N/A	N/A		480 POWER
SS386B-03-007	4"	RGS		SS386B-3	N/A	N/A		480 POWER
SS386B-03-008	4"	RGS		SS386B-3	N/A	N/A		480 POWER
SS386B-05-001	3"	RGS	S386B-SECTION 5			T8	3 #4.0 AWG + #2 AWG GND	120V/208 POWER
SS386B-05-002	3"	RGS	S386B-SECTION 5			T8	3 #4.0 AWG + #2 AWG GND	120V/208 POWER
SS386B-05-003	4"	RGS		SS386B-5	N/A	N/A		480 POWER
SS386B-05-004	4"	RGS		SS386B-5	N/A	N/A		480 POWER
SS386B-05-005	4"	RGS		SS386B-5	N/A	N/A		480 POWER
SS386B-05-006	4"	RGS		SS386B-5	N/A	N/A		480 POWER
SS386B-05-007	4"	RGS		SS386B-5	N/A	N/A		480 POWER
SS386B-05-008	4"	RGS		SS386B-5	N/A	N/A		480 POWER
SS386B-05-009	4"	RGS		SS386B-5	N/A	N/A		480 POWER
SS386B-05-010	4"	RGS		SS386B-5	N/A	N/A		480 POWER
SS386B-06-001	4"	RGS		SS386B-6	N/A	N/A		480 POWER
SS386B-06-002	4"	RGS		SS386B-6	N/A	N/A		480 POWER

SS386B-06-003	4"	RGS	SS386B-6	N/A	N/A	480 POWER
SS386B-06-004	4"	RGS	SS386B-6	N/A	N/A	480 POWER
SS386B-06-005	4"	RGS	SS386B-6	N/A	N/A	480 POWER
SS386B-06-006	4"	RGS	SS386B-6	N/A	N/A	480 POWER
SS386B-06-007	4"	RGS	SS386B-6	N/A	N/A	480 POWER
SS386B-06-008	4"	RGS	SS386B-6	N/A	N/A	480 POWER
SS386B-07-001	4"	RGS	SS386B-7	N/A	N/A	480 POWER
SS386B-07-002	4"	RGS	SS386B-7	N/A	N/A	480 POWER
SS386B-07-003	4"	RGS	SS386B-7	N/A	N/A	480 POWER
SS386B-07-004	4"	RGS	SS386B-7	N/A	N/A	480 POWER
SS386B-07-005	4"	RGS	SS386B-7	N/A	N/A	480 POWER
SS386B-07-006	4"	RGS	SS386B-7	N/A	N/A	480 POWER
SS386B-07-007	4"	RGS	SS386B-7	N/A	N/A	480 POWER
SS386B-07-008	4"	RGS	SS386B-7	N/A	N/A	480 POWER
MHD5-001	4"	RGS	MH-D5	N/A	N/A	
MHD5-002	4"	RGS	MH-D5	N/A	N/A	
MHD5-003	4"	RGS	MH-D5	N/A	N/A	
MHD5-004	4"	RGS	MH-D5	N/A	N/A	
MHD5-005	4"	RGS	MH-D5	N/A	N/A	
MHD5-006	4"	RGS	MH-D5	N/A	N/A	
MHD5-007	4"	RGS	MH-D5	N/A	N/A	
MHD5-008	4"	RGS	MH-D5	N/A	N/A	
MHD5-009	4"	RGS	MH-D5	N/A	N/A	
MHD5-010	4"	RGS	MH-D5	N/A	N/A	
T3-S386A-001	4"	RGS	T3	S386A-SECTION 1	4-600 MCM +350AWG GND	480 POWER
T3-S386A-002	4"	RGS	T3	S386A-SECTION 1	4-600 MCM +350AWG GND	480 POWER
T3-S386A-003	4"	RGS	T3	S386A-SECTION 1	4-600 MCM +350AWG GND	480 POWER
T3-S386A-004	4"	RGS	T3	S386A-SECTION 1	4-600 MCM +350AWG GND	480 POWER
T3-S386A-005	4"	RGS	T3	S386A-SECTION 1	4-600 MCM +350AWG GND	480 POWER
T3-S386A-006	4"	RGS	T3	S386A-SECTION 1	4-600 MCM +350AWG GND	480 POWER
T4-S386A-001	4"	RGS	T4	S386A-SECTION 8	4-600 MCM +350AWG GND	480 POWER
T4-S386A-002	4"	RGS	T4	S386A-SECTION 8	4-600 MCM +350AWG GND	480 POWER
T4-S386A-003	4"	RGS	T4	S386A-SECTION 8	4-600 MCM +350AWG GND	480 POWER
T4-S386A-004	4"	RGS	T4	S386A-SECTION 8	4-600 MCM +350AWG GND	480 POWER
T4-S386A-005	4"	RGS	T4	S386A-SECTION 8	4-600 MCM +350AWG GND	480 POWER
T4-S386A-006	4"	RGS	T4	S386A-SECTION 8	4-600 MCM +350AWG GND	480 POWER
T5-S386B-001	4"	RGS	T5	S386B-SECTION 1	4-600 MCM +350AWG GND	480 POWER
T5-S386B-002	4"	RGS	T5	S386B-SECTION 1	4-600 MCM +350AWG GND	480 POWER
T5-S386B-003	4"	RGS	T5	S386B-SECTION 1	4-600 MCM +350AWG GND	480 POWER
T5-S386B-004	4"	RGS	T5	S386B-SECTION 1	4-600 MCM +350AWG GND	480 POWER
T5-S386B-005	4"	RGS	T5	S386B-SECTION 1	4-600 MCM +350AWG GND	480 POWER
T5-S386B-006	4"	RGS	T5	S386B-SECTION 1	4-600 MCM +350AWG GND	480 POWER
T6-S386B-001	4"	RGS	T6	S386B-SECTION 8	4-600 MCM +350AWG GND	480 POWER
T6-S386B-002	4"	RGS	T6	S386B-SECTION 8	4-600 MCM +350AWG GND	480 POWER
T6-S386B-003	4"	RGS	T6	S386B-SECTION 8	4-600 MCM +350AWG GND	480 POWER
T6-S386B-004	4"	RGS	T6	S386B-SECTION 8	4-600 MCM +350AWG GND	480 POWER
T6-S386B-005	4"	RGS	T6	S386B-SECTION 8	4-600 MCM +350AWG GND	480 POWER
T6-S386B-006	4"	RGS	T6	S386B-SECTION 8	4-600 MCM +350AWG GND	480 POWER
TS1-LPA-001	2"	RGS	TS1	LPA	3 #3/0 AWG+ #6 AWG GND	120V/208 POWER
DPB-TS1-001	2"	RGS	DP-A	TS1	3 #3/0 AWG+ #6 AWG GND	120V/208 POWER
DPA-TS1-001	2"	RGS	DP-B	TS1	3 #3/0 AWG+ #6 AWG GND	120V/208 POWER
T7-DPA-001	3.5"	RGS	T7	DPA	4#350 MCM + #3/0 AWG GND	120V/208 POWER
T7-DPA-002	3.5"	RGS	T7	DPA	4#350 MCM + #3/0 AWG GND	120V/208 POWER
T7-DPA-003	3.5"	RGS	T7	DPA	4#350 MCM + #3/0 AWG GND	120V/208 POWER
T7-DPA-004	3.5"	RGS	T7	DPA	4#350 MCM + #3/0 AWG GND	120V/208 POWER

T8-DPB-001	3.5"	RGS		T8	DPB	4#350 MCM + #3/0 AWG GND	120V/208 POWER
T8-DPB-002	3.5"	RGS		T8	DPB	4#350 MCM + #3/0 AWG GND	120V/208 POWER
T8-DPB-003	3.5"	RGS		T8	DPB	4#350 MCM + #3/0 AWG GND	120V/208 POWER
T8-DPB-004	3.5"	RGS		T8	DPB	4#350 MCM + #3/0 AWG GND	120V/208 POWER
DP-A-001	4"	RGS	DP-A	DP-A	SPARE	N/A	120V/208 POWER
DP-A-002	4"	RGS	DP-A	DP-A	SPARE	N/A	120V/208 POWER
DP-A-003	4"	RGS	DP-A	DP-A	SPARE	N/A	120V/208 POWER
DP-A-004	4"	RGS	DP-A	DP-A	SPARE	N/A	120V/208 POWER
DP-A-005	4"	RGS	DP-A	DP-A	SPARE	N/A	120V/208 POWER
DP-A-006	4"	RGS	DP-A	DP-A	SPARE	N/A	120V/208 POWER
DP-A-007	4"	RGS	DP-A	DP-A	SPARE	N/A	120V/208 POWER
DP-A-008	4"	RGS	DP-A	DP-A	SPARE	N/A	120V/208 POWER
DP-A-009	4"	RGS	DP-A	DP-A	SPARE	N/A	120V/208 POWER
DP-A-010	4"	RGS	DP-A	DP-A	SPARE	N/A	120V/208 POWER
DP-A-011	4"	RGS	DP-A	DP-A	SPARE	N/A	120V/208 POWER
DP-A-012	4"	RGS	DP-A	DP-A	SPARE	N/A	120V/208 POWER
DP-B-001	4"	RGS	DP-B	DP-B	SPARE	N/A	120V/208 POWER
DP-B-002	4"	RGS	DP-B	DP-B	SPARE	N/A	120V/208 POWER
DP-B-003	4"	RGS	DP-B	DP-B	SPARE	N/A	120V/208 POWER
DP-B-004	4"	RGS	DP-B	DP-B	SPARE	N/A	120V/208 POWER
DP-B-005	4"	RGS	DP-B	DP-B	SPARE	N/A	120V/208 POWER
DP-B-006	4"	RGS	DP-B	DP-B	SPARE	N/A	120V/208 POWER
DP-B-007	4"	RGS	DP-B	DP-B	SPARE	N/A	120V/208 POWER
DP-B-008	4"	RGS	DP-B	DP-B	SPARE	N/A	120V/208 POWER
DP-B-009	4"	RGS	DP-B	DP-B	SPARE	N/A	120V/208 POWER
DP-B-010	4"	RGS	DP-B	DP-B	SPARE	N/A	120V/208 POWER
DP-B-011	4"	RGS	DP-B	DP-B	SPARE	N/A	120V/208 POWER
DP-B-012	4"	RGS	DP-B	DP-B	SPARE	N/A	120V/208 POWER
LMC-LPA-001	1"	RGS		LPA	LIFT MACHINE CONTROLLER	2 #8 AWG + #10 AWG GND	208V POWER
TP-DPA-001	2"	RGS	DP-A	DP-A	TERMINATION PANEL A	2 #1/0 AWG + #6 AWG GND	208V POWER
TP-DPA-002	2"	RGS	DP-A	DP-A	TERMINATION PANEL B	2 #1/0 AWG + #6 AWG GND	208V POWER
TP-DPA-003	2"	RGS	DP-A	DP-A	TERMINATION PANEL C	2 #1/0 AWG + #6 AWG GND	208V POWER
TP-DPA-004	2"	RGS	DP-A	DP-A	TERMINATION PANEL D	2 #1/0 AWG + #6 AWG GND	208V POWER
LPA-EUH1-001	3/4"	RGS		LPA	EUH-1	2 #8 AWG + #10 AWG GND	208V POWER
LPA-EUH2-001	3/4"	RGS		LPA	EUH-2	2 #8 AWG + #10 AWG GND	208V POWER
LPA-EUH3-001	3/4"	RGS		LPA	EUH-3	2 #8 AWG + #10 AWG GND	208V POWER
LPA-EUH4-001	3/4"	RGS		LPA	EUH-4	2 #8 AWG + #10 AWG GND	208V POWER

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Temporary generators for use during construction.

1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electric Code.
- B. New York City Electrical Code - NYCEC.

1.03 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Shop Drawings: Indicate locations where temporary electric service and/or generator(s) will be located and routed.

1.04 REGULATORY REQUIREMENTS

- A. Provide temporary power in accordance with NEC and NYCEC.
- B. Obtain required permits from authorities.
- C. Notify affected utility companies before starting work and comply with their requirements.
- D. Do not close or obstruct egress width to exits.
- E. Do not turn off electric equipment without authorization from Owner and Engineer. Provide 72 hours advance notification minimum, unless otherwise noted on drawings and/or in the specifications.

1.05 SCHEDULING

- A. Provide temporary electric generator in accordance with Maintenance of Building Operations requirements.

PART 2 - PRODUCTS

2.01 TEMPORARY GENERATOR

- A. Minimum of one (1) Temporary generator shall be available during the entire contract period when required by the Maintenance of Building operations.
- B. Temporary generators shall be installed and maintained per NEC,, NYCEC, OSHA, N.Y.C. Building Code and local code requirements.
- C. One (1) temporary generator shall be a minimum of 250KW @ 120/208 Volt 3Ø, 4 wire.
- D. All existing equipment shall be protected against damage caused by the installation, operation and removal of the temporary generator service. Any equipment or items damaged shall be replaced at no cost to the Owner.
- E. Provide portable sound-attenuated generators system for temporary electric service.

- F. Provide all necessary wire, cables and conduit for connection between portable generator and equipment listed in the Maintenance of Building Operations and deemed necessary by the owner. Generators shall be configured to be automatically started and stopped.
 - 1. Provide all necessary fuel for operation. Generators shall be diesel powered.
 - 2. Coordinate with Owner for exact location of temporary generator.
 - 3. Provide and install a lockable fence enclosure to protect and secure generators from vandalism and theft.
 - 4. Upon completion of the project, remove all temporary electric light and power work and restore all affected finishes, connections and site work.

2.02 MINIMUM GENERATOR SYSTEM REQUIREMENTS

- A. The temporary engine generator shall start and provide continuous power to all of the existing site loads and loads required for construction purposes with 100 percent block loading at the time of transfer.
- B. The genset shall be trailer mounted with an integral sub base tank:
- C. The 250KW Genset shall be provided with diesel fuel tank sized for a minimum of 24 hour runtime based on loads being served.
- D. All gensets to be provided with an electronic governor.
- E. The fuel storage tank shall utilize double wall sub base containment.
- F. Strobe light to indicate low fuel level alarm
- G. Provide portable sound-attenuated generator system for temporary electric service. Sound level must not exceed 65 dBA at 50'.
- H. 110 VAC receptacle for use at low voltages
- I. Easy voltage selection: 120/240V, 120/208V, 277/480V
- J. Trailer shall be provided with out-riggers to provide security and remove load from trailer tires when genset is in stationary position.
- K. AC voltage and frequency meters, digital display panel, panel backlighting, Run-off-auto switch, self diagnostics, idle mode control, and voltmeter/ammeter phase selector switch.
- L. Overcurrent sensing, Voltage adjustment potentiometer.
- M. Provide all necessary wire, cables and conduit for connection between portable generator and all electrical equipment.
- N. Provide a full tank of fuel with delivery of unit. Generator shall be diesel powered.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing system voltage characteristics and match to existing system voltage characteristics.
- B. Verify that the temporary service is sized to accommodate all loads.

- C. Determine locations and routings for temporary electric wires, cables and conduits with Engineer and Owner.

3.02 TEMPORARY POWER

- A. Temporary wiring and power shall be installed so as not to be a hazard and shall be protected from damage. Separate circuits shall be provided for light and power. Over-current protective devices and switches shall be provided. All equipment, tools, metal cabinets and boxes shall be grounded.
- B. Disable existing power only to make final connections or when permanent service is to be installed.
- C. Temporary wires, cables and conduits shall be protected from damage and accessibility by unauthorized persons.
- D. Pay for all fuel and maintenance of unit during course of project. Power shall not be interrupted during any course of construction, except when transferring from existing source to temporary generator and back to new permanent source power. Power interruptions shall be limited to two (2) 20-minute durations and owner shall be notified a minimum of 72 hours before any power interruptions.
- E. Temporary Generator Plan:
 - 1. Contractor shall provide a minimum of one (1) 250 kw generator for the duration of any power outages in the building.
 - 2. For bidding, contractor shall assume 250 feet of temporary cable per phase, neutral, and ground will be required between the generator and load served.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Remove and dispose of surface debris as required.
- B. Remove and dispose of paving, sidewalk, curbs, etc.
- C. Clear site or designated areas of the site of plant life and grass as required, and dispose of as required.
- D. Remove and dispose of trees and shrubs as required.
- E. Remove and dispose of stumps and root system of trees and shrubs as required.
- F. Removal and storage of topsoil.

1.02 RELATED SECTIONS

- A. Section 312316 - Excavation
- B. Section 312333 - Trenching

1.03 REGULATORY REQUIREMENTS

- A. Conform to applicable local code(s) for disposal of debris.
- B. Burning of materials on site is prohibited.
- C. Coordinate clearing work with utility companies.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 PREPARATION

- A. Verify existing conditions.
- B. Identify existing plant life designated to be removed. Verify with Owner and Engineer prior to removal.
- C. Verify limits of clearing.

3.02 PROTECTION

- A. Locate, identify and protect utilities that are to remain from damage.
- B. Protect trees, plant growth and features designated to remain as final landscaping.
- C. Protect benchmarks and existing structures from damage or displacement. Any damage to existing structures is to be promptly repaired at no additional cost to the Owner.

3.03 APPLICATION

- A. Clear areas required for access to site and execution of work.
- B. Remove paving, curbs, debris and sidewalks as required.
- C. Remove trees and shrubs designated to be removed. Remove stumps, main root ball, surface rock and perishable debris.
- D. Clear undergrowth and dead wood without disturbing subsoil.
- E. Remove paving, debris, rock and extracted plant life from site and dispose of in accordance with State and local ordinances.
- F. Excavate topsoil from areas to be further excavated, re-landscaped or regraded. Do not excavate wet topsoil.
- G. Stockpile topsoil in area designated on site to a height not exceeding 8 feet. Protect from erosion. Remove excess topsoil not being reused from site. Do not remove any topsoil from the site prior to obtaining the approval of the Engineer.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Removal and storage of subsoil.
- B. Cutting, grading, filling and rough contouring the site prior to placement of topsoil or pavement base for final grading.

1.02 RELATED SECTIONS

- A. Section 311100 - Site Clearing.
- B. Section 312316 - Excavation.
- C. Section 312323.13 - Backfill.

1.03 REFERENCES

- A. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18 inch Drop.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Sieve Analysis: Submit a sieve analysis of all types of fill material to be used.

1.05 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of utilities remaining, by horizontal dimensions, elevations or inverts, and slope gradients.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Subsoil: Reused excavated material, graded, free of lumps, rocks and gravel larger than 3 inches in size, debris and contaminants.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify site conditions.
- B. Verify that survey benchmark and intended elevations for the work are as indicated.

3.02 PREPARATION

- A. Identify required lines, levels, contours and datum.
- B. Identify known underground, aboveground and aerial utilities. Stake and flag locations.
- C. Coordinate the removal or relocation of utilities with the necessary utility companies.
- D. Protect above and below-grade utilities that are to remain.

- E. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.
- F. Protect benchmarks, existing structures, fences, sidewalks, paving and curbs from excavation equipment and vehicular traffic.

3.03 APPLICATION

- A. Excavate subsoil from areas to be further excavated or regraded. Do not excavate wet subsoil.
- B. Stockpile in area designated on site. Remove excess subsoil not being reused from site.
- C. Stockpile subsoil to a height not exceeding 8 feet. Cover to protect from erosion.
- D. When excavation through roots is necessary, perform work by hand and cut roots with sharp axe.
- E. Fill areas to contours and elevations with unfrozen subsoil material with allowances made for topsoil, aggregate base course or paving.
- F. Place and compact subsoil fill material in 12 inch lifts (compacted thickness). Compact to 92 percent maximum dry density in accordance with ANSI/ASTM D1557.
- G. Maintain optimum moisture content of fill materials to attain required compaction density.
- H. Make grade changes gradual. Blend slope into level areas.
- I. Remove surplus fill materials from site.

3.04 TOLERANCES

- A. Maximum Variation From Top Surface of Subgrade: 1 inch.

3.05 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014500.
- B. Perform tests and analysis of fill material in accordance with ANSI/ASTM D1557.
- C. Perform compaction tests at a rate of one for every 10 cubic yards of material placed.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Excavation for building foundations.
- B. Excavation for slabs-on-grade, paving and landscaping.
- C. Excavation for site structures.
- D. Site excavation.

1.02 RELATED SECTIONS

- A. Section 312213 - Rough Grading.
- B. Section 312323.13 - Backfill: Backfilling excavated material.

1.03 QUALITY ASSURANCE

- A. Do not excavate wet or frozen materials without written approval from the Engineer.
- B. Provide safety barricades around open excavations.

1.04 FIELD MEASUREMENTS

- A. Verify that survey benchmark and intended elevations for the work are as indicated.

1.05 COORDINATION

- A. Coordinate work under provisions of Section 013100.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Identify required lines, levels, contours and datum.
- B. Identify known underground, above ground and aerial utilities. Stake and flag locations.
- C. Notify utility company to remove or relocate utilities, if required.
- D. Protect above and below grade utilities which are to remain.
- E. Protect plant life, lawns and other features remaining as a portion of final landscaping.
- F. Protect bench marks, existing structures, fences, sidewalks, paving and curbs from excavation equipment and vehicular traffic.
- G. Notify the Engineer prior to commencement of excavation.

3.02 EXCAVATION

- A. Underpin adjacent structures that may be damaged by excavation work, including utilities and pipe chases.
- B. Excavate subsoil required to accommodate landscaping and construction operations to the limits as indicated on the plans.
- C. Machine slope banks to angle of repose or less, until shored.
- D. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- E. Hand trim excavation. Remove loose matter.
- F. Remove lumped subsoil, boulders, and rock.
- G. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- H. Correct unauthorized excavation at no extra cost to Owner in accordance with Section 312323.13.
- I. Stockpile excavated material in area designated on site and remove excess material not being reused from site.

3.03 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014500.
- B. Provide for visual inspection of bearing surfaces.

3.04 PROTECTION

- A. Protect work under provisions of Section 015000.
- B. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.
- C. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION

PART -1 GENERAL

1.01 SECTION INCLUDES

- A. Site structure backfilling to sub-grade elevations.
- B. Site filling and backfilling.
- C. Consolidation and compaction.
- D. Fill for over-excavation.
- E. Environmental testing.

1.02 RELATED SECTIONS

- A. Section 312316 - Excavation.
- B. Section 312213 - Rough Grading.

1.03 REFERENCES

- A. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18-inch Drop.
- B. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Material Source: Submit name of imported material suppliers.
- C. Provide a letter certifying that each type of imported fill material has been provided by a NYSDEC certified clean fill source or has been tested in accordance with NYSDEC Unrestricted Soil Use Guidelines as defined in Subpart 375-6 Remedial Program Soil Cleanup Objectives.
- D. Test Reports: Submit sieve analysis and test results from NYSDEC Unrestricted Soil Use Guidelines for each type of imported fill to be used.

1.05 PROJECT CLOSEOUT SUBMITTALS

- A. Submit under provisions of Section 017200.
- B. Provide documentation on the contractor's letterhead certifying that all fill material utilized for this project came from approved sources and met the requirements of the NYSDEC Unrestricted Program Soil Use Guidelines.

PART 2 - PRODUCTS

2.01 IMPORTED FILL SOURCE

- A. All imported fill materials shall be provided by a NYSDEC certified clean fill source or meet the requirements of NYSDEC Unrestricted Soil Use Guidelines as defined in Subpart 375-6: Remedial Program Soil Cleanup Objectives.
- B. Test samples of imported fill in accordance with the following table:

Recommended Number of Soil Samples for Imported Soil			
Contaminant	VOC's	SVOC's, Inorganics & PCB's/Pesticides	
Soil Quantity (cubic yards)	Discrete Samples	Composite	Discreet Samples/Composite
0-50	1	1	3-5 discrete samples from different locations in the fill being provided will comprise a composite sample for analysis
50-100	2	1	
100-200	3	1	
200-300	4	1	
300-400	4	2	
400-500	5	2	
500-800	6	2	
800-1000	7	2	
>1000	Add an additional 2 VOC and 1 composite for each additional 1000 cubic yards or consult with DER		

- C. Provide materials from the same source throughout the work. Change of source requires approval from the Engineer.

2.02 FILL MATERIALS

- A. Coarse Aggregate: Angular crushed or natural stone; washed, free of shale, clay, friable material, sand and debris; graded in accordance with ASTM D2487 Group Symbol GW or GP within the following limits

1. Sieve Size	Percent Passing
a. 1 1/2 inch	100
b. 1 inch	90 - 100
c. 1/2 inch	0 - 15
d. No. 200	0 - 1

- B. Pea Gravel: Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ASTM D2487 Group Symbol GC or GM, within the following limits:

1. Minimum Size: 1/4 inch.
2. Maximum Size: 5/8 inch.

- C. Sand: Natural river or bank sand; washed, free of silt, clay, loam, friable or soluble materials, or organic matter; graded in accordance with ASTM D2487 Group Symbol SW or SP, within the following limits:

1. Sieve Size	Percent Passing
a. No. 4	100
b. No. 14	0 - 100
c. No. 50	5 - 90
d. No. 100	4 - 30
e. No. 200	0

- D. Subsoil: Reused, excavated material, graded, free of lumps, rocks and gravel larger than 3 inches in size, debris and contaminants; no more than 15% passing the No. 200 sieve; no more than 30% retained on the ¾" sieve.
- E. Drywell Collar Material: Clean sand and gravel containing less than 15% fine sand, silt and clay. Silt and clay fractions are not to exceed 5%. Native material may be reused if it meets this requirement.
- F. New York State Department of Transportation No. 2 Stone

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate.
- B. Verify fill materials to be reused are acceptable.
- C. Verify items to be buried during backfilling process have been inspected prior to backfilling.

3.02 PREPARATION

- A. Compact subgrade to 92 percent maximum dry density in accordance with ANSI/ASTM D1557.
- B. Cut out soft areas of subgrade not capable of in situ compaction. Backfill with sand or subsoil and compact to density equal to or greater than requirements for subsequent backfill material.

3.03 BACKFILLING

- A. Backfill areas to contours and elevations with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy materials.
- C. Place and compact fill material in 12 inch lifts (compacted thickness). Compact to 92 percent maximum dry density in accordance with ANSI/ASTM D1557.
- D. Employ a placement method that does not disturb or damage structures or other items against which material is backfilled.
- E. Backfill against supported structures. Do not backfill against unsupported structures.
- F. Backfill simultaneously on each side of structure.
- G. Make grade changes gradual. Blend slope into level areas.
- H. Remove surplus backfill materials from site.
- I. Leave fill material stockpile areas completely free of excess fill materials.

3.04 TOLERANCES

- A. Maximum Variation From Top Surface of Backfilling Under Paved Areas: 1/4 inch.
- B. Maximum Variation From Top Surface of General Backfilling: 1 inch.

3.05 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014500.
- B. Perform field tests and analysis of fill material in accordance with ANSI/ASTM D1557.
- C. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.
- D. Unless additional testing is required by the Engineer, compaction tests shall be taken at the following rates:
 - 1. Pavement Subgrade: One test per 5,000 square feet of subgrade immediately prior to placing subbase.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Excavate trenches for piping and utilities.
- B. Compacted bedding and backfill around and over piping and utilities to subgrade elevations.
- C. Backfilling and compaction.

1.02 RELATED SECTIONS

- A. Section 312213 - Rough Grading: Topsoil removal from site surface.

1.03 REFERENCES

- A. ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- B. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18-inch Drop.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Test Reports: Submit a sieve analysis for backfill to be used.

1.05 QUALITY ASSURANCE

- A. Do not excavate wet or frozen materials without written approval from the Engineer.
- B. Do not backfill over or with wet or frozen materials.
- C. Provide safety barricades around open excavations.

1.06 FIELD MEASUREMENTS

- A. Verify that survey benchmark and intended elevations for the work are as shown on plans.

1.07 COORDINATION

- A. Coordinate work under provisions of Section 013100.
- B. Coordinate trenching with installation of pipe or conduit.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Subsoil: Reused, excavated material, graded, free of lumps, rocks and gravel larger than 3 inches in size, debris and contaminants.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing site conditions and substrate.

- B. Verify fill materials to be reused are acceptable.
- C. Verify items to be buried during backfilling process have been inspected prior to backfilling.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Maintain and protect existing utilities remaining which pass through work area.
- C. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.
- D. Protect benchmarks, existing structures, fences, sidewalks, paving and curbs from excavation equipment and vehicular traffic. Any item damaged by the contractor shall be promptly repaired at the contractor's expense.
- E. Protect above and below grade utilities which are to remain.
- F. Cut out soft areas of subgrade not capable of in situ compaction. Backfill with subsoil fill and compact to density equal to or greater than requirements for subsequent backfill material.

3.03 EXCAVATION

- A. Excavate subsoil required for piping.
- B. Cut trenches to the dimensions shown on the plans.
- C. Excavation shall not interfere with normal 45 degree bearing splay of foundations.
- D. Hand trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.
- E. Remove lumped subsoil, boulders, and rock.
- F. For trenches made in solid rock, excavate to a depth of 1 foot below the proposed pipe invert.
- G. Correct unauthorized excavation at no cost to Owner in accordance with Section 312323.13.
- H. Stockpile excavated material in area designated on site and remove excess material not being used from site. Remove excavated material from site.

3.04 BACKFILLING

- A. Support pipe and conduit during placement and compaction of fill material.
- B. For trenches made in solid rock, place an additional 1 foot of fill material under pipe or conduit.
- C. Place fill material to the dimensions and limits as shown on the plans.
- D. Place and compact fill material in 12 inch lifts (compacted thickness) for depths greater than 2 feet and 6 inch lifts (compacted thickness) for depths less than 2 feet. Compact to 92 percent maximum dry density in accordance with ANSI/ASTM D1557.
- E. Place fill material simultaneously on both sides of the pipe or conduit. Backfill to the dimensions and limits shown on the plans with reused subsoil.

- F. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- G. Employ a placement method that does not disturb or damage conduit or pipe.

3.05 TOLERANCES

- A. Maximum Variation From Top Surface of Backfilling Under Paved Areas: 1/4 inch.
- B. Maximum Variation From Top Surface of General Backfilling: 1 inch.

3.06 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014500.
- B. Perform field tests and analysis of fill material in accordance with ANSI/ASTM D1557.
- C. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.
- D. Unless additional testing is required by the Engineer, compaction tests shall be taken at the springline of the pipe and after each lift at 100 foot intervals along the pipe run.

3.07 CLEANING

- A. Remove surplus backfill materials from site.
- B. Leave fill material stockpile areas completely free of excess fill materials.

3.08 PROTECTION

- A. Protect finished work under provisions of Section 015000.
- B. Recompact fills subjected to vehicular traffic.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Wood Sheeting.
- B. Steel Sheeting
- C. Sheeting box.
- D. Lagging.
- E. Walers
- F. Capping

1.02 RELATED SECTIONS

- A. Section 312316 - Excavation.
- B. Section 312323.13 - Backfilling.
- C. Section 312333 - Trenching.

1.03 REFERENCES

- A. Occupational Safety and Health Standards - Excavations; Final Rule (29 CFR Part 1926) - OSHA Standards.
- B. ASTM International (ASTM)
 - 1. ASTM D 7290: Standard Practice for Evaluating Material Property Characteristic Values for Polymeric Composites for Civil Engineering Structural Applications
 - 2. ASTM D 695 Standard Test Method for Compressive Properties of Rigid Plastics
 - 3. ASTM D 6641: Standard Test Method for Compressive Properties of Polymer Matrix Composite Materials Using a Combined Loading Compression (CLC) Test Fixture
 - 4. ASTM D 638 Standard Test Method for Tensile Properties of Plastics
 - 5. ASTM D 256 Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics
 - 6. ASTM D 790 Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position
 - 7. ASTM D 2344 Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Provide Product Data for FRP Sheet Piling including but not limited to: ASTM certifications and test results proving conformance to ASTM referenced standards and strength characteristics required by the contract documents, material thickness, sectional configurations, fasteners, sheet size, interlock details; manufacturer's detail, installation and maintenance requirements and sample 20 year warranty.

- C. Characteristic Value Report in accordance with D7290, containing no less than 20 samples, pulled from no less than 5 independent material runs, over no less than one year.
- D. Certification that the material was produced in accordance with the manufacturer's quality control plan in an ISO 9001 certified manufacturing facility.
- E. Material certification indicating that the material being received by the contractor is in conformance with the geometric and material requirements outlined in the specifications.
- F. Provide information describing the method for handling piling to prevent permanent deflection, distortion or damage to piling interlocks, plus type of transportation vehicle for bringing piles to point of installation.
- G. Shop Drawings: Indicate materials and methods to be used during excavation. Submit drawings and details of sheeting including corner conditions, various intersections, connection details, anchoring methods, capping, relation to adjoining surfaces with elevation references. Include supporting calculations and product data showing conformance to the design parameters shown on the contract documents.
- H. Provide pertinent data for all proposed Driving equipment and a letter from the FRP Sheeting manufacturer approving the proposed equipment for use with the proposed FRP Sheeting system.

1.05 QUALITY ASSURANCE

- A. Perform all work of this section in accordance with OSHA Standards and approved shop drawings.
- B. For each shipment, submit certificates provided by the sheet pile manufacturer prior to installing piling. Include in the identification data piling type, section depth, section width, sheet thickness, and section modulus.
- C. Sheeting shall be installed by persons regularly engaged in sheeting installation and who have a minimum of five years of experience with the type of system being installed.
- D. Installing Contractor shall coordinate with the FRP sheet pile manufacturer regarding their recommendations concerning the proper vibratory plates or hammer / equipment and tools.

1.06 COORDINATION

- A. Coordinate work under provisions of Section 013100.
- B. Coordinate work with all other sections requiring temporary sheeting and bracing.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Materials delivered to the site shall be new and undamaged and shall be accompanied by certified test reports. Provide the manufacturer's name and mill identification mark on the sheet piling.
- B. Store and handle sheet piling in the manner recommended by the manufacturer to prevent permanent deflection, distortion or damage to the interlocks; as a minimum, support on level blocks or racks spaced not more than 10 feet apart and not more than 2 feet from the ends.
- C. Storage of sheet piling should also facilitate required inspection activities and prevent damage to coatings and corrosion prior to installation.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Wood Sheeting: Hardwood species of size and dimensions capable of being driven to the required depths and capable of supporting excavation sides and soil pressures when braced; free from wormholes, wind shakes, loose knots, decayed or unsound portions or defects which would impair its strength or tightness; 2 3 inches thick minimum.
- B. Steel Sheeting: ASTM A328, corrugated "Z" shape cross-section; of size and dimensions capable of being driven to the required depths and capable of supporting excavation sides and soil pressures when braced; structurally sound; special shapes for corner construction and transition points.

Property	Method	Characteristic Value
Compressive Strength (ksi)	ASTM D695	66.54
Compressive Strength via CLC (ksi)	ASTM D6641	73.07
Compressive Modulus (Mpsi)	ASTM D695	3.88
Tensile Strength (ksi)	ASTM D638	64.77
Tensile Modulus (Mpsi)	ASTM D638	3.86
Flexural Strength (ksi)	ASTM D790	88.19
Flexural Modulus (Mpsi)	ASTM D790	3.35
Izod (ft. lb. /in)	ASTM d256	42.50
SBS (psi)	ASTM D2344	3727

Property	Method	Characteristic Value
Compressive Strength (ksi)	ASTM D695	21.44
Compressive Strength via CLC (ksi)	ASTM D6641	21.09
Compressive Modulus (Mpsi)	ASTM D695	1.24
Tensile Strength (ksi)	ASTM D638	7.78
Tensile Modulus (Mpsi)	ASTM D638	1.02
Flexural Strength (ksi)	ASTM D790	14.43
Flexural Modulus (Mpsi)	ASTM D790	1.11
Izod (ft. lb. /in)	ASTM d256	4.33
SBS (psi)	ASTM D2344	1843

- C. Structural Steel: ASTM A36. Hot Dip Galvanized as per ASTM A153.
- D. Tiebacks: ASTM A722, ASTM A416
- E. Steel Anchor Rods:
- Anchor Rods: manufactured from A36 steel and meet the requirements of ASTM A307, Grade A, bolts and studs.
 - Turnbuckles: manufactured entirely from heat-treated 1035 steel meeting the structural requirements of ASTM F1145, Type I, Grade 1, Class B turnbuckles.
 - All components (Rods and Turnbuckles) shall be Hot Dip Galvanized in accordance with ASTM A153.
 - Diameter: not less than 1 1/4 inch.
 - Length: not less than 25 feet in length, as indicated on the drawings.
 - All anchor rods shall have a minimum of 3 feet of weatherable polymer coating applied to the exposed end.

7. Manufacturer: Crane Materials International, 1165 Northchase Parkway SE, Suite 300, Marietta, Georgia 30067. T: 770-850-4906; F: 770-933-8363 or approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing soil substrate and site conditions and elevations are as indicated on the plans.
- B. Verify elevations and grades are as indicated on the plans.
- C. Verify proposed locations of excavations are as indicated on the plans.
- D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage or other evidence of movement to ensure that systems are stable.
- E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.02 PREPARATION

- A. Excavate to a depth no greater than 4 feet from existing grade.
- B. Assemble and drive the sheeting in accordance with approved shop drawings, prepared by the contractor's engineer.

3.03 INSTALLATION - SHEETING

- A. Hammers shall be single-acting, gravity drop or vibratory type. The weight of the hammers shall be determined jointly by the manufacturer and the contractor for the piling products and subsurface materials to be encountered.
- B. Pilings shall be carefully located as shown. Pilings shall be placed plumb with out-of-plumbness not exceeding 1/8 inch per foot of length and true to line. Place the pile so the face will not be more than 6 inches from vertical alignment at any point. Top of pile at elevation of cut-off shall be within 1/2 inch horizontally and 2 inches vertically of the location indicated. Manipulation of piles to force them into position will not be permitted. Check all piles for heave. Redrive all heaved piles to the required tip elevation.
- C. Provide temporary wales, templates, master pilings or guide structures to ensure that the pilings are placed and driven to the correct alignment. Use a system of structural framing sufficiently rigid to resist lateral and driving forces and to adequately support the sheet piling until design tip elevation is achieved. Use at least two templates when placing each piling at third points not less than 20 feet apart. Templates shall not move when supporting sheet piling. Fit templates with wood blocking to bear against the web of each alternate sheet pile and hold the sheet pile at the design location alignment. Provide outer template straps or other restraints as necessary to prevent the sheets from warping or wandering from the alignment. Mark template for the location of the leading edge of each alternate sheet pile. If in view, also mark the second level to assure that the piles are vertical and in position. If two guide marks cannot be seen, other means shall be used to keep the sheet pile vertical along its leading edge.
- D. Submit records of the completed sheet piling driving operations, including a system of identification which shows the disposition of approved piling in the work, driving equipment performance data, piling penetration rate data, piling dimensions and top and bottom elevations of installed piling. Prior to driving pilings in water, paint a horizontal line on both sides of each

piling at a fixed distance from the bottom so that it will be visible above the water line after installation. This line shall indicate the profile of the bottom elevation of installed pilings and potential problem areas can be identified by abrupt changes in its elevation. Drive pilings with the proper size hammer and by approved methods so as not to subject the pilings to damage and to ensure proper interlocking throughout their lengths.

- E. Water jetting of sheeting will not be permitted. Do not loosen adjacent ground which might result in collapse.
- F. Install walls and braces or shores tight and in accordance with approved shop drawings prepared by the contractor's engineer.

3.04 CUTTING OFF

- A. Pilings driven to refusal or to the point where additional penetration cannot be attained and are extending above the required top elevation in excess of the specified tolerance shall be cut off to the required elevation. Pilings shall not be driven below the required top elevation.
 - 1. The tops of pilings excessively battered during driving shall be trimmed when directed, at no cost to the Owner. Piling cut-offs shall become the property of the Contractor and shall be removed from the site.
 - 2. Cut holes in pilings for bolts, rods, drains or utilities in a neat and workmanlike manner, as shown or as directed. Use a straight edge in cuts made by burning to avoid abrupt nicks. Bolt holes in FRP piling shall be drilled by approved methods which will not damage the pile. Holes other than bolt holes shall be reasonably smooth and the proper size for rods and other items to be inserted.

3.05 INSPECTION OF DRIVEN PILING

- A. Perform continuous inspection during pile driving. Inspect all piles for compliance with tolerance requirements. Bring any unusual problems which may occur to the attention of the Structural Engineer. Inspect the interlocked joints of driven pilings extending above ground. Pilings found to be out of interlock shall be removed and replaced at the Contractor's expense. Use divers to inspect underwater interlocked joints of cofferdam sheet piling. The inspection of cofferdams shall be performed after driving is completed, prior to filling each cell and connecting arc, and within 48 hours after filling each cell and arc.

3.06 PULLING AND RE-DRIVING

- A. In general, pulling of FRP sheet piles is discouraged unless special methods are employed to remove the pilings. Submit the proposed method of pulling sheet piling, prior to pulling any piling. Pull, as directed, selected pilings after driving to determine the condition of the underground portions of pilings. Any piling so pulled and found to be damaged, to the extent that its usefulness in the structure is impaired, shall be removed and replaced at the Contractor's expense. Pilings pulled and found to be in satisfactory condition shall be redriven when directed.

3.07 INSTALLATION RECORDS

- A. Maintain a pile driving record for each sheet pile driven. Indicate on the installation record: installation dates and times, type and size of hammer, rate of operation, total driving time, dimensions of driving helmet and cap used, blows required per meter foot for each meter foot of penetration, final driving resistance in blows for final 6 inches, pile locations, tip elevations, ground elevations, cut-off elevations, and any reheading or cutting of piles. Record any unusual pile driving problems during driving. Submit complete records to the Structural Engineer. Include a copy of the records in the project O & M Manual.

3.08 CLEANING

- A. Clean work under provisions of Section 017423.
- B. Clean site of any debris, Piling sections, miscellaneous hardware / fasteners and pile cut-offs at completion of the work.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY:

- A. The work listed under this section includes, but is not limited to, all Labor, equipment plant and materials required for the installation of a Micro-Pile Foundation System as located, detailed, and having a design capacity as indicated on the drawings.
- B. General Contractor must use a pre-approved specialty Contractor for micro-pile work under this section having the following qualifications:
- C. Specialty Contractors proposed to perform the micro-pile work must have at least 5 years documented experience installing micro-piles of similar capacity as required on this project. The name of the specialty contractor must be submitted with the bid.
- D. The Contractor shall provide all equipment capable of installing all pile as indicated on the drawings and within the site constraints subject to site verifications by the contractor(s) prior to submitting bids for the project.

1.02 SUBMITTALS

- A. See Submittals Section 013300 - SUBMITTALS.
- B. Complete description of equipment, procedures and techniques for pile installation.
 - 1. Equipment required for installation including, but not limited to: drills, pumps, casing, etc. Information shall include Product Data, Machinery Specifications and information to ensure compatibility of the equipment proposed for use with the actual site conditions at the project location.
 - 2. Pipe and rebar specifications
 - 3. Grout mix design
 - 4. Centralizers, couplers and other accessories.
- C. Delegated Pile design - Delegated Design drawings and calculations shall be prepared by a registered professional engineer, licensed in the state in which the project is being constructed, who has at least 5-years documented experience in the design of micro-piles. The design shall include pile design and pile-footing connection design at existing footings. The design shall conform with applicable provisions of the applicable Building Codes, NYCDOB requirements, FHWA Micro-pile Design and Construction Guidelines, and accepted industry practice.
- D. Load Test Equipment - Submit for approval information on the test jack and calibration results. The test jack and pressure gauge shall be calibrated in conformance with ASTM, NYCDOB, and AHJ requirements.
- E. Drawings and calculations for load testing frames and jacks shall be performed by a New York State registered engineer with 5-years documented experience. Signed and sealed documents shall be submitted to the E.O.R for review and approval.

1.03 QUALITY ASSURANCE

- A. Work shall be performed in accordance with the project plans, specifications, and addenda. The Owner will provide and pay for the independent inspection of the pile installation and all testing required.

1.04 SUBSURFACE INFORMATION

- A. Borings have been made available for design and estimating purposes. The Contractor, at his/her own expense, may make additional investigations prior to bid with prior permission of the owner.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Pipe reinforcement shall conform to ASTM A252, Grade 2 or approved equal. Mill secondary pipe is acceptable provided coupons are submitted for each truckload. Splicing shall be by threaded and coupled connections or continuous butt welds, using procedures recommended by the pipe supplier.
- B. Reinforcing bar shall conform to ASTM A615/A615M, Grade 60 or approved equal. Splicing details shall be either lap splices or approved couplers.
- C. Grout shall consist of Type I or III Portland Cement and water mix with a minimum 28-day compressive strength as selected by the Delegated Pile Design Engineer to meet the load requirements and NYC Load Regulations (minimum stresses). Potable water shall be used for mixing grout.
- D. Regrout tubes, if required, shall be PVC pipe or approved equal. The pipe material shall be non-degradable and compatible with Portland cement. Regrout tubes shall be filled with grout at the completion of work.

PART 3 EXECUTION

3.01 GENERAL NOTES

- A. Piles shall be oriented as shown on the foundation plans. All piles shall be drilled within 4% of the angle indicated on the plans and within 3 inches of the location shown. Piles installed out of plumb or location shall be cause for rejection or reduced capacity as determined by the Engineer of Record.
- B. All pile installation shall be performed under the supervision of a qualified geotechnical engineer retained by the Owner as required by the Building Code of NYC.
- C. The Contractor shall protect all existing equipment and structures during pile installation.

3.02 INSTALLATION

- A. The minimum drilled hole diameter shall be within $\frac{1}{2}$ " of that shown on the plans. Holes shall be temporarily cased, as necessary, to the pile tip elevation or casing refusal materials. Casing may be terminated prior to the above requirements if the soils encountered can be drilled without caving.
- B. If pile capacity dictates extending into refusal materials, continue drilling until an adequate rock socket is obtained as determined by the Engineer of Record.
- C. Install mini-pile reinforcing in the center of the hole using centralizers as required. Measures shall be implemented to permit grout to flow from the pile to the annular spaces between the pile and the casing. Reinforcing bar and pile reinforcement shall be spliced as necessary.
- D. Drill hole and casing shall be tremie grouted per Delegated Design Engineer recommendations.

- E. Temporary casing shall be slowly withdrawn and the grout level shall be checked periodically to ensure that the top of the grout does not fall below the bottom of the casing.
- F. Care shall be exercised to prevent damage to previously installed piles. The center to center spacing of subsequently installed piles shall be adjusted based on soil conditions.
- G. Piles may be regouted to increase the bond with the surrounding soils. Piles which are to be regouted shall be fitted with a regout tube securely attached to the pile reinforcing. Regrouting shall be performed within 12 hours of pile installation.
- H. Drill pile using duplex drilling methods and flush with water only. When cleaning inside casing, a two (2) pile diameter or two (2) feet minimum should be maintained behind the tip of the outer casing.

3.03 INSPECTION

- A. All pile shall be continuously inspected by the Owner's representative. A record shall be kept of each pile and shall include as a minimum:
 - 1. Length of pile as installed
 - 2. Depth to rock
 - 3. Length of rock socket
 - 4. Theoretical grout volume
 - 5. Actual grout volume for primary and regrouting
 - 6. Grout pressure during casing withdrawal
 - 7. Conditions encountered during drilling
 - 8. Date and time of installation
 - 9. Pile number or location description
 - 10. Spoil classification: Contractor shall contact the Engineer of Record if soil types contrary to the Geotechnical Report are encountered at the site.
- B. Load tests, if required, shall be performed in accordance with ASTM D1143/D1143M - "Quick Load Test Procedures" (10.1.2). The Contractor shall provide reaction system, calibrated jack, reference beams, dial gages, and personnel to operate the jacking system. Grout cubes shall be made from each mini-pile and tested at 3, 7, and 28 days. Grout shall have attained adequate strength for testing prior to performance of the load test.
 - 1. Alternate Test Methods may be submitted subject to prior approval by the Engineer of Record.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Helical piles and appurtenances for support of building foundations and valve vaults.

1.02 SUBMITTALS

- A. Submit under provisions of NYC BC.
- B. Product Data: Provide data on helical piles and appurtenances including washers and nuts.
- C. Shop Drawings: Indicate profiles, sizes, spacing and locations of helical piles, attachments, fasteners, connections, and rated loads. Design service life shall be 50 years. Provide erection and fabrication drawings. Indicate welded connections with AWS A2.0 welding symbols. Indicate net weld lengths. Shop drawings and erection drawings shall bear the seal and signature and a Licensed Professional Engineer registered in the State of New York.
- D. Written Installation Record (field log) of each helical pile prepared by a Special Inspector under the supervision of a Professional Engineer registered in the State of New York. The pile log shall bear the seal and signature and a Licensed Professional Engineer registered in the State of New York. These records shall include:
 - 1. Project name and location.
 - 2. Name of contractor's foreman or representative who witnessed the installation.
 - 3. Date and time of installation.
 - 4. Location and reference number of each pile.
 - 5. Description of lead section and extensions installed.
 - 6. Overall depth of installation referenced from bottom of foundation.
 - 7. Torque reading for the last three (3) feet of installation, if practical. In lieu of this requirement, the terminal torque shall be recorded as a minimum.
 - 8. Any other information relating to the installation.
- E. Welder's Certificates: Submit certificates certifying that welders employed on the work have met AWS qualifications within the previous 12 months.
- F. Submit copies of calibration reports for each torque indicator or torque motor, and all load test equipment to be used on the project. The calibration tests shall have been performed within forty-five (45) working days of the date submitted. Helical Pile installation and testing shall not proceed until the Owner has received the calibration reports. These calibration reports shall include, but are not limited to, the following information:
 - 1. Name of project and Contractor
 - 2. Name of testing agency
 - 3. Identification (serial number) of device calibrated
 - 4. Description of calibrated testing equipment
 - 5. Date of calibration
 - 6. Calibration data
- G. As-built Drawings: Submit for record purposes as-built drawings signed and sealed by a licensed professional engineer in New York. Indicate profiles, sizes, and locations of piles, attachments, fasteners, connections and rated loads.
- H. Manufacturer's Certificates: Certify that products meet or exceed specified requirements.

1.03 QUALIFICATIONS

- A. Fabricator: Company specializing in performing the work of this section with minimum 5 years documented experience.
- B. Installer: Company specializing in performing the work of this section with minimum 3 years documented experience.
- C. Design connections, not detailed on the drawings, shall be prepared under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of New York.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products to the site under the provisions of this Section.
- B. Schedule deliveries of materials to the site at intervals, which will ensure uninterrupted progress of the work.
- C. Do not store or handle materials in a manner that will damage or distort materials or supporting structures.
- D. Do not store materials directly on the ground.
- E. Store materials in a manner that will permit easy access for inspection and identification.

1.05 FIELD MEASUREMENTS

- A. Verify that field measurements are as shown on the plans and approved shop drawings.
- B. The Contractor is responsible for the proper location and elevations of the work.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Helical Piles: Shall be designed to support the nominal compressive load as shown on the plans. The overall length, helix configuration and minimum effective torsional resistance of a helical pile shall be such that the required geotechnical capacity is developed by the helix plate(s) in an appropriate bearing stratum.
 - 1. Helical piles, extensions and appurtenances shall be hot-dip galvanized steel in accordance with ASTM-A153.
 - 2. Shaft: Solid steel hollow shaft round.
 - 3. The helical pile shafts and plates shall receive a hot-dip galvanized steel coating to protect against corrosive elements in the soil.
- B. Grout Sleeve: a 5-inch diameter uncased flowable grout sleeve can be placed around the pile shaft to protect against lateral buckling and provide additional protection against corrosion.
 - 1. Cement shall be Portland Type I or II conforming to ASTM C150, pre-packaged non-shrink grout. Minimum compressive strength at 28 days shall be 3000 psi.
- C. Structural Steel Members: ASTM A36.
- D. Welding Materials AWS D1.1: type required for materials being welded.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work of this Section.
- B. Beginning of installation means installer accepts existing conditions.

3.02 INSTALLATION

- A. All helical piles should be installed as shown on the approved shop drawing. All changes in pile location shall be approved by the Contractor's engineer prior to installation.
- B. The Contractor shall obtain the services of a licensed Professional Engineer registered in the State of New York to supervise all helical pile operations. The supervisory engineer shall keep a complete record (log) of the pile installation operation.
- C. Helical piles shall be installed to a minimum torque as specified by the manufacturer and approved by the E.O.R.. subject to the following provisions:
 - 1. If the minimum torque requirement has not been satisfied at the maximum depth level, the Contractor shall have the following options:
 - a. Install the pile deeper using additional extensions until the specified torque level is obtained.
 - b. Remove the existing pile and install a pile with larger and/or more helices. The revised pile shall be installed beyond the termination depth of the original pile, as directed by the engineer.
 - c. Add additional piles as recommended by the Engineer.
 - 2. If the maximum torque rating of the pile and/or installing unit has been reached prior to satisfying the minimum depth requirement, the Contractor shall have the option to:
 - a. After consulting with the Engineer of record, the Contractor may reduce the size of the helix as required to achieve the minimum depth while still achieving the minimum torque.
 - 3. Installation equipment shall have clockwise and counter-clockwise rotation capabilities and be capable of applying adequate down pressure and torque simultaneously to suit project soil conditions and load requirements.
- D. If underground obstructions are encountered during installation, the Contractor shall have the option of removing the obstruction if possible or relocating the pile with the Engineer's approval the later option may require the relocation of adjacent piles.
- E. The helical pile shall be connected to the structure using a PTS approved steel bracket or slab-supporting channel as shown on the Engineer's Plan. These connection devices shall be capable of safely transferring the structural loads to the helical pile.
- F. Helical Pile Installation shall comply with the Building Code of New York City as well as NYC Building Code Bulletin 2014-20.

3.03 FIELD QUALITY CONTROL

- A. Field supervision by a Licensed Professional Engineer registered in the State of New York shall be provided by the Contractor. The cost for the supervision will not be eligible under the cash allowance for testing.
- B. Field inspection will be performed under provisions of this Section.

- C. Helical pile plumbness shall be within 2 degrees of design alignment.
- D. Top elevation of helical pile shall be within +1 inch to -2 inches of design vertical elevation.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Recycled concrete aggregate base course.

1.02 RELATED SECTIONS

- A. Section 312323.13 – Backfilling.
- B. Section 312333 – Trenching.

1.03 REFERENCES

- A. ANSI/ASTM C88 - Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
- B. ANSI/ASTM C136 - Sieve Analysis of Fine and Coarse Aggregates.
- C. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18-inch Drop.
- D. ASTM D4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Test Reports: Submit a sieve analysis for the aggregate base course used.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products to the site under provisions of Section 016500.
- B. Do not handle aggregate in any manner which will cause segregation of large or fine particles.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Aggregate Base Course: At least 95% by weight, of angular, crushed, recycled concrete; free of organic matter and deleterious material; graded in accordance with ANSI/ASTM C136 within the following limits:

1. Sieve Size	Percent Passing
2. 2 inches	90-100
3. 1/4 inch	30-65
4. No. 40	5-40
5. No. 200	0-10
- B. The material may contain up to 5% by weight of asphalt and/or brick.
- C. Material retained on the 1/2 inch sieve is coarse aggregate.
- D. Coarse aggregate shall not have more than 10 percent by weight of flat or elongated pieces. A flat or elongated piece is defined as being three times greater in the largest dimension as compared to its least dimension.

- E. The portion of the aggregate base course which passes the No. 40 screen shall have a plasticity index of one as tested in accordance with ASTM D4318.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate.
- B. Verify elevations of subgrade are as indicated on the plans.
- C. Verify that subgrade is properly compacted and ready to receive work of this section.
- D. Beginning work of this section means acceptance of existing conditions.

3.02 PREPARATION

- A. Fine grade and compact subgrade to 95 percent maximum dry density in accordance with ANSI/ASTM D1557.

3.03 AGGREGATE PLACEMENT

- A. Spread course aggregate over prepared subgrade to a total compacted thickness as indicated on the plans.
- B. Place aggregate in 3 inch layers and compact by roller.
- C. Level and contour surfaces to elevations and gradients indicated.
- D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- E. Compact placed aggregate materials to achieve 95% maximum dry density in accordance with ANSI/ASTM D1557. Maintain optimum moisture content to attain required density.
- F. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- G. Use mechanical vibrating tamping in areas inaccessible to compaction equipment.
- H. New pavement must be placed on the properly compacted aggregate base course within 24 hours of final compaction. If aggregate base course is left open for more than 24 hours, re-compact and retest in accordance with ANSI/ASTM D1557.

3.04 TOLERANCES

- A. Maximum Variation From Flatness: 1/4 inch measured with 10 foot straight edge.
- B. Maximum Variation From Scheduled Compacted Thickness: 1/4 inch.
- C. Maximum Variation from True Elevation: 1/4 inch.

3.05 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014500.
- B. Perform compaction testing in accordance with ANSI/ASTM D1557.

C. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.

D. Frequency of Tests: One test per 500 sq ft. immediately prior to paving.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Asphaltic concrete paving; wearing, binder or base course.

1.02 RELATED SECTIONS

- A. Section 321123 - Recycled Concrete Aggregate Base Course.

1.03 REFERENCES

- A. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot Mix Types.
- B. AI MS-8 - Asphalt Paving Manual.
- C. ASTM D242 - Mineral Filler for Bituminous Paving Mixtures.
- D. ASTM D546 - Test Method for Sieve Analysis of Mineral Filler for Road and Paving Materials.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Supplier: Submit name of asphalt supplier to be used on the project prior to placement of any asphalt on the project.
- C. Design Data: Submit asphalt mix design for each asphalt type to be used.
- D. Testing Firm: Submit name of testing firm to be performing tests on asphalt pavement.

1.05 QUALITY ASSURANCE

- A. Obtain materials from the same supplier throughout the duration of the project.
- B. Do not alter from mix design requirements.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products to the site under provisions of Section 016500.
- B. Deliver asphalt in sealed, metal containers covered with suitable material to protect the asphalt from the elements.
- C. Lightly lubricate the inside surface of the container with a thin oil or soap solution before loading asphalt.
- D. All containers must be cleaned of all foreign materials prior to loading.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphalt when base surface temperature is less than 40 degrees F, or if surface is wet or frozen.
- B. Do not place asphalt when precipitation is occurring.

PART 2 - PRODUCTS

2.01 2.01 - MATERIALS

- A. Asphalt Cement: AC-20; homogeneous, and shall not foam when heated to 347 degrees F.
- B. Fine Aggregate: Material passing the 1/8 inch sieve; natural sand of hard, strong, durable particles which are free from coatings or injurious amounts of clay, loam or other deleterious substances.
- C. Coarse Aggregate: Material retained on the 1/8 inch sieve; crushed stone or gravel; clean, durable, sharp angled fragments of rock of uniform quality.
- D. Mineral Filler: ASTM D242, finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter; 100 percent shall pass the No. 30 sieve; a minimum of 85 percent shall pass the No. 80 sieve; and a minimum of 65 percent shall pass the No. 200 sieve as measured in accordance with ASTM D546.

2.02 2.02 - EQUIPMENT

- A. Rollers: Minimum weight of 10 tons; equipped with lubricating devices for the roller wheels.
- B. Pavers: Equipped with a vibratory device.

2.03 2.03 - ACCESSORIES

- A. Tack Coat: Homogeneous, medium curing, liquid asphalt.
- B. Wheel Lubricant: Oil-water mixture containing maximum 10 percent lubricating oil.

2.04 2.04 - MIXES

- A. Use dry material to avoid foaming. Mix uniformly.
- B. Base Course: NYSDOT Type 1; 4.0 to 6.0 percent of asphalt cement by weight in mixture in accordance with the following gradation:

SIEVE SIZE	PERCENT PASSING
2 INCHES	100
1 ½ INCHES	90-100
1 INCH	78-95
½ INCH	57-84
¼ INCH	40-72
1/8 INCH	26-57
NO. 20	12-36
NO. 40	8-25
NO. 80	4-16
NO. 200	2-8

- A. Binder Course: NYSDOT Type 3; 4.5 to 6.5 percent of asphalt cement by weight in mixture in accordance with the following gradation:

Sieve Size	Percent Passing
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1-1/2 inches	100
1 inch	95-100
1/2 inch	70-90
1/4 inch	48-74
1/8 inch	32-62
No. 20	15-39
No. 40	8-27
No. 80	4-16
No. 200	2-8

- B. Wearing Course: NYSDOT Type 6; 5.8 to 7.0 percent of asphalt cement by weight in mixture in accordance with the following gradation:

Sieve Size	Percent Passing
1 inch	100
1/2 inch	95-100
1/4 inch	65-85
1/8 inch	36-65
No. 20	15-39
No. 40	8-27
No. 80	4-16
No. 200	3-6

2.05 SOURCE QUALITY CONTROL

- A. Obtain asphalt materials from same source throughout the project.
- B. Provide asphalt in accordance with the approved mix design for each type of asphalt.
- C. Test samples in accordance with AI MS-2.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate.
- B. Verify that compacted subbase is dry and ready to receive work of this section.
- C. Verify gradients and elevations of base are correct.
- D. Verify that all castings are properly installed and are at the correct elevations.
- E. Beginning of installation means installer accepts existing conditions.

3.02 PREPARATION

- A. Apply tack coat at uniform rate of 0.03 to 0.07 gal/sq. yd. to contact surfaces of castings, curbs, gutters and any asphalt or concrete material.
- B. Do not apply tack coat to wet or frozen surfaces.
- C. Coat top surfaces of castings with oil to prevent bond with asphalt pavement.

3.03 INSTALLATION

- A. Install work in accordance with AI MS-8.
- B. Maintain asphalt temperature between 250 and 325 degrees F during placement.
- C. Place asphalt within 24 hours of applying tack coat.
- D. Place asphalt to compacted thicknesses as identified on plans. If a multiple course pavement is to be used, place top course within 24 hours of placing bottom course. If more than 24 hours elapse, a tack coat will be required to be placed over the entire surface of the bottom course prior to any additional paving.
- E. Utilize the vibratory device on the paver at all times.
- F. Compact pavement by rolling. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
- G. Compact pavement to a minimum of 94% maximum density.
- H. Develop rolling with consecutive passes to achieve even and smooth finish, without roller marks.
- I. Seal all joints between new pavement and existing pavement with asphalt cement.

3.04 TOLERANCES

- A. Maximum Variation From Flatness: 1/8 inch measured with 10 foot straight edge.
- B. Maximum Variation From Scheduled Compacted Thickness: 1/8 inch.
- C. Maximum Variation from True Elevation: 1/4 inch.

3.05 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014500.
- B. Take samples and perform tests in accordance with AI MS-2.
- C. Test are to include percent compaction, gradation and asphalt content.
- D. Provide an asphalt thermometer for determining the asphalt temperature during paving operations.
- E. Frequency of Tests: One test for every 1,000 square feet of each pavement course.

3.06 PROTECTION

- A. Protect finished work under provisions of Section 015000.
- B. Immediately after placement, protect pavement from mechanical injury until project is accepted by the Owner.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Crushed bluestone paving course, compacted.

1.02 RELATED WORK

- A. Section 312000 - Earth Moving

1.03 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Sieve Analysis: Submit a sieve analysis for the stone.
- C. Product Data: Submit data for filter fabric.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Coarse Stone: Angular or crushed, washed natural bluestone; free of shale, clay, friable materials and debris; 3/4 inch nominal size.
- B. Filter Fabric: Non-woven, needle punched geotextile; 1112 manufactured by HOECHST CELANESE or specifically approved equal.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify compacted subgrade is dry and ready to receive work of this Section.
- B. Verify gradients and elevations of base are correct.
- C. Beginning of installation means installer accepts existing conditions.

3.02 INSTALLATION

- A. Excavate and grade to subgrade elevations.
- B. Fine grade and compact subgrade to 95 percent maximum dry density in accordance with ANSI/ASTM D1557.
- C. Place filter fabric on prepared subgrade. Provide 12 inch overlap at splices.
- D. Spread stone material over prepared base to a total compacted thickness as indicated on the plans.
- E. Level surfaces to elevations and gradients indicated.
- F. Compact placed stone materials with a minimum 10 ton roller.
- G. Perform hand tamping in areas inaccessible to compaction equipment.

END OF SECTION

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Contractor shall provide all materials, labor, tools, equipment, and services required to design, assemble, furnish and install a 20-ton underhung single bridge crane system complete and operational on the runway girders as specified in the contract documents, including but not limited to:
 - 1. Bridge.
 - 2. End trucks.
 - 3. Trolley.
 - 4. Hoisting equipment.
 - 5. Cabling
 - 6. Power and control circuit conductors.
 - 7. Safety and control mechanisms.
- B. Coordination:
 - 1. Review installation procedures under this and other Sections and coordinate installation of items that must be installed with or before hoisting equipment Work.
 - 2. Notify other contractors in advance of the installation of bridge cranes and hoisting equipment to provide them with sufficient time for installing items included in their contracts that must be installed with or before bridge crane and hoisting equipment Work.

1.02 REFERENCED STANDARDS

- A. American Institute of Steel Construction (AISC):
 - 1. AISC 303 – Standard Practice for Steel Building and Bridges.
- B. American Gear Manufacturers Standards (AGMA)
 - 1. ANSI/AGMA 6013-A, Standard for Industrial Enclosed Gear Drives.
- C. American Society of Mechanical Engineers (ASME):
 - 1. ASME B30.10 – Hooks.
 - 2. ASME B30.16 - Overhead Underhung and Stationary Hoists.
 - 3. ASME B30.17 - Cranes and Monorails (with Underhung Trolley or Bridge)
 - 4. ASME B30.19 - 1993 - Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, And Slings.
 - 5. ASME HST-4M - Performance Standard for Overhead Electric Wire Rope Hoists.
 - 6. ASME NUM-1 - Rules for Construction of Cranes, Monorails, and Hoists.
- D. American Welding Society: (AWS):
 - 1. AWS D1.1/D1.1M, Structural Welding Code – Steel.
 - 2. AWS D14.1, Specification for Welding of Industrial and Mill Cranes and other Material Handling Equipment.
- E. Crane Manufacturers Association of America (CMAA):
 - 1. CMMA 74, Specification for Top Running and Under Running Single Girder Electric Overhead Cranes Utilizing Under Running Trolley Hoist
- F. National Electrical Manufacturers Association (NEMA):
 - 1. NEMA MG-1 – Motors and Generators
 - 2. NEMA ICS-6 - Industrial Control and Systems: Enclosures
- G. National Fire Protection Association (NFPA):
 - 1. NFPA 70 - National Electric Code

- H. Occupational Safety and Health Administration (OSHA):
 - 1. 29-CFR 1910, Subpart N - OSHA General Industry Standards, Materials Handling and Storage.
 - 2. 29-CFR 1926, Subpart H - OSHA Construction Standards, Materials Handling, Storage, Use, and Disposal.
 - 3. 29-CFR 1926, Subpart N - OSHA Construction Standards, Helicopters, Hoists, Elevators, and Conveyors.

1.03 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer:
 - a. The manufacturer shall have a minimum of ten (10) years of experience producing substantially similar equipment and shall be able to show evidence of at least five installations in satisfactory operation for at least five years.
 - b. The manufacturer shall have a service office which has been established for a minimum of five years and is staffed with factory-authorized service technicians capable of servicing all aspects of the crane, operating within 60 miles of the project site.
 - c. The manufacturer shall be staffed with a NYS licensed professional engineer to accomplish or directly supervise the crane design.
 - d. The manufacturer shall be a current registered member of CMAA.
 - 2. Installer:
 - a. The installer shall have a minimum of five (5) years of successful experience in assembly and installation of cranes.
 - b. The service crew and installer shall adhere to OSHA, state, and local safety guidelines, laws, rules, and regulations.
- B. Component Supply and Compatibility:
 - 1. Obtain all equipment included in this Section regardless of component manufacturer, from single bridge crane manufacturer.
 - a. All major crane components (hoist, motors, electrical controls, VFD inverters, trolley, end trucks, wheels and gearing must be rated for crane duty and from the same crane OEM source.
 - b. Components must be produced in ISO 9001 certified factories assuring consistent quality and reliability.
 - c. All components shall be specifically constructed for specified service conditions and shall be integrated into overall equipment assembly by bridge crane equipment manufacturer.
 - d. All electric equipment components shall be UL, CSA, or ETL labeled.
 - 2. Bridge crane equipment manufacturer shall review and approve or prepare all Shop Drawings and other submittals for components furnished under this Section.
 - 3. The shop assembly of all components of the crane shall assure that all parts are properly aligned and fitted minimizing erection labor. The hoist, trolley and bridge functions shall be shop tested with the drives as installed for operation of the crane.

1.04 SUBMITTALS

- A. Action Submittals:
 - 1. Manufacturer's and Installer's Qualifications:
 - a. Submit name, address and telephone number of the local representative.
 - b. Manufacturer's certification that the line of products proposed for this contract have been in continuous and successful use for not less than 5 years.

- c. Manufacturer's written certification that the components and the systems proposed will be maintained and supported by the manufacturer for parts and service for not less than 10 years.
- d. Installer's welding qualifications in accordance with AWS D14.1.
- 2. Product Data:
 - a. Manufacturer's literature, illustrations, specifications, and data including:
 - 1) Product cut sheets for each system component and device including all data needed to prove compliance with this specification.
 - (a) Clearly indicate the exact model of each component to be provided.
 - (b) Indicate all options or accessories to be provided and cross out or strike through those not to be provided. Indicate part numbers to be ordered with all options.
 - (c) Include complete description in sufficient detail to permit item-by-item comparison with the Specifications.
 - 2) Dimensions and required clearances.
 - 3) Performance characteristics.
 - 4) Manufacturer's installation and testing instructions.
 - 5) Affidavits of compliance with referenced standards and codes.
 - 6) Manufacturer's standard guarantee.
 - 7) Manufacturer's Installation Report.
 - b. List of any deviations from the Contract Drawings.
- 3. Shop Drawings:
 - a. Scaled drawings showing plan, elevations and sectional views along with all major features and fabricated components, including:
 - 1) Hook approaches on all four sides.
 - 2) Clearances and principal dimensions.
 - 3) Fabrication methods and assemblies of hoist, trolley and bridge drives.
 - 4) All accessories and installation details.
 - b. Speeds: Indicate speeds with hoist loaded with rated crane capacity load:
 - 1) The crane speeds along the runway
 - 2) The trolley speeds along the bridge girder.
 - 3) The hoist lifting speeds.
 - c. Weights:
 - 1) Include weights and centers of gravity of major components.
 - 2) Specify maximum wheel loads (without impact) and spacing imparted to the crane runway system track beams.
 - 3) Indicate maximum support reactions.
 - d. Electrical schematic drawings, including the following:
 - 1) Panel Layout and schematic wiring diagrams, showing all electrical devices, numbered terminal strips and wiring.
 - 2) Information for controls logic
 - 3) Motor nameplate data
 - 4) Overcurrent protective device ratings for motors, controllers, and branch circuits.
 - e. Shop drawings shall be prepared, signed, and sealed by a NYS registered professional engineer.
- 4. Engineering Data:
 - a. Design data and calculations verifying the load cases, sizing of the bridge girders, end trucks, travel drives, brake selections.
 - b. Include free body diagrams or sketches of each load case.
 - c. A list of all codes and standards, design assumptions, equations, specified efficiencies, limits, factors of safety, component ratings, and sources of values used.
 - d. Structural calculations for the bridge.
 - e. Calculations shall be prepared, signed, and sealed by a NYS registered professional engineer.

- B. Informational Submittals:
 - 1. Quality Control:
 - a. Testing Procedure: Submit for shop and field performance tests used to verify compliance with this specification.
 - b. Inspection and Rated Load Test Reports: Written inspection reports and operational and rated load test reports in accordance with ASME B30.17 & CMMA 74.
 - c. Mill Test Reports: Submit mill test reports for the bridge.
 - 2. List of spare parts recommended by the manufacturer. The list shall describe each part, the quantity recommended, and the unit price of each part.
- C. Closeout Submittals:
 - 1. Operational and Maintenance Data for all equipment and devices, parts and services as defined in this specification, including the following:
 - a. Manufacturer's model and part numbers.
 - b. Catalog cut pages.
 - c. Key component breakaway pictures for ease of parts ordering.
 - d. Manufacturer's installation instructions.
 - e. Frequency of inspection.
 - f. Recommended cleaning methods and materials
 - g. Testing methods and calibration tolerances.
 - h. Name, address, phone numbers (office and cell), and email address of the service representative to be called in the event of equipment failure.
 - i. Statement of Guarantee including date of service termination.
 - j. Copies of test reports, maintenance data, and schedules, descriptions of operation, and spare parts information.
 - k. Required Operation Data: Explanation of all safety considerations relating to operation.
 - l. Furnish operation and maintenance manuals per Section 017823, Operations and Maintenance Data.
 - m. Advertising brochures shall not be used in lieu of the required technical manuals.
 - 2. Project Record Documents:
 - a. "As-Built" drawings showing installed conditions and actual locations of all system components and affected equipment.
 - 3. Crane certification documentation.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Packing, Shipping, Handling and Unloading:
 - 1. Assemble components in the factory to the greatest extent possible prior to shipping.
 - 2. Packing:
 - a. Inspect prior to packing to assure that assemblies and components are complete and undamaged.
 - b. Protect machined surfaces and mating connections.
 - c. Protect bearings and gearing with a shop applied corrosion prevention coating.
 - d. Cover all openings into gear boxes with vapor inhibiting and water repellent material.
 - e. Crate in a manner which will prevent damage during shipment, delivery and storage.
 - f. Identify crate contents by a packing slip fastened to the outside of the crate.
 - 3. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.
- B. Storage and Protection:

1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
- C. Acceptance at Site:
1. Unloading of crane shall be under the direct supervision of Contracted Installer or Crane manufacturer.
 2. All boxes, crates and packages shall be inspected by Contractor upon delivery to the Site. Contractor shall notify Engineer, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

1.06 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights or remedies Owner may otherwise have under the Contract Documents and shall be in addition to and run concurrent with other warranties made by Contractor under the Contract Documents. Obligations of Contractor under the Contract Documents shall not be limited in any way by provisions of specified special warranty.
- B. Special Warranty on Materials and Equipment:
1. Provide manufacturer's written warranty including parts and labor for materials and equipment specified in this Section found to be defective during period of two (2) years after date of Substantial Completion.
 2. Provide free maintenance services for one (1) year after final system acceptance. These services shall consist of manufacturer's factory-trained representatives providing emergency repair service with on-site response within 24 hours of call, all test equipment and hardware necessary for maintenance and repair work and installation of any hardware modifications designed to improve system performance or eliminate known problems or deficiencies.

PART 2 – PRODUCTS

2.01 SYSTEM PERFORMANCE

- A. System Description:
1. Bridge crane and hoisting equipment shall be of the underhung, single girder, and low-headroom type with hoist nested in trolley to provide maximum clearance over the operating floor. Bridge crane and hoisting equipment shall conform to maximum lift elevation, limits of hook travel, runway locations, and side clearance requirements shown and indicated in the Contract Documents, and shall provide required available lift height and capacity.
- B. Performance Criteria:
1. Equipment description: Bridge crane, runway beams, electric trolley, and electric wire rope hoist.
 2. Bridge Type: Under-running, single girder, motorized, variable speed.
 3. Hoist Type: Nested, low headroom, electric wire rope, double reeved, motorized, two-speed hoist to fit wide-flange beams.
 - a. Hoist can be single reeved if it provides no more than 1/8" nominal hook drift in 1' of travel while raising or lowering a load.
 - b. Alternatively, provide Right and Left grooved drum for True Vertical Lift.
 4. Trolley Type: Under-running, single girder with a nested hoist.
 5. Service Classification: Class C – Moderate.
 6. Rated Capacity: Twenty (20) ton.
 7. Runway Beam Length: As shown on the Drawings.

8. Bridge Span: 17.00 feet.
9. End Truck Wheelbase: As shown on the Drawings.
10. Maximum Lift Height: 29'-0".
11. Environmental Conditions: Indoor.
12. Hoist End Approach: Hook centerline to runway centerline:
 - a. East Side: 2.90 feet.
 - b. West Side: 2.10 feet.
13. Nominal Operating Speeds:
 - a. Bridge: 100/16 feet per minute (stepless)
 - b. Trolley: 65 feet per minute (stepless)
 - c. Hoist: 10.0/1.6 feet per minute (2-speed)
14. Electric Motors:
 - a. Bridge Motor:
 - 1) Drive: CMAA Type A-4 Dual Motor Drive
 - 2) Rated Voltage: 460 VAC, 115 V, 3 phase, 60 Hz.
 - b. Trolley Motor:
 - 1) Drive: Motorized drive with at least 2 driven wheels
 - 2) Rated Voltage: 460 VAC, 115 V, 3 phase, 60 Hz.
 - c. Hoist Motor:
 - 1) Rated Voltage: 460 VAC, 115 V, 3 phase, 60Hz.
15. Operator Controls: Radio control from hand-held transmitter with festooned pendant backup.
16. Manufacturer:
 - a. Konecrane (Basis of Design) - CXT.
 - b. R & M Materials Handling Inc. - QX
 - c. Or equal.

2.02 PRODUCTS

A. General:

1. All equipment of structural steel construction shall be in accordance with AISC "Specifications for Design, Fabrication and Erection of Structural Steel for Buildings".
2. Crane structural design shall be in accordance with the latest revision of CMAA 74.
3. Castings, forgings and stampings shall be designed with an allowable stress not to exceed 20 percent of the ultimate strength of the material.
4. All shop welding shall conform to the requirements of AWS D14.1. Field welding of equipment shall be in accordance with manufacturer's written instructions. Field welding to the building structure shall be in accordance with AWS D1.1/D1.1M.
5. The rated load of the bridge crane and hoisting equipment shall be plainly marked on each side of the bridges and load blocks. Markings shall be clearly legible from the loading position.
6. Provide special consideration to available headroom and vertical clearance.
7. Provide cranes with configurations and weights that do not result in a load exceeding the design capacity of the runway beams.
8. An impact allowance shall be included in design calculations for trolleys, cranes, and runway beams. The impact allowance shall be 1/2 percent of the rated load for each foot per minute of hoisting speed with a minimum allowance of 15 percent and a maximum of 50 percent.
9. Safety requirements of ANSI B30.11 shall be incorporated in all equipment furnished.

B. Runway Beams:

1. Runway Beams: ASTM A36, structural steel.
2. Maximum Deflection: 1/888 inches of span.
3. Provide cushioned hard rubber stops on the ends of runway beams.
4. Support Spacing: As shown on the Drawings.

5. Support Type: As shown on the Drawings.
- C. Crane Bridge:
1. Bridge Girders: ASTM A 36, structural steel rolled Wide Flange beams with or without Channel Caps.
 2. Maximum Deflection: CMAA 70.
 3. Trolley shall ride on the bottom flange of the girder.
 4. Bridge Travel limit switches to be provided mounted on the bridge for slow down and stop prior to bumpers contacting the runway end stops in each direction.
 5. No maintenance platforms are required. Crane shall be serviced by means of a man lift, ladder or special provision access in the building.
 6. Girders shall be reinforced at ends and shall be bolted to end trucks using tight fitting bound bolts in addition to locating pins to maintain alignment. Welding of Girders directly to end trucks is UNACCEPTABLE
- D. Bridge Trucks:
1. End trucks shall be designed in accordance with CMAA specifications to ride on the bottom flange of the specified Wide Flange runway beams. End truck design MUST include provisions to have all wheels articulate and sit on the beam flange to share the load. End trucks without load sharing articulating side plates are NOT ACCEPTABLE.
 2. End trucks shall be bolted to bridge girder. Using tight fitting bound bolts in addition to locating pins to maintain alignment. Welding of Girders directly to end trucks is UNACCEPTABLE
 3. End trucks shall be equipped with rail sweeps, and drop catches designed to minimize drop and dislodgment in case of axle, bearing or wheel failure. End Trucks shall include energy-absorbing rubber bumpers mounted to match the building mounted Runway end stops.
- E. Truck Wheels and Bearings:
1. End Truck Wheels shall be machined flat tread with double flanges. Wheel material shall contain graphite and designed to work harden to 300+ Bhn. Steel wheels at this hardness are also acceptable. Wheels with Tapered treads shall NOT be used. NO EXCEPTIONS.
 2. Wheel bearings. Bridge wheels shall be mounted on rotating axles with antifriction bearings in bolted bearing cartridges.
- F. Bridge Crane Power and Motor:
1. Motors shall be of sufficient size so that there will be no overload on the motor above rated nameplate horsepower under any condition of operation.
 2. All wiring and equipment shall comply with the provisions of Article 610, Cranes and Hoists of the National Electrical Code, NFPA 70.
 3. Motors: Suitable for crane and hoist service and rated on not less than a 30-minute basis with temperature rise in accordance with NEMA standards.
 - a. Bridge Motors: AC INDUCTION TYPE Single Winding designed for variable speed VFD Inverter duty TENV, TEFC or TEAO frame IEC rated IP55 dust and water tight enclosure with minimum class F insulation. Motors are to be flange mounted eliminating any need for couplings and alignment shafts.
 - b. Bridge drive shall be dual-motor (Type A-4 arrangement per CMAA). WORM type drives are unacceptable. All gearing shall be enclosed to retain lubricants.
 - c. Bridge drive and brakes shall be designed to stop the bridge within CMAA specifications.
- G. Electrically Operated Trolley and Hoist:
1. Load Blocks: Load blocks shall be enclosed type and shall be constructed to prevent rope jamming and to be spark resistant. Lower block frame shall be bronze. Lower block side plates shall be aluminum.

2. Hooks: A 360-degree swiveling single (DIN forging) Hook shall be made of forged alloy steel (34CrMo4QT or 34CrNiMo6QT) mounted in a swinging yoke and shall be fitted with a spring-loaded flipper-type safety latch. Hook forging shall be certified with documentation copy provided in Operator Manuals.
3. Hoisting Rope: Wire rope shall be constructed from corrosion resistant galvanized steel having a minimum safety factor of 5 based on ultimate breaking strength of the rope.
4. Rope Sheaves: Sheave grooves shall be smoothly finished to a close formfitting saddle for the rope with the sides of the groove tapered outwardly. Running sheaves shall be provided with means for lubrication. Pitch diameter of running sheaves shall not be less than 16 times rope diameter and for non-running sheaves not less than 12 times rope diameter.
5. Drum: Large diameter rope drum with a minimum of 36:1 drum to wire rope diameter ratio. Machined groove depth shall be at least 35% of rope diameter. The rope drum shall be equipped with a metal rope guide to help keep the rope aligned in the grooves of the drum. Plastic Rope Guides are NOT ACCEPTABLE. Rope guide shall not operate the hoist travel limit switch.
6. Gearing: High precision AGMA quality class 10, 11 or 12, hardened and precision ground hoist and trolley and bridge gearing. ALL gearing shall be totally enclosed and either splash or semi fluid grease lubricated, warranted not to leak lubricant. Lower quality minimum AGMA Class 6-8 gearing as called for in CMAA and ASME standard specifications and gearing less than class 10 is NOT ACCEPTABLE.
7. Bearings: All bearings shall be permanently-lubricated type.
8. Brakes:
 - a. Hoist Load Holding brake shall be self-adjusting or adjustment free direct acting DC disc type with adequate torque to stop and hold over 150% of the hoist rated load. Brake shall be capable of 1 million + of stops before requiring adjustment or replacement of linings. Brake stops shall be measured by the control monitoring module (see Paragraph 2.03.B.1) AC magnetic solenoid brakes with laminated operating coils and / or operating linkages shall not be used.
 - b. Regenrative braking shall provide the required 2nd speed limiting control braking system called for by ASME CMAA and HMI. Weston type or other constant friction Mechanical Load brakes are NOT ACCEPTABLE and shall not be used.
9. Trolley:
 - a. Wheels:
 - 1) Machined crowned tread single flanged wheels and frame designed to minimize drop and dislodgment in case of axle, bearing or wheel failure.
 - 2) Wheel material shall include graphite and designed to work harden to 300 + BHN. Steel wheels at this hardness are also acceptable.
 - b. Trolley frame to be designed to insure all wheels contact the rail and share the load.
 - c. Trolley gears are to be enclosed to retain lubricant.
 - d. Trolley bumper: Energy-absorbing rubber.
10. Hoist Motor:
 - a. Motor shall be of sufficient size so that there will be no overload on the motor above rated nameplate horsepower under any condition of operation.
 - b. Motor Type: TENV or TEFC AC INDUCTION, two winding two speed.
 - c. Motor shall be IEC rated and designed specifically for Hoist and Crane service, totally enclosed with ribbed frame IP55 rated dust and water tight enclosure with minimum class F insulation and 60% ED rating.
 - d. Motor to include thermal protection.
 - e. ALL motors are to be flange mounted eliminating any need for couplings and alignment shafts.
11. Trolley Motor:
 - a. Motor shall be of sufficient size so that there will be no overload on the motor above rated nameplate horsepower under any condition of operation.

- b. Motor Type: TENV or TEFC AC INDUCTION TYPE, single-winding, infinite variable frequency.
 - c. Motor shall be of stepless, totally enclosed, thermally protected type.
12. Provide supports, fasteners, brackets and all accessories required for the hoist and trolley.

2.03 CONTROLS

- A. Hoist Control shall be two speed hoist with a two winding AC Induction Motor with a 1:6 speed ratio.
- B. Trolley shall be inverter controlled for ramped Stepless acceleration and deceleration and variable speeds.
- C. Bridge shall be inverter controlled for ramped Stepless acceleration and deceleration and variable speeds.
- D. Control Monitoring Unit:
 1. Control to include a self-contained monitoring unit that continuously monitors the crane usage and stores the hoist motor runtime, motor starts, number of overloads and calculates and records the actual load spectrum automatically. Control monitor shall guard against operator abuse of excessive jogging by shutting the hoist off requiring a restart.
 2. Control unit must provide the follow features:
 - a. Overload supervision
 - b. Three adjustable load limit levels
 - c. Sudden load increase supervision
 - d. Hoist motor overheating supervision
 - e. Motor function monitoring
 - f. Supply voltage phase supervision
 - g. Motor start and stop through slow speed
 - h. Number of Brake stops
 - i. Connectable to PC software for maintenance scheduling
- E. Control Panels:
 1. Enclosure: Hoist, Bridge and Trolley control panels shall be enclosed in a gasketed dust-ans water- tight enclosure at least equivalent to IP55 rating. Inside of enclosures shall be white.
 2. Mounting: Bridge control panel enclosure shall be mounted on the crane Bridge, with Hoist and Trolley control mounted on the Hoist.
- F. Operator Control:
 1. Operator of Crane from the floor shall be operated by Hand Held Radio control with festooned pendant backup.
 2. Pendant or Radio control shall include "RED" On/ Emergency Off button that controls mainline contactor in bridge control panel.
 3. Pushbuttons shall be clearly marked with bridge, hoist, and trolley travel directions. Matching compass directions shall also be shown on bottom of bridge girder.
 - 4.

2.04 ELECTRIFICATION

- A. Power supply for the hoist and crane shall be 460 volts, 3-phase, 60 Hz. Plus, ground. All power required for the operation of the hoist, trolley, and end truck shall be developed from this source.
- B. Cross bridge electrification shall be flat cable style festoon track system or enclosed Energy Chain with terminal box, multi-conductor cord, and accessories.

- C. Crane shall include (4) double shoe Mainline conductor bar collectors. Crane manufacture shall be responsible to provide suitable collectors to match the type of Mainline conductor system used.
- D. A wall-mounted fused disconnect switch for power to runway conductors is to be provided by the building Electrical Contractor including supply of conduit and wire up to the runway power conductor bar. Termination of the conductor bar is to be provided by the Owner.

2.05 FINISHING

- A. Surface Preparation and Painting:
 - 1. Surface preparation and shop painting is required for ferrous metals, equipment, and accessories. Do not paint stainless steel and machined surfaces.
 - 2. Clean and apply in the shop prime coat in accordance with Section 099100, Painting.
 - 3. Apply in the shop finish coat in accordance with Section 099100, Painting.
- B. Gears, bearing surfaces, and other machined surfaces shall receive a heavy application of rust-inhibiting coating that shall be maintained during storage and until equipment is placed into operation.
- C. Include touch up paint for use by crane installer for nicks made during crane installation.
- D. The following items shall not be painted:
 - 1. Rail surfaces in contact with wheels
 - 2. Wheel running surfaces
 - 3. Hoist wire rope
 - 4. Conductor bar and festoon cables
 - 5. Stainless steel control enclosures.

2.06 IDENTIFICATION

- A. Identify component subassemblies with stainless steel nameplates and each labeled with the following:
 - 1. Name of manufacturer.
 - 2. Model number and serial number.
 - 3. Capacity.
 - 4. Date of manufacture (month and year).
- B. Date of manufacture with pertinent ratings, operation, and maintenance information.
 - 1. Certification, stamp, or approval to applicable codes.
- C. Crane bridge beam shall be labeled with load rating visible from the floor.
- D. Bottom block shall be labeled with load rating.

2.07 ASSEMBLY AND PREPARATION FOR SHIPMENT

- A. Cranes shall be assembled and wired in plant, after which they shall be suitably match marked and dismantled to the extent required for shipment.
- B. All material shall be carefully loaded for transportation and suitably braced to guard against possible damage in transit. Small pieces shall be boxed for shipment.
- C.

PART 3 – EXECUTION

3.01 INSPECTION

- A. Examine conditions under which products are to be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.
- B. Inspect and verify that no part of the building, structure, piping, mechanical systems including ductwork, electrical systems including lighting and conduit, or other elements that will interfere with proper operation of bridge crane and hoisting equipment along the entire length of both bridge crane runway beams.

3.02 INSTALLATION

- A. Bridge crane shall be installed in conformance with manufacturer's instructions. Provide all necessary accessories to make bridge crane complete, usable, and capable of meeting the operating requirements specified in the Operating Requirements.
- B. Manufacturer's representative shall inspect and approve the installation prior to operation. Manufacturer's representative shall field test and calibrate the equipment to assure that the system operates to the Owner's satisfaction.
- C. Lubricate, adjust, test and leave crane in proper operating condition.
- D. Install all power and control, conductors, wire, cables and connectors on the load side of the manual safety switch. Receive approval from Engineer, in writing, before wiring.

3.03 FIELD TESTS

- A. Start-up and Commissioning:
 - 1. After installing equipment and associated controls, perform at the Site running tests for bridge crane and hoisting equipment and appurtenances.
 - 2. All crane equipment shall be operated through a complete lift and lowering cycle under load and through a complete travel of the bridge and trolley to determine that the equipment shall perform smoothly and safely.
 - 3. Verify that the pendant cable length is sufficient to permit operation from desired floor levels.
 - 4. Tests to verify proper operation of all travel limit switches and all safety clearance dimensions.
 - 5. Should testing indicate malfunction, make repairs and adjustments as required. Repeat testing and adjusting until, in Engineer's opinion, installation is complete and equipment is functioning properly and accurately, and is Substantially Complete.
- B. Load Test:
 - 1. Perform load tests under supervision of manufacturer's factory-trained service technician, in presence of Engineer.
 - 2. Weights used in load testing shall be certified by a state or local bureau of weights and measures. Submit weight certification as part of the load test report.
 - 3. Load testing shall conform to ASME B30.11, ASME B30.16, and the following:
 - a. For electric hoists, power failure test with rated load: Load shall be held suspended when power is removed.
 - b. Bridge crane travel full length of runway beams and trolley travel full length of bridge crane girders with rated load, while verifying that all functions operate properly.

- c. Hoist brake drift test with rated load: Lift weight, measure distance to floor, allow five minutes to elapse, and re-measure. Record the results measured. Criteria for Acceptance: No difference in measurements.
 - d. Upper/lower limit switch test with no load.
 - e. Emergency stop test with no load.
 - f. Deflection Test: With hoist positioned at center of bridge span, and at center of longest runway beam span), while hoisting rated load, measure distance from hook to floor. Remove load and measure distance from hook to floor. Criteria for Acceptance: Difference in measurements shall conform to 1/888 inches of span. Deflection test shall be done prior to load test and shall be done with a load equal to minimum 100% not to exceed 125% of rated capacity.
4. Load Test Report: Submit results of load testing as report that lists tests performed, data collected, results of each test, and corrective actions taken (if any). Test report shall be signed by manufacturer's service technician present during testing.

3.04 MANUFACTURER'S SERVICES

- A. A qualified, factory trained representative shall be provided for installation supervision, start-up and test services, and operation and maintenance personnel training services.
- B. The manufacturer's representative shall make a minimum of two visits to the Site as described below. Representative shall revisit the Site as often as necessary until all trouble is corrected and the installation is entirely satisfactory.
 - 1. First visit shall be for checking completed installation, start-up of system, and performing field quality control testing. Manufacturer's representative shall test operate the system in the presence of the Engineer and verify that the equipment conforms to the requirements. Minimum number of hours on-Site: 16 hours, no more than 8 hours per day.
 - 2. Second visit shall be for instructing operations and maintenance personnel in recommended operation and maintenance of equipment. Training requirements, duration of instruction, and qualifications shall be in accordance with Section 01821, Instruction of Operations and Maintenance Personnel.
- C. Reports: Submit report by manufacturer of each visit to the site that provides complete information on time, schedule, tasks performed, persons contacted, problems corrected, test results, training, instruction and all other pertinent information.
- D. All costs, including travel, lodging, meals and incidentals, for additional visits shall be at no additional cost to the Owner.

3.05 SITE CLEANUP

- A. Clean, touch-up paint, and lubricate equipment for acceptance by Owner.
- B. Upon completion of work, area shall be cleaned and restored to original condition, acceptable to the Owner.

END OF SECTION

APPENDIX A

GEOTECH REPORT

(WORK AREA IS ONLY BUILDING 386)



Geotechnical Engineering Report

BNYDC - Design Services for Boilers, Substations, and Isolated Electrical Work

Brooklyn, New York

PREPARED FOR:

H2M Architects + Engineers
538 Broad Hollow Road, 4th Floor East
Melville, NY 11747

PREPARED BY:

MFS Consulting Engineers and Surveyor, DPC
31 W. 34th Street, Suite 7071
New York, NY 10001

T: (908) 922-4622

F: (866) 517-7413

February 7, 2020
MFS Project No. 1119060



Geotechnical Engineering Report

BNYDC - Design Services for Boilers, Substations, and Isolated Electrical Work

Brooklyn, New York

A handwritten signature in black ink, appearing to read 'J. Fradkin'.

Jacob M. Fradkin, PE
Project Engineer I

PREPARED FOR:

H2M Architects + Engineers
538 Broad Hollow Road, 4th Floor East
Melville, NY 11747

A handwritten signature in black ink, appearing to read 'Michael L. Mudalel'.

PREPARED BY:

MFS Consulting Engineers and Surveyor, DPC
31 W. 34th Street, Suite 7071
New York, NY 10001

Michael L. Mudalel, PE, LEED AP
Senior Associate Engineer

T: (908) 922-4622

F: (866) 517-7413

February 7, 2020
MFS Project No. 1119060

TABLE OF CONTENTS

INTRODUCTION.....	2
PROPOSED DEVELOPMENT.....	2
SUBSURFACE INVESTIGATION.....	3
MFS 2019 BORINGS.....	3
MFS 2019 TEST PITS.....	3
GEOTECHNICAL LABORATORY TESTING.....	4
SUBSURFACE CONDITIONS.....	4
PHYSIOGRAPHY AND HISTORIC CONDITIONS.....	4
MFS 2019 BORINGS.....	5
MFS 2019 TEST PITS.....	7
EVALUATION AND DESIGN RECOMMENDATIONS.....	10
SEISMIC EVALUATION.....	10
FLOOD LOADS.....	11
FOUNDATION RECOMMENDATIONS.....	11
SOIL DESIGN PARAMETERS.....	16
SETTLEMENT.....	18
FOUNDATION CONSTRUCTION CONSIDERATIONS.....	19
PILE INSTALLATION METHOD.....	19
TEMPORARY EXCAVATION SUPPORT.....	19
TEMPORARY GROUNDWATER CONTROL.....	20
SUBGRADE PREPARATION.....	21
FILL MATERIAL, PLACEMENT, AND COMPACTION CRITERIA.....	21
SOIL REUSE.....	21
MONITORING OF ADJACENT STRUCTURES.....	22
CONSTRUCTION DOCUMENTS AND QUALITY CONTROL.....	22
FURTHER INVESTIGATION.....	22
LIMITATIONS.....	23

LIST OF FIGURES

FIGURE 1	USGS TOPOGRAPHIC SITE LOCATION MAPS
FIGURE 2	AS-DRILLED AND AS-DUG TEST PIT LOCATION PLANS
FIGURE 3	FEMA FLOOD INSURANCE RATE MAP (FIRM)
FIGURE 4	2014 NYCBC LIQUIFACTION ASSESSMENT
FIGURE 5	LIQUEFACTION FACTOR OF SAFETY ASSESSMENT

LIST OF APPENDICES

APPENDIX A	2019 MFS BORING LOGS
APPENDIX B	2019 MFS TEST PIT PLANS AND SECTIONS
APPENDIX C	2019 MFS TEST PIT PHOTOGRAPHS
APPENDIX D	GEOTECHNICAL LABORATORY RESULTS



INTRODUCTION

This report presents the results of the MFS Consulting Engineers and Surveyor, DPC (MFS) geotechnical engineering study for the Brooklyn Navy Yard Development Corporation (BNYDC) Design Services for Boilers, Substations, and Isolated Electrical Work Project in the borough of Brooklyn, New York. The purpose of this study is to investigate the subsurface conditions at the project site and develop recommendations for the design and construction of restoration and flood mitigation measures at the Brooklyn Navy Yard. Our study includes a review of available information, a subsurface investigation, an engineering evaluation, and recommendations for the proposed restoration and mitigation efforts. A summary of our findings and recommendations are presented herein.

Work included in this study was performed in general accordance with the executed Sub Consultant Services Work Letter between MFS and H2M architects + engineers (H2M) for H2M Project Numbers: BNYD 1901, 1902, 1904, 1905, and 1907 dated 21 October 2019 and executed on 23 October 2019. All elevations referenced herein are in units of U.S. survey feet and reference the North American Vertical Datum of 1988 (NAVD88).

PROPOSED DEVELOPMENT

The Brooklyn Navy Yard is located on Block 2023, Lot 1 in the borough of Brooklyn, New York as identified on the New York City tax maps. The specific buildings at the Brooklyn Navy Yard that are the subject of this report are presented on the “USGS Topographic Site Location Map” in Figure 1 and are identified as buildings 41A, 62, 234, 293, and 386.

The entire Brooklyn Navy Yard consists of six (6) dry docks, five (5) piers with several inclusive berths, and 55 buildings for which the BNYDC is responsible. The BNYDC is also responsible for operating, maintaining, and repairing all of the electrical substations, distribution centers, feeder lines, and associated equipment leading into the utility rooms. During Hurricane Sandy, floodwater levels averaged four (4) feet above grade throughout the Brooklyn Navy Yard and saltwater caused extensive damage to electrical components.

It is our understanding that the project consists of activities to repair damage from Hurricane Sandy and mitigate against future flood-related losses at utility substations and boilers in the Brooklyn Navy Yard. Specifically, the focus of this project involves work on five (5) buildings at the Brooklyn Navy Yards, denoted as Buildings 41A, 62, 234, 293, and 386. It is our understanding that flood mitigation strategies at each of the subject buildings will consist of raising existing roofs to accommodate elevated equipment, building platforms within each building footprint to bring the electrical equipment or boilers above the design flood elevation, and/or construction of flood walls to limit the flood loads on the existing structures. In order to support structures as part of the flood mitigation strategies, new or modified/reinforced foundations are proposed.

The specific scope of work that is the subject of this report are described in six (6) FEMA Public Assistance PA Project Worksheets (PWs): PWs 4307, 4273, 4275, 3820, 4388, and 4270.

SUBSURFACE INVESTIGATION

MFS 2019 BORINGS

MFS completed a subsurface investigation consisting of seven (7) geotechnical borings. Each of the borings were completed in the vicinity of the existing buildings that are the subject of this report. Each boring is designated by the building number corresponding to each respective boring location. The seven (7) borings completed are denoted as B-41A-1, B-41A-2, B-62-1, B-234-1, B-293-1, B-386-1, and B-386-2. Note that borings B-41A-1, B-234-1, and B-386-1 were completed in multiple boreholes due to encountering obstructions in the subsurface including utilities, pipes, railroad tracks, and debris. Re-attempted borings are denoted as “(A)” for the first attempt, “(B)” for the second attempt, and “(C)” for the third attempt. The as-drilled boring locations are shown on the "As-Drilled Boring and As-Dug Test Pit Location Plans" presented in Figure 2 with dimensions provided from existing fixed site features. In addition to the borings, available information from the regional geology described below was used to assist in our investigation.

Each of the seven (7) borings were drilled by Craig Geotechnical Drilling, Inc. from 13 December 2019 to 26 December 2019 under the full-time special inspection of MFS. A truck mounted CME-75 drill rig was used to advance each boring at the project site. Each boring was hand cleared using a hand auger to a depth of 6 feet below grade and sampled thereafter via Standard Penetration Testing (SPT)¹. Grab samples were collected during the hand auger process for classification and testing purposes. Following hand clearing, all borings were sampled via SPT continuously in the upper 12 feet below grade and at five (5) foot intervals thereafter until each respective boring termination depth. Each of the borings were advanced using a 4-inch inner diameter steel casing and the mud rotary drilling technique. Where cohesive materials were encountered, Shelby tube (undisturbed) samples were obtained in general accordance with ASTM D1587. Bedrock was not encountered or sampled during the field investigation. Upon completion of each boring, the borehole was backfilled with the soil cuttings and hole plug and the surface grade was patched to match existing conditions.

Recovered soil samples were visually examined and classified in the field in accordance with the Unified Soil Classification System (USCS) and the New York City Building Code (NYCBC). Soil classifications, standard penetration resistances, action of the drill rig, and other observations during drilling operations were recorded in the field boring logs. The boring logs were compiled using gINT geotechnical engineering software and are provided in Appendix A.

MFS 2019 TEST PITS

MFS completed a subsurface investigation consisting of five (5) test pits. Each of the test pits were conducted adjacent to the existing buildings that are the subject of this report. Each test pit is designated by the building number corresponding to each respective test pit location. The five (5) test pits completed are denoted as TP-41A-1, TP-41A-2, TP-62-1, TP-293-1, and TP-386-1. The as-dug test pit locations are shown on the “As-Drilled Boring and As-Dug Test

¹The Standard Penetration Test is a measure of the soil density and consistency. The SPT N-value is defined as the number of blows required to drive a 2-inch outside diameter split-barrel sampler 12 inches, after an initial penetration of 6 inches, using a 140-pound hammer free falling from a height of 30 inches in general accordance with ASTM D1586.

Pit Location Plans” presented in Figure 2. Each of the test pits were hand excavated, backfilled, and restored by MFS Construction, LLC from 2 December 2019 to 6 December 2019 under the full-time controlled special inspection of MFS. Where encountered, concrete surfaces were demolished using a Stihl MS-420 cut-saw and a Bosch Brute electric jackhammer. Subsequently, shovels and hand augers were used to hand excavate each of the test pits to their respective termination depths.

Throughout the duration of the field test pit operations, the MFS engineer visually examined and classified the soil encountered in accordance with the USCS and the NYCBC. In addition, the conditions and extents of the existing foundations were observed and documented, as well as other notable features including utilities and concrete slab reinforcement, where encountered. The subsurface conditions, results of the investigation, test pit plan and elevation sketches, and other observations during the test pit operations are shown in the “Test Pit Plan and Sections” presented in Appendix B. Photographs taken during the test pit operations and upon completion/site restoration are provided in Appendix C.

GEOTECHNICAL LABORATORY TESTING

All samples obtained during the 2019 MFS Subsurface Investigation were brought back to our office for further evaluation and selection of samples for geotechnical laboratory testing. Soil classifications were verified by a senior level geotechnical engineer and select soil samples were sent to a certified geotechnical testing laboratory for further testing. The purpose of the testing is to confirm the visual classifications and define several of the relevant material properties for use in the evaluation and design of the restoration and flood mitigation measures on site.

Selected soil samples were tested by our certified geotechnical laboratory, RSA Geolab, LLC, to determine their physical and engineering properties and to aid in our analysis and material evaluation. The testing on soil samples in this investigation includes moisture content (ASTM D2216), sieve and hydrometer analyses (ASTM D422), Atterberg limits (ASTM D4318), organic content (ASTM D2974), bulk unit weight (ASTM 7263), and unconsolidated undrained triaxial testing (ASTM D2850). The geotechnical laboratory testing results are provided in Appendix D.

SUBSURFACE CONDITIONS

PHYSIOGRAPHY AND HISTORIC CONDITIONS

The project site is located along the boundary of two (2) physiographic provinces; the Manhattan Prong and the Atlantic Coastal Plain. These physiographic provinces share an irregular border that trends southwest-northeast from southern Staten Island to the Long Island Sound and follows the alignment of the East River. The Atlantic Coastal Plain Province consists of the terminal moraines and the associated outwash deposits beyond the terminus of a large ice sheet that covered a majority of the northern United States approximately 18,000 years ago. The entire province has very low relief of approximately 400 feet and the moraine consists of irregular deposits of sand, compact till, and stratified drift, with scattered large boulders from local and upstream sources. The Manhattan Prong consists of a belt of worn-down complex mountains reduced to a plain lying between the Atlantic Coastal Plain and the Hudson Highlands. It includes the northern portion of Staten Island, all of Manhattan

Island, a small portion of western Long Island, and most of Westchester County. The ridges and valleys trend north-northeast and south-southwest and are composed of heavily metamorphosed crystalline rock such as gneiss, marble, schist, and granodiorite. Topography in the Manhattan Prong is predominantly controlled by bedrock with superimposed glacial, alluvial, and swamp deposits. Based on our review of available geologic resources, bedrock at the project site is anticipated at approximately 100 to 150 feet below grade, however deepened borings were not completed during the 2019 MFS Subsurface Investigation to confirm the presence and depth of bedrock.

Historic USGS topographic maps of the project site are shown in Figures 1.1 and 1.2 from 1947 and 1956, respectively. It is observed from the 1947 USGS topographic map that the existing location of Buildings 293 and 386 at the Brooklyn Navy Yard was once marshland and water at the extent of the old piers within the navy yard basin. Between 1947 and 1956, it is assumed that the area was infilled, new piers were constructed to further extend out into Wallabout Channel, and Buildings 293 and 386 appear to have been constructed. Based on the historic topographic maps and the results of the MFS 2019 Subsurface Investigation, the overburden at the existing Brooklyn Navy Yards consists of made land, or fill that was used to fill in the Wallabout Channel and associated marshland underlain by glacial deposits. The greatest extent of fill was identified in the borings completed at buildings 293 and 386. The fill strata was less extensive at the other buildings investigated which is expected based on the historic topographic maps.

MFS 2019 BORINGS

The following is a description of each strata in the order that it was encountered below grade within the borings conducted at the project site.

Surface Course

Asphalt was encountered at existing site grade in borings B-41A-1, B-41A-2, B-293-1, B-386-1, and B-386-2. The thickness of the asphalt ranged between 3 inches in boring B-41A-2(B) and 12 inches in boring B-386-2. Concrete was encountered at existing site grade in boring B-62-1 and B-234-1 and below the top asphalt layer in boring B-41A-2. The concrete ranged in thickness between 5 inches in boring B-234-1 and 12 inches in boring B-62-1.

Fill (Class 7)

Fill comprised primarily of brown, grey, and black sand with varying amounts of silt, gravel, clay, and organics was the uppermost strata encountered in each of the borings below the surface course. The fill also contained varying amounts of miscellaneous debris including brick, wood, security glass, shell, and metal fragments. The fill layer was observed to range between approximately 15 to 47.7 feet thick. Note that the greatest extent of fill was identified in borings B-293-1, B-386-1, and B-386-2, which is expected based on the historic USGS topographic maps presented in Figures 1.1 and 1.2. In borings B-293-1, B-386-1, and B-386-2, the fill layer was identified from elevations EL. +5.1± to -43.1± at the project site. A less extensive fill strata was identified on the remaining borings which ranged from 15 feet to 27.2 feet in thickness. The fill strata on the remaining borings was identified from elevations EL. +7.6± to -22.8± at the project site. The relative density for the fill layer was very loose to very dense based on SPT N-values ranging between 1 blow per foot to refusal and an average value

of approximately 9 blows per foot excluding the refusals. Note that the refusals are anticipated to be obstructions located within the fill layer and are not representative of the actual soil relative density.

Clay/Organic Clay (Class 4 and Class 6)

Black, brown, dark grey, and grey clay and organic clay with varying amounts of sand, gravel, and silt was encountered in each boring except borings B-386-1 and B-386-2. The clay layer was identified directly below the fill layer in borings B-41A-1 and B-62-1 corresponding to EL. -11.3± and EL. -7.4±, respectively, and directly beneath the silt layer in borings B-41A-2, B-234-1, and B-293-1 corresponding to EL. -32.8±, EL. -42.0±, and EL. -57.1±, respectively. The thickness of the clay layer was noted to range between approximately 3.4 feet and 14.5 feet. The relative density for the clay layer was very soft to medium stiff based on SPT N-values ranging between weight of hammer (WOH) to 8 blows per foot and an average value of approximately 3 blows per foot.

Sand (Class 6 and Class 3)

Brown, light brown, tan, black, and grey sand with varying amounts of silt, gravel, clay, and organics was encountered in each of the borings. The sand layer was identified directly below the organic clay and silt, and encountered again at the termination depth of borings B-41A-1, B-62-1 and B-234-1. An additional sand layer was encountered interlayered between the silt and clay layers in boring B-62-1. In borings B-41-2, B-293-1, and B-386-1, sand was encountered directly below the top fill layer and at termination depth of the borings. In addition, a sand layer was interbedded between the silt layers in boring B-293-1 and interbedded between the gravel and silt layers in boring B-386-1. In boring B-386-2, sand was encountered between a gravel and silt strata near the boring termination depth. The sand layers were observed to range between approximately 0.8 feet to 17.5 feet thick. The sand strata was identified at elevations ranging from EL. -20.3± to the termination depth of each boring except B-386-2. The relative density for the sand layer was loose to dense based on SPT N-values ranging between 6 blows per foot to 64 blows per foot and an average value of approximately 20 blows per foot.

Silt/Organic Silt (Class 5 and Class 6)

Light brown, brown, grey, tan, and olive silt and organic silt with varying amounts of sand, clay and gravel was encountered in borings B-41A-1, B-41A-2, B-62-1, B-234-1, B-293-1, and B-386-1 interlayered with the sand and clay layers. In boring B-386-2, silt was encountered from EL. -52.5 to the boring termination depth corresponding to EL. -54.2±. An additional organic silt and silt layer was encountered in boring B-234-1 directly below the fill layer from elevation EL. -12.0± to EL. -26.5±. The thickness of the silt layer was noted to range between approximately 0.8 feet and 24 feet. The relative density for the silt layer was very soft to hard based on SPT N-values ranging from WOH to 64 blows per foot and an average value of approximately 13 blows per foot.

Gravel (Class 2 and Class 6)

Brown and grey coarse to fine gravel with varying amounts of sand and clay was identified below the fill layer in boring B-386-2. The gravel strata was identified from elevations EL. -37.7± to EL. -51.7±. The relative density for the gravel layer was loose to dense based on SPT

N-values ranging from 8 blows per foot to 40 blows per foot and an average value of approximately 24 blows per foot.

MFS 2019 TEST PITS

The following is a detailed description of the subsurface conditions encountered in each test pit conducted as part of the 2019 MFS subsurface investigation. Note that blow counts were not obtained during test pit operations and therefore NYCBC Soil Classes have not been assigned to the soil layers with the exception of NYCBC Class 7 fill.

Test Pit TP-41A-1

Test Pit TP-41A-1 was excavated at the exterior northwestern corner of Building 41, directly southwest of Building 41A. The test pit had approximate plan dimensions of 3 feet by 4.25 feet and was excavated to a depth of approximately 6.92 feet below existing site grade at the deepest depth. The footing was encountered below the concrete bearing wall of Building 41 and sloped away from the wall at an approximate slope of 1:6 Horizontal:Vertical (H:V). The bottom of the footing was not encountered as it was beyond the extents of the test pit. A 5-inch ductile iron pipe was identified approximately 3.2 feet below existing grade and ran parallel to the wall and concrete footing.

The existing surface grade consisted of a concrete sidewalk with a thickness ranging between 7.5 inches and 11 inches. Below the concrete sidewalk, the upper soil layer in test pit TP-41A-1 consisted of NYCBC Class 7 fill comprised of brown/light brown fine to coarse sand, some fine to coarse gravel, little silt, and debris including brick, concrete, and metal fragments from below existing surface course to 5.3 feet below existing grade. At the groundwater table (5.3 feet below existing grade), the subsurface conditions changed to poorly graded sands consisting of brown/grey fine to coarse sand, little fine to coarse gravel, and trace silt and extended to the termination depth of the test pit.

Test Pit TP-41A-2

Test Pit TP-41A-2 was excavated at the exterior face of the southeastern wall of Building 22, directly north of Building 41A. The test pit had approximate plan dimensions of 3 feet by 4.17 feet and was excavated to a depth of approximately 5.25 feet below existing site grade. The existing surface grade consisted of concrete sidewalk identified at EL. +5.83± with a thickness of 5.5 inches. The concrete footing was identified directly below the concrete sidewalk offset approximately 1.3 feet from the exterior wall of Building 22 and sloped away from the wall at an approximate slope of 1.75:6 H:V. The bottom of the concrete footing was not identified as the footing extended deeper than the extent of the test pit. A 14-inch ductile iron pipe was identified 3.5 feet below existing grade and ran parallel to the wall and concrete footing.

The soil strata encountered in test pit TP-41A-2 was NYCBC Class 7 fill consisting of brown fine to coarse sand, some coarse to fine gravel, little silt, and debris materials including brick, glass, asphalt, concrete, and metal fragments.

Test Pit TP-62-1

Test Pit TP-62-1 was excavated at the exterior face of the southeastern wall of Building 62 and the exterior face of the northeastern wall of the concrete masonry unit (CMU) boiler room that abuts Building 62. The test pit had approximate plan dimensions of 4 feet by 2.92 feet

and was excavated to a depth of approximately 3.5 feet below existing site grade at EL. +5.42±. The top of the footing for the southeast bearing wall of Building 62 was identified approximately 0.6 feet below existing grade corresponding to EL. +8.34± and the bottom of the footing was identified 3.25 feet below grade corresponding to EL. +5.67±. The boiler room appeared to be founded on a one (1) foot thick concrete slab-on-grade. A 3.5-inch ductile iron pipe was identified 2 feet below existing grade and ran parallel to and offset approximately 2.54 feet from the exterior wall of Building 62.

The existing surface grade was encountered at EL. +8.92± and consisted of 9-inch thick concrete sidewalk. A 4-inch thick layer of pea gravel was identified below the slab-on-grade for the boiler room. The subsurface conditions in test pit TP-62-1 consisted of NYCBC Class 7 fill comprised of brown fine to medium sand, some coarse to fine gravel, little silt, and brick and mica fragments. In addition, cobbles were identified within the subsurface.

Test Pit TP-293-1

Test Pit TP-293-1 was excavated at the north interior corner of the electrical room of Building 293. The electrical room is located along the southwest wall of Building 293. The test pit had approximate plan dimensions of 5.17 feet by 2.38 feet and was excavated to a depth of approximately 3.25 feet below existing site grade to EL. +3.69±. No footing was identified below the northwest CMU wall of the electrical room. A CMU wall located 1.25 feet below the top of the existing electrical room slab supported by a strip footing was identified and ran parallel to the northwest wall of the electrical room. The extents and bottom of the strip footing was not identified within the test pit at the test pit completion depth.

The existing concrete slab varied in thickness throughout the extents of the test pit. The concrete slab from the northwest wall of the electrical room to an offset 1.83 feet from the wall consisted of a 10-inch thick concrete slab with welded wire reinforcement and #7 reinforcing steel encountered within. The concrete slab offset 1.83 feet to 3.45 feet from the northwest wall of the electric room has a thickness of 15 inches with welded wire reinforcement and #4 reinforcing steel. The remaining slab encountered comprised of a 12-inch thick concrete slab underlain by 5 inches of asphalt and 9 inches of subbase consisting of grey gravel and sand. The 12-inch concrete slab contained welded wire reinforcement and #4 reinforcing steel. Where welded wire reinforcing steel was identified, the reinforcement was 6 inches below the top of the slab and had a center to center spacing of 6 inches in both directions. Where #4 reinforcing steel was identified, the reinforcement was 10 inches below the top of the slab and had a center to center spacing of 10 inches in both directions. Where #7 reinforcing steel was identified, the reinforcement was 3 inches below the top of slab and had a center to center spacing of 12 inches in the one direction observed. A C4X7.25 steel channel and flat bar was observed embedded within the concrete slab. The soil strata encountered in test pit TP-293-1 was NYCBC Class 7 fill comprised of brown fine to medium sand, some coarse to fine gravel, little silt, and brick and metal debris.

Test Pit TP-386-1

Test Pit TP-386-1 was excavated at the exterior face of the southeast wall of Building 386. The test pit had approximate plan dimensions of 3 feet by 4 feet and was excavated to a depth of approximately 7.33 feet below existing site grade corresponding to EL. -1.73±. The

concrete foundation wall extended to 7 feet below grade at EL. -1.4± where a foundation was observed to extend outward 8 inches from the face of the foundation wall. The bottom of the footing was not identified as it was beyond the extents of the test pit.

The uppermost strata in test pit TP-386-1 consisted of NYCBC Class 7 fill comprised of dark brown coarse to fine gravel, some fine to coarse sand, and little silt. This fill was encountered from grade at elevation EL. +5.60± to approximately 2.33 feet below grade corresponding to elevation EL. +3.27±. From EL. +3.27± to the bottom of the test pit at elevation EL. -1.7±, the soil strata consisted of brown fine to coarse sand, some silt, little coarse to fine gravel, cobbles, and brick and ceramic debris classified as NYCBC Class 7 fill.

Water Table

As the Brooklyn Navy Yard is located on the Wallabout Channel and the Navy Yard Basin, the water table is tidally influenced. Due to the project vicinity to water bodies and the tidal influence at the subject buildings, MFS determined the tidal datums at the project site. Based on our review of available tidal datums in the area and the use of the Vertical Datum Transformation software (VDatum) developed by the National Oceanic and Atmospheric Administration (NOAA), it is anticipated that the mean higher high water (MHHW) elevation at the project site is EL. +2.22± and the mean lower low water (MLLW) elevation is EL. -2.63±.

During the 2019 MFS Subsurface Investigation consisting of borings and test pits, the groundwater table was identified from elevations EL. +2.07 ± to EL. -0.90±. Our water table observations are based upon increased moisture in soil samples collected during the field subsurface investigation, the presence of standing water during test pit operations, as well as water readings obtained directly after the completion of drilling operations using a Solinst water level indicator. Soil moisture and groundwater conditions should be expected to fluctuate with seasons, tides, precipitation amounts, utility leaks, and other on-site and offsite factors including site utilization.

Flood Zone

As indicated on the FEMA Flood Insurance Rate Map (FIRM) in Figure 3, the majority of the Brooklyn Navy Yard, including each of the buildings that are the subject of this report, are located in special flood hazard zone AE, defined as areas subject to flooding by the 1% annual chance flood. It should also be noted that each of the subject buildings at the project site with the exception of Building 41A are located within the limit of moderate wave action. Within the limit of moderate wave action, Zone AE is defined as a Coastal A Zone subject to wave heights of 1.5 to 3 feet. Based on our review of the FIRM, the design flood elevation varies from EL. +11 to EL. +13 at the project site. Building 234 is located in Zone AE with a base flood elevation of EL. +13. Buildings 62, 293, and 386 are located in Zone AE with a base flood elevation of EL. +12. Building 41A is located in Zone AE with a base flood elevation of EL. +11.

MFS recommends that a minimum design water elevation of the base flood elevations specified herein for each building be used. If the design flood elevation is to be adjusted for sea level rise and freeboard height, MFS recommends that the recommendations in the NYC Mayor's Office of Recovery and Resiliency Climate Resiliency Design Guidelines be used based on the design life and criticality of the structure. It is our understanding based on a review of Attachment A – Detailed Scope of Services included in the Request for Proposals

for the subject project that preliminary design water elevations (Mitigation Design Elevations (MDE)) were determined at the buildings to include freeboard height and sea level rise. The MDE elevations at each building consider the FIRM design flood elevation plus 1-foot of freeboard and 2.5 feet of sea level rise.

EVALUATION AND DESIGN RECOMMENDATIONS

SEISMIC EVALUATION

This section presents the results of our seismic evaluation for the site according to the provisions outlined in the NYCBC and provides recommended parameters for use in seismic design of the proposed site development.

Soil Liquefaction

The NYCBC requires that non-cohesive soils and cohesive soils with a plasticity index less than 20 below the groundwater table and less than 50 feet below the ground surface be considered for liquefaction. The subsurface profile underlying the project site consisted of very loose to very dense fill, soft to stiff clay and silt marshland, and loose to very dense glacial outwash sands within the upper 50 feet of overburden and below the groundwater table. As such, liquefaction of the overburden soils should be considered by the structural engineer of record. MFS has plotted the SPT N_{60} values from each of the borings conducted on Figure 1813.1 from the NYCBC; see Figure 4. Based on this plot, it is seen that the subsurface profile at the project site is susceptible to liquefaction.

MFS performed a site-specific evaluation for the potential of soil liquefaction using the “simplified procedure” initially established by Seed and Idriss (1982) and later updated by Youd et al (2001). This analysis compares corrected N-values $[(N_1)_{60}]$ to the calculated critical $(N_1)_{60}$ values. The corrected N-value $[(N_1)_{60}]$ is the measured N-value normalized for overburden pressure and for drive hammer efficiency. The critical $(N_1)_{60}$ value is considered the minimum N-value, at a given depth, corresponding to a factor of safety of 1 for liquefaction. Based on the liquefaction analysis of the subsurface data recorded during the 2019 MFS Subsurface Investigation, the minimum factor of safety against liquefaction was determined to be under 1 based on a design earthquake having a magnitude of 5.75; see Figure 5. Therefore, it is our recommendation that soil liquefaction be considered by the design engineer of record for the proposed construction at the project site.

Mapped Spectral Accelerations

As liquefiable and organic soils were identified at the project site during the 2019 MFS Subsurface Investigation, the site is assigned as Site Class F in accordance with Table 1613.5.2 of the NYCBC. As such, a site-specific evaluation is required in accordance with ASCE 7-10 and NYCBC Section 1813. As outlined in Section 20.3.1 of ASCE 7-10, structures having fundamental periods of vibration equal to or less than 0.5s do not require a site response analysis, and a site class is able to be determined in accordance with ASCE 7-10 Section 20.3. Based upon the nature of the proposed construction at the project site, MFS has assumed that the exception requirements of ASCE 7-10 20.3.1 are met for this project, however this should be verified by the structural engineer of record. If the exception requirements of ASCE

7-10 20.3.1 are not met, a site response analysis shall be performed in accordance with ASCE 7-10 Section 21.1 and the following seismic recommendations are not to be followed.

Assuming that the exception requirements of ASCE 7-10 20.3.1 are met and based upon the limited geotechnical investigation performed, the site is assigned as Site Class E (Soft Soil Profile) in accordance with Table 1613.5.2 of the NYCBC and based on average soil properties (i.e. N-values and soil undrained shear strength). The mapped maximum considered earthquake response spectra for the short period (S_s) is 0.281g, the one-second period (S_1) is 0.073g, and the peak ground acceleration adjusted for site class effects (PGA_M) is 0.33g for Site Class E in New York City according to the NYCBC.

Site Classification

The corresponding seismic factors and the design spectral response accelerations at short period (S_{DS}) and at one-second period (S_{D1}) are calculated based on site class and the mapped spectral response accelerations. The maximum design spectral acceleration at short periods (S_{DS}) is 0.444g and one-second period (S_{D1}) is 0.170g. The site is classified within the NYCBC as Seismic Design Category C under Risk Categories I, II, and III. If the subject buildings are considered essential facilities as outlined in NYCBC Table 1604.5, it is classified as Seismic Design Category D under Risk Category IV.

FLOOD LOADS

MFS recommends that any new building envelopes or platform structures that will be subject to flooding be designed to resist flood lateral hydrostatic, lateral hydrodynamic, uplift loads, debris impact, and wave action loads. It is recommended that the flood loads be determined in accordance with the FEMA Coastal Construction Manual P-55 (Fourth Edition), Volume II, dated August 2011 and ASCE 7-16. In addition, MFS recommends that the structural engineer analyze the existing buildings which will not be demolished to determine if they can withstand the flood loads mentioned herein.

FOUNDATION RECOMMENDATIONS

General Understanding of Proposed Development

Our understanding of the proposed strategies for flood mitigation at each subject building is referenced from Attachment A – Detailed Scope descriptions included in the BNYDC Request for Proposals for the subject project. At the time that this report was prepared, MFS has not been provided any as-build or design drawings that accurately depict existing structures foundations types, sizes, or conditions. The flood mitigation strategies at each subject building in this report are summarized below:

- Building 41A – Scope of work includes the restoration to repair flood damage to damaged equipment. As part of this task, we understand that the existing Building 41A may be demolished and reconstructed. Additional scope of work may include the construction of a floodwall for hazard mitigation. MFS recommends that if Building 41A is being demolished and reconstructed, that the new exterior building walls and bottom slabs be designed and constructed as the flood walls and pressure slabs, respectively to prevent the infiltration of water into the structure, or the building be elevated above the MDE elevation.

- Building 62 – The existing boiler room is a separate structure that was added on southeast wall of Building 62. The scope of work includes raising the elevation of the prefabricated roof and installing a platform supported on new steel girders installed though and bearing on the existing CMU walls and foundations of the boiler room. The boiler shall be elevated on the newly constructed platform supported on the new steel girders above the MDE. In addition, a new OSHA compliant staircase will be constructed beginning on the south face of the building and turning to the west face to access the new door.
- Building 234 – Scope of work includes relocating the boiler to a new adjacent electrical substation elevated platform constructed above the MDE. It is our understanding that the existing building will be demolished and new raised platforms will be constructed to elevate the replaced equipment. The new platform may be supported on the existing foundations or may be supported on new pile foundations. In addition, a new chain link security fence is proposed to be constructed around the new substation platform.
- Building 293 – Scope of work includes relocating the electrical equipment to a new elevated metal framed platform within Building 293. The proposed platform will be constructed above the MDE and will be supported on a pile foundation system. The platform will be comprised of a metal flamed platform with grate deck, metal railings, and stairs. In addition, a new chain link security fence is proposed to be constructed around the new substation platform.
- Building 386 – Scope of work includes relocating the electrical equipment to a new elevated platform in the location of the existing electrical equipment within Building 386. The new platform is to be constructed above the MDE and supported on a pile foundation system. Once constructed, the existing building encasing the new platform and the old equipment will be demolished.

Frost Depth

The frost depth at the project site is 4 feet below grade per the NYCBC. As such, the base of all foundations proposed on site are required to extend a minimum of four (4) feet below the lowest adjacent permanent exposed grade or below the calculated scour depth (to be determined by others). Alternatively, the foundations may be constructed in accordance with ASCE-32 (Design and Construction of Frost Protected Shallow Foundations). Grade beams, if used, shall extend a minimum of 18-inches below the lowest adjacent permanent exposed grade.

Existing Foundation Analysis

As described above, it is proposed to construct a new elevated platform for the boilers/electrical equipment to be supported on the existing foundations at Building 62 and potentially building 234. MFS recommends that the structural engineer analyze the existing foundations to determine if they are adequate to support the loads incurred due to the proposed elevated platforms. If the existing foundations are not suitable, the existing foundations shall be altered, reinforced, and/or reconstructed to support the additional loads. Based on the test pit conducted at the northeast face of the concrete masonry unit (CMU) boiler room that abuts Building 62, it is believed that the boiler room is founded on a one (1)

foot thick concrete slab-on-grade as no foundation walls or others footings were identified. Information on the existing boiler room foundation at Building 234 is not known as a test pit was not conducted at this location and no as-built drawings have been provided for MFS review.

As the existing foundation at the boiler room in Building 62 did not appear to be constructed to bear below the design frost depth based upon the results of the test pit conducted on site, MFS recommends that the proposed elevated platform be constructed on a new foundation system due to the presence of liquefiable soils encountered onsite, MFS recommends that the new foundations be designed and constructed using the deep foundations recommendations provided herein.

Any existing shallow foundations, bearing a minimum of 4 feet below grade shall be analyzed using an allowable bearing pressure of 0.5 tons per square foot (tsf). The existing slabs-on-grade shall be analyzed using a modulus of subgrade reaction 50 psi/inch (based on a 12-inch square plate). MFS recommends that any existing deep foundation be analyzed using a recognized method of analysis in accordance with the NYCBC and the recommendations for the deep foundations provided herein.

If reinforcing of the existing foundations is required, MFS recommends underpinning the existing foundations using helical screw piles following the recommendations in the “Deep Foundations” sections of this report.

Security Fence Shallow Foundations

It is our understanding that proposed security fences will be constructed around the proposed raised platforms in the vicinity of Buildings 234, 293, and 386. The subsurface conditions at borings B-234-1, B-293-1, B-386-1, and B-386-2 typically consisted of loose to medium dense granular fill in the upper 10 feet of each boring. Based on the subsurface conditions and relatively light loads anticipated from the fence structures, MFS recommends the proposed security fences be supported on shallow sonotube type piers in accordance with NYCBC Section 1805.5.7. The piers shall have a minimum plan dimension of 2 feet. Piers founded 4 feet below grade on the fill soils shall be designed using an allowable bearing pressure of 0.5 tsf. The pier foundations shall be designed to resist the lateral design loads. MFS recommends the minimum embedment depths of the piers to resist the lateral loads be completed using the embedded post and poles calculation in IBC Section 1807.3. The lateral analysis shall be performed by the structural engineer of record using the soil design parameters outlined in the *Soil Design Parameters* section of this report.

Deep Foundations

MFS recommends that all of the proposed elevated platforms and associated structures be designed and constructed on a deep foundation system. Based upon the results of the 2019 MFS Subsurface Investigation and our project understanding, we recommend that the deep foundation elements be drilled or augured elements due to the proximity of existing structures and utilities as this method will induce minimal vibrations during the installation/casting process compared to driven or vibratory piles. The deep foundation elements may be designed in accordance with the stated NYCBC section as one of the following pile types:

- Drilled or augered uncased piles (NYCBC 1810.3) – The minimum diameter of drilled or augered uncased piles shall be 12 inches. The piles may develop their geotechnical capacity through a combination of skin friction (concrete/grout to soil/rock) and end bearing.
- Micropiles (NYCBC 1810.8) – The piles shall have an outside diameter between 5 and 14 inches. Micropiles shall develop their geotechnical capacity by means of a bond zone in soil (concrete/grout to soil) and shall not consider end bearing.
- Helical piles (NYCBC 1812) – Steel elements consisting of a shaft and one or more helical bearing plates screwed into the ground by application of torque on the shaft. Refer to the *Helical Piles* section below for detailed pile considerations.

Drilled or Augured Uncased Piles and Micropiles

The piles shall be designed for lateral and axial capacities using a recognized method of analysis in accordance with the NYCBC and shall achieve their capacity bearing in soil with Class 4 or better that are not susceptible to liquefaction. MFS recommends completing the drilled or augered pile design using the Naval Facilities Engineering Command (NAVFAC) design manual in conjunction with applicable analysis software including AllPile or LPile. The deep foundation elements shall be designed assuming that the soil immediately below the pile caps and grade beams do not support any vertical loads. The pile caps may be designed to transfer the loads to a single pile or multiple piles. The axial capacity of the drilled or augered piles shall be designed with a minimum factor of safety of two (2) in compression and three (3) in tension. As large amounts of fill and subsurface obstructions (i.e. boulders, debris, etc.) were encountered at the project site, the drilled or augered elements would allow for installation with minimal concern for pile refusal or being pushed out of plumb or alignment.

It is recommended that vertically loaded piles be designed and constructed to have a minimum pile center-to-center spacing of 3 times the nominal pile diameter. Pile group effects from soil on lateral pile strength shall be accounted for where the pile center-to-center spacing in the direction of the lateral force is less than 8 pile diameters. Any piles installed in a group shall have the appropriate reductions applied based on the group configuration to account for the group effects.

Helical Piles

Helical piles, if used, shall be designed to support axial (compressive and tensile) and lateral loads using a recognized method of analysis in accordance with NYCBC Section 1812 and shall achieve their capacity bearing in soil with an SPT N-value of 10 or better that are not susceptible to liquefaction. Increased lateral capacity of helical piles may be achieved by utilizing grade beam construction to brace the helical pile caps. Battered piles will allow for increased lateral resistance, however as down drag forces are expected due to the compressible clay layers, the battered piles will be subject to additional loads that may cause pile bending and distortion. Battered helical piles within the compressible clay layers, as described below, shall be designed to resist the increased loads. In addition, helical piles shall be installed to the specified embedment depth and torsional resistance criteria as determined by a registered professional engineer in the state of New York. MFS recommends that the helical pile installation torque correlation demonstrates a factor of safety of 2.5 on the

allowable load and the maximum axial compressive load does not exceed 10 tons. If each of these requirements are met, MFS recommends that compressive pile load tests not be required on the helical piles. If these requirements are not met, compressive pile load tests shall be conducted as outlined below. The helical pile foundations shall be designed using a minimum factor of safety of 2 in compression, and a minimum factor of safety of 3 in tension. It is recommended that the minimum spacing between the center lines of helical piles shall be four (4) times the largest helix plate diameter in accordance with NYCBC Section 1812.10.

As the helical piles will be installed through soft/loose Class 6 and Class 7 material which offer minimal lateral resistance, the structural engineer of record shall ensure the helical piles be designed within an allowable factor of safety for buckling. A buckling analysis shall be completed in accordance with NYCBC Section 1812.7.

It is anticipated that the subsurface conditions will allow for the installation of the helical piles based on the borings and test pit conducted. However, it should be noted that if subsurface obstructions (i.e. boulders, debris, etc.) are encountered during the installation of helical piles, the helical piles will not work as an effective deep foundation element and different pile types will be required.

Pile Load Tests

The piles constructed to support the proposed elevated platforms and associated structures shall be subject to load testing in accordance with the requirements of NYCBC Section 1808 and NYCBC Section 1812.4. The allowable geotechnical axial compressive capacity shall be demonstrated by load tests unless the exceptions of NYCBC 1808.3.1 or NYCBC Section 1812.4.1.1 are met for the given pile type. If required, the compressive load test procedures must be completed in accordance with ASTM D1143 - Standard Test Methods for Deep Foundations Under Static Axial Compressive Load and Section 1808.4.1.3 of the NYCBC.

The allowable uplift for a single pile shall be determined in accordance with accepted engineering practices based on a minimum factor of safety of 3 or by uplift load tests per NYCBC section 1808.3.4 and 1812.4.2 for the given pile type. The maximum allowable lateral load of a pile shall be 1 ton, unless verified by lateral load testing per NYCBC section 1808.3.5 and 1812.4.3 for the given pile type. The piles may require compressive, uplift, and lateral load testing depending on the design methods used and design loads. If load tests are required, the quantity of each type of load test to be performed and load testing procedures shall be determined in accordance with NYCBC Section 1808.4 or 1812.4 depending on the pile type used.

Down Drag

The highly compressible organic soft clay and silt identified in borings B-41A-1, B-62 and B-234-1(C) during the subsurface investigation will induce a down drag force on the shaft of the installed piles due to consolidation settlement of the organic clay/silt layer. The down drag load should be included with the proposed structure loads when analyzing the piles for axial capacity. Based on the thickness of the clay layers, we estimate a down drag force of approximately $7000 \cdot P$ lbs., where P is equal to the pile shaft unit surface area (ft²/ft).

Liquefaction induced down drag shall be considered by the design engineer due to the soils susceptible to liquefaction identified in all borings performed at the project site with the exceptions of building 41A and 234. During liquefaction, down drag occurs because of increases in effective stress caused by pore pressure dissipation and settlement by the liquefiable soil layer relative to the pile. Based on the thickness of the fill layer susceptible to liquefaction, we estimate a down drag force of approximately $16,250 \cdot P$ lbs., where P is equal to the pile shaft unit surface area (ft^2/ft).

Foundation Layout

The design engineer shall consider the site layout, depth, and location of all proposed foundations so as to prevent the undermining of existing foundations or utilities and to minimize any additional incurred loads on the existing buildings foundation elements. MFS recommends that an influence line having a slope of 1.5H:1V be used to determine if the proposed construction will influence the existing foundations. If the excavation for the proposed foundations is planned to extend beyond the influence lines of the existing foundations as defined herein, underpinning shall be required to prevent undermining of the foundations during excavation and to avoid differential settlement of the existing structure. If the new foundations will bear below the existing adjacent foundations, lateral surcharge loads on the new foundations shall be considered. It is recommended that any new foundations bear, at a minimum, at the same elevation as the existing adjacent foundations. If the foundations of the proposed mitigation strategies are proposed to abut existing foundations, MFS recommends that a Styrofoam or similar bond breaker be installed between the existing and proposed foundations to reduce any additional loading on existing foundation due to the proposed foundation.

SOIL DESIGN PARAMETERS

MFS recommends that the soil properties tabulated below be used for the design of the proposed flood mitigation strategies foundations. In addition to earth pressures, appropriate surface surcharge pressures such as potential construction, adjacent structures, adjacent roadways, and other appropriate surcharge loads should be considered. It is also recommended that flood lateral hydrostatic, lateral hydrodynamic, uplift loads, debris impact, and wave action loads be considered for the design of the proposed structures that are located within the limit of moderate wave action.

Axial Design

The following design parameters shall be used for the geotechnical axial design capacity of drilled deep foundations:

Material	Maximum Allowable Bearing Capacity (tsf)	Pressure Grouted Ultimate Bond Stress (Soil to Concrete/Grout) (psi) ^{1,2}	Gravity Grouted Ultimate Bond Stress (Soil to Concrete/Grout) (psi) ^{1,2}
Sandy Gravel and Gravel <ul style="list-style-type: none"> • Class 2a • Class 2b 	10 6	50 40	15 10
Granular Soils <ul style="list-style-type: none"> • Class 3a • Class 3b 	6 3	40 30	15 10
Clay and Clayey Soils <ul style="list-style-type: none"> • Class 4c 	2	10	7
Silts and Silty Soils <ul style="list-style-type: none"> • Class 5a • Class 5b 	3 1.5	30 20	7 5
Nominally Unsatisfactory Bearing Materials (Class 6)	N/A	5	3
Uncontrolled fills (Class 7)	0.5	5	3

Note:

1. The ultimate bond stresses for soil to concrete/grout are provided for pressure grouted and gravity grouted piles. The values provided are ultimate bond stresses and need to be divided by an appropriate factor of safety. It is recommended that a factor of safety of 2 be used for compressive capacity and a factor of safety of 3 be used for tensile capacity.
2. In order to limit or eliminate load testing on select pile elements, the bond stress may be reduced to the allowable limits outlined in NYCBC Section 1810.

Lateral Design

It is recommended that the lateral deflection at the top of any deep foundations be calculated using a modeling software such as LPILE. The following design soil and rock parameters should be used for the lateral analysis of the pier and deep foundations:

Material	γ (pcf)	γ' (pcf) ¹	ϕ (°)	C (psf)	K (pci)	K' (pci) ¹	ϵ_{50} (-)
Gravel							
• Class 2	125	62	34	---	210	120	---
• Class 6	105	42	29	---	35	20	---
Sand							
• Class 3a	125	62	34	---	220	125	---
• Class 3b	120	57	33	---	100	60	---
• Class 6	105	42	29	---	30	20	---
Organic Clay/Clay							
• Class 4c	115	52	---	800	190	175	0.0109
• Class 6	95	32	---	300	20	15	0.0316
Organic Silt/Silt							
• Class 5a	130	67	33	---	275	150	---
• Class 5b	120	57	29	1,000	400	400	0.0079
• Class 6	100	37	25	300	80	80	0.0138
Fill							
• N>10	115	52	33	---	45	30	---
• N<10	100	37	27	---	15	13	---

Note:

1. Effective unit weight and coefficient of static lateral subgrade reaction shall be used for all soils below the design water elevations.

Where,

γ = design total unit weight (pounds per cubic foot)

γ' = design effective unit weight (pounds per cubic foot)

ϕ = angle of internal friction (degrees)

C = undrained shear strength (pounds per square foot)

K = coefficient of static lateral subgrade reaction (pounds per cubic inch)

K' = effective coefficient of static lateral subgrade reaction (pounds per cubic inch)

ϵ_{50} = axial strain of soil corresponding to one-half of the maximum principal stress difference

The coefficient of friction between concrete foundations and the fill shall be 0.35. If clean crushed stone is used, the coefficient of friction between the concrete foundations and the stone may be taken as 0.55.

SETTLEMENT

The settlement of the various foundations on site will be a function of the structural loads, type of foundation, and is dependent on the layout and stiffness of the respective foundations. In addition, settlement will depend on variations in the subsurface profile, thickness of compacted fill, and quality of earthwork operations. At the time that this report was completed, no design loads have been provided and therefore a detailed settlement analysis was not performed. Based on the allowable bearing capacities and soil design parameters provided herein, it is anticipated that the total settlements of all foundations may be designed and managed to be less than approximately 1 inch. Differential settlement will vary depending on the foundation systems used, but are anticipated to be less than approximately 1/2-inch for a given structures as long as similar foundation elements are used to support the entirety of the structure. MFS recommends that a detailed settlement analysis be performed when the foundation design is being performed.

FOUNDATION CONSTRUCTION CONSIDERATIONS

PILE INSTALLATION METHOD

Based upon the results of the 2019 MFS Subsurface Investigation and our review the historic USGS topographic maps presented in Figures 1.1 and 1.2, it is anticipated that the proposed piles will need to be installed through a thick fill layer comprised of sand, gravels, cobbles, and miscellaneous debris at Building 293 and Building 386. It is likely that boulders will also be encountered during the installation of the proposed piles.

Based on our project understanding and due to the proximity of existing structures and utilities we recommended that the piles be drilled or augered elements as they will induce minimal vibrations during the installation/casting process. It is anticipated that any proposed piers will be installed/constructed using standard excavation or drilling methods. The contractor shall be prepared to advance the installation of piles and piers through potential boulders, cobbles, and miscellaneous debris that may be encountered in the top fill layer. The drilling equipment shall have sufficient power, torque, and downward thrust to advance the piles through the soil overburden and bedrock, if required, on site. During drilling, all soil shall be removed from within the casing using augers or reverse circulation methods to keep the wash water return inside the casing (internal flush). Flushing that results in circulation outside of the casing shall not be permitted and can result in the reduced lateral and axial capacity of the pile. Any external flush should be immediately brought to the attention of the engineer of record. Any temporary or permanent casings used during installation of piles shall be extended to the full depth of the drilled pile during construction. Removal of the casing, if performed, shall be completed so that the level of the concrete/grout within the casing is at least 2 feet above the bottom of the casing at all times. Due to the shallow groundwater table, tremie methods shall be used to properly displace the water during the placement of grout and/or concrete for the pile construction installation, if required/selected.

The contractor shall ensure all piles are installed within the project tolerances for location and plumbness to avoid the potential for increased lateral forces and decreased axial capacity of the piles.

During construction, if any load tests are performed, the same equipment, methods, and procedures that were used to advance the test piles shall be used to install the production piles. In addition, the tested piles and production piles shall be of the same type, size, and shape and be installed to the same bearing stratum. If there is a change to the pile type, size, and/or shape, additional load testing will be required.

TEMPORARY EXCAVATION SUPPORT

If sonotube piers are used for the security fence foundations, temporary excavation support will likely not be required. The excavation for the construction of the concrete sonotube piers will be performed using either an auger or other drilling techniques to be determined by the contractor. One benefit of this construction method is that it limits the disturbance at the project site. Using an auger or other drilling method to construct the pier foundations will limit the excavation size to the size of the foundations being constructed and limit large excavations, benching, or shoring. The annulus outside of the sonotube shall be backfilled with lean concrete to allow for compact backfill around the foundations.

Construction of the pile caps and deep foundation system for the elevated platforms will likely require temporary excavation support. As the anticipated excavations are relatively shallow, lateral support of the soil overburden will likely consist of benching or shoring. A benched slope out at 1.5H:1V can be performed if site clearance and adjacent structures and/or utilities are not interfering with the excavation. If there are obstructions on site that do not allow for the soil overburden to be benched, MFS recommends that pre-engineered trench boxes or timber shoring be used to excavate to the required depths to construct the proposed foundations. The contractor shall determine the most appropriate temporary excavation support system to fulfill their means and methods of construction.

In addition to earth and hydrostatic pressures, appropriate surface surcharge pressures such as potential construction loads should be considered when evaluating the temporary excavation support systems. The design of all temporary support of excavation systems shall be performed by a professional engineer licensed in the state of New York. The contractor shall be responsible for ensuring the installation of the excavation support so as not to adversely impact any existing utilities or other structures in the area. It is recommended that the project specifications require that the contractor be responsible for all damage and repairs (or replacement, as necessary) to existing utilities resulting from their work. If existing utilities fall within the limits of excavations for the proposed construction, the contractor shall take all the necessary precautions to monitor and prevent the undermining of the existing utility. In addition, barriers shall be placed along the extend of the excavation and shall be detailed in a maintenance and protection of traffic (MPT) plan for both pedestrians and vehicular safety.

TEMPORARY GROUNDWATER CONTROL

Based on the anticipated depths of the excavations required for the construction of the foundations and groundwater depth at the project site, it is likely that the construction will require localized dewatering within the extents of the excavations in certain areas of the site. Additionally, the water table is tidally influenced and is likely to fluctuate from the groundwater observations at the time of the investigation. If the groundwater table is encountered during excavation operations, the groundwater should be maintained at least one (1) foot below the final excavation depth. The contractor shall be prepared to perform dewatering activities in advance of excavating to maintain stable excavation subgrades and slopes. The contractor shall be responsible for determining the means and methods of dewatering. It is recommended that the dewatering system be designed by a professional engineer licensed in the state of New York. The designs shall be completed to ensure that dewatering does not result in any softening or loss of soil at the proposed foundation subgrade elevations and so that the system do not adversely affect any existing adjacent structures.

Where piers are proposed to extend to depths below the groundwater level, the piers shall be constructed by a method that will provide accurate preparation and inspection of the subgrade in dry conditions.

Discharge of dewatering effluent may not be placed into sewers without a permit from the NYCDEP. Contaminated water, if present, will need to be treated prior to discharging into the storm or sanitary sewers.

Furthermore, the site should be graded during construction to facilitate proper drainage and minimize ponding during precipitation events. All areas of disturbed soil shall be compacted and sealed at the end of each work day to reduce the risk of subgrade softening.

SUBGRADE PREPARATION

Excavation within the last foot from final sonotube pier and pile cap subgrade elevations should be performed with care to minimize soil disturbance. The exposed subgrade surface should be level and free of loose soil, debris, standing water, or other unsatisfactory material. The exposed subgrade condition should be verified and approved by the geotechnical engineer responsible for special inspections before any foundation construction takes place.

Where shallow sonotube piers are proposed, MFS recommends the foundations be constructed on a minimum of 6 inches of 3/4-inch clean crushed stone.

Prior to concrete placement, except within the piers, the subgrade areas should be compacted with at least five (5) passes of a 2-ton-walk-behind smooth drum vibratory roller. If the accessibility for large compaction equipment is limited, a rammer or vibratory plate shall be used. Any areas exhibiting excessive weaving, rutting, or pumping should be removed and replaced with crushed stone or compacted controlled fill, as described below. The pile caps and foundations should be poured and/or installed the same day they are excavated to minimize possible subgrade deterioration. If this is not possible, MFS recommends that the base of all excavations be protected with a minimum 6-inch thick layer of 3/4-inch clean crushed stone, or a thin concrete mud mat, to protect against subgrade deterioration. Prior to pouring concrete, all water, debris, and ice/snow shall be removed from the subgrades. Any unprotected subgrade exposed to rain or snow events should be re-inspected by the geotechnical engineer responsible for special inspection prior to concrete placement.

FILL MATERIAL, PLACEMENT, AND COMPACTION CRITERIA

If needed, all imported fill should be controlled fill as defined by the NYCBC. Controlled fill shall be well-graded sand and gravel having not more than 10% by dry weight passing the No. 200 sieve. The maximum particle size should be 3 inches. The fill should be free of organics, clay, and other deleterious or compressible materials.

Controlled fill material should be placed in uniform 12-inch-thick loose lifts and compacted using a 2-ton-walk-behind vibratory roller to at least 95% of its maximum dry unit weight as determined by ASTM test designation D1557. In restricted areas where only hand-operated compactors can be used, the maximum lift thickness should be limited to 6 inches. The appropriate water content at the time of compaction should be plus or minus 2 percentage points of optimum as determined by the laboratory compaction tests of proposed fill material. No fill should be placed until all unsuitable material is removed and the underlying material has been compacted. No backfill material should be placed on areas where free water is standing or on frozen subsoil areas.

SOIL REUSE

As the uppermost soils encountered on site consisted primarily of NYCBC Class 7 fill sands with relatively high fines content and debris, MFS recommends that the soil on site shall not be re-used as controlled fill. The fill may be used as uncontrolled fill in locations that are not

required for support of structures, roadways, or other site features. In order for any existing fill and native soil to be reused as uncontrolled fill, it is recommended that the contractor be required to complete gradation and compaction testing on representative soil samples and submit the results to the geotechnical engineer for approval prior to reuse. Prior to reuses as uncontrolled fill all particles larger than 3-inches across, any organic materials, and miscellaneous debris material should be removed prior to construction.

MONITORING OF ADJACENT STRUCTURES

During the construction of the deep foundations, it is recommended that a vibration and optical monitoring program be implemented to monitor the existing utilities and structures adjacent to the proposed construction. It is recommended that a detailed monitoring plan be prepared by a professional engineer licensed in the state of New York. The plan should show the locations of the seismographs and optical monitoring points, outline thresholds for maximum allowed peak particle velocity and movement, and provide project procedures in the event of a vibration or movement exceedance to limit damage to existing structures or utilities in the vicinity of the project.

CONSTRUCTION DOCUMENTS AND QUALITY CONTROL

Technical specifications and design drawings should incorporate our recommendations to ensure that subsurface conditions and other geotechnical issues at the site are adequately addressed in the construction documents. MFS should assist the design team in preparing specification sections related to geotechnical issues such as earthwork and deep foundations. MFS should also review foundation drawings and details, and all contractor submittals and construction procedures related to geotechnical work.

All foundation work for this project shall be subject to special inspections as required by the NYCBC. We recommend that MFS provide special inspections during construction to verify that the foundation design is implemented and to provide timely responses to field questions and changes.

FURTHER INVESTIGATION

As the 2019 MFS Subsurface Investigation was conducted during the preliminary design stage of the envisioned project, the subsurface investigation was planned to obtain general subsurface conditions and to identify the extents of the existing foundations at the specific subject properties.

Once designs of the proposed strategies to mitigate against future flood-related losses at the electrical substations and boilers in the Brooklyn Navy Yard at the specific subject properties are finalized, MFS recommends the evaluation of the requirements set forth in NYCBC Section 1802.4 to determine if additional geotechnical borings are required. As the subsurface conditions varied significantly between borings B-41A-1 and B-41A-2 at the project site, we recommend that one (1) additional boring, preferably in the footprint of the proposed reconstructed building, be performed to better delineate the subsurface profile in the vicinity of Building 41A.

As the intended test pit to be conducted at Building 234 was not performed and a structural analysis of the existing foundation is required, MFS recommends one (1) test pit be performed

to determine the extents of the existing foundation. Additionally, the extents of the existing foundations were not encountered within the limits of the performed tests pits at Buildings 41A, 293, and 386. If existing as-built drawings are not available, MFS recommends that additional deepened test pits with dewatering be performed to identify the extents of the existing foundations.

LIMITATIONS

The conclusions and recommendations provided in this report are based on subsurface conditions inferred from the seven (7) borings and five (5) test pits conducted as part of the 2019 MFS Subsurface Investigation at the Brooklyn Navy Yard located in the borough of Brooklyn, New York. Recommendations provided are contingent upon one another and no recommendation should be followed independent of the others.

This report has been prepared to assist the Owner and Structural Engineer and is only applicable to the envisioned project discussed herein. The recommendations herein are specifically for the proposed strategies to mitigate against future flood-related losses at the electrical substations and boilers in the Brooklyn Navy Yard at the specific subject properties that were part of our investigation. Our recommendations may not be applicable to additional improvements at buildings that were outside of the scope of our study. Any changes in the proposed development should be brought to our attention so that we can determine whether such changes affect our recommendations. MFS cannot assume responsibility for use of this report for any areas beyond the limits of this study or for any projects not specifically discussed herein.

Information on subsurface strata shown on the boring logs and test pit sketches represent conditions encountered only at the location indicated and at the time of investigation. If different conditions are encountered during construction, they should immediately be brought to our attention for evaluation as they may affect our recommendations.

Environmental issues (such as potentially contaminated soil and groundwater) are outside the scope of this study and should be addressed in a separate study. In addition, seismic response analyses, dynamic loading conditions, soil corrosivity testing, corrosivity considerations, and flood wall design recommendations were not considered as part of this study.

FIGURES



1 USGS 1947 HISTORIC TOPOGRAPHIC SITE LOCATION MAP
 Scale: 1" = 1000'
 0 1000' 2000'

LEGEND

PROJECT LOCATION

NOTE:
 1. THE BASE MAP USED FOR THIS FIGURE IS THE 1947 USGS 7.5 MINUTE TOPOGRAPHIC MAP FOR BROOKLYN, NY

MFS ENGINEERS & SURVEYORS
 MFS CONSULTING ENGINEERS & SURVEYOR, DPC
 320 FIFTH AVE., FLOOR 11-SUITE #1102, NEW YORK, NY 10001
 T: 212.943.6576 www.MFSengineers.com
 F: 866.517.7413
 N.Y. CERTIFICATE OF AUTHORIZATION: 0007564

PROJECT NAME
 BROOKLYN NAVY YARD DEVELOPMENT CORPORATION
 DESIGN SERVICES FOR BOILERS, SUBSTATIONS,
 AND ISOLATED ELECTRICAL WORK
 BROOKLYN KINGS COUNTY NEW YORK

DRAWING TITLE
 HISTORIC USGS TOPOGRAPHIC
 SITE LOCATION MAP (1947)

PROJECT NO.	1119060	SHEET NO.	FIG. 1.1 1 OF 3
DATE	11/26/2019		
SCALE	AS NOTED		
DRAWN BY	ATG		
CHECKED BY	MLM		



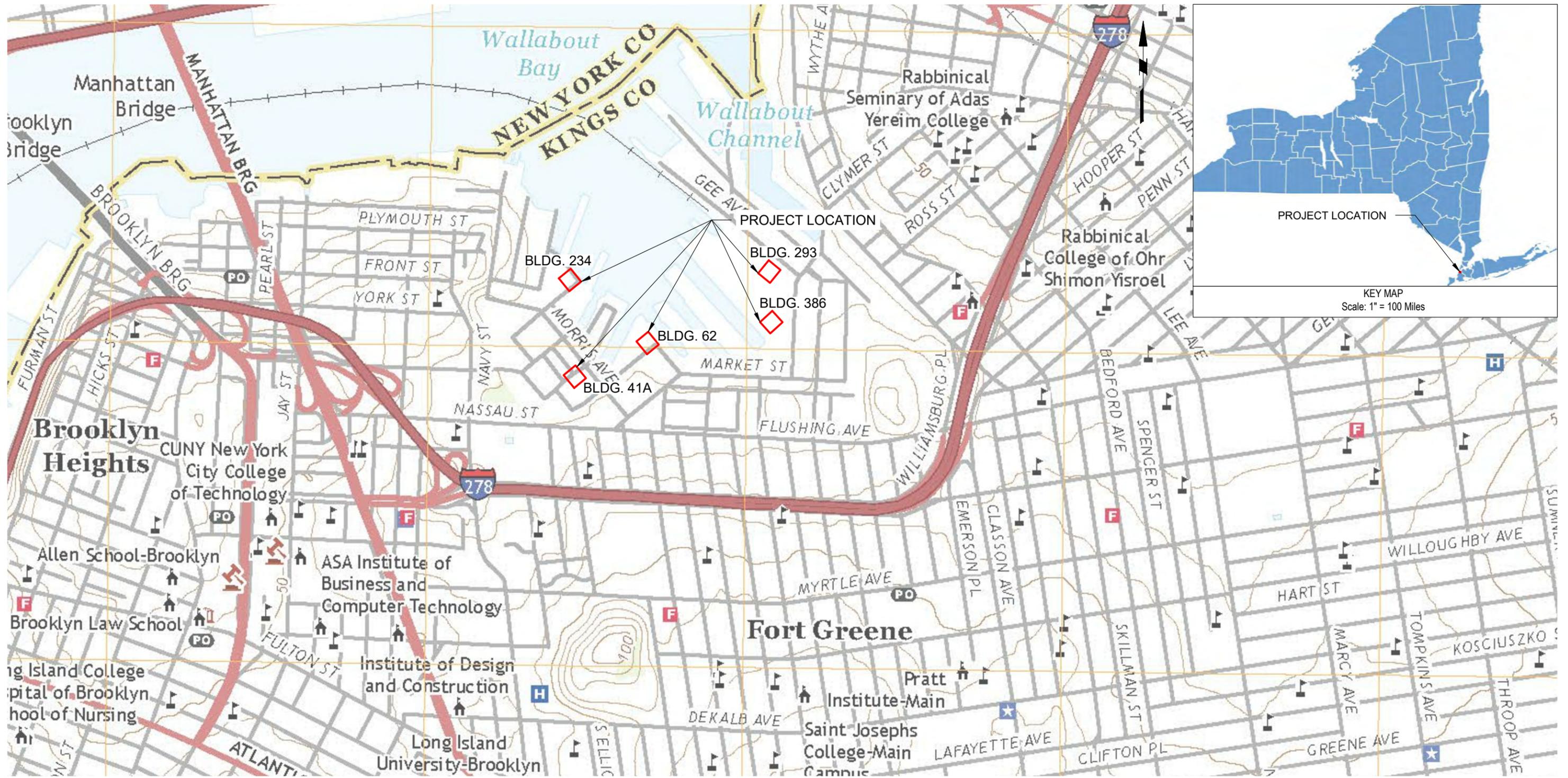
2 USGS 1956 HISTORIC TOPOGRAPHIC SITE LOCATION MAP
 Scale: 1" = 1000'
 0 1000' 2000'

LEGEND

PROJECT LOCATION

NOTE:
 1. THE BASE MAP USED FOR THIS FIGURE IS THE 1956 USGS 7.5 MINUTE TOPOGRAPHIC MAP FOR BROOKLYN, NY

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	BROOKLYN KINGS COUNTY NEW YORK			



3 USGS 2019 TOPOGRAPHIC SITE LOCATION MAP
 Scale: 1" = 1000'
 0 1000' 2000'

LEGEND

PROJECT LOCATION

NOTE:
 1. THE BASE MAPS USED FOR THIS FIGURE IS THE 2019 USGS 7.5 MINUTE TOPOGRAPHIC MAP FOR BROOKLYN, NY: USGS - NATIONAL GEOSPATIAL TECHNICAL OPERATIONS CENTER

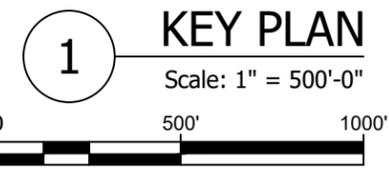
 MFS CONSULTING ENGINEERS & SURVEYOR, DPC 320 FIFTH AVE., FLOOR 11-SUITE #1102, NEW YORK, NY 10001 T: 212.943.6576 www.MFSengineers.com F: 866.517.7413 N.Y. CERTIFICATE OF AUTHORIZATION: 0007564	PROJECT NAME BROOKLYN NAVY YARD DEVELOPMENT CORPORATION DESIGN SERVICES FOR BOILERS, SUBSTATIONS, AND ISOLATED ELECTRICAL WORK	DRAWING TITLE USGS TOPOGRAPHIC SITE LOCATION MAP (2019)	PROJECT NO. 1119060 DATE 11/26/2019 SCALE AS NOTED DRAWN BY ATG CHECKED BY MLM	SHEET NO. FIG. 1.3 3 OF 3
	BROOKLYN KINGS COUNTY NEW YORK			

GENERAL NOTES:

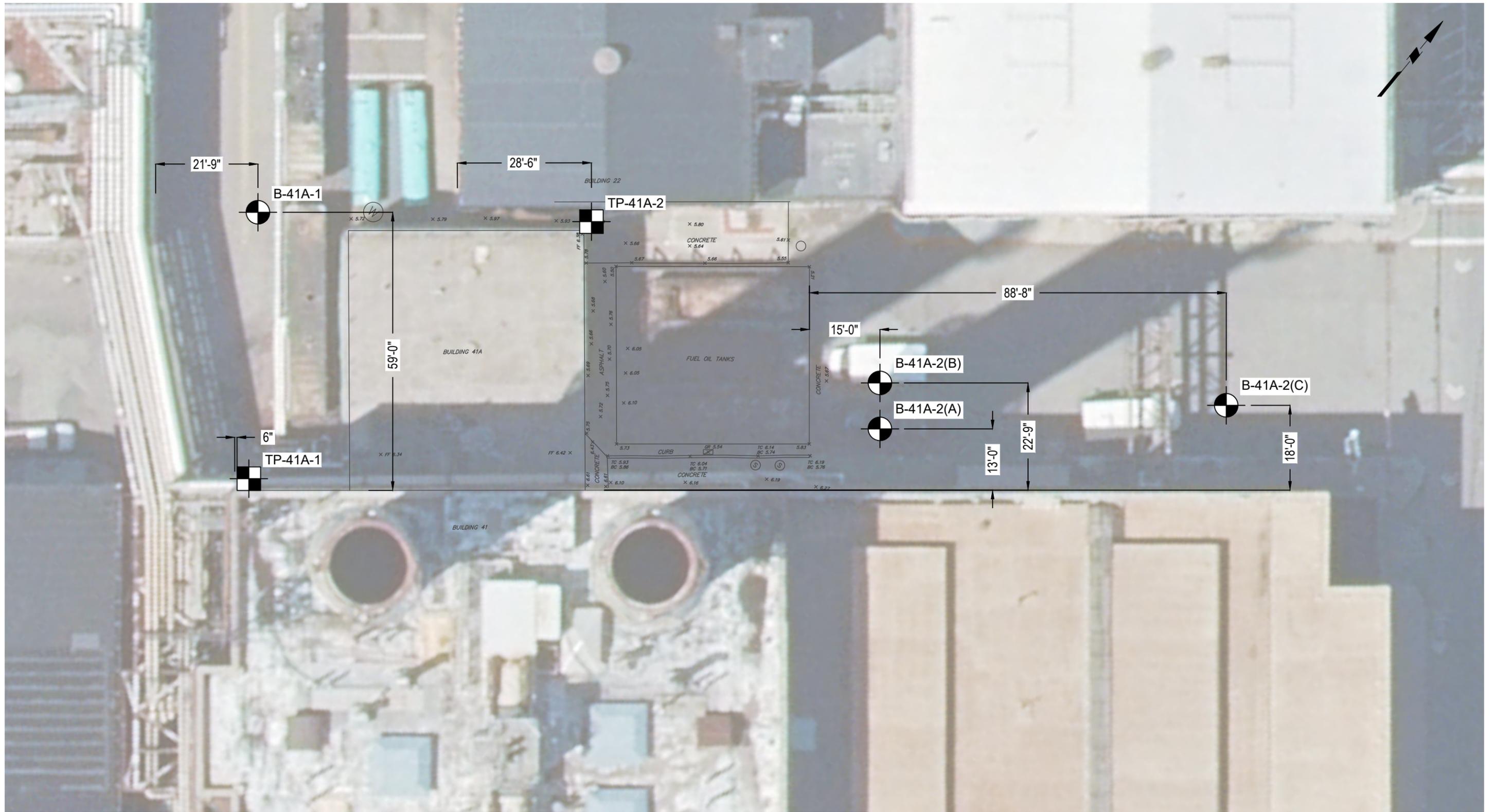
1. ALL AS-DRILLED BORING LOCATIONS REFERENCE THE FIELD SUBSURFACE INVESTIGATION COMPLETED BY CRAIG GEOTECHNICAL DRILLING, INC. UNDER THE FULL TIME ENGINEERING SPECIAL INSPECTION OF MFS CONSULTING ENGINEERS AND SURVEYOR, DPC (MFS) FROM 13 DECEMBER 2019 TO 26 DECEMBER 2019.
2. ALL TEST PIT LOCATIONS REFERENCE THE FIELD SUBSURFACE INVESTIGATION COMPLETED BY MFS CONSTRUCTION, LLC UNDER THE FULL TIME ENGINEERING SPECIAL INSPECTION OF MFS FROM 2 DECEMBER 2019 TO 6 DECEMBER 2019.
3. THE BACKGROUND IMAGES USED FOR THIS SUBSURFACE INVESTIGATION PLAN WERE OBTAINED FROM THE NEW YORK STATE DISCOVER GIS DATA NY 2018 ORTHOIMAGERGY (TILES 987192, 987195, 990192, 990195, 992192, AND 992195).
4. THE PARTIAL BACKGROUND SURVEY WAS OBTAINED FROM THE ELEVATION SURVEYS PERFORMED BY MFS DATED 17 SEPTEMBER 2019. THE SURVEY REFLECTS CONDITIONS AS SURVEYED BY MFS BETWEEN 22 AUGUST 2019 AND 29 AUGUST 2019.
5. COORDINATES AND BEARINGS ARE BASED ON NEW YORK LONG ISLAND STATE PLANE COORDINATE SYSTEM (NAD83) AS DETERMINED BY GPS OBSERVATIONS.
6. ELEVATIONS ARE BASED ON NAVD1988 DATUM AS DETERMINED BY GPS OBSERVATIONS.
7. DIMENSIONS ARE NOT TO BE SCALED. ALL DIMENSIONS SHALL BE TAKEN AS EXPLICITLY WRITTEN ON DRAWINGS.



LEGEND	
	B-# AS-DRILLED BORING LOCATION
	TP-# TEST PIT LOCATION



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	BROOKLYN NAVY YARD DEVELOPMENT CORPORATION DESIGN SERVICES FOR BOILERS, SUBSTATIONS, AND ISOLATED ELECTRICAL WORK BROOKLYN KINGS COUNTY NEW YORK	NOTES AND KEY PLAN	1119060	FIG. 2.0
			DATE	12/17/2019
			SCALE	AS NOTED
			DRAWN BY	ATG
			CHECKED BY	MLM
				1 OF 4



1 BORING AND TEST PIT LOCATION PLAN - BUILDING 41A
 Scale: 1" = 20'-0"



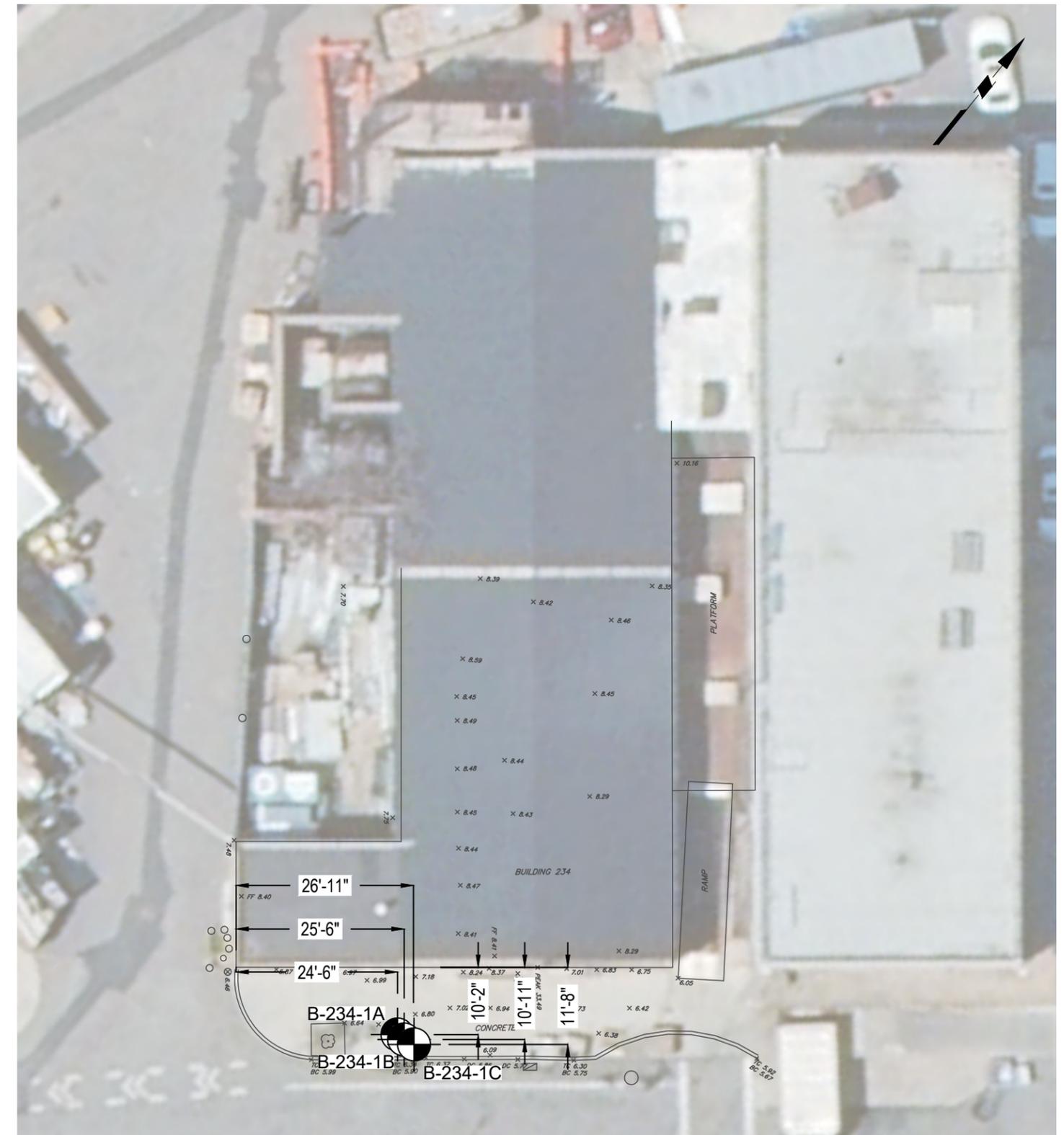
NOTES:
 1. SEE SHEET FIG. 2.0 (SHEET 1 OF 4) FOR ALL GENERAL NOTES.

MFS ENGINEERS & SURVEYORS
 MFS CONSULTING ENGINEERS & SURVEYOR, DPC
 320 FIFTH AVE., FLOOR 11-SUITE #1102, NEW YORK, NY 10001
 T: 212.943.6576 www.MFSengineers.com
 F: 866.517.7413
 N.Y. CERTIFICATE OF AUTHORIZATION: 0007564

PROJECT NAME
 BROOKLYN NAVY YARD DEVELOPMENT CORPORATION
 DESIGN SERVICES FOR BOILERS, SUBSTATIONS,
 AND ISOLATED ELECTRICAL WORK
 KINGS COUNTY
 BROOKLYN NEW YORK

DRAWING TITLE
 AS-DRILLED BORING
 AND AS-DUG TEST PIT
 LOCATION PLAN

PROJECT NO.	1119060	SHEET NO.
DATE	12/17/2019	
SCALE	AS NOTED	FIG. 2.1
DRAWN BY	ATG	
CHECKED BY	MLM	
		2 OF 4



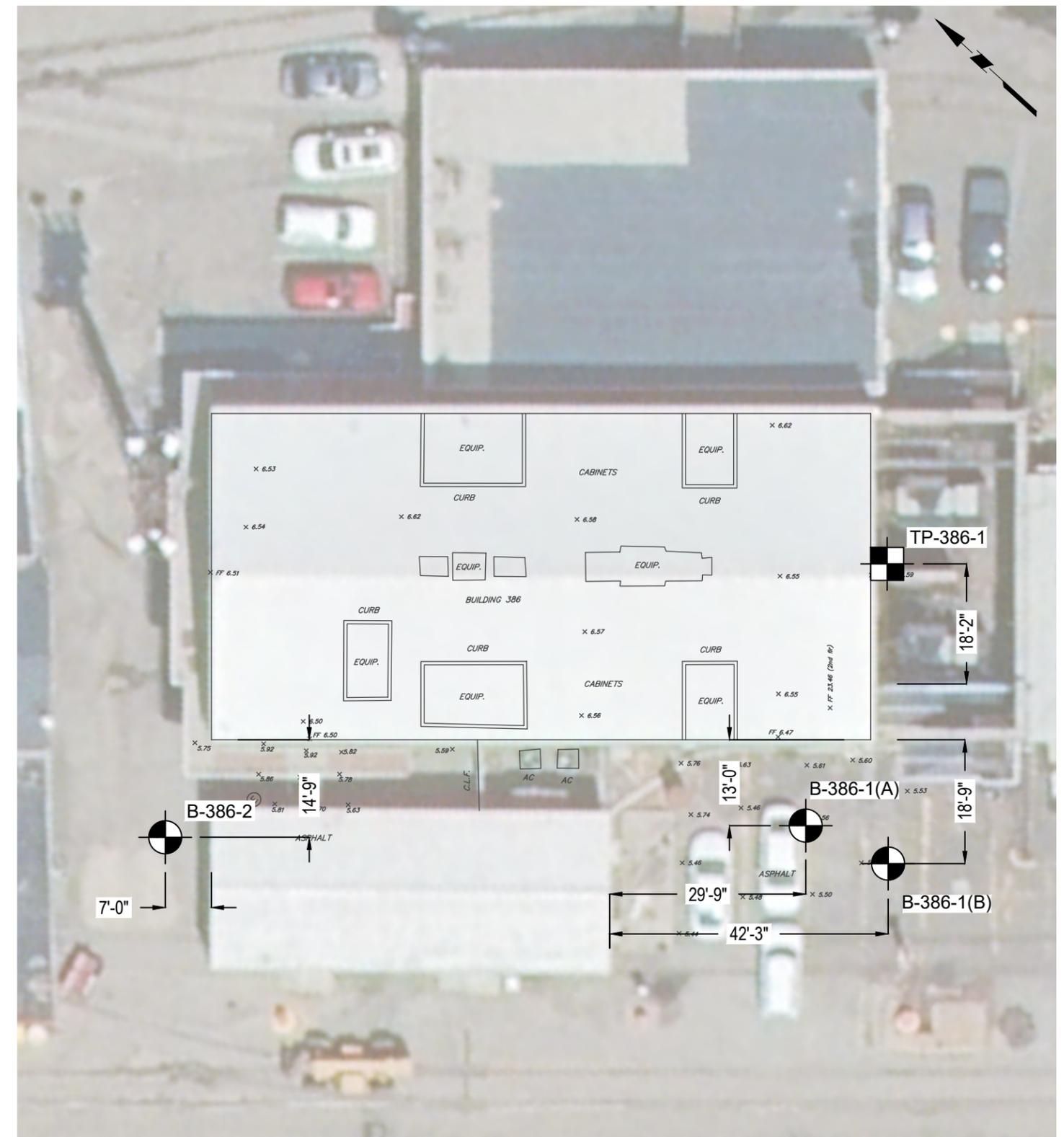
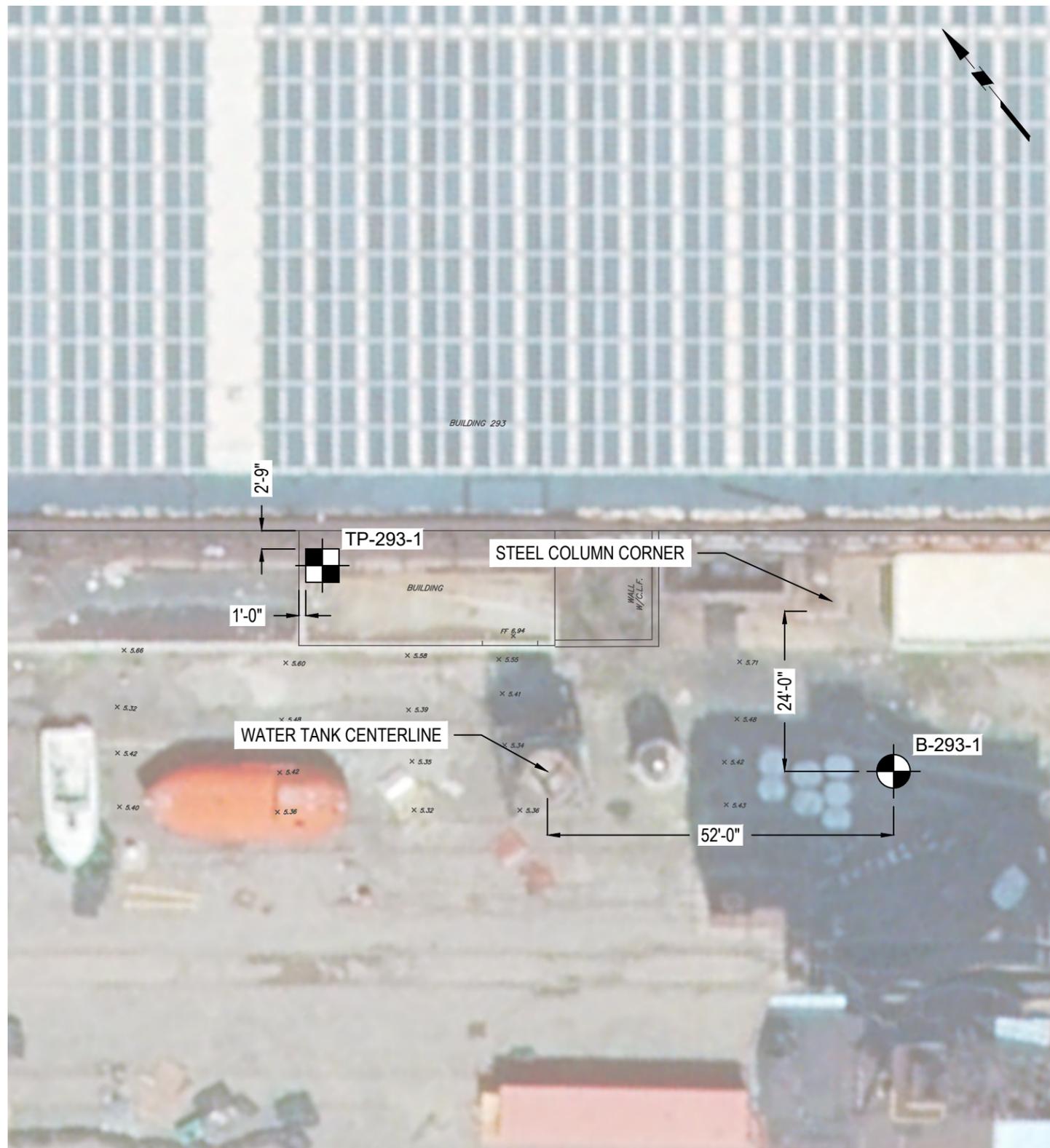
1 BORING AND TEST PIT LOCATION PLAN - BUILDING 62
Scale: 1" = 20'-0"

2 BORING LOCATION PLAN - BUILDING 234
Scale: 1" = 20'-0"



NOTES:
1. SEE SHEET FIG. 2.0 (SHEET 1 OF 4) FOR ALL GENERAL NOTES.

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	BROOKLYN NAVY YARD DEVELOPMENT CORPORATION DESIGN SERVICES FOR BOILERS, SUBSTATIONS, AND ISOLATED ELECTRICAL WORK	AS-DRILLED BORING AND AS-DUG TEST PIT LOCATION PLAN	DATE	12/17/2019	FIG. 2.2
BROOKLYN KINGS COUNTY NEW YORK		SCALE	AS_NOTED		
			DRAWN BY	ATG	
			CHECKED BY	MLM	3 OF 4



1 BORING AND TEST PIT LOCATION PLAN - BUILDING 293
Scale: 1" = 20'-0"

2 BORING AND TEST PIT LOCATION PLAN - BUILDING 386
Scale: 1" = 20'-0"



NOTES:
1. SEE SHEET FIG. 2.0 (SHEET 1 OF 4) FOR ALL GENERAL NOTES.

MFS ENGINEERS & SURVEYORS
MFS CONSULTING ENGINEERS & SURVEYOR, DPC
320 FIFTH AVE., FLOOR 11-SUITE #1102, NEW YORK, NY 10001
T: 212.943.6576 www.MFSengineers.com
F: 866.517.7413
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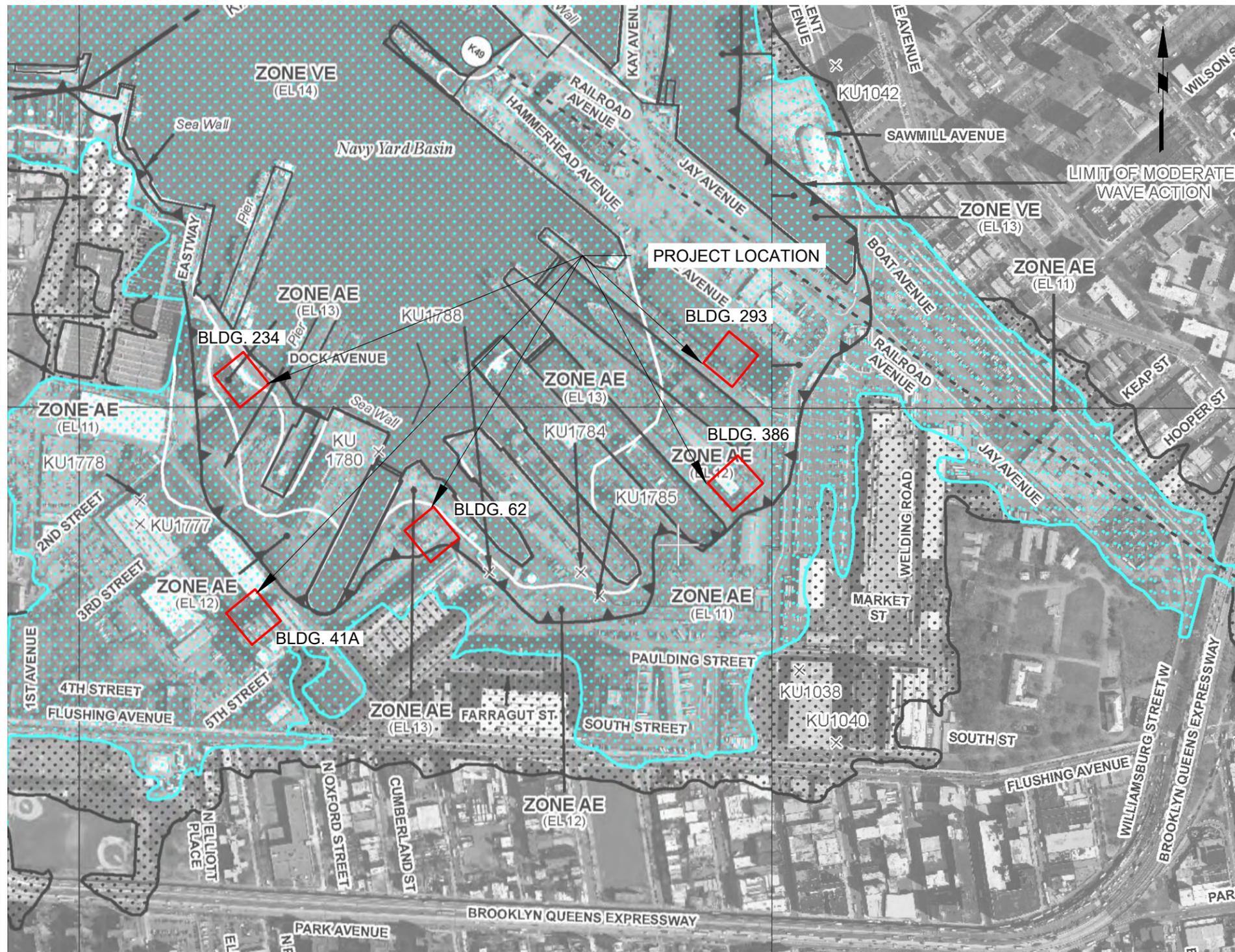
PROJECT NAME
BROOKLYN NAVY YARD DEVELOPMENT CORPORATION
DESIGN SERVICES FOR BOILERS, SUBSTATIONS,
AND ISOLATED ELECTRICAL WORK
BROOKLYN KINGS COUNTY NEW YORK

DRAWING TITLE
AS-DRILLED BORING
AND AS-DUG TEST PIT
LOCATION PLAN

PROJECT NO.	1119060	SHEET NO.	FIG. 2.3
DATE	12/17/2019		
SCALE	AS NOTED		
DRAWN BY	ATG		
CHECKED BY	MLM	4 OF 4	

LEGEND

-  SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD
- The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.
- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently derelict. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.
-  FLOODWAY AREAS IN ZONE AE
- The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.
-  OTHER FLOOD AREAS
- Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
-  OTHER AREAS
- ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D** Areas in which flood hazards are undetermined, but possible.
-  COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
-  OTHERWISE PROTECTED AREAS (OPAs)
- CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.
-  1% annual chance floodplain boundary
-  0.2% annual chance floodplain boundary
-  Floodway boundary
-  Zone D boundary
-  CBRS and OPA boundary
-  Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
-  Limit of Moderate Wave Action
-  51.3 Base Flood Elevation line and value; elevation in feet* (EL 987)
-  Base Flood Elevation value where uniform within zone; elevation in feet*
- * Referenced to the North American Vertical Datum of 1988
-  Cross section line
-  Transect line
-  Culvert, Flume, Penstock or Aqueduct
-  Road or Railroad Bridge
-  Footbridge
-  87°07'45", 32°22'30"
-  2476000N 1000-meter Universal Transverse Mercator grid values, zone 18
-  600000 FT 5000-foot grid values: New York State Plane coordinate system, Long Island zone (FIPSZONE 3104), Lambert Conformal Conic projection
-  DX5510 x Bench mark (see explanation in Notes to Users section of this FIRM panel)
-  M1.5 River Mile



PANEL 0203G

FIRM
FLOOD INSURANCE RATE MAP

CITY OF
NEW YORK
NEW YORK
BRONX, RICHMOND, NEW YORK,
QUEENS, AND KINGS COUNTIES

PANEL 203 OF 457
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
NEW YORK, CITY OF 360497 0203 G

PRELIMINARY
DECEMBER 5, 2013

Notice to User: The Map Number shown below should be used when placing map orders. The Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
3604970203G

MAP REVISED

Federal Emergency Management Agency

PANEL 0204G

FIRM
FLOOD INSURANCE RATE MAP

CITY OF
NEW YORK
NEW YORK
BRONX, RICHMOND, NEW YORK,
QUEENS, AND KINGS COUNTIES

PANEL 204 OF 457
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
NEW YORK, CITY OF 360497 0204 G

PRELIMINARY
DECEMBER 5, 2013

Notice to User: The Map Number shown below should be used when placing map orders. The Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
3604970204G

MAP REVISED

Federal Emergency Management Agency

1

FEMA FLOOD INSURANCE RATE MAP (FIRM)

Scale: 1" = 500'



LEGEND



PROJECT LOCATION

	PROJECT NAME BROOKLYN NAVY YARD DEVELOPMENT CORPORATION DESIGN SERVICES FOR BOILERS, SUBSTATIONS, AND ISOLATED ELECTRICAL WORK	DRAWING TITLE FEMA FLOOD INSURANCE RATE MAP (FIRM)	PROJECT NO. 1119060	SHEET NO. 1 OF 1
	MFS CONSULTING ENGINEERS & SURVEYORS, DPC 320 FIFTH AVE., FLOOR 11-SUITE #1102, NEW YORK, NY 10001 T: 212.943.6576 www.MFSengineers.com F: 866.517.7413 N.Y. CERTIFICATE OF AUTHORIZATION: 0007564	KINGS COUNTY NEW YORK	DATE 11/26/2019	SCALE AS NOTED
			DRAWN BY ATG	
			CHECKED BY MLM	



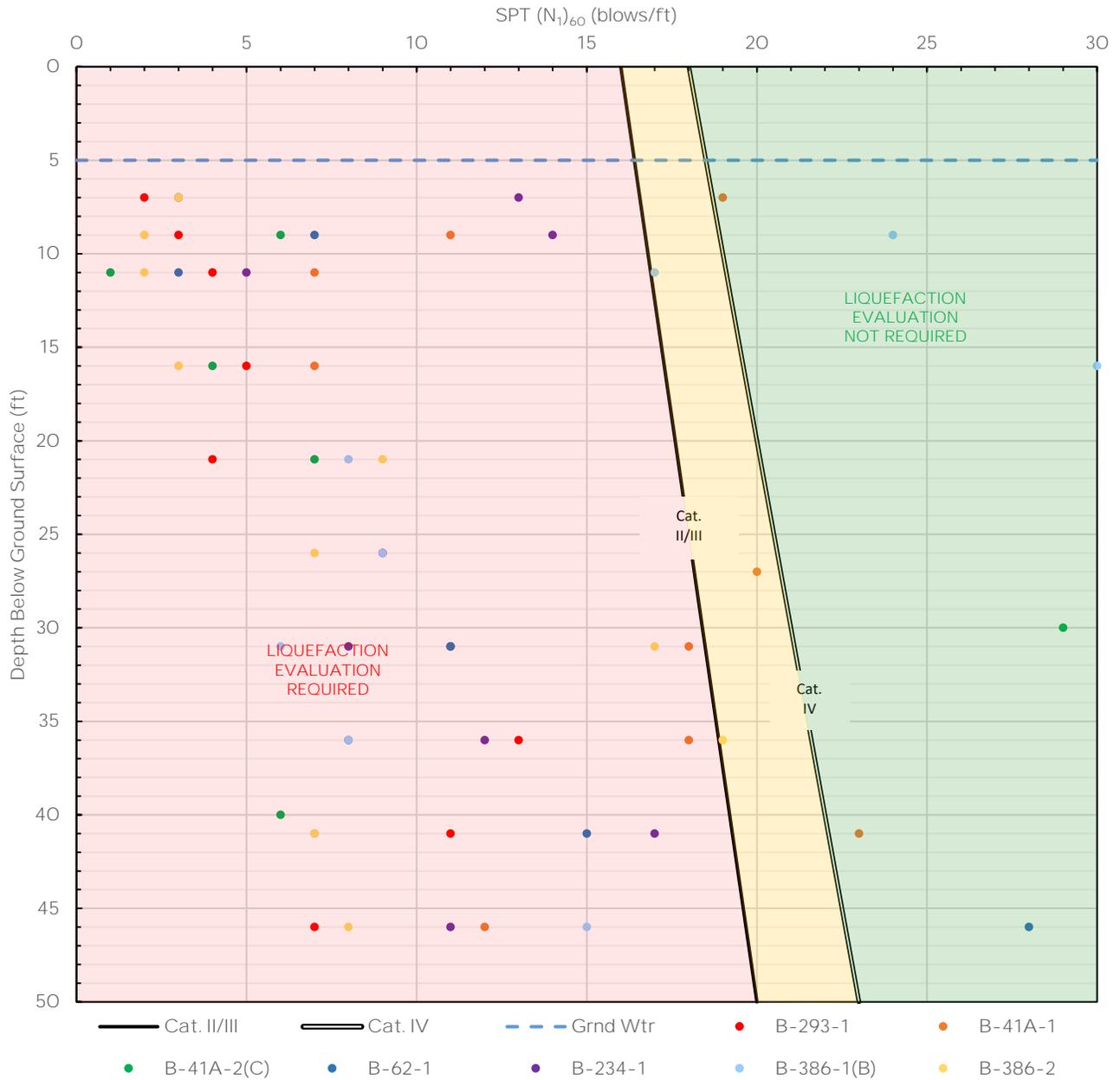
Made By: ATG
 Checked By: JMF

Date: 2/6/2020
 Date: 2/6/2020

Sheet No. 1 of 1
 Project No: 1119060

FOR: SEISMIC ANALYSIS - LIQUEFACTION
 SUBJECT: FIG. 4 - 2014 NYCBC LIQUEFACTION ASSESSMENT

Liquefaction Assessment Diagram



Notes:

1. Diagram is applicable only to granular soils below the groundwater table. Cohesive soils and Rock are not shown on the diagram.
2. Cohesive soils with $PI < 20$ shall be considered to have potential for liquefaction.
3. N_{60} is the standard penetration resistance normalized to an energy of 60% efficiency.
4. See 2014 NYCBC Table 1604.5 for Structural Risk/Occupancy Category definitions.
5. Structural Risk/Occupancy Category I structures are exempt from liquefaction assessment.

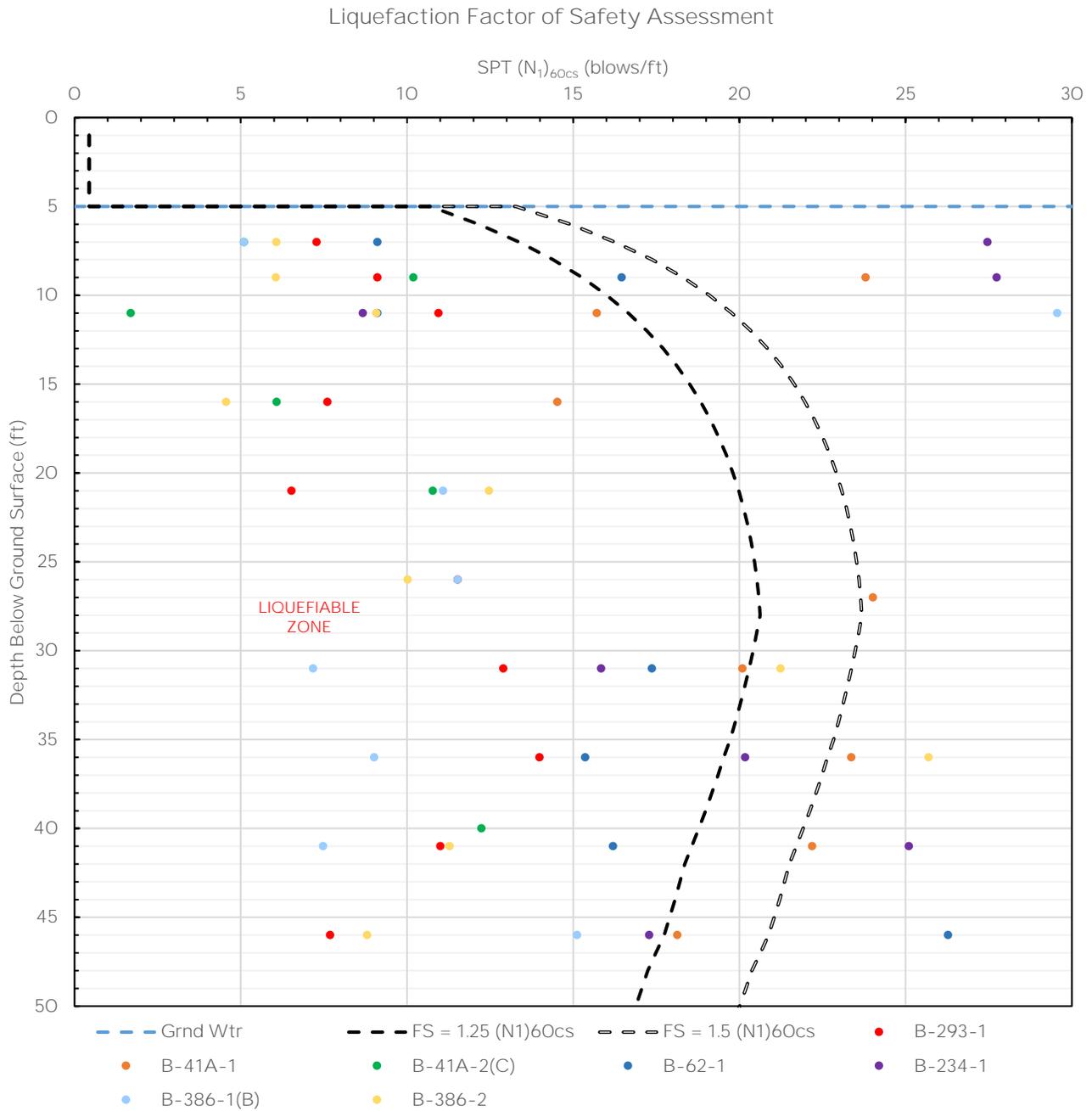


Made By: ATG
 Checked By: JMF

Date: 2/6/2020
 Date: 2/6/2020

Sheet No. 1 of 1
 Project No: 1119060

FOR: SEISMIC ANALYSIS - LIQUEFACTION
 SUBJECT: FIG. 5 - ASSESSMENT OF FACTOR OF SAFETY AGAINST LIQUEFACTION



Notes:

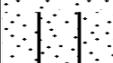
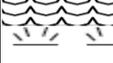
1. Diagram is applicable only to granular soils below the groundwater table. Cohesive soils (clays, silts) and rock are not shown on the diagram.
2. Cohesive soils with PI < 20 shall be considered to have potential for liquefaction.
3. (N_1)_{60cs} is the standard penetration resistance normalized to an energy of 60% efficiency and adjusted for fines content to clean sand.
4. SPT (N_1)_{60cs} values greater than 30 are not shown on the diagram for clarity purposes.
5. Soils greater than 50 feet below the ground surface are not considered to have potential for liquefaction (NYCBC 2014).
6. Reference: *Liquefaction Resistance of Soils*, Youd et al, 2001.

APPENDIX A

2019 MFS Boring Logs



SOIL CLASSIFICATION SYSTEM

MAJOR DIVISION		GRAPHIC SYMBOL	GROUP SYMBOL (ASTM D2487)	TYPICAL DESCRIPTION
COARSE-GRAINED SOIL MORE THAN 50% BY WEIGHT RETAINED ON NO. 200 SIEVE*	GRAVEL 50% OR MORE OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVEL LESS THAN 5% FINES**		GW WELL GRADED GRAVEL, GRAVEL-SAND MIXTURES
		GRAVEL WITH FINES MORE THAN 5% FINES**		GP POORLY GRADED GRAVEL, GRAVEL-SAND MIXTURES
		CLEAN SAND LESS THAN 5% FINES**		GM GRAVEL-SAND-SILT MIXTURES
		SAND WITH FINES MORE THAN 12% FINES**		GC GRAVEL-SAND-CLAY MIXTURES
	SAND MORE THAN 50% OF COARSE FRACTION PASSES NO. 4 SIEVE	CLEAN SAND LESS THAN 5% FINES**		SW WELL GRADED SAND, SAND-GRAVEL MIXTURES
		SAND WITH FINES MORE THAN 12% FINES**		SP POORLY GRADED SAND, SAND-GRAVEL MIXTURES
		SAND WITH FINES MORE THAN 12% FINES**		SM SAND-SILT MIXTURES
		SAND WITH FINES MORE THAN 12% FINES**		SC SAND-CLAY MIXTURES
		SILT & CLAY LIQUID LIMIT LESS THAN 50		ML INORGANIC SILT, CLAYEY SILT, LOW PLASTICITY
		SILT & CLAY LIQUID LIMIT GREATER THAN 50		CL INORGANIC CLAY OF LOW TO MEDIUM PLASTICITY, SILTY CLAY
HIGHLY ORGANIC SOIL 30% OR MORE ORGANICS			OL ORGANIC, LOW PLASTICITY, SILT-CLAY MIXTURES, LESS THAN 30% ORGANICS	
HIGHLY ORGANIC SOIL 30% OR MORE ORGANICS			MH INORGANIC SILT OF HIGH PLASTICITY,	
HIGHLY ORGANIC SOIL 30% OR MORE ORGANICS			CH INORGANIC CLAY OF HIGH PLASTICITY	
HIGHLY ORGANIC SOIL 30% OR MORE ORGANICS			OH ORGANIC, MEDIUM TO HIGH PLASTICITY, SILT-CLAY MIXTURES, LESS THAN 30% ORGANICS	
HIGHLY ORGANIC SOIL 30% OR MORE ORGANICS			PT PEAT, MUCK, OTHER HIGHLY ORGANIC SOIL	

* BASED ON MATERIAL PASSING THE 3" (75MM) SIEVE; COBBLES 3" TO 12"; BOULDERS > 12"

** MATERIALS WITH 5% TO 12% FINES ARE BORDERLINE CASES, DESIGNATED: GW-GM, SW-SC, ETC.

GRADATION		RELATIVE DENSITY (COARSE-GRAINED SOIL)		CONSISTENCY (FINE-GRAINED SOIL)	
TERM	% BY DRY WEIGHT	TERM	SPT N-VALUE (BLOWS/FT.)	TERM	SPT N-VALUE (BLOWS/FT.)
TRACE	< 10	VERY LOOSE	0 to 4	VERY SOFT	0 to 2
LITTLE	10 to 20	LOOSE	5 to 10	SOFT	3 to 4
SOME	20 to 35	MEDIUM DENSE	11 to 30	MEDIUM STIFF	5 to 8
AND	35 to 50	DENSE	31 to 50	STIFF	9 to 15
		VERY DENSE	> 50	VERY STIFF	16 to 30
TERM	% BY VOLUME	TERM	PLASTICITY	HARD	31 to 50
OCCASIONAL	< 1	SILT	NON-PLASTIC	VERY HARD	> 50
FREQUENT	1 to 10	CLAYEY SILT	LOW PLASTICITY		
NUMEROUS	> 10	SILTY CLAY	MEDIUM PLASTICITY		
		CLAY	HIGH PLASTICITY		

VALUES OF PERCENT CONTENT ARE FROM LABORATORY OR FIELD TEST DATA, WHERE APPLICABLE.

WHEN NO TESTING WAS PERFORMED, VALUES OF PERCENT CONTENT ARE ESTIMATED BASED ON VISUAL OBSERVATION.



MFS Engineers & Surveyors
 2780 Hamilton Boulevard
 South Plainfield, New Jersey 07080
 Telephone: Telephone: (908) 922-4622
 Fax: Fax: (866) 517-7413

BORING NUMBER B-41A-1

CLIENT H2M architects + engineers	PROJECT NAME BNYDC - Boilers, Substations, and Electrical Work
MFS PROJECT NUMBER 1119060	PROJECT LOCATION Brooklyn, New York
DRILLING AGENCY Craig Geotechnical Drilling Inc.	SURFACE ELEVATION 5.70 feet+/- DATUM NAVD88
DRILLING EQUIPMENT Truck-Mounted CME-75	DATE STARTED 12/20/19 COMPLETED 12/20/19
SIZE AND TYPE OF BIT 5-7/8", 3-7/8", & 2-15/16" Tri-Cone Roller Bit	COMPLETION DEPTH 70 feet ROCK DEPTH ----
CASING 4-inch I.D. Steel Casing	NO. SAMPLES 20 DIST. 18 UNDIST. 2 CORE 0
CASING HAMMER Auto	GROUND WATER LEVELS (ft. BG): ∇ AT TIME OF DRILLING 5.5
WEIGHT 140 pounds DROP 30 inches	▼ AT END OF DRILLING 5 AFTER DRILLING ----
SAMPLER 2-inch O.D. Split Spoon	FOREMAN Ed Flanagan
SAMPLER HAMMER Auto	INSPECTOR Gilbert Del Orbe
WEIGHT 140 pounds DROP 30 inches	CHECKED BY Michael Mudalel, PE

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in) (RQD%)	BLOW COUNTS /6 INCHES (N VALUE)	GRAPHIC LOG	NYC BUILDING CODE	DEPTH BELOW SURFACE (ft)	MATERIAL DESCRIPTION	ELEVATION	REMARKS
0									
0.42	GB S-1					5.28	5" Asphalt		Mobilize to boring at 7:10 AM
	GB S-2						Wet, grey c.-f. SAND, sm. f. Gravel, tr. Silt (Class 7) (FILL)		Start boring at 7:50 AM
	GB S-3						Moist, brown/black f.-c. SAND, sm. f.-c. Gravel, lt. Silt (wood fragments) (Class 7) (FILL)		Drill through surface course with 5-7/8" tri-cone roller bit (TCRB)
5							▼ Moist/wet, grey f.-m. SAND, lt. Silt, tr. f. Gravel (Class 7) (FILL)		Hand clear to 6' below grade
	SS S-4	12	5-10-8-5 (18)		Class 7		Wet, brown f.-c. SAND, sm. Silt, tr. f. Gravel (brick fragments) (Class 7) (FILL)		Grab S-1
	SS S-5	24	6-5-5-3 (10)				Wet, brown/grey f.-c. SAND, sm. Silt, lt. f. Gravel (Class 7) (FILL)		Grab S-2
10							Wet, grey/brown f.-m. SAND, sm. Silt, tr. f. Gravel (Class 7) (FILL)		Grab S-3
	SS S-6	24	3-4-3-3 (7)						Take S-4
									Take S-5
									Take S-6
15							No Recovery		Add 15' of 4" casing to 13' below grade
	SS S-7	0	5-4-3-3 (7)						Mix drilling mud
						17.00			Drill to 15' below grade using 2-15/16" TCRB
									Take S-7
20							No Recovery		Add 5' of 4" casing to 18' below grade (20' total)
	ST U-1	0			Class 6				Drill to 20' below grade using 2-15/16" TCRB
	SS S-8	24	WOH-WOH-WOH-WOH				Wet, grey ORGANIC CLAY, sm. Silt, tr. f. Sand (shell fragments) (Class 6) (OH) (P.P.=*0.094TSF)		Driller noted strata changed to clay between 15' and 20' below grade
	ST U-2	24					Wet, grey ORGANIC CLAY, lt. Silt, tr. f. Sand (OH)		Redrill to 20' below grade using 3-7/8" TCRB
25						26.00			Take U-1
	SS S-9	24	8-7-12-14 (19)		Class 3		Wet, grey f.-m. SAND, sm. Organic Clay (Class 3b) (SC)		Take S-8
									Drill to 24' below grade using 3-7/8" TCRB
									Take U-2
						29.00			Take S-9
30									Drill to 30' below grade using 3-7/8" TCRB
	SS S-10	13	8-7-10-12 (17)		Class 3		Wet, brown f.-c. SAND, tr. Silt, tr. f. Gravel (Class 3b) (SP)		Take S-10
									Drill to 35' below grade using 3-7/8" TCRB
						33.50			
35					Class 3				

(Continued Next Page)

MFS BORING LOG WITHOUT ROCK CORING (NYC) - 1214013, GINT.GPJ - 12220 11:14 - P:\JOB_FOLDERS\3\11 NEW YORK\2019\1119060\ENGINEERING DATA\GEO\TECHNICAL\GINT\LOGS\1119060_GINT.LOGS.GPJ



MFS Engineers & Surveyors
 2780 Hamilton Boulevard
 South Plainfield, New Jersey 07080
 Telephone: Telephone: (908) 922-4622
 Fax: Fax: (866) 517-7413

BORING NUMBER B-41A-1

PAGE 2 OF 2

CLIENT H2M architects + engineers

PROJECT NAME BNYDC - Boilers, Substations, and Electrical Work

MFS PROJECT NUMBER 1119060

PROJECT LOCATION Brooklyn, New York

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in) (RQD%)	BLOW COUNTS / 6 INCHES (N VALUE)	GRAPHIC LOG	NYC BUILDING CODE	DEPTH BELOW SURFACE (ft)	MATERIAL DESCRIPTION	ELEVATION	REMARKS
35	SS S-11	14	7-9-8-10 (17)	[Pattern]	Class 3		Wet, brown f.-m. SAND, lt. Silt (Class 3b) (SM)		Take S-11 Drill to 40' below grade using 3-7/8" TCRB
40	SS S-12	16	7-9-13-10 (22)				Wet, grey/brown f.-m. SAND and Silt, tr. Clay, tr. f. Gravel (Class 3b) (SM)		Take S-12 Drill to 45 below grade using 3-7/8" TCRB
45	SS S-13	20	7-5-6-7 (11)	[Pattern]	Class 5	43.50	Wet, brown SILT, sm. Clay, tr. f. Sand (Class 5b) (ML)	-37.80	Take S-13 Drill to 50' below grade using 3-7/8" TCRB
50	SS S-14	16	2-3-4-4 (7)				Wet, brown SILT, sm. Clay, lt. f. Sand (Class 6) (ML) (P.P.=0.25TSF)	-42.80	Take S-14 Drill to 55' below grade using 3-7/8" TCRB
55	SS S-15	12	4-5-4-4 (9)	[Pattern]	Class 6	48.50	Wet, brown SILT, lt. f. Sand, lt. Clay (Class 6) (ML)		Take S-15 Drill to 60' below grade using 3-7/8" TCRB
60	SS S-16	19	4-4-5-9 (9)				Wet, brown SILT, sm. f.-m. Sand, lt. Clay (Class 6) (ML)		Take S-16 Drill to 65' below grade using 3-7/8" TCRB
65	SS S-17	24	WOH-WOH-2-3	[Pattern]	Class 3	67.50	Wet, brown SILT, sm. Clay, tr. f. Sand (Class 6) (ML) (P.P.=0.5TSF)	-61.80	Take S-17 Drill to 68' below grade using 3-7/8" TCRB
70	SS S-18	10	12-13-14-18 (27)				Wet, brown f.-c. SAND, lt. Silt, tr. f. Gravel (Class 3b) (SM)	-64.30	Take S-18 End of boring at 11:35 AM to 70' below grade Backfill hole with soil cuttings and hole plug Patch to grade with concrete patch
							Bottom of borehole at 70.0 feet.		

* Pocket Penetrometer reading take with adapter foot attachment in the field. Values shown have been corrected to an equivalent 1/4-inch diameter piston.

MFS BORING LOG WITHOUT ROCK CORING (NYC) - 1214013, GINT.GPJ - 12220 11:14 - P:\JOB_FOLDERS\3111 NEW YORK\2019\1119060\ENGINEERING DATA\GEO\TECHNICAL\GINT\LOGS\1119060_GINT.LOGS.GPJ



MFS Engineers & Surveyors
 2780 Hamilton Boulevard
 South Plainfield, New Jersey 07080
 Telephone: Telephone: (908) 922-4622
 Fax: Fax: (866) 517-7413

BORING NUMBER B-41A-2(A)

CLIENT <u>H2M architects + engineers</u>	PROJECT NAME <u>BNYDC - Boilers, Substations, and Electrical Work</u>
MFS PROJECT NUMBER <u>1119060</u>	PROJECT LOCATION <u>Brooklyn, New York</u>
DRILLING AGENCY <u>Craig Geotechnical Drilling Inc.</u>	SURFACE ELEVATION <u>5.67 feet+/-</u> DATUM <u>NAVD88</u>
DRILLING EQUIPMENT <u>Truck-Mounted CME-75</u>	DATE STARTED <u>12/20/19</u> COMPLETED <u>12/20/19</u>
SIZE AND TYPE OF BIT <u>3-7/8" Drag Bit</u>	COMPLETION DEPTH <u>1 feet</u> ROCK DEPTH <u>----</u>
CASING <u>----</u>	NO. SAMPLES <u>1</u> DIST. <u>1</u> UNDIST. <u>0</u> CORE <u>0</u>
CASING HAMMER <u>---</u>	GROUND WATER LEVELS (ft. BG): AT TIME OF DRILLING <u>----</u>
WEIGHT <u>----</u> DROP <u>----</u>	AT END OF DRILLING <u>----</u> AFTER DRILLING <u>----</u>
SAMPLER <u>----</u>	FOREMAN <u>Ed Flanagan</u>
SAMPLER HAMMER <u>----</u>	INSPECTOR <u>Gilbert Del Orbe</u>
WEIGHT <u>----</u> DROP <u>----</u>	CHECKED BY <u>Michael Mudalel, PE</u>

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in) (RQD%)	BLOW COUNTS /6 INCHES (N VALUE)	GRAPHIC LOG	NYC BUILDING CODE	DEPTH BELOW SURFACE (ft)	MATERIAL DESCRIPTION	ELEVATION	REMARKS
0									
	GB S-1			XXXX	Class 7	0.50	6" Asphalt	5.17	Mobilize to hole at 12:20 PM Start boring at 12:45 PM Drill through surface course with 3-7/8" drag bit Hand clear to 1' below grade Obstruction (concrete) encountered 1' below grade. Re-attempt boring at 41A-2(B) due to obstruction End of boring at 1:00 PM to 1' below grade Backfill hole with soil cuttings Patch to grade with concrete patch
						1.00	Moist, grey/black f.-c. SAND. sm. c.-f. Gravel, lt Silt (Class 7) (FILL) Bottom of borehole at 1.0 feet.	4.67	



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 2780 Hamilton Boulevard
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 Telephone: Telephone: (908) 922-4622
 Fax: Fax: (866) 517-7413

BORING NUMBER B-41A-2(B)

CLIENT <u>H2M architects + engineers</u>	PROJECT NAME <u>BNYDC - Boilers, Substations, and Electrical Work</u>
MFS PROJECT NUMBER <u>1119060</u>	PROJECT LOCATION <u>Brooklyn, New York</u>
DRILLING AGENCY <u>Craig Geotechnical Drilling Inc.</u>	SURFACE ELEVATION <u>5.67 feet+/-</u> DATUM <u>NAVD88</u>
DRILLING EQUIPMENT <u>Truck-Mounted CME-75</u>	DATE STARTED <u>12/23/19</u> COMPLETED <u>12/23/19</u>
SIZE AND TYPE OF BIT <u>3-7/8" Drag Bit</u>	COMPLETION DEPTH <u>0.25 feet</u> ROCK DEPTH <u>----</u>
CASING <u>----</u>	NO. SAMPLES <u>0</u> DIST. <u>0</u> UNDIST. <u>0</u> CORE <u>0</u>
CASING HAMMER <u>---</u>	GROUND WATER LEVELS (ft. BG): AT TIME OF DRILLING <u>----</u>
WEIGHT <u>----</u> DROP <u>----</u>	AT END OF DRILLING <u>----</u> AFTER DRILLING <u>----</u>
SAMPLER <u>----</u>	FOREMAN <u>Ed Flanagan</u>
SAMPLER HAMMER <u>----</u>	INSPECTOR <u>Gilbert Del Orbe</u>
WEIGHT <u>----</u> DROP <u>----</u>	CHECKED BY <u>Michael Mudalel, PE</u>

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in) (RQD%)	BLOW COUNTS /6 INCHES (N VALUE)	GRAPHIC LOG	NYC BUILDING CODE	DEPTH BELOW SURFACE (ft)	MATERIAL DESCRIPTION	ELEVATION	REMARKS
0						0.25	3" Asphalt	5.42	Start boring at 8:15 AM Drill through surface course with 3-7/8" drag bit Attempt to hand clear to 1' below grade Old railroad track encountered 3" below grade Re-attempt boring at 41A-2(C) due to obstruction End of boring at 8:20 AM to 3" below grade Backfill hole with soil cuttings Patch to grade with concrete patch
							Bottom of borehole at 0.3 feet.		



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 2780 Hamilton Boulevard
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BORING NUMBER B-41A-2(C)

CLIENT H2M architects + engineers	PROJECT NAME BNYDC - Boilers, Substations, and Electrical Work
MFS PROJECT NUMBER 1119060	PROJECT LOCATION Brooklyn, New York
DRILLING AGENCY Craig Geotechnical Drilling Inc.	SURFACE ELEVATION 5.67 feet+/- DATUM NAVD88
DRILLING EQUIPMENT Truck-Mounted CME-75	DATE STARTED 12/23/19 COMPLETED 12/23/19
SIZE AND TYPE OF BIT 3-7/8" Drag Bit, 5-7/8", 3-7/8", & 2-15/16" TCRB	COMPLETION DEPTH 60 feet ROCK DEPTH ----
CASING 4-inch I.D. Steel Casing	NO. SAMPLES 15 DIST. 15 UNDIST. 0 CORE 0
CASING HAMMER Auto	GROUND WATER LEVELS (ft. BG): ∇ AT TIME OF DRILLING 5
WEIGHT 140 pounds DROP 30 inches	∇ AT END OF DRILLING 5 AFTER DRILLING ----
SAMPLER 2-inch O.D. Split Spoon	FOREMAN Ed Flanagan
SAMPLER HAMMER Auto	INSPECTOR Gilbert Del Orbe
WEIGHT 140 pounds DROP 30 inches	CHECKED BY Michael Mudalel, PE

MFS BORING LOG WITHOUT ROCK CORING (NYC) - 1214013, GINT.GPJ - 12220 11:14 - P:\JOB_FOLDERS\3\11 NEW YORK\2019\1119060\ENGINEERING DATA\GEO\TECHNICAL\GINTLOGS\1119060_GINT.LOGS.GPJ

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in) (RQD%)	BLOW COUNTS /6 INCHES (N VALUE)	GRAPHIC LOG	NYC BUILDING CODE	DEPTH BELOW SURFACE (ft)	MATERIAL DESCRIPTION	ELEVATION	REMARKS
0						0.67	8" Asphalt	5.00	Start boring at 8:45 AM Drill through surface course with 3-7/8" drag bit and 5-7/8" tri-cone roller bit (TCRB) Hand clear to 6' below grade Grab S-1 Grab S-2
						1.33	8" Concrete	4.34	
5	GB S-1						Moist, brown f.-c. SAND, lt. f. Gravel, tr. Silt (Class 7) (FILL)		
	GB S-2						∇ Moist/wet, brown f.-c. SAND, lt. f. Gravel, tr. Silt (Class 7) (FILL)		
	SS S-3	1	1-2-1-1 (3)				Wet, brown f.-c. SAND, lt. f. Gravel, tr. Silt (Class 7) (FILL)		Take S-3
	SS S-4	3	1-3-3-2 (6)				Wet, brown/grey f.-c. SAND, tr. f. Gravel, tr. Silt (Class 7) (FILL)		Take S-4
10	SS S-5	12	1-WOH-1-1				Wet, brown f.-c. SAND, tr. f. Gravel, tr. Silt (Class 7) (FILL)		Take S-5 Add 15' of 4" casing to 13' below grade Slow advancement at approximately 12' below grade Mix drilling mud Drill to 15' below grade using 3-7/8" TCRB Take S-6 Add 5' of 4" casing to 18' below grade (20' total) Drill to 20' below grade using 3-7/8" TCRB
15	SS S-6	9	3-2-2-2 (4)		Class 7		Wet, black f.-c. SAND, lt. Silt, lt. f. Gravel (wood fragments) (Class 7) (FILL)		
20	SS S-7	6	5-4-3-5 (7)				Wet, black f.-c. SAND and f.-c. Gravel, lt. Silt (Class 7) (FILL)		Take S-7 Add 5' of 4" casing to 23' below grade (25' total) Drill to 25' below grade using 2-15/16" TCRB
25	SS S-8	7	10-23-33-18 (56)				Wet, black f.-m. SAND, lt. Silt, lt. f.-c. Gravel (wood fragments) (Class 7) (FILL)		Take S-8 Add 5' of 4" casing to 28' below grade (30' total) Slow advancement of casing Drill to 30' below grade using 2-15/16" TCRB Wood fragments observed in soil cuttings Take S-9 Mix more drilling mud Drill to 35' below grade using 3-7/8" TCRB
30	SS S-9	15	16-13-15-9 (28)		Class 3	28.50	Wet, brown f.-m. SAND, sm. Silt (Class 3b) (SM)	-22.83	
35					Class 5	33.50		-27.83	

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MFS Engineers & Surveyors
 2780 Hamilton Boulevard
 South Plainfield, New Jersey 07080
 Telephone: Telephone: (908) 922-4622
 Fax: Fax: (866) 517-7413

BORING NUMBER B-41A-2(C)

CLIENT H2M architects + engineers

PROJECT NAME BNYDC - Boilers, Substations, and Electrical Work

MFS PROJECT NUMBER 1119060

PROJECT LOCATION Brooklyn, New York

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in) (RQD%)	BLOW COUNTS / 6 INCHES (N VALUE)	GRAPHIC LOG	NYC BUILDING CODE	MATERIAL DESCRIPTION	ELEVATION	REMARKS
35	SS S-10	18	14-14-23-18 (37)		Class 5	Wet, brown SILT and f.-m. Sand, tr. Clay (Class 5a) (ML)		Take S-10 Drill to 40' below grade using 3-7/8" TCRB
40	SS S-11	8	3-50/5"		Class 4	Wet, brown CLAY, sm. Silt, tr. f. Sand (wood fragments) (Class 4c) (CL) (P.P.=1TSF) Assumed Boulder	-32.83 -35.25 -37.33	Take S-11 Refusal at 40'-11" below grade Drill to 45' below grade using 3-7/8" TCRB Assumed boulder from approximately 40'-11" to 43' below grade
45	SS S-12	12	17-16-15-20 (31)		Class 3	Wet, brown f.-c. SAND, lt. Silt, lt. c.-f. Gravel (Class 3a) (SM)	-42.83	Attempt S-12. Hole collapsed while lowering split spoon Add 15' of 4" casing to 43' below grade (45' total) Re-drill to 45' below grade using 3-7/8" TCRB
50	SS S-13	14	10-9-11-16 (20)		Class 3	Wet, brown f.-m. SAND, tr. Silt, tr. f. Gravel (Class 3b) (SP-SM)		Take S-12 Drill to 50' below grade using 3-7/8" TCRB Take S-13 Drill to 55' below grade using 3-7/8" TCRB
55	SS S-14	3	8-9-10-12 (19)		Class 3	Wet, brown f.-c. SAND, lt. f.-c. Gravel, tr. Silt (Class 3b) (SP-SM)		Take S-14 Drill to 58' below grade using 3-7/8" TCRB
60	SS S-15	16	18-13-16-18 (29)		Class 3	Wet, brown f.-c. SAND, tr. Silt, tr. f. Gravel (Class 3b) (SP-SM)	-54.33	Take S-15 End of boring at 12:05 PM to 60' below grade Backfill hole with soil cuttings and hole plug Patch to grade with concrete patch

Bottom of borehole at 60.0 feet.

MFS BORING LOG WITHOUT ROCK CORING (NYC) - 1214013.GINT.GPJ - 12220 11:14 - P:\JOB_FOLDERS\3111 NEW YORK\2019\1119060\ENGINEERING DATA\GEO\TECHNICAL\GINT\LOGS\1119060_GINT.LOGS.GPJ



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 2780 Hamilton Boulevard
 South Plainfield, New Jersey 07080
 Telephone: Telephone: (908) 922-4622
 Fax: Fax: (866) 517-7413

BORING NUMBER B-62-1

PAGE 1 OF 2

CLIENT H2M architects + engineers	PROJECT NAME BNYDC - Boilers, Substations, and Electrical Work
MFS PROJECT NUMBER 1119060	PROJECT LOCATION Brooklyn, New York
DRILLING AGENCY Craig Geotechnical Drilling Inc.	SURFACE ELEVATION 8.57 feet+/- DATUM NAVD88
DRILLING EQUIPMENT Truck-Mounted CME-75	DATE STARTED 12/19/19 COMPLETED 12/19/19
SIZE AND TYPE OF BIT 5-7/8" and 3-7/8" Tri-Cone Roller Bit	COMPLETION DEPTH 60 feet ROCK DEPTH ----
CASING 4-inch I.D. Steel Casing	NO. SAMPLES 17 DIST. 16 UNDIST. 1 CORE 0
CASING HAMMER Auto	GROUND WATER LEVELS (ft. BG): ∇ AT TIME OF DRILLING 6.5
WEIGHT 140 pounds DROP 30 inches	∇ AT END OF DRILLING 7 AFTER DRILLING ----
SAMPLER 2-inch O.D. Split Spoon	FOREMAN Ed Flanagan
SAMPLER HAMMER Auto	INSPECTOR Gilbert Del Orbe
WEIGHT 140 pounds DROP 30 inches	CHECKED BY Michael Mudalel, PE

MFS BORING LOG WITHOUT ROCK CORING (NYC) - 1214013, GINT.GPJ - 122220 11:14 - P:\JOB_FOLDERS\3\11 NEW YORK\2019\1119060\ENGINEERING DATA\GEO\TECHNICAL\GINT\LOGS\1119060_GINT.LOGS.GPJ

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (RQD%)	BLOW COUNTS / 6 INCHES (N VALUE)	GRAPHIC LOG	NYC BUILDING CODE	DEPTH BELOW SURFACE (ft)	MATERIAL DESCRIPTION	ELEVATION	REMARKS
0									
0	GB S-1					1.00	12" Concrete	7.57	Mobilize to boring at 7:45 AM Start boring at 8:05 AM Drill through surface course with 5-7/8" tri-cone roller bit (TCRB) Hand clear to 6' below grade Grab S-1 Grab S-2 Grab S-3
5	GB S-2						Moist, brown/black f.-c. SAND, sm. f.-c. Gravel, lt. Silt (Class 7) (FILL)		
5	GB S-3						Moist, brown f.-c. SAND, sm. f.-c. Gravel, lt. Silt (Class 7) (FILL)		
5	SS S-4	6	2-2-1-2 (3)		Class 7		∇ Wet, brown/black f.-c. SAND, sm. Silt, lt. Clay, tr. f. Gravel (Class 7) (FILL)		Take S-4
10	SS S-5	10	8-3-4-4 (7)				Wet, black/brown f.-c. SAND, sm. Silt, lt. f.-c. Gravel, tr. Clay (Class 7) (FILL)		Take S-5
10	SS S-6	1	1-1-2-3 (3)				Wet, brown f. SAND, sm. Silt, lt. c.-f. Gravel (Class 7) (FILL)		Take S-6 Add 15' of 4" casing to 13' below grade Mix drilling mud Drill to 15' below grade using 2-15/16" TCRB
15	SS S-7	0	WOH-WOH-1-1			16.00	No Recovery	-7.43	Take S-7 Add 5' of 4" casing to 18' below grade (20' total) Drill to 20' below grade using 2-15/16" TCRB
20	SS S-8	16	WOH-WOH-WOH		Class 6		Wet, grey CLAY, lt. Silt, tr. f. Sand, tr. Organics (shell fragments) (Class 6) (CL) (P.P.=*0.063TSF)		Take S-8 Drill to 22' below grade using 3-7/8" TCRB
25	ST U-1	24					Wet, grey CLAY, sm. Silt, tr. f. Sand, tr. Organics (shell fragments) (CL)		Take U-1
25	SS S-9	24	1-1-2-3 (3)				Wet, grey CLAY, sm. Silt, tr. f. Sand, tr. Organics (shell fragments) (Class 6) (CL) (P.P.=*0.156TSF)		Take S-9 Drill to 30' below grade using 3-7/8" TCRB
30	SS S-10	12	2-4-6-9 (10)		Class 3	30.50	S-10A - Top 3": Wet, grey CLAY, sm. Silt, tr. f. Sand, tr. Organics (shell fragments) (Class 6) (CL)	-21.93	Take S-10 Drill to 35' below grade using 3-7/8" TCRB
35					Class 4	33.50	S-10B - Bottom 9": Wet, grey f.-m. SAND, lt. Clay, tr. Organics (Class 3b) (SC)	-24.93	

(Continued Next Page)



MFS Engineers & Surveyors
 2780 Hamilton Boulevard
 South Plainfield, New Jersey 07080
 Telephone: Telephone: (908) 922-4622
 Fax: Fax: (866) 517-7413

BORING NUMBER B-62-1

CLIENT H2M architects + engineers

PROJECT NAME BNYDC - Boilers, Substations, and Electrical Work

MFS PROJECT NUMBER 1119060

PROJECT LOCATION Brooklyn, New York

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in) (RQD%)	BLOW COUNTS / 6 INCHES (N VALUE)	GRAPHIC LOG	NYC BUILDING CODE	MATERIAL DESCRIPTION	ELEVATION	REMARKS	
35	SS S-11	15	3-4-4-4 (8)		Class 4	Wet, grey CLAY, sm. f. Sand, lt. Silt (Class 4c) (CL)	38.50	-29.93	Take S-11 Drill to 40' below grade using 3-7/8" TCRB
40	SS S-12	12	5-5-9-10 (14)		Class 3	Wet, brown f.-c. SAND, lt. Silt (Class 3b) (SM)			Take S-12 Drill to 45' below grade using 3-7/8" TCRB
45	SS S-13	18	7-12-15-14 (27)		Class 3	Wet, tan/light brown f. SAND and Silt, tr. Clay, tr. f. Gravel (Class 3b) (SM)	48.50	-39.93	Take S-13 Drill to 50' below grade using 3-7/8" TCRB
50	SS S-14	24	5-6-4-4 (10)		Class 5	Wet, tan/light brown SILT, sm. Clay, tr. f. Sand (Class 5b) (ML) (P.P.=0.5TSF)			Take S-14 Drill to 55' below grade using 3-7/8" TCRB
55	SS S-15	18	3-6-5-5 (11)		Class 5	Wet, tan/light brown SILT, sm. Clay, tr. f. Sand (Class 5b) (ML) (P.P.=0.5TSF)	57.50	-48.93	Take S-15 Drill to 58' below grade using 3-7/8" TCRB
60	SS S-16	12	13-14-18-14 (32)		Class 3	Wet, tan/light brown f.-m. SAND, sm. Silt, tr. Clay (Class 3a) (SM)	60.00	-51.43	Take S-16 End of boring at 10:40 AM to 60' below grade Backfill hole with soil cuttings and hole plug Patch to grade with concrete patch

Bottom of borehole at 60.0 feet.

* Pocket Penetrometer reading take with adapter foot attachment in the field. Values shown have been corrected to an equivalent 1/4-inch diameter piston.



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 2780 Hamilton Boulevard
 South Plainfield, New Jersey 07080
 Telephone: Telephone: (908) 922-4622
 Fax: Fax: (866) 517-7413

BORING NUMBER B-234-1(A)

CLIENT <u>H2M architects + engineers</u>	PROJECT NAME <u>BNYDC - Boilers, Substations, and Electrical Work</u>
MFS PROJECT NUMBER <u>1119060</u>	PROJECT LOCATION <u>Brooklyn, New York</u>
DRILLING AGENCY <u>Craig Geotechnical Drilling Inc.</u>	SURFACE ELEVATION <u>6.50 feet+/-</u> DATUM <u>NAVD88</u>
DRILLING EQUIPMENT <u>Truck-Mounted CME-75</u>	DATE STARTED <u>12/23/19</u> COMPLETED <u>12/23/19</u>
SIZE AND TYPE OF BIT <u>5-7/8" Tri-Cone Roller Bit</u>	COMPLETION DEPTH <u>2 feet</u> ROCK DEPTH <u>----</u>
CASING <u>---</u>	NO. SAMPLES <u>1</u> DIST. <u>1</u> UNDIST. <u>0</u> CORE <u>0</u>
CASING HAMMER <u>---</u>	GROUND WATER LEVELS (ft. BG): AT TIME OF DRILLING <u>----</u>
WEIGHT <u>----</u> DROP <u>----</u>	AT END OF DRILLING <u>----</u> AFTER DRILLING <u>----</u>
SAMPLER <u>----</u>	FOREMAN <u>Ed Flanagan</u>
SAMPLER HAMMER <u>----</u>	INSPECTOR <u>Gilbert Del Orbe</u>
WEIGHT <u>----</u> DROP <u>----</u>	CHECKED BY <u>Michael Mudalel, PE</u>

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in) (RQD%)	BLOW COUNTS /6 INCHES (N VALUE)	GRAPHIC LOG	NYC BUILDING CODE	DEPTH BELOW SURFACE (ft)	MATERIAL DESCRIPTION	ELEVATION	REMARKS
0									
	GB S-1				Class 7	0.42	5" Concrete	6.08	Start boring at 12:50 PM Drill through surface course with 5-7/8" tri-cone roller bit Hand clear to 2' below grade Grab S-1 Utility pipe encountered at 2' below grade Re-attempt boring at 234-1(B) due to utility conflict End of boring at 1:10 PM to 2' below grade Backfill hole with soil cuttings Patch to grade with concrete patch
						2.00	Moist, brown f.-m. SAND, lt. Silt, lt. f.-c. Gravel (Class 7) (FILL)	4.50	
Bottom of borehole at 2.0 feet.									



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 2780 Hamilton Boulevard
 South Plainfield, New Jersey 07080
 Telephone: Telephone: (908) 922-4622
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BORING NUMBER B-234-1(B)

CLIENT <u>H2M architects + engineers</u>	PROJECT NAME <u>BNYDC - Boilers, Substations, and Electrical Work</u>
MFS PROJECT NUMBER <u>1119060</u>	PROJECT LOCATION <u>Brooklyn, New York</u>
DRILLING AGENCY <u>Craig Geotechnical Drilling Inc.</u>	SURFACE ELEVATION <u>6.50 feet+/-</u> DATUM <u>NAVD88</u>
DRILLING EQUIPMENT <u>Truck-Mounted CME-75</u>	DATE STARTED <u>12/23/19</u> COMPLETED <u>12/26/19</u>
SIZE AND TYPE OF BIT <u>5-7/8" Tri-Cone Roller Bit</u>	COMPLETION DEPTH <u>3.5 feet</u> ROCK DEPTH <u>----</u>
CASING <u>---</u>	NO. SAMPLES <u>0</u> DIST. <u>0</u> UNDIST. <u>0</u> CORE <u>0</u>
CASING HAMMER <u>---</u>	GROUND WATER LEVELS (ft. BG): AT TIME OF DRILLING <u>----</u>
WEIGHT <u>----</u> DROP <u>----</u>	AT END OF DRILLING <u>----</u> AFTER DRILLING <u>----</u>
SAMPLER <u>----</u>	FOREMAN <u>Ed Flanagan</u>
SAMPLER HAMMER <u>----</u>	INSPECTOR <u>Gilbert Del Orbe</u>
WEIGHT <u>----</u> DROP <u>----</u>	CHECKED BY <u>Michael Mudalel, PE</u>

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in) (RQD%)	BLOW COUNTS /6 INCHES (N VALUE)	GRAPHIC LOG	NYC BUILDING CODE	DEPTH BELOW SURFACE (ft)	MATERIAL DESCRIPTION	ELEVATION	REMARKS
0									
					Class 7	0.42	5" Concrete	6.08	12/23/19 Start boring at 1:16 PM Drill through surface course with 5-7/8" tri-cone roller bit Hand clear to 2' below grade End of boring operations for the day
						3.50	See Log for Boring B-234-1(C) Bottom of borehole at 3.5 feet.	3.00	12/26/19 Resume boring operations at 8:00 AM Continue hand clearing Utility pipe encountered at 3.5' below grade Re-attempt boring at 234-1(C) due to utility conflict End of boring at 8:17 PM to 3.5' below grade Backfill hole with soil cuttings Patch to grade with concrete patch



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 2780 Hamilton Boulevard
 South Plainfield, New Jersey 07080
 Telephone: Telephone: (908) 922-4622
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BORING NUMBER B-234-1(C)

CLIENT H2M architects + engineers	PROJECT NAME BNYDC - Boilers, Substations, and Electrical Work
MFS PROJECT NUMBER 1119060	PROJECT LOCATION Brooklyn, New York
DRILLING AGENCY Craig Geotechnical Drilling Inc.	SURFACE ELEVATION 6.50 feet+/- DATUM NAVD88
DRILLING EQUIPMENT Truck-Mounted CME-75	DATE STARTED 12/26/19 COMPLETED 12/26/19
SIZE AND TYPE OF BIT 5-7/8", 3-7/8", & 2-15/16" Tri-Cone Roller Bit	COMPLETION DEPTH 62 feet ROCK DEPTH ----
CASING 4-inch I.D. Steel Casing	NO. SAMPLES 15 DIST. 14 UNDIST. 1 CORE 0
CASING HAMMER Auto	GROUND WATER LEVELS (ft. BG): ∇ AT TIME OF DRILLING 5.75
WEIGHT 140 pounds DROP 30 inches	∇ AT END OF DRILLING 6 AFTER DRILLING ----
SAMPLER 2-inch O.D. Split Spoon and 3-inch O.D. Split Spoon	FOREMAN Ed Flanagan
SAMPLER HAMMER Auto	INSPECTOR Gilbert Del Orbe
WEIGHT 140 pounds DROP 30 inches	CHECKED BY Michael Mudalel, PE

MFS BORING LOG WITHOUT ROCK CORING (NYC) - 1214013.GINT.GPJ - 122220 11:14 - P:\JOB_FOLDERS\3\11 NEW YORK\2019\1119060\ENGINEERING DATA\GEO\TECHNICAL\GINT\LOGS\1119060_GINT_LOGS.GPJ

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in) (RQD%)	BLOW COUNTS / 6 INCHES (N VALUE)	GRAPHIC LOG	NYC BUILDING CODE	DEPTH BELOW SURFACE (ft)	MATERIAL DESCRIPTION	ELEVATION	REMARKS
0						0.42	5" Concrete	6.08	Start boring at 8:20 AM Drill through surface course with 5-7/8" tri-cone roller bit Hand clear to 6' below grade Grab S-1
5	GB S-1						Moist, brown f.-c. SAND, lt. Silt, lt. f.-c. Gravel (Class 7) (FILL)		Grab S-2
	GB S-2						Moist/wet, brown/grey f.-c. SAND, lt. Silt, lt. f. Gravel (petroleum odor) (Class 7) (FILL)		Take S-3
	SS S-3	12	5-6-6-5 (12)				Wet, grey/brown f.-c. SAND, sm. Silt, tr. f. Gravel (wood fragments) (petroleum odor) (Class 7) (FILL)		Take S-4
10	SS S-4	14	10-10-3-3 (13)		Class 7		Wet, grey f.-m. SAND, sm. Silt, tr. f. Gravel, tr. Organics (petroleum odor) (Class 7) (FILL)		Take S-5 Add 15' of 4" casing to 13' below grade Drill to 15' below grade using 2-15/16" tri-cone roller bit (TCRB)
	SS S-5	5	3-3-2-2 (5)				Wet, grey/brown f.-c. SAND, lt. f.-c. Gravel, lt. Silt (wood fragments) (petroleum odor) (Class 7) (FILL)		Unable to obtain sample at 15' below grade due to casing being pushed down while clearing out casing Add 5' of 4" casing to 18' below grade (20' total) Drill to 20' below grade using 2-15/16" TCRB Take S-6 Add 5' of 4" casing to 23' below grade (25' total) Drill to 25' below grade using 2-15/16" TCRB Drilling through clay/silt at 23' below grade Take S-7 Drill to 27' below grade using 3-7/8" TCRB Take U-1
15									
20	SS S-6	0	1-2-1-2 (3)		Class 6	18.50	No Recovery	-12.00	
25	SS S-7	20	WOH-WOH-1-1				Wet, grey ORGANIC SILT, sm. Clay, tr. f. Sand (Class 6) (OH) (P.P.=0.25TSF)		Take S-8 Drill to 35' below grade using 3-7/8" TCRB
	ST U-1	24				29.00	Wet, grey ORGANIC SILT, sm. Clay, tr. f. Sand (Class 6) (OH)	-22.50	
30	SS S-8	13	2-4-4-6 (8)		Class 6		Wet, grey SILT and f. Sand, sm. Clay (Class 6) (ML) (P.P.=0.25TSF)		
						33.00		-26.50	
35					Class 3				

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MFS Engineers & Surveyors
 2780 Hamilton Boulevard
 South Plainfield, New Jersey 07080
 Telephone: Telephone: (908) 922-4622
 Fax: Fax: (866) 517-7413

BORING NUMBER B-234-1(C)

CLIENT H2M architects + engineers

PROJECT NAME BNYDC - Boilers, Substations, and Electrical Work

MFS PROJECT NUMBER 1119060

PROJECT LOCATION Brooklyn, New York

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in) (RQD%)	BLOW COUNTS / 6 INCHES (N VALUE)	GRAPHIC LOG	NYC BUILDING CODE	MATERIAL DESCRIPTION	ELEVATION	REMARKS
35	SS S-9	10	5-5-6-6 (11)		Class 3	Wet, grey/brown f.-c. SAND, sm. Silt, lt. Clay, tr. f. Gravel (clay lumps) (Class 3b) (SM)	-32.00	Take S-9 Drill to 40' below grade using 3-7/8" TCRB
40	SS S-10	13	6-9-7-8 (16)		Class 5	Wet, brown SILT, sm. Clay, tr. f. Sand, tr. f. Gravel (Class 5b) (ML) (P.P.=1.5TSF)	-42.00	Take S-10 Drill to 45' below grade using 3-7/8" TCRB
45	SS S-11	14	5-6-4-4 (10)		Class 5	Wet, brown SILT, sm. Clay, lt. f. Sand (Class 5b) (ML)	-42.00	Take S-11 Drill to 50' below grade using 3-7/8" TCRB
50	SS S-12	20	4-5-3-4 (8)		Class 4	Wet, brown CLAY and Silt, lt. f. Sand (Class 4c) (CL) (P.P.=0.5TSF)	-47.00	Take S-12 Drill to 55' below grade using 3-7/8" TCRB
55	SS S-13	13	4-5-5-8 (10)		Class 3	Wet, brown f.-m. SAND, sm. Silt, tr. Clay (Class 3b) (SM)	-55.50	Take S-13 Drill to 60' below grade using 3-7/8" TCRB
60	SS S-14	15	5-9-11-10 (20)		Class 3	Wet, brown f.-m. SAND, sm. Silt, tr. Clay (Class 3b) (SM)	-55.50	Take S-14 Drill to 60' below grade using 3-7/8" TCRB

Bottom of borehole at 62.0 feet.

Finish boring at 10:29 AM to 62' below grade
 Backfill hole with hole plug
 Patch to grade with concrete patch
 Drum soil cuttings and drilling mud

MFS BORING LOG WITHOUT ROCK CORING (NYC) - 1214013.GINT.GPJ - 12220 11:14 - P:\JOB_FOLDERS\3111 NEW YORK\2019\1119060\ENGINEERING DATA\GEO\TECHNICAL\GINT\LOGS\1119060_GINT.LOGS.GPJ



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 2780 Hamilton Boulevard
 South Plainfield, New Jersey 07080
 Telephone: Telephone: (908) 922-4622
 Fax: Fax: (866) 517-7413

BORING NUMBER B-293-1

CLIENT H2M architects + engineers	PROJECT NAME BNYDC - Boilers, Substations, and Electrical Work
MFS PROJECT NUMBER 1119060	PROJECT LOCATION Brooklyn, New York
DRILLING AGENCY Craig Geotechnical Drilling Inc.	SURFACE ELEVATION 5.42 feet+/- DATUM NAVD88
DRILLING EQUIPMENT Truck-Mounted CME-75	DATE STARTED 12/13/19 COMPLETED 12/13/19
SIZE AND TYPE OF BIT 3-7/8" Drag Bit, 2-15/16" Tri-Cone Roller Bit	COMPLETION DEPTH 70 feet ROCK DEPTH ----
CASING 4-inch I.D. Steel Casing	NO. SAMPLES 17 DIST. 17 UNDIST. 0 CORE 0
CASING HAMMER Auto	GROUND WATER LEVELS (ft. BG): ∇ AT TIME OF DRILLING 6
WEIGHT 140 pounds DROP 30 inches	\blacktriangledown AT END OF DRILLING 5.75 AFTER DRILLING ----
SAMPLER 2-inch and 3-inch O.D. Split Spoon	FOREMAN Ed Flanagan
SAMPLER HAMMER Auto	INSPECTOR Gilbert Del Orbe
WEIGHT 140 pounds DROP 30 inches	CHECKED BY Michael Mudalel, PE

MFS BORING LOG WITHOUT ROCK CORING (NYC) - 1214013, GINT.GPJ - 12220 11:14 - P:\JOB_FOLDERS\3111 NEW YORK\2019\1119060\ENGINEERING DATA\GEO\TECHNICAL\GINT\LOGS\1119060_GINT.LOGS.GPJ

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in) (RQD%)	BLOW COUNTS / 6 INCHES (N VALUE)	GRAPHIC LOG	NYC BUILDING CODE	DEPTH BELOW SURFACE (ft)	MATERIAL DESCRIPTION	ELEVATION	REMARKS
0						0.83	10" Asphalt	4.59	Mobilize to boring at 7:25 AM Start boring at 8:28 AM Drill through surface course with 3-7/8" drag bit Hand clear to 6' below grade Grab S-1 Grab S-2
5	GB S-1				Class 7		Moist, brown f.-c. SAND and c.-f. Gravel, lt. Silt, tr. Cobbles (Class 7) (FILL)		Take S-3
	GB S-2					Moist, brown f.-c. SAND, sm. Silt, lt. f.-c. Gravel (Class 7) (FILL)			
	SS S-3	12	1-1-1-2 (2)				Wet, brown f.-c. SAND, sm. Silt, lt. f. Gravel (Class 7) (FILL)		Take S-4
	SS S-4	24	2-1-1-1 (2)				Wet, brown f.-c. SAND, sm. Silt, lt. f. Gravel (Class 7) (FILL)		Take S-5
	SS S-5	24	1-2-2-2 (4)				Wet, brown/grey f.-c. SAND, sm. Silt, lt. f. Gravel (Class 7) (FILL)		Add 15' of 4" casing to 13' below grade Mix drilling mud Drill to 15' below grade using 2-15/16" tri-cone roller bit (TCRB)
15	SS S-6	1	1-2-3-3 (5)				Wet, brown c.-f. GRAVEL, lt. f.-m. Sand (Class 7) (FILL)		Take S-6 Coarse gravel in split spoon shoe Add 5' of 4" casing to 18' below grade (20' total) Drill to 20' below grade using 2-15/16" TCRB
20	SS S-7	7	1-2-2-1 (4)				Wet, brown/grey/black f.-c. SAND and f.-c. Gravel, lt. Silt (Class 7) (FILL)		Take S-7 Add 5' of 4" casing to 23' below grade (25' total) Drill to 25' below grade using 2-15/16" TCRB Slow, hard drilling from 22' to 25' below grade
25	SS S-8	10	6-4-5-4 (9)				Wet, brown f.-c. SAND, lt. f.-c. Gravel, tr. Silt (Class 7) (FILL)		Take S-8 Add 5' of 4" casing to 28' below grade (30' total) Drill to 30' below grade using 2-15/16" TCRB Slow drilling due to gravel getting caught between rods and casing while drilling
30	SS S-9	11	5-3-7-7 (10)				Wet, light brown/grey f.-c. SAND, lt. f.-c. Gravel, tr. Silt (shell and brick fragments) (Class 7) (FILL)		Take S-9 Add 5' of 4" casing to 33' below grade (35' total) Drill to 35' below grade using 2-15/16" TCRB Slow drilling due to gravel getting
35									

(Continued Next Page)



MFS Engineers & Surveyors
 2780 Hamilton Boulevard
 South Plainfield, New Jersey 07080
 Telephone: Telephone: (908) 922-4622
 Fax: Fax: (866) 517-7413

BORING NUMBER B-293-1

CLIENT H2M architects + engineers

PROJECT NAME BNYDC - Boilers, Substations, and Electrical Work

MFS PROJECT NUMBER 1119060

PROJECT LOCATION Brooklyn, New York

MFS BORING LOG WITHOUT ROCK CORING (NYC) - 1214013, GINT.GPJ - 12220 11:14 - P:\JOB_FOLDERS\3111 NEW YORK\2019\1119060\ENGINEERING DATA\GEO\TECHNICAL\GINT\LOGS\1119060_GINT.LOGS.GPJ

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in) (RQD%)	BLOW COUNTS / 6 INCHES (N VALUE)	GRAPHIC LOG	NYC BUILDING CODE	DEPTH BELOW SURFACE (ft)	MATERIAL DESCRIPTION	ELEVATION	REMARKS	
35	SS S-10	2	7-4-8-6 (12)	[Cross-hatched pattern]	Class 7		Wet, black/brown f.-c. SAND, sm. c.-f. Gravel, tr. Silt (Class 7) (FILL)		caught between rods and casing while drilling Take S-10 Poor recovery (2" c. gravel). Retake S-10 with 3" O.D. split spoon Soil description taken from 3" O.D. split spoon sample Add 5' of 4" casing to 38' below grade (40' total) Drill to 40' below grade using 2-15/16" TCRB Slow drilling due to gravel getting caught between rods and casing while drilling Take S-11 Add 5' of 4" casing to 43' below grade (45' total) Drill to 45' below grade using 2-15/16" TCRB	
40	SS S-11	3	11-5-5-6 (10)	[Cross-hatched pattern]				Wet, brown f.-c. SAND, lt. f.-c. Gravel, tr. Silt (brick fragments) (Class 7) (FILL)		
45	SS S-12	13	6-4-3-4 (7)	[Cross-hatched pattern]				Wet, brown/black f.-m. SAND, sm. c.-f. Gravel, lt. Silt, tr. Clay (brick and wood fragments) (Class 7) (FILL)		
						48.50		-43.08	Slow drilling due to gravel getting caught between rods and casing while drilling Take S-11 Add 5' of 4" casing to 43' below grade (45' total) Drill to 45' below grade using 2-15/16" TCRB	
50	SS S-13	15	3-3-4-4 (7)	[Dotted pattern]	Class 6		Wet, brown/grey/black f.-m. SAND, sm. Silt, tr. Clay (Class 6) (SM)		Slow drilling due to gravel getting caught between rods and casing while drilling Take S-12 Add 5' of 4" casing to 48' below grade (50' total) Drill to 50' below grade using 2-15/16" TCRB Take S-13 Drill to 55' below grade using 2-15/16" TCRB	
55	SS S-14	24	1-1-5-11 (6)	[Dotted pattern]				S-14A: Top 10" - Wet, brown f. SAND and Silt (Class 6) (SM)	-50.41	Take S-14
								S-14B: Middle 10" - Wet, black SILT, lt. Clay, tr. f. Sand (Class 6) (ML) (P.P.=0.5TSF)	-51.25	Drill to 58' below grade using 2-15/16" TCRB
							S-14C: Bottom 4" - Wet, brown f. SAND and Silt, lt. Clay (Class 6) (SM)	-52.08	Take S-15	
60	SS S-15	17	3-4-9-14 (13)	[Dotted pattern]	Class 5		Wet, black/brown SILT, sm. f. Sand, lt. Clay (organic odor) (Class 6) (ML) (P.P.=2TSF)		Drill to 65' below grade using 2-15/16" TCRB	
									62.50	-57.08
65	SS S-16	24	WOH-1-1-3 (2)	[Diagonal hatched pattern]	Class 6		Wet, brown CLAY, lt. Silt, tr. f. Sand (f. sand at bottom of sample) (Class 6) (CL) (P.P.=0.5TSF)		Take S-16 Drill to 68' below grade using 2-15/16" TCRB	
									67.50	-62.08
70	SS S-17	15	8-9-10-8 (19)	[Dotted pattern]	Class 3		Wet, brown f.-c. SAND, tr. Silt (mica fragments) (Class 3b) (SP-SM)		Take S-17 Finish boring to 70' below grade Backfill hole with soil cuttings and hole plug Patch to grade with concrete patch	
						70.00	Bottom of borehole at 70.0 feet.	-64.58		



MFS Engineers & Surveyors
 2780 Hamilton Boulevard
 South Plainfield, New Jersey 07080
 Telephone: Telephone: (908) 922-4622
 Fax: Fax: (866) 517-7413

BORING NUMBER B-386-1(A)

CLIENT H2M architects + engineers **PROJECT NAME** BNYDC - Boilers, Substations, and Electrical Work
MFS PROJECT NUMBER 1119060 **PROJECT LOCATION** Brooklyn, New York
DRILLING AGENCY Craig Geotechnical Drilling Inc. **SURFACE ELEVATION** 5.56 feet+/- **DATUM** NAVD88
DRILLING EQUIPMENT Truck-Mounted CME-75 **DATE STARTED** 12/16/19 **COMPLETED** 12/18/19
SIZE AND TYPE OF BIT 3-7/8" Drag Bit, 3-7/8" Tri-Cone Roller Bit **COMPLETION DEPTH** 8.67 feet **ROCK DEPTH** ----
CASING 4-inch I.D. Steel Casing **NO. SAMPLES** 4 **DIST.** 4 **UNDIST.** 0 **CORE** 0
CASING HAMMER Auto **GROUND WATER LEVELS (ft. BG):** ▽ AT TIME OF DRILLING 5
WEIGHT 140 pounds **DROP** 30 inches **▽ AT END OF DRILLING 5.5** **AFTER DRILLING ----**
SAMPLER 2-inch O.D. Split Spoon **FOREMAN** Ed Flanagan
SAMPLER HAMMER Auto **INSPECTOR** Gilbert Del Orbe
WEIGHT 140 pounds **DROP** 30 inches **CHECKED BY** Michael Mudalel, PE

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in) (RQD%)	BLOW COUNTS / 6 INCHES (N VALUE)	GRAPHIC LOG	NYC BUILDING CODE	DEPTH BELOW SURFACE (ft)	MATERIAL DESCRIPTION	ELEVATION	REMARKS
0									
0.50						0.50	6" Asphalt	5.06	12/16/19 Mobilize to boring at 12:45 PM Start boring at 12:50 PM Drill through surface course with 3-7/8" drag bit Hand clear to 6' below grade Grab S-1
5	GB S-1				Class 7		Moist, grey f.-c. SAND, sm. c.-f. Gravel, tr. Silt, tr. Cobbles (Class 7) (FILL)		Drill through surface course with 3-7/8" drag bit Hand clear to 6' below grade Grab S-1
	GB S-2						Moist, brown f.-c. SAND, sm. f.-c. Gravel, lt. Silt (security glass fragments) (Class 7) (FILL)		Grab S-2
	SS S-3	3	50/4"				Moist/wet, brown f.-c. SAND, lt. f.-c. Gravel, lt. Silt, tr. Organics (brick fragments) (Class 7) (FILL)		End of boring operations for the day at 1:25 PM 12/18/19
	SS S-4	2	20-50/2"				Wet, brown f.-c. SAND, lt. f.-c. Gravel, lt. Silt (Class 7) (FILL)		Resume boring operation at 8:10 AM
8.67						8.67	Copper wire and rubber fragments (Class 7) (FILL)	-3.11	Take S-3 Refusal at 6'-4" below grade Mix drilling mud Drill to 8' below grade using 3-7/8" tri-cone roller bit Take S-4 Refusal at 8'-8" below grade (spoon bouncing) Reattempt boring at B-386-1(B) due to copper wire recovered from split spoon Finish boring at 8:40 AM to 8'-8" below grade Backfill hole with soil cuttings and hole plug Patch to grade with concrete patch
							Bottom of borehole at 8.7 feet.		

MFS BORING LOG WITHOUT ROCK CORING (NYC) - 1214013_GINT.GPJ - 12220 11:14 - P:\JOB_FOLDERS\3\11 NEW YORK\2019\1119060\ENGINEERING DATA\GEO\TECHNICAL\GINT\LOGS\1119060_GINT.LOGS.GPJ



MFS Engineers & Surveyors
 2780 Hamilton Boulevard
 South Plainfield, New Jersey 07080
 Telephone: Telephone: (908) 922-4622
 Fax: Fax: (866) 517-7413

BORING NUMBER B-386-1(B)

CLIENT <u>H2M architects + engineers</u>	PROJECT NAME <u>BNYDC - Boilers, Substations, and Electrical Work</u>
MFS PROJECT NUMBER <u>1119060</u>	PROJECT LOCATION <u>Brooklyn, New York</u>
DRILLING AGENCY <u>Craig Geotechnical Drilling Inc.</u>	SURFACE ELEVATION <u>5.53 feet+/-</u> DATUM <u>NAVD88</u>
DRILLING EQUIPMENT <u>Truck-Mounted CME-75</u>	DATE STARTED <u>12/18/19</u> COMPLETED <u>12/18/19</u>
SIZE AND TYPE OF BIT <u>3-7/8" Drag Bit, 3-7/8" & 2-15/16" TCRB</u>	COMPLETION DEPTH <u>70 feet</u> ROCK DEPTH <u>----</u>
CASING <u>4-inch I.D. Steel Casing</u>	NO. SAMPLES <u>15</u> DIST. <u>15</u> UNDIST. <u>0</u> CORE <u>0</u>
CASING HAMMER <u>Auto</u>	GROUND WATER LEVELS (ft. BG): <u>▽ AT TIME OF DRILLING 5.5</u>
WEIGHT <u>140 pounds</u> DROP <u>30 inches</u>	▽ AT END OF DRILLING 5.75 AFTER DRILLING <u>----</u>
SAMPLER <u>2-inch O.D. Split Spoon</u>	FOREMAN <u>Ed Flanagan</u>
SAMPLER HAMMER <u>Auto</u>	INSPECTOR <u>Gilbert Del Orbe</u>
WEIGHT <u>140 pounds</u> DROP <u>30 inches</u>	CHECKED BY <u>Michael Mudalel, PE</u>

MFS BORING LOG WITHOUT ROCK CORING (NYC) - 1214013.GINT.GPJ - 12220 11:14 - P:\JOB_FOLDERS\3111 NEW YORK\2019\1119060\ENGINEERING DATA\GEO\TECHNICAL\GINT\LOGS\1119060_GINT_LOGS.GPJ

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in) (RQD%)	BLOW COUNTS / 6 INCHES (N VALUE)	GRAPHIC LOG	NYC BUILDING CODE	DEPTH BELOW SURFACE (ft)	MATERIAL DESCRIPTION	ELEVATION	REMARKS
0									
5							See Log for Boring B-386-1(A)		Mobilize to boring at 12:45 PM Start boring at 12:50 PM Drill through surface course with 3-7/8" drag bit Hand clear to 6' below grade
6.00						6.00		-0.47	
	SS S-1	10	1-2-1-1 (3)		Class 7		Wet, brown f.-c. SAND, sm. Silt, lt. f.-c. Gravel (Class 7) (FILL)		Take S-1
	SS S-2	8	4-5-18-10 (23)				Wet, brown f.-c. SAND, sm. Silt, lt. f.-c. Gravel (Class 7) (FILL)		Take S-2
	SS S-3	13	8-7-9-12 (16)				Wet, grey/brown f.-c. SAND, sm. f.-c. Gravel, lt. Silt (brick fragments) (Class 7) (FILL)		Take S-3 Add 15' of 4" casing to 13' below grade Drill to 15' below grade using 2-15/16" tri-cone roller bit (TCRB) Slow drilling due to gravel getting caught between rods and casing while drilling
	SS S-4	0	17-18-11-12 (29)				No Recovery		Take S-4 Add 5' of 4" casing to 18' below grade (20' total) Drill to 20' below grade using 2-15/16" TCRB
	SS S-5	11	11-6-2-3 (8)				Wet, brown/grey f.-c. SAND, sm. f.-c. Gravel, tr. Silt (brick fragments) (Class 7) (FILL)		Take S-5 Add 5' of 4" casing to 23' below grade (25' total) Drill to 25' below grade using 2-15/16" TCRB Slow drilling due to gravel getting caught between rods and casing while drilling
	SS S-6	8	11-5-4-5 (9)				Wet, brown/grey f.-c. SAND, sm. f.-c. Gravel, tr. Silt (brick fragments) (Class 7) (FILL)		Take S-6 Add 5' of 4" casing to 28' below grade (30' total) Drill to 30' below grade using 2-15/16" TCRB Slow drilling due to gravel getting caught between rods and casing while drilling
	SS S-7	0	3-3-3-5 (6)				No Recovery		Take S-7 Add 5' of 4" casing to 33' below grade (35' total) Drill to 35' below grade using 2-15/16" TCRB Slow drilling due to gravel getting
35									

(Continued Next Page)



MFS Engineers & Surveyors
 2780 Hamilton Boulevard
 South Plainfield, New Jersey 07080
 Telephone: Telephone: (908) 922-4622
 Fax: Fax: (866) 517-7413

BORING NUMBER B-386-1(B)

CLIENT H2M architects + engineers

PROJECT NAME BNYDC - Boilers, Substations, and Electrical Work

MFS PROJECT NUMBER 1119060

PROJECT LOCATION Brooklyn, New York

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in) (RQD%)	BLOW COUNTS / 6 INCHES (N VALUE)	GRAPHIC LOG	NYC BUILDING CODE	DEPTH BELOW SURFACE (ft)	MATERIAL DESCRIPTION	ELEVATION	REMARKS
35	SS S-8	7	4-4-4-5 (8)	[Cross-hatched pattern]	Class 7		Wet, brown f.-c. SAND, sm. f.-c. Gravel, tr. Silt (Class 7) (FILL)		caught between rods and casing while drilling Take S-8 Add 5' of 4" casing to 38' below grade (40' total) Drill to 40' below grade using 2-15/16" TCRB
40	SS S-9	2	4-3-4-3 (7)				Wet, brown/grey/white c.-f. GRAVEL, tr. f.-c. Sand (Class 7) (FILL)		Take S-9 Add 5' of 4" casing to 43' below grade (45' total) Drill to 45' below grade using 2-15/16" TCRB
45	SS S-10	0	7-5-9-9 (14)	[Vertical lines pattern]	Class 3	46.00	No Recovery	-40.47	Take S-10 Add 5' of 4" casing to 48' below grade (50' total) Drill to 50' below grade using 2-15/16" TCRB Hard, slow drilling from 49' to 50' below grade
50	SS S-11	9	3-3-10-7 (13)				Wet, grey/brown f.-c. SAND, sm. c.-f. Gravel, tr. Silt (Class 3b) (SP-SM)	53.50	-47.97
55	SS S-12	2	2-3-3-5 (6)	[Vertical lines pattern]	Class 6	58.50	Wet, black SILT and Clay, tr. f. Sand (Class 6) (ML)	-52.97	Take S-12 Drill to 60' below grade using 3-7/8" TCRB
60	SS S-13	24	10-8-10-9 (18)				Wet, tan SILT and Clay, lt. f. Sand (Class 5b) (ML) (P.P.=0.5TSF)	63.50	-57.97
65	SS S-14	18	5-3-6-6 (9)	[Vertical lines pattern]	Class 6	67.50	Wet, grey f. SAND, lt. Silt, lt. Clay (Class 6) (SM)	-61.97	Take S-14 Drill to 68' below grade using 3-7/8" TCRB
70	SS S-15	16	8-9-11-9 (20)				Wet, brown f.-m. SAND, tr. Silt (Class 3b) (SP)	70.00	-64.47
Bottom of borehole at 70.0 feet.									

MFS BORING LOG WITHOUT ROCK CORING (NYC) - 1214013, GINT.GPJ - 12220 11:14 - P:\JOB_FOLDERS\3111 NEW YORK\2019\1119060\ENGINEERING DATA\GEO\TECHNICAL\GINT\LOGS\1119060_GINT.LOGS.GPJ



MFS Engineers & Surveyors
 2780 Hamilton Boulevard
 South Plainfield, New Jersey 07080
 Telephone: Telephone: (908) 922-4622
 Fax: Fax: (866) 517-7413

BORING NUMBER B-386-2

CLIENT <u>H2M architects + engineers</u>	PROJECT NAME <u>BNYDC - Boilers, Substations, and Electrical Work</u>
MFS PROJECT NUMBER <u>1119060</u>	PROJECT LOCATION <u>Brooklyn, New York</u>
DRILLING AGENCY <u>Craig Geotechnical Drilling Inc.</u>	SURFACE ELEVATION <u>5.81 feet+/-</u> DATUM <u>NAVD88</u>
DRILLING EQUIPMENT <u>Truck-Mounted CME-75</u>	DATE STARTED <u>12/16/19</u> COMPLETED <u>12/16/19</u>
SIZE AND TYPE OF BIT <u>3-7/8" Drag Bit, 3-7/8" & 2-15/16" TCRB</u>	COMPLETION DEPTH <u>60 feet</u> ROCK DEPTH <u>----</u>
CASING <u>4-inch I.D. Steel Casing</u>	NO. SAMPLES <u>15</u> DIST. <u>15</u> UNDIST. <u>0</u> CORE <u>0</u>
CASING HAMMER <u>Auto</u>	GROUND WATER LEVELS (ft. BG): <u>▽ AT TIME OF DRILLING 5</u>
WEIGHT <u>140 pounds</u> DROP <u>30 inches</u>	▽ AT END OF DRILLING <u>5.6</u> AFTER DRILLING <u>----</u>
SAMPLER <u>2-inch O.D. Split Spoon</u>	FOREMAN <u>Ed Flanagan</u>
SAMPLER HAMMER <u>Auto</u>	INSPECTOR <u>Gilbert Del Orbe</u>
WEIGHT <u>140 pounds</u> DROP <u>30 inches</u>	CHECKED BY <u>Michael Mudalel, PE</u>

MFS BORING LOG WITHOUT ROCK CORING (NYC) - 1214013, GINT.GPJ - 12220 11:14 - P:\JOB_FOLDERS\3111 NEW YORK\2019\1119060\ENGINEERING DATA\GEO\TECHNICAL\GINT\LOGS\1119060_GINT.LOGS.GPJ

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in) (RQD%)	BLOW COUNTS / 6 INCHES (N VALUE)	GRAPHIC LOG	NYC BUILDING CODE	DEPTH BELOW SURFACE (ft)	MATERIAL DESCRIPTION	ELEVATION	REMARKS
0						1.00	1' Asphalt	4.81	Mobilize to boring at 8:00 AM Start boring at 8:10 AM Drill through surface course with 3-7/8" drag bit Hand clear to 6' below grade Grab S-1 Grab S-2
5	GB S-1						Moist, grey c.-f. SAND and c.-f. Gravel, lt. Silt (Class 7) (FILL) Moist, brown f.-c. SAND, lt. c.-f. Gravel, lt. Silt (Class 7) (FILL) ▽ Moist/wet, brown f.-c. SAND, lt. c.-f. Gravel, lt. Silt (Class 7) (FILL)		
	SS S-3	13	1-2-1-1 (3)				Wet, brown f.-c. SAND, sm. c.-f. Gravel, lt. Silt (Class 7) (FILL)		Take S-3
	SS S-4	8	1-1-1-1 (2)				Wet, brown/black f.-c. SAND, lt. f.-c. Gravel, lt. Silt (Class 7) (FILL)		Take S-4
	SS S-5	8	1-1-1-1 (2)				Wet, brown/grey f.-c. SAND, lt. f.-c. Gravel, tr. Silt (Class 7) (FILL)		Take S-5 Mix drilling mud Add 15' of 4" casing to 13' below grade Drill to 15' below grade using 2-15/16" tri-cone roller bit (TCRB) Slow drilling due to gravel getting caught between rods and casing while drilling Take S-6 Add 5' of 4" casing to 18' below grade (20' total) Drill to 20' below grade using 2-15/16" TCRB Slow drilling due to gravel getting caught between rods and casing while drilling Take S-7 Add 5' of 4" casing to 23' below grade (25' total) Drill to 25' below grade using 2-15/16" TCRB Slow drilling due to gravel getting caught between rods and casing while drilling Take S-8 Add 5' of 4" casing to 28' below grade (30' total) Drill to 30' below grade using 2-15/16" TCRB Slow drilling due to gravel getting caught between rods and casing while drilling Take S-9 Add 5' of 4" casing to 33' below grade (35' total)
15	SS S-6	0	2-1-2-2 (3)				No Recovery		
20	SS S-7	1	7-3-6-8 (9)		Class 7		Wet, grey c.-f. GRAVEL (Class 7) (FILL)		
25	SS S-8	7	8-4-3-3 (7)				Wet, grey/brown f.-c. SAND, lt. f. Gravel, lt. Silt (Class 7) (FILL)		
30	SS S-9	1	3-6-10-8 (16)				Wet, grey/brown c.-f. GRAVEL, lt. f.-c. Sand, lt. Silt (Class 7) (FILL)		
35									

(Continued Next Page)



MFS Engineers & Surveyors
 2780 Hamilton Boulevard
 South Plainfield, New Jersey 07080
 Telephone: Telephone: (908) 922-4622
 Fax: Fax: (866) 517-7413

BORING NUMBER B-386-2

CLIENT H2M architects + engineers

PROJECT NAME BNYDC - Boilers, Substations, and Electrical Work

MFS PROJECT NUMBER 1119060

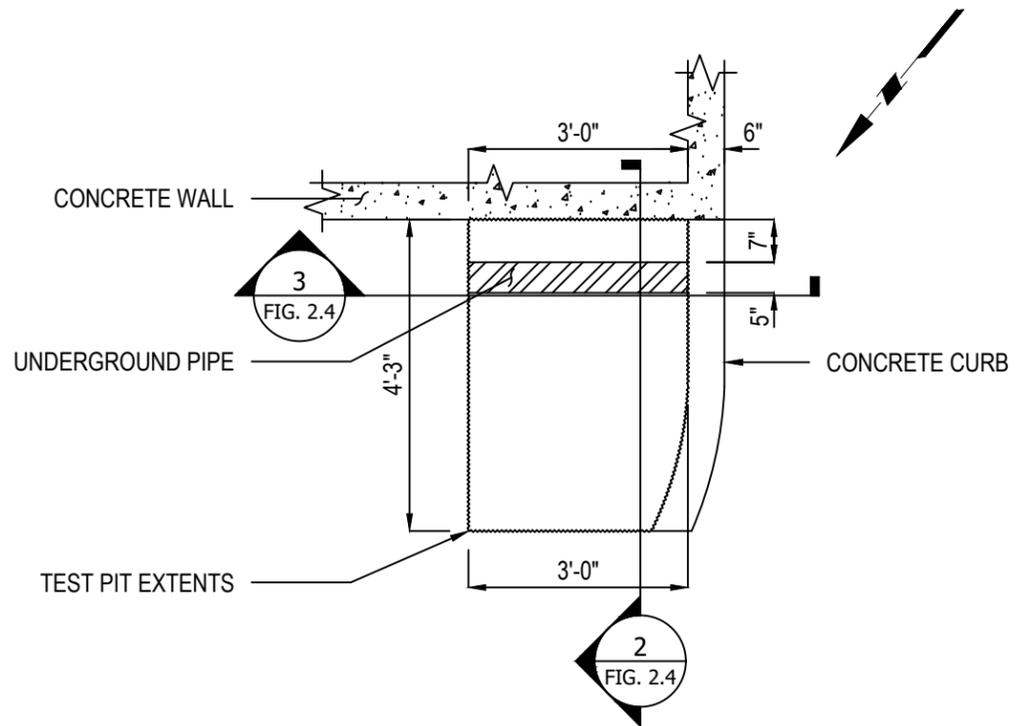
PROJECT LOCATION Brooklyn, New York

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in) (RQD%)	BLOW COUNTS / 6 INCHES (N VALUE)	GRAPHIC LOG	NYC BUILDING CODE	DEPTH BELOW SURFACE (ft)	MATERIAL DESCRIPTION	ELEVATION	REMARKS
35	SS S-10	10	5-6-12-12 (18)	[Cross-hatched pattern]	Class 7		Wet, brown/grey f.-c. SAND, sm. Silt, sm. f.-c. Gravel (brick fragments) (Class 7) (FILL)		Drill to 35' below grade using 2-15/16" TCRB Take S-10 Add 5' of 4" casing to 38' below grade (40' total) Drill to 40' below grade using 2-15/16" TCRB
40	SS S-11	11	3-3-4-5 (7)					Wet, brown/black f.-c. SAND, sm. Silt, tr. f. Gravel (brick and wood fragments) (Class 7) (FILL)	
45	SS S-12	3	8-5-3-18 (8)	[Stippled pattern]	Class 6		Wet, brown/grey c.-f. GRAVEL, lt. Clay, tr. f. Sand (Class 6) (GC)		Take S-12 Add 5' of 4" casing to 48' below grade (50' total) Drill to 50' below grade using 2-15/16" TCRB Mix drilling mud
50	SS S-13	0	50/4"					Assumed Boulder	
55	SS S-14	10	8-10-30-32 (40)	[Stippled pattern]	Class 2		Wet, grey c.-f. GRAVEL and c.-f. Sand (Class 2a) (GP)		Drill to 55' below grade using 3-7/8" TCRB Driller losing drilling mud Mixing additional mud Hard slow drilling 50'-55'
60	SS S-15	16	28-31-33-29 (64)					S-15A: Top 4" - Wet, grey c.-f. SAND, sm. c.-f. Gravel, lt. Silt (Class 3a) (SM)	
					Class 3 Class 5		S-15B: Bottom 12" - Wet, brown/olive SILT and f. Sand (Class 5a) (ML)		Finish boring at 11:58 AM to 60' below grade Backfill hole with soil cuttings and hole plug Patch to grade with concrete patch
Bottom of borehole at 60.0 feet.									

MFS BORING LOG WITHOUT ROCK CORING (NYC) - 1214013_GINT.GPJ - 12220 11:14 - P:\JOB_FOLDERS\3\11 NEW YORK\2019\1119060\ENGINEERING DATA\GEO\TECHNICAL\GINT\LOGS\1119060_GINT.LOGS.GPJ

APPENDIX B

2019 MFS TEST PIT PLANS AND SECTIONS



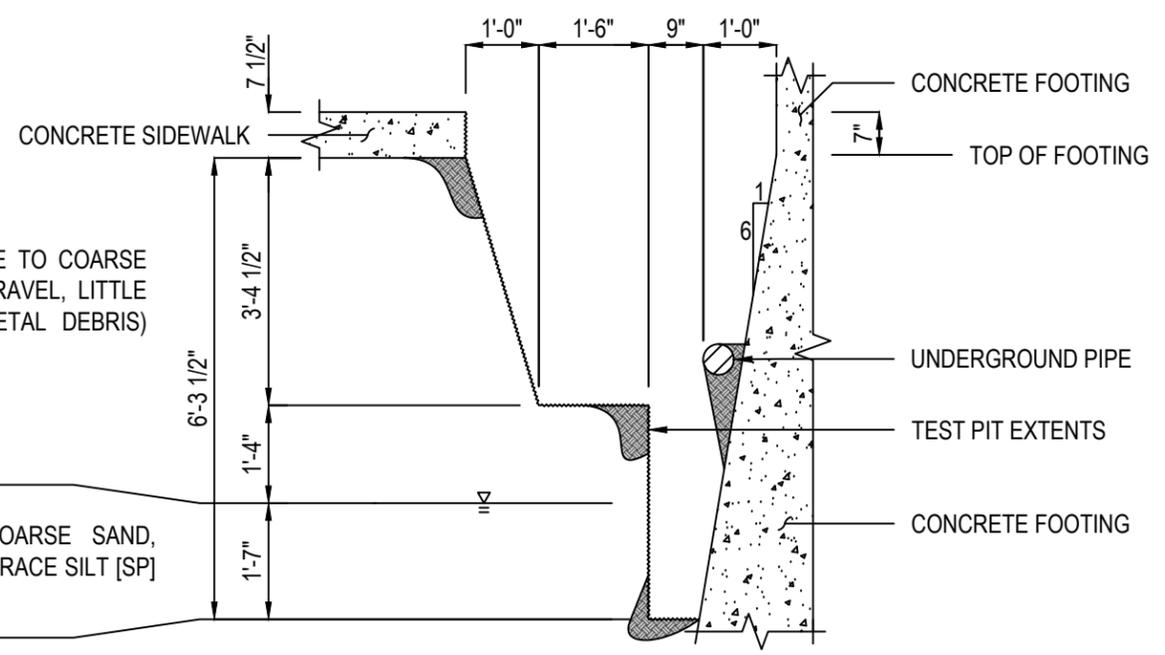
1 TP-41A-1 PLAN
Scale: 1" = 2'-6"
0 2.5' 5'

MOIST, BROWN/LIGHT BROWN FINE TO COARSE SAND, SOME FINE TO COARSE GRAVEL, LITTLE SILT (BRICK, CONCRETE, AND METAL DEBRIS) [SP-SM] [FILL] [CLASS 7]

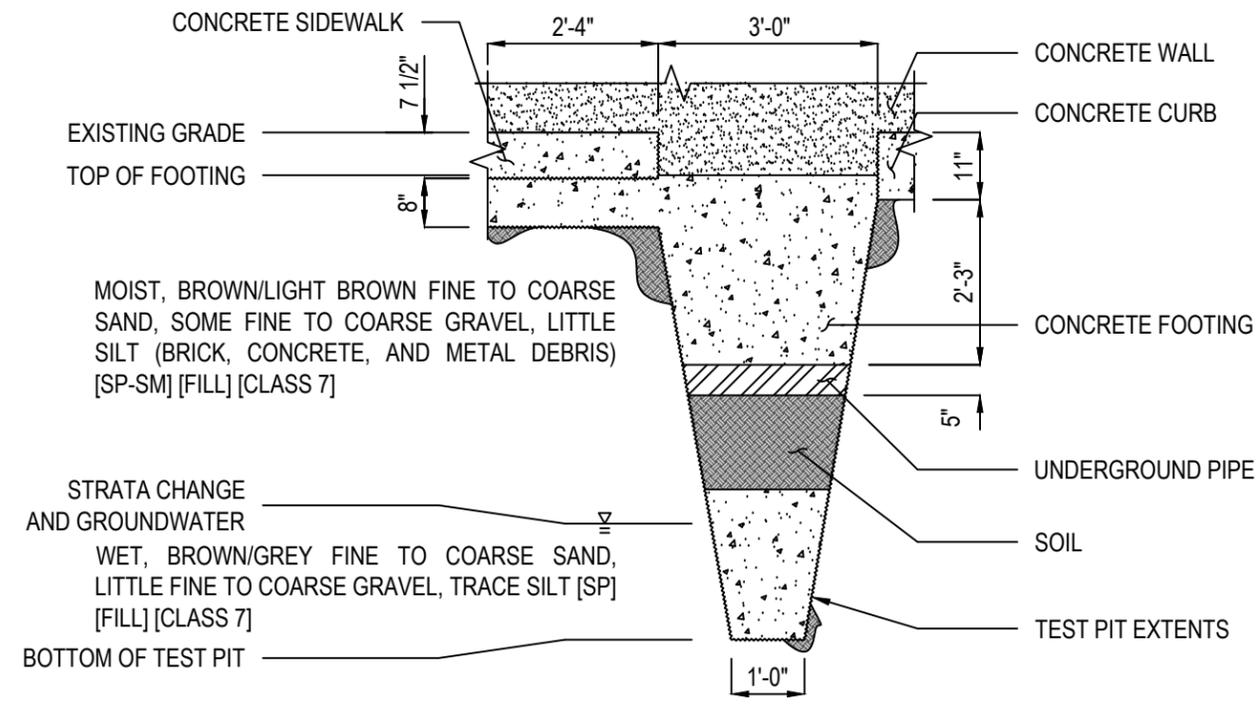
STRATA CHANGE AND GROUNDWATER

WET, BROWN/GREY FINE TO COARSE SAND, LITTLE FINE TO COARSE GRAVEL, TRACE SILT [SP] [FILL] [CLASS 7]

BOTTOM OF TEST PIT



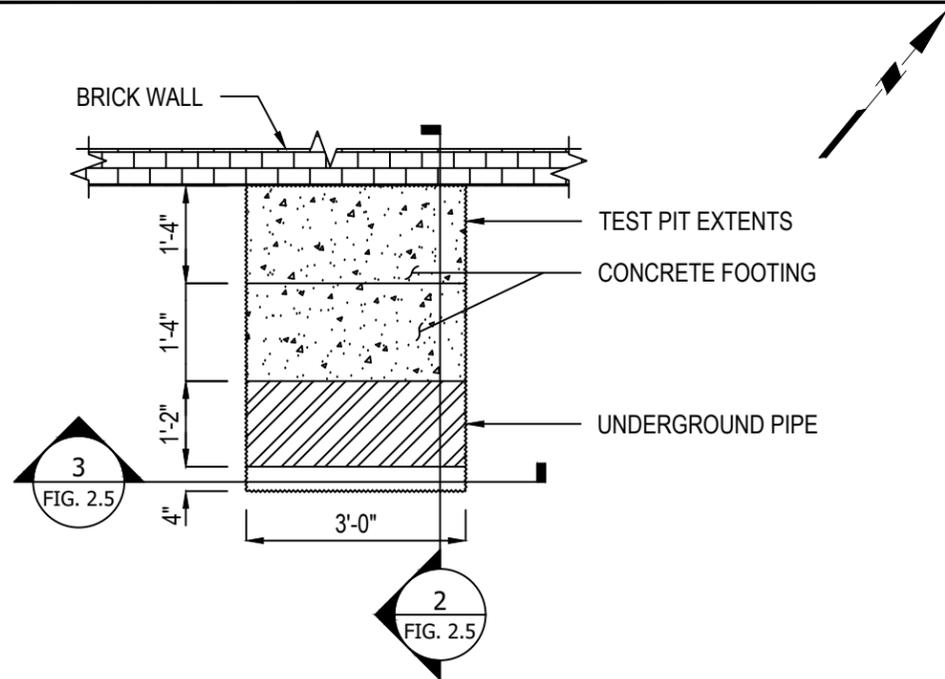
2 TP-41A-1 SECTION
Scale: 1" = 2'-6"
0 2.5' 5'



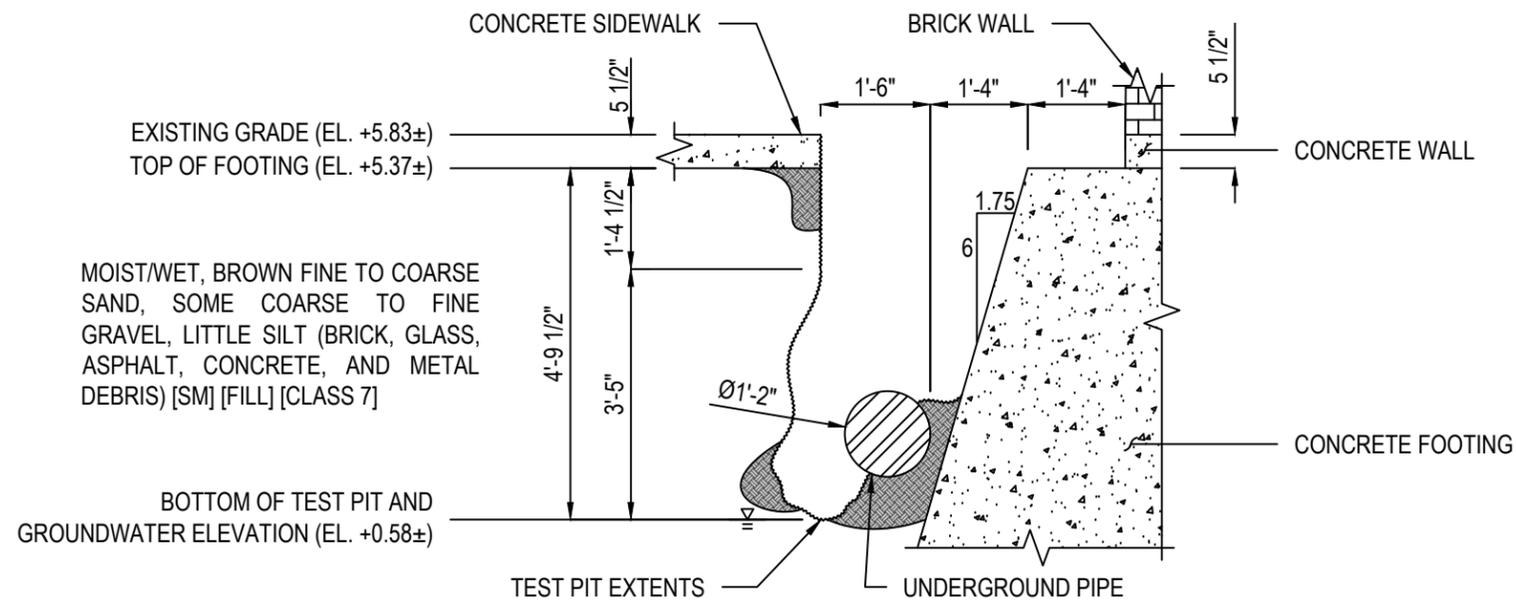
3 TP-41A-1 SECTION
Scale: 1" = 2'-6"
0 2.5' 5'

- NOTES:**
- SEE FIGURE 2.0 FOR ALL GENERAL NOTES.
 - THE TEST PIT INVESTIGATION WAS UNABLE TO IDENTIFY THE BOTTOM EXTENT OF THE CONCRETE FOOTING DUE TO ENCOUNTERING THE GROUNDWATER TABLE.

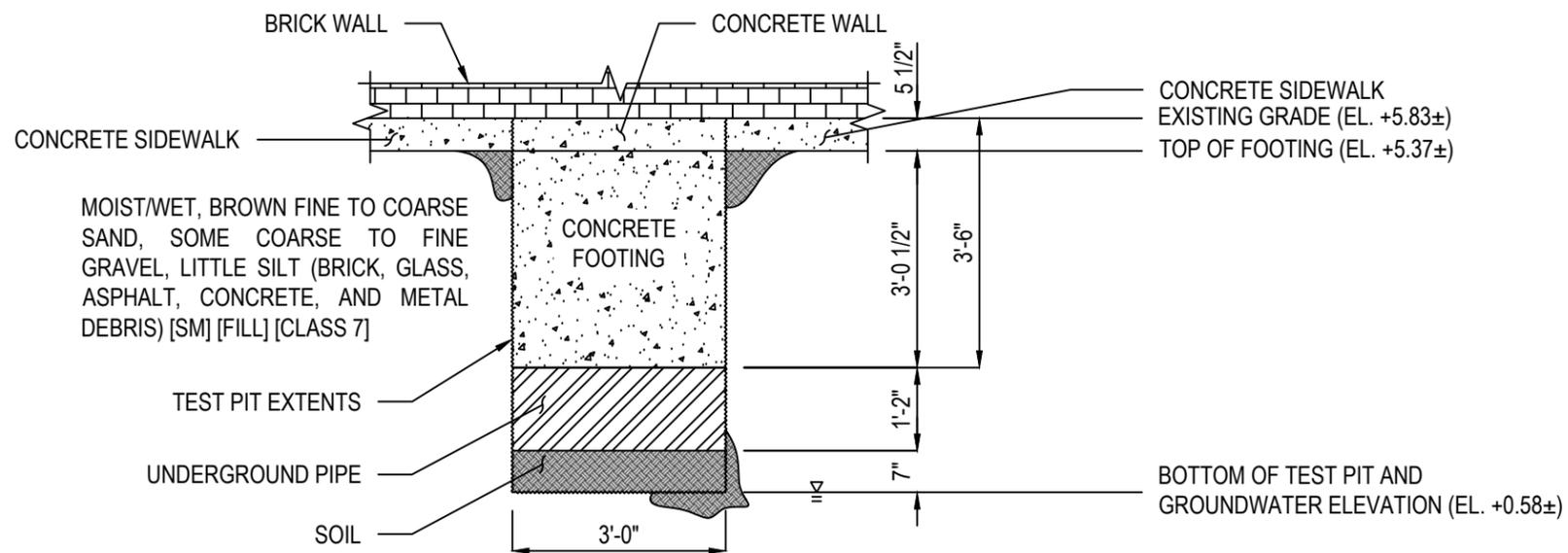
 MFS CONSULTING ENGINEERS & SURVEYOR, DPC 320 FIFTH AVE., FLOOR 11-SUITE #1102, NEW YORK, NY 10001 T: 212.943.6576 www.MFSengineers.com F: 866.517.7413 N.Y. CERTIFICATE OF AUTHORIZATION: 0007564	PROJECT NAME	DRAWING TITLE	PROJECT NO.	1119060	SHEET NO.
	BROOKLYN NAVY YARD DEVELOPMENT CORPORATION DESIGN SERVICES FOR BOILERS, SUBSTATIONS, AND ISOLATED ELECTRICAL WORK	TEST PIT PLAN AND SECTIONS	DATE	12/17/2019	APPENDIX B.1
BROOKLYN KINGS COUNTY NEW YORK		SCALE	AS NOTED		
		DRAWN BY	ATG	1 OF 5	
		CHECKED BY	MLM		



1 TP-41A-2 PLAN
Scale: 1" = 2'-6"
0 2.5' 5'



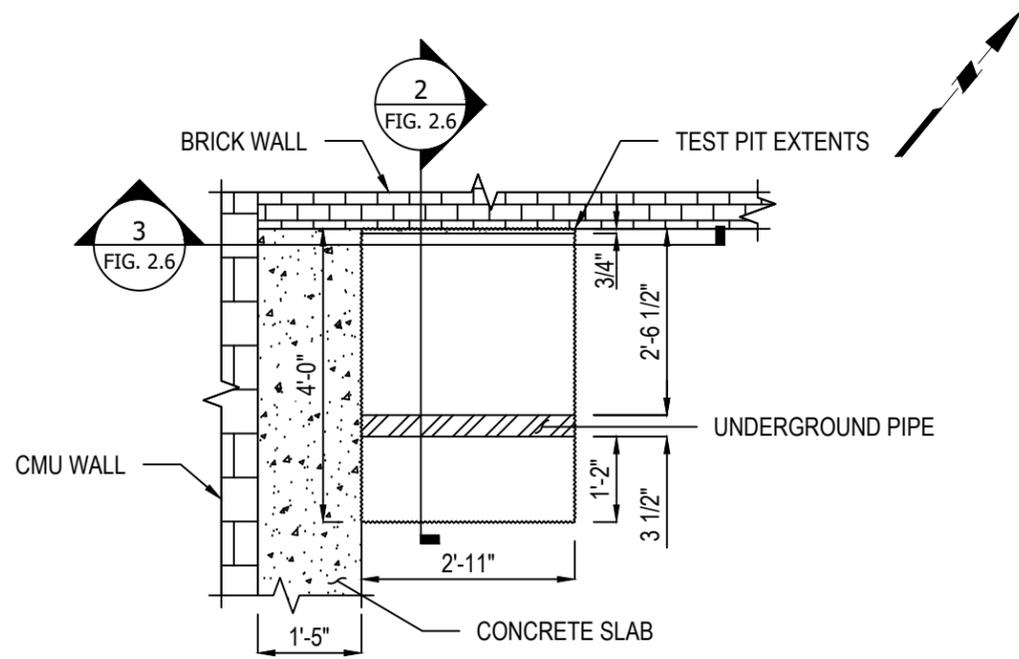
2 TP-41A-2 SECTION
Scale: 1" = 2'-6"
0 2.5' 5'



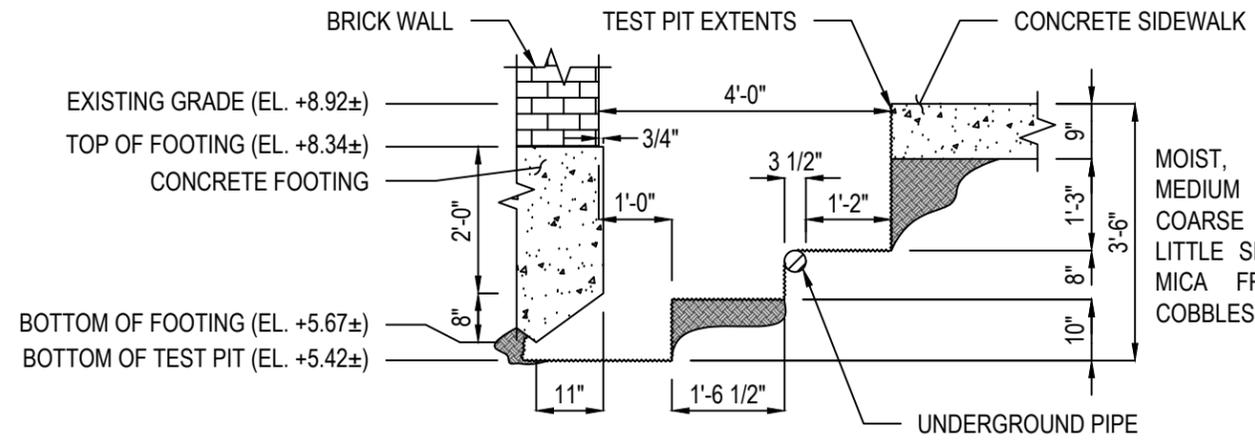
3 TP-41A-2 SECTION
Scale: 1" = 2'-6"
0 2.5' 5'

NOTES:

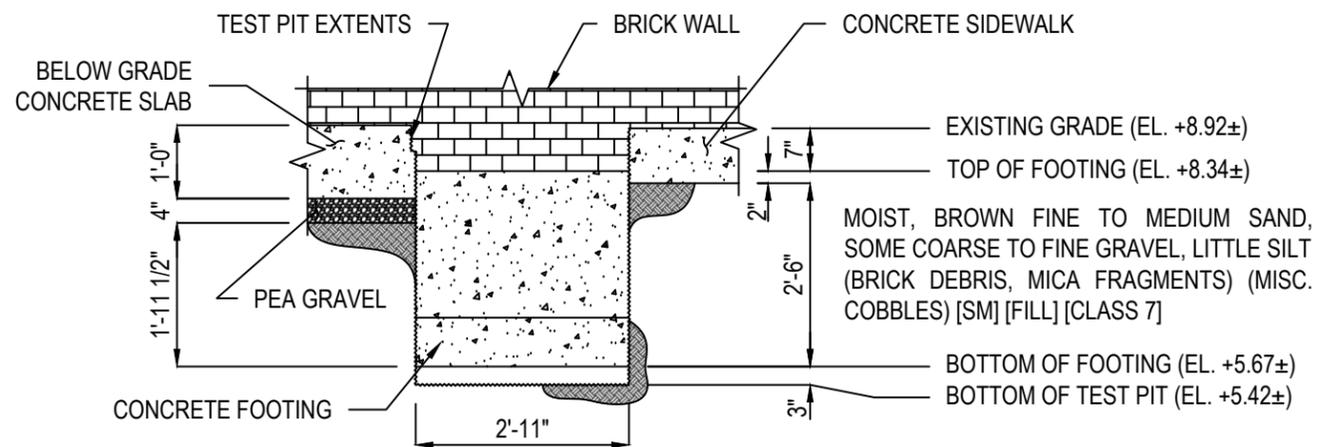
- SEE FIGURE 2.0 FOR ALL GENERAL NOTES.
- THE TEST PIT INVESTIGATION WAS UNABLE TO IDENTIFY THE BOTTOM EXTENT OF THE CONCRETE FOOTING DUE TO ENCOUNTERING THE GROUNDWATER TABLE AND UTILITY CONFLICTS.



1 TP-62-1 PLAN
Scale: 1" = 2'-6"
0 2.5' 5'



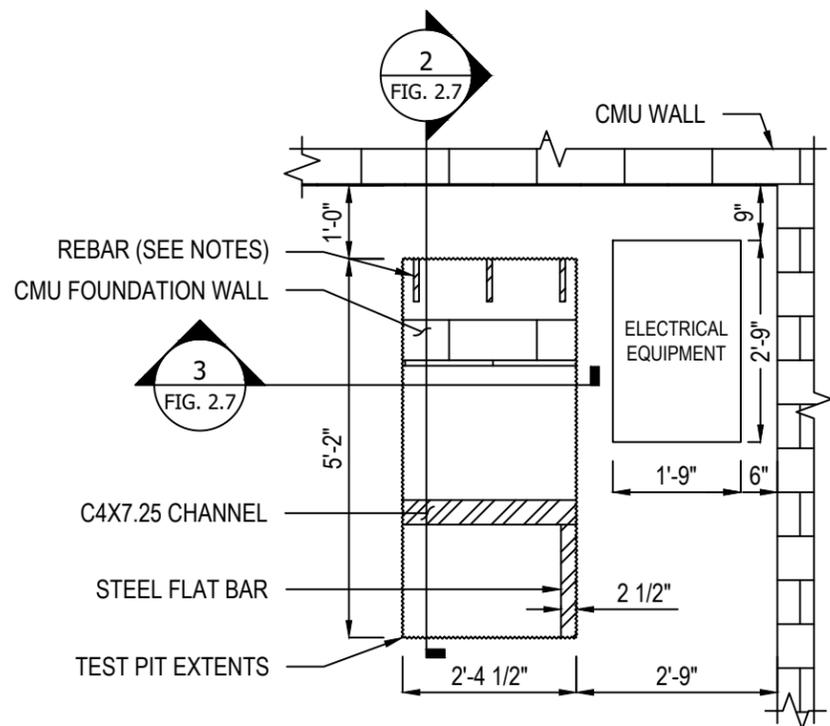
2 TP-62-1 SECTION
Scale: 1" = 2'-6"
0 2.5' 5'



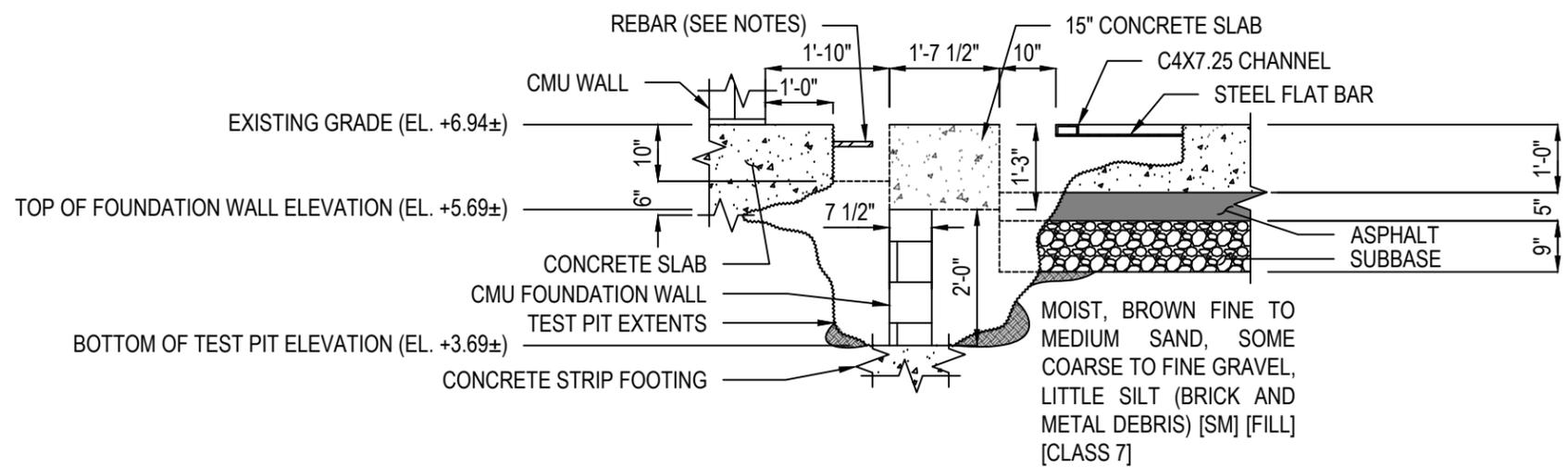
3 TP-62-1 SECTION
Scale: 1" = 2'-6"
0 2.5' 5'

NOTES:
1. SEE FIGURE 2.0 FOR ALL GENERAL NOTES.

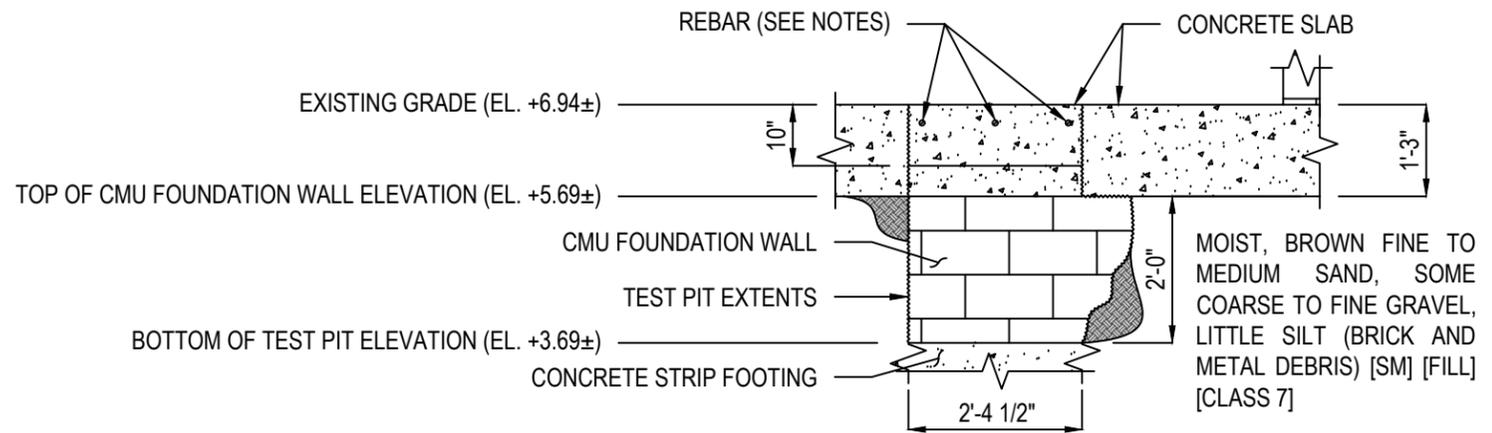
 MFS CONSULTING ENGINEERS & SURVEYOR, DPC 320 FIFTH AVE., FLOOR 11-SUITE #1102, NEW YORK, NY 10001 T: 212.943.6576 www.MFSengineers.com F: 866.517.7413 N.Y. CERTIFICATE OF AUTHORIZATION: 0007564	PROJECT NAME	DRAWING TITLE	PROJECT NO.	SHEET NO.
	BROOKLYN NAVY YARD DEVELOPMENT CORPORATION DESIGN SERVICES FOR BOILERS, SUBSTATIONS, AND ISOLATED ELECTRICAL WORK BROOKLYN KINGS COUNTY NEW YORK	TEST PIT PLAN AND SECTIONS	1119060	APPENDIX B.3
			DATE	3 OF 5
			SCALE	
			DRAWN BY	
			CHECKED BY	



1 TP-293-1 PLAN
Scale: 1" = 2'-6"
0 2.5' 5'



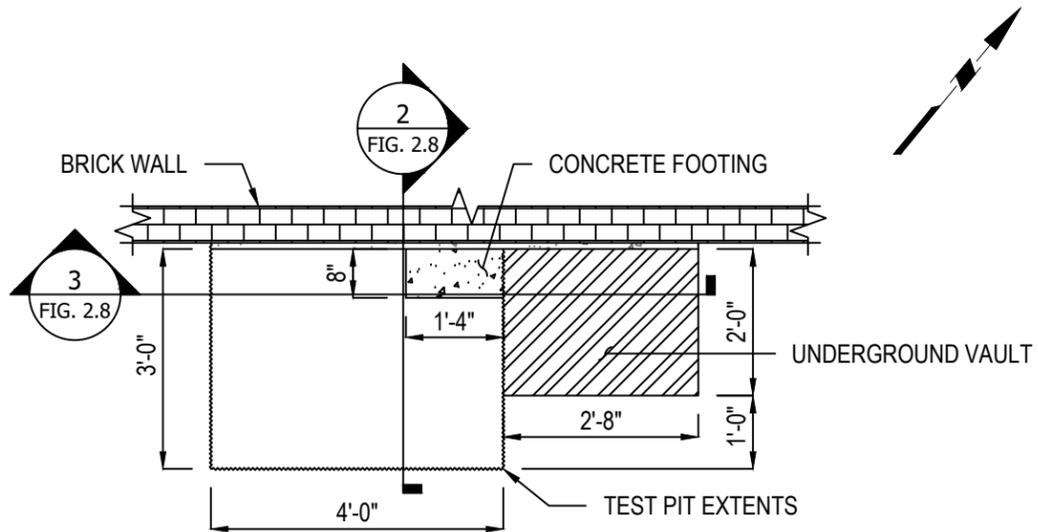
2 TP-293-1 SECTION
Scale: 1" = 2'-6"
0 2.5' 5'



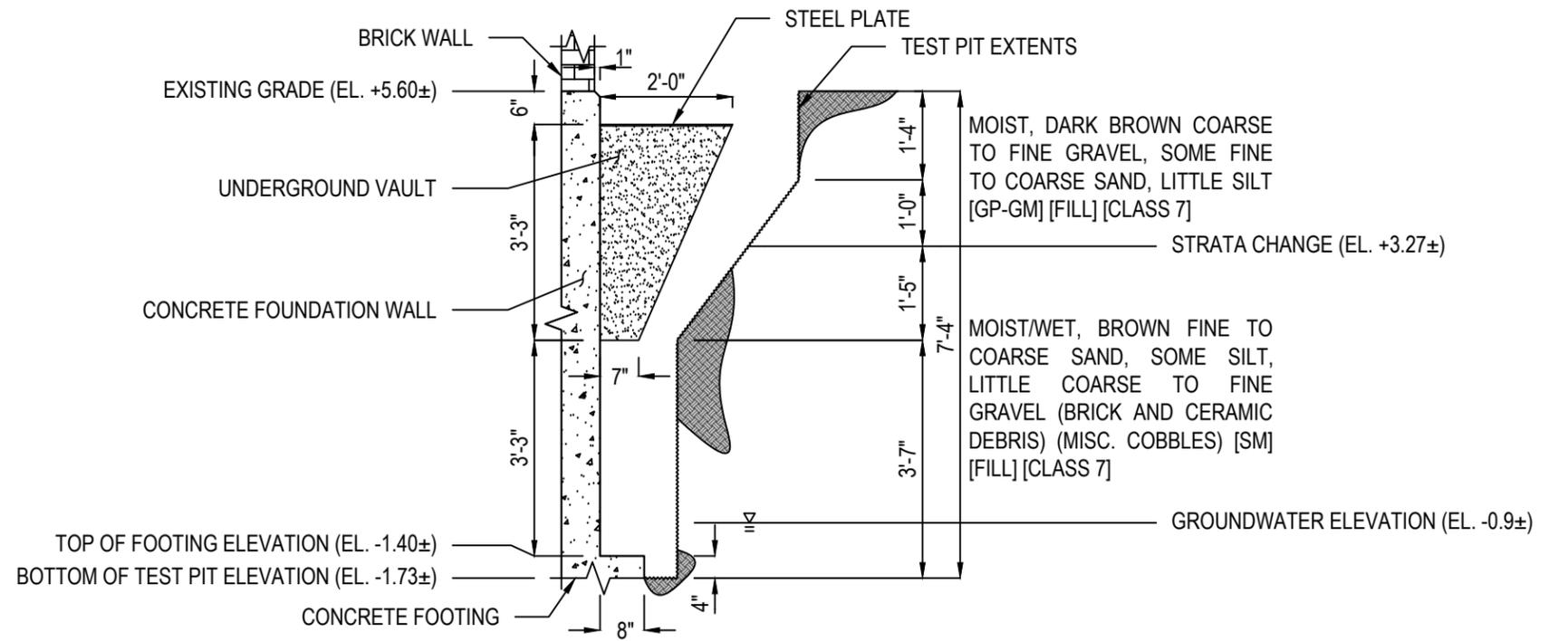
3 TP-293-1 SECTION
Scale: 1" = 2'-6"
0 2.5' 5'

- NOTES:**
1. SEE FIGURE 2.0 FOR ALL GENERAL NOTES.
 2. THE 9" SUBBASE LAYER ENCOUNTERED DIRECTLY BELOW THE ASPHALT LAYER CONSISTED OF DRY, GREY COARSE GRAVEL AND SOME FINE SAND.
 3. NOTE THAT NO FOUNDATION WAS ENCOUNTERED BENEATH THE NORHTHWEST CMU WALL AND ONLY A CONCRETE SLAB WAS OBSERVED.
 4. THE CONCRETE SLAB VARIED FROM 10" THICK AT THE NORTHWEST END OF THE TEST PIT, 15" THICK AT THE CENTER OF THE TEST PIT, AND 12" AT THE SOUTHEAST END OF THE TEST PIT.
 5. THE FOLLOWING CONCRETE REINFORCEMENT WAS OBSERVED WITHIN THE CONCRETE SLABS:
 - 5.1. THE 10" SLAB HAD WELDED WIRE REINFORCEMENT AND #7 REBAR.
 - 5.2. THE 15" SLAB HAD WELDED WIRE REINFORCEMENT AND #4 REBAR.
 - 5.3. THE 12" SLAB HAD WELDED WIRE REINFORCEMENT AND #4 REBAR.
 - 5.1.1. WELDED WIRE REINFORCEMENT WAS 6"X6" CENTER ON CENTER (COC) 6" BELOW THE TOP OF THE SLAB.
 - 5.1.2. #4 REBAR WAS AT 10"X10" COC 10" BELOW THE TOP OF THE SLAB.
 - 5.1.3. #7 REBAR WAS AT 12" COC 3" BELOW THE TOP OF THE SLAB

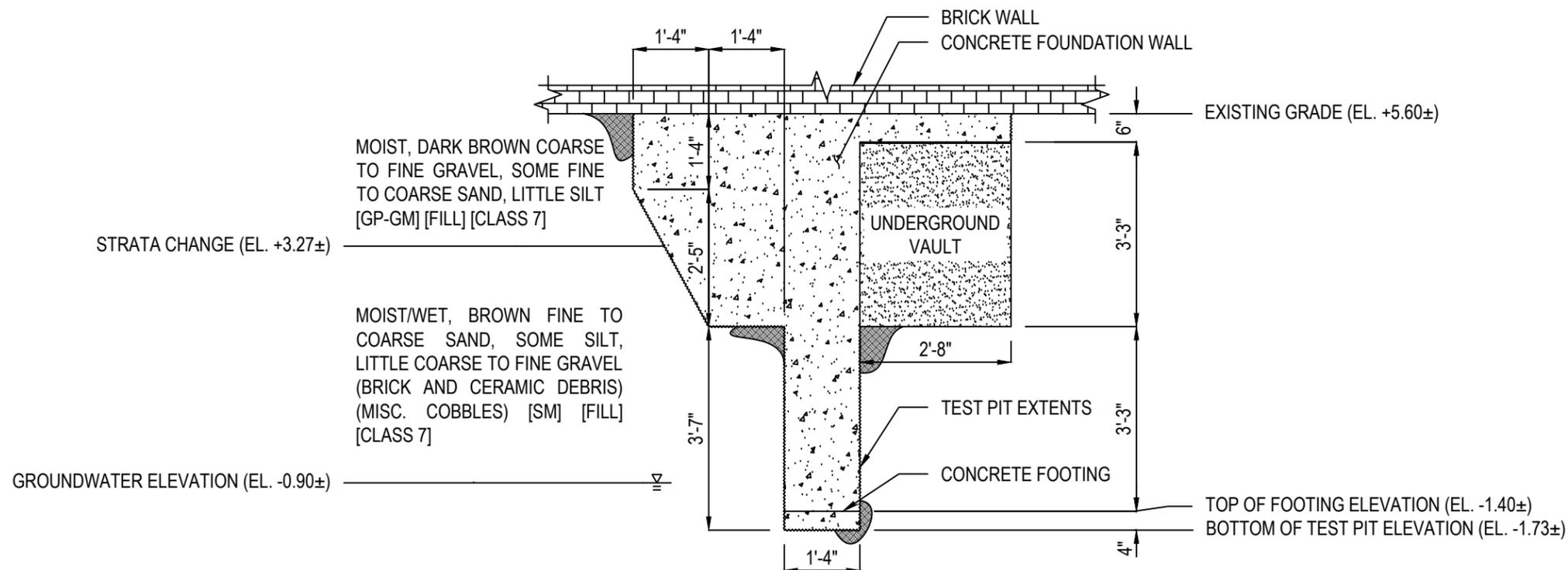
 MFS CONSULTING ENGINEERS & SURVEYOR, DPC 320 FIFTH AVE., FLOOR 11-SUITE #1102, NEW YORK, NY 10001 T: 212.943.6576 www.MFSengineers.com F: 866.517.7413 N.Y. CERTIFICATE OF AUTHORIZATION: 0007564	PROJECT NAME	DRAWING TITLE	PROJECT NO.	SHEET NO.
	BROOKLYN NAVY YARD DEVELOPMENT CORPORATION DESIGN SERVICES FOR BOILERS, SUBSTATIONS, AND ISOLATED ELECTRICAL WORK BROOKLYN KINGS COUNTY NEW YORK	TEST PIT PLAN AND SECTIONS	1119060	APPENDIX B.4
			DATE	12/17/2019
			SCALE	AS NOTED
			DRAWN BY	ATG
			CHECKED BY	MLM
				4 OF 5



1 TP-386-1 PLAN
Scale: 1" = 2'-6"
0 2.5' 5'



2 TP-386-1 SECTION
Scale: 1" = 2'-6"
0 2.5' 5'



- NOTES:**
- SEE FIGURE 2.0 FOR ALL GENERAL NOTES.
 - THE TEST PIT INVESTIGATION WAS UNABLE TO IDENTIFY THE BOTTOM EXTENT OF THE CONCRETE FOOTING DUE TO ENCOUNTERING THE GROUNDWATER TABLE.

3 TP-386-1 SECTION
Scale: 1" = 2'-6"
0 2.5' 5'

 MFS CONSULTING ENGINEERS & SURVEYOR, DPC 320 FIFTH AVE., FLOOR 11-SUITE #1102, NEW YORK, NY 10001 T: 212.943.6576 www.MFSengineers.com F: 866.517.7413 N.Y. CERTIFICATE OF AUTHORIZATION: 0007564	PROJECT NAME	DRAWING TITLE	PROJECT NO.	SHEET NO.
	BROOKLYN NAVY YARD DEVELOPMENT CORPORATION DESIGN SERVICES FOR BOILERS, SUBSTATIONS, AND ISOLATED ELECTRICAL WORK	TEST PIT PLAN AND SECTIONS	1119060	APPENDIX B.5
BROOKLYN KINGS COUNTY NEW YORK	CHECKED BY	MLM	5	OF 5

APPENDIX B

2019 MFS TEST PIT PHOTOGRAPHS



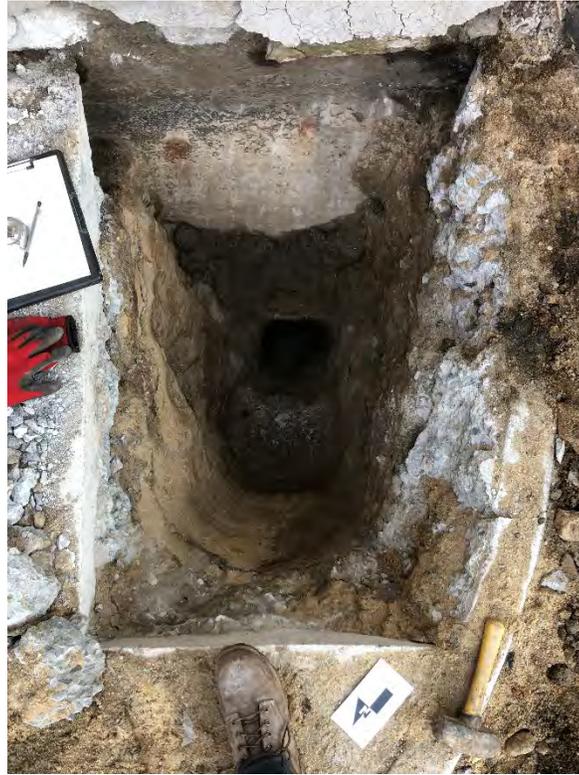


Photo 1: Test Pit TP-41A-1 upon completion (facing southeast)



Photo 2: Test Pit TP-41A-1 upon completion (southwest)



Photo 3: Test Pit TP-41A-1 after backfilling and concrete patch (facing east)



Photo 4: Test Pit TP-41A-2 prior to excavation (facing west)



Photo 5: Test Pit TP-41A-2 upon completion (facing northwest)



Photo 6: Test Pit TP-41A-2 upon completion (facing southwest)



Photo 7: Test Pit TP-41A-2 upon completion (facing northeast)



Photo 8: Test Pit TP-62-1 prior to excavation (facing west)



Photo 9: Test Pit TP-62-1 upon encountering bottom of footing (facing west)



Photo 10: Test Pit TP-62-1 upon encountering bottom of footing (facing southwest)



Photo 11: Test Pit TP-62-1 after backfilling and concrete patch (facing west)

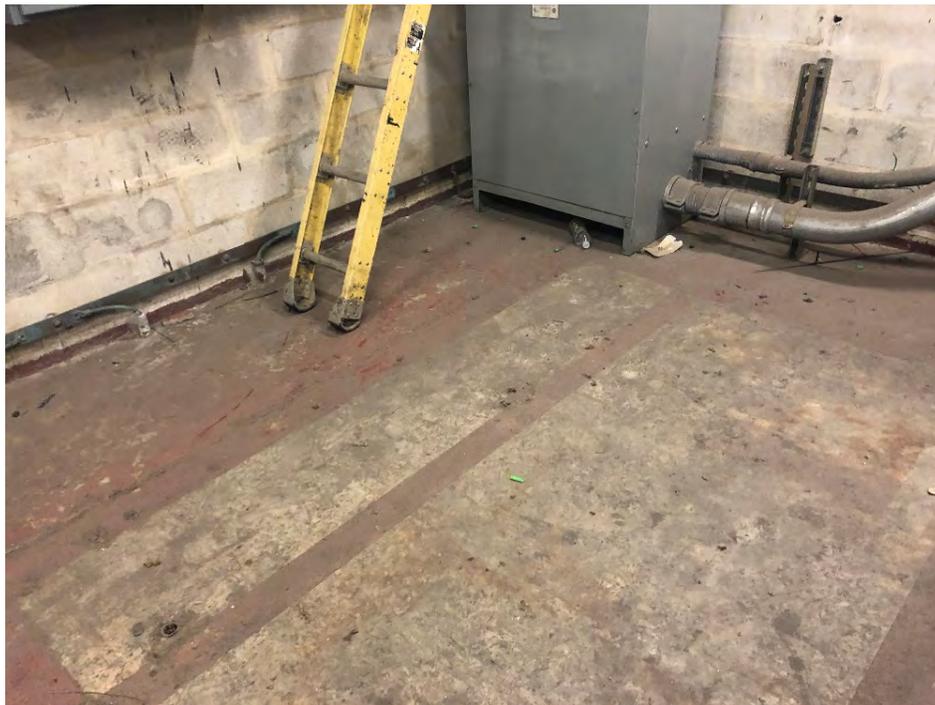


Photo 12: Test Pit TP-293-1 prior to excavation (facing north)



Photo 13: Test Pit TP-293-1 upon completion (facing north)



Photo 14: Test Pit TP-293-1 upon completion (facing northwest)



Photo 15: Test Pit TP-293-1 waterproofing along northwest wall (facing northwest)



Photo 16: Test Pit TP-293-1 after backfill and concrete patch (facing northwest)



Photo 17: Test Pit TP-386-1 prior to excavation (facing north)



Photo 18: Test Pit TP-386-1 upon completion (facing southwest)



Photo 19: Test Pit TP-386-1 upon completion (facing north)



Photo 20: Test Pit TP-386-1 upon completion (facing northeast)



Photo 21: Test Pit TP-386-1 after backfill (facing southwest)

APPENDIX D

GEOTECHNICAL LABORATORY RESULTS



1017 Greeley Avenue North
Union, New Jersey 07083
908-964-0786 (P)
www.RSAgeolab.com

Letter of Transmittal

Date: 1-13-20

Job No.: 909

Lab Log: 19-563

Attention: Jacob Fradkin
MFS Consulting Engineers and Surveyor, DPC
2780 Hamilton Boulevard
South Plainfield, NJ 07080

CC:

Re: Brooklyn Navy Yard DC Boilers
Project#1119060

Sample(s) ID: **B-41A-1 S-4 thru B-234-1C S-10**

Dear Mr. Fradkin,

Please find attached results for the samples referenced above. The following lab testing was performed:

- ASTM D2216 Moisture Content (25 tests)
- ASTM D4318 Atterberg Limits (5 tests)
- ASTM D422 Washed Sieve Analysis (13 tests)
- ASTM D422 Sieve & Hydrometer Analysis (7 tests)
- ASTM D2974 Organic Content (3 tests)

Regards,
RSA Geolab, LLC

Remarks: If you have any questions, please call 908-964-0786.

Signed: _____

Dr. Raza S. Ahmed
President RSA Geolab, LLC

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RSA Geolab	MOISTURE CONTENTS			
	TEST METHOD ASTM D-2216			
CLIENT:	MFS Consulting Engineers and Surveyor, DPC	DATE:	13-Jan-20	
PROJECT:	Brooklyn Navy Yard DC Boilers Project#1119060	PROJECT #	909	

HOLE #/ SAMPLE #	B-41A-1 S-4	B-41A-1 S-8	B-41A-1 S-11	B-41A-1 S-13	B-41A-1 S-15
DEPTH	6-8'	22-24'	35-37'	45-47'	55-57'
WET WGT. + tare (gms.)	435.5	174.4	427.6	396.6	403.5
DRY WGT. + tare (gms.)	373.8	115.2	363.4	312.3	316.4
WGT. WATER (gms.)	61.7	59.2	64.2	84.3	87.1
TARE (gms.)	7.2	7.1	8.4	7.1	7.2
DRY WGT. (gms.)	366.6	108.1	355.0	305.2	309.2
MOISTURE CONTENT	16.8%	54.8%	18.1%	27.6%	28.2%

HOLE #/ SAMPLE #	B-41A-1 S-17	B-41A-2C S-5	B-41A-2C S-7	B-41A-2C S-10	B-41A-2C S-11
DEPTH	65-67'	10-12'	20-22'	35-37'	40-42'
WET WGT. + tare (gms.)	378.9	450.9	275.4	481.0	214.1
DRY WGT. + tare (gms.)	280.4	385.1	241.9	397.1	160.4
WGT. WATER (gms.)	98.5	65.8	33.5	83.9	53.7
TARE (gms.)	6.9	6.9	8.6	8.7	7.1
DRY WGT. (gms.)	273.5	378.2	233.3	388.4	153.3
MOISTURE CONTENT	36.0%	17.4%	14.4%	21.6%	35.0%

Performed by: EE Entered by: KH Checked by: KP

RSA Geolab	MOISTURE CONTENTS			
	TEST METHOD ASTM D-2216			
CLIENT:	MFS Consulting Engineers and Surveyor, DPC	DATE:	13-Jan-20	
PROJECT:	Brooklyn Navy Yard DC Boilers Project#1119060	PROJECT #	909	

HOLE #/ SAMPLE #	B-41A-2C S-13	B-41A-2C S-15	B-62-1 S-3	B-62-1 S-5	B-62-1 S-8
DEPTH	50-52'	58-60'	4-6'	8-10'	20-22'
WET WGT. + tare (gms.)	418.9	393.0	314.9	403.9	152.7
DRY WGT. + tare (gms.)	351.1	339.6	286.0	340.6	107.0
WGT. WATER (gms.)	67.8	53.4	28.9	63.3	45.7
TARE (gms.)	7.0	7.1	7.1	7.0	7.1
DRY WGT. (gms.)	344.1	332.5	278.9	333.6	99.9
MOISTURE CONTENT	19.7%	16.1%	10.4%	19.0%	45.7%

HOLE #/ SAMPLE #	B-62-1 S-10B	B-62-1 S-11	B-62-1 S-14	B-62-1 S-15	B-62-1 S-16
DEPTH	30-32'	35-37'	50-52'	55-57'	58-60'
WET WGT. + tare (gms.)	366.5	183.9	376.4	396.3	384.9
DRY WGT. + tare (gms.)	296.5	150.3	283.0	296.9	320.6
WGT. WATER (gms.)	70.0	33.6	93.4	99.4	64.3
TARE (gms.)	7.1	7.1	6.9	7.0	7.0
DRY WGT. (gms.)	289.4	143.2	276.1	289.9	313.6
MOISTURE CONTENT	24.2%	23.5%	33.8%	34.3%	20.5%

Performed by: EE Entered by: KH Checked by: KP

RSA Geolab	MOISTURE CONTENTS			
	TEST METHOD ASTM D-2216			
CLIENT:	MFS Consulting Engineers and Surveyor, DPC	DATE:	13-Jan-20	
PROJECT:	Brooklyn Navy Yard DC Boilers Project#1119060	PROJECT #	909	

HOLE #/ SAMPLE #	B-234-1C S-3	B-234-1C S-5	B-234-1C S-7	B-234-1C S-9	B-234-1C S-10
DEPTH	6-8'	10-12'	25-27'	35-37'	40-42'
WET WGT. + tare (gms.)	400.1	247.1	110.6	453.8	362.9
DRY WGT. + tare (gms.)	334.5	189.6	46.0	378.0	290.0
WGT. WATER (gms.)	65.6	57.5	64.6	75.8	72.9
TARE (gms.)	7.1	8.3	7.0	8.3	8.3
DRY WGT. (gms.)	327.4	181.3	39.0	369.7	281.7
MOISTURE CONTENT	20.0%	31.7%	165.6%	20.5%	25.9%

HOLE #/ SAMPLE #					
DEPTH					
WET WGT. + tare (gms.)					
DRY WGT. + tare (gms.)					
WGT. WATER (gms.)	0.0	0.0	0.0	0.0	0.0
TARE (gms.)					
DRY WGT. (gms.)	0.0	0.0	0.0	0.0	0.0
MOISTURE CONTENT					

Performed by: EE Entered by: KH Checked by: KP

LIQUID AND PLASTIC LIMIT TEST DATA

1/13/2020

Client: MFS Consulting Engineers and Surveyor, DPC

Project: Brooklyn Navy Yard DC Boilers

Project No. 1119060

Project Number: 909

Sample Number: B-41A-1 S-8 22-24'

Material Description: Gray Clay & Silt, trace cmf Sand, organics (visual)

Tested by: SD

Checked by: KP

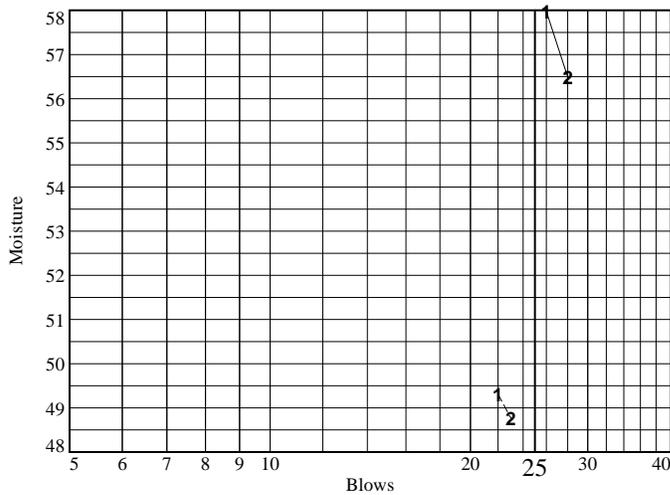
Testing Remarks: 1-13-20

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	8.35	8.15				
Dry+Tare	5.77	5.67				
Tare	1.32	1.28				
# Blows	26	28				
Moisture	58.0	56.5				

Organics Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	8.83	8.61				
Dry+Tare	6.34	6.23				
Tare	1.29	1.35				
# Blows	22	23				
Moisture	49.3	48.8				



Liquid Limit= 59
Liquid Limit (organics)= 48
Plastic Limit= 29
Plasticity Index= 30

Plastic Limit Data

Run No.	1	2	3	4	
Wet+Tare	7.56	7.32			
Dry+Tare	6.15	5.97			
Tare	1.27	1.29			
Moisture	28.9	28.8			

LIQUID AND PLASTIC LIMIT TEST DATA

1/13/2020

Client: MFS Consulting Engineers and Surveyor, DPC

Project: Brooklyn Navy Yard DC Boilers

Project No. 1119060

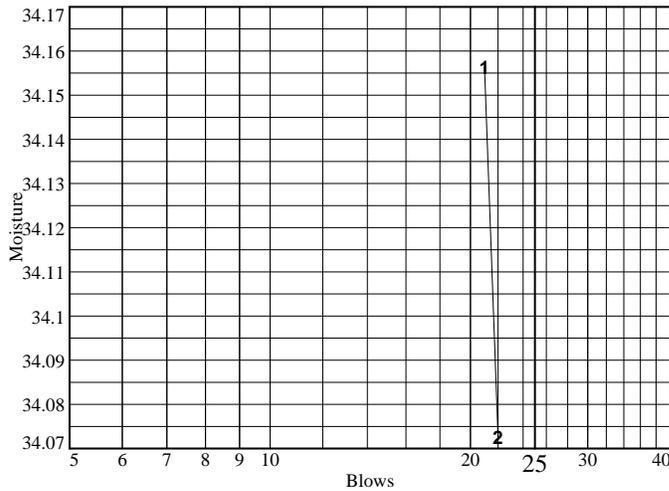
Project Number: 909

Sample Number: B-41A-2C S-11 40-42'

Material Description: Light Yellowish Brown Clay & Silt, trace cmf Sand (visual)

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	7.78	7.91				
Dry+Tare	6.12	6.22				
Tare	1.26	1.26				
# Blows	21	22				
Moisture	34.2	34.1				



Liquid Limit= 34
Plastic Limit= 22
Plasticity Index= 12

Plastic Limit Data

Run No.	1	2	3	4	
Wet+Tare	8.69	7.08			
Dry+Tare	7.36	6.05			
Tare	1.26	1.26			
Moisture	21.8	21.5			

LIQUID AND PLASTIC LIMIT TEST DATA

1/13/2020

Client: MFS Consulting Engineers and Surveyor, DPC

Project: Brooklyn Navy Yard DC Boilers

Project No. 1119060

Project Number: 909

Sample Number: B-62-1 S-8 20-22'

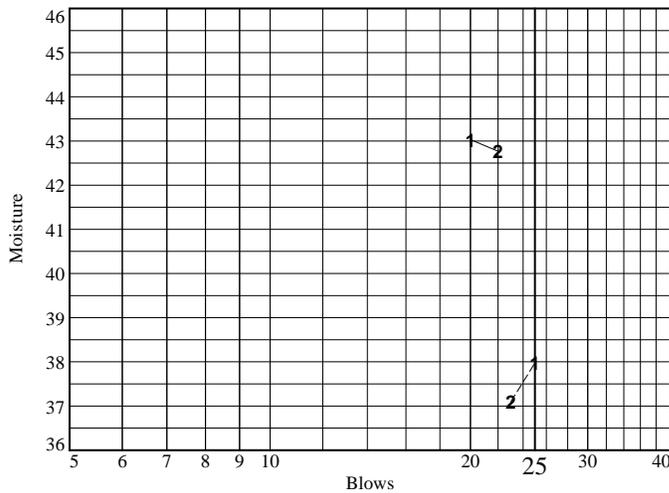
Material Description: Gray Clay & Silt, trace cmf Sand, organics (visual)

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	8.68	8.25				
Dry+Tare	6.55	6.18				
Tare	1.60	1.34				
# Blows	20	22				
Moisture	43.0	42.8				

Organics Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	7.86	7.27				
Dry+Tare	6.06	5.66				
Tare	1.32	1.32				
# Blows	25	23				
Moisture	38.0	37.1				



Liquid Limit= 42
 Liquid Limit (organics)= 38
 Plastic Limit= 23
 Plasticity Index= 19

Plastic Limit Data

Run No.	1	2	3	4
Wet+Tare	7.45	7.33		
Dry+Tare	6.30	6.20		
Tare	1.34	1.35		
Moisture	23.2	23.3		

LIQUID AND PLASTIC LIMIT TEST DATA

1/13/2020

Client: MFS Consulting Engineers and Surveyor, DPC

Project: Brooklyn Navy Yard DC Boilers

Project No. 1119060

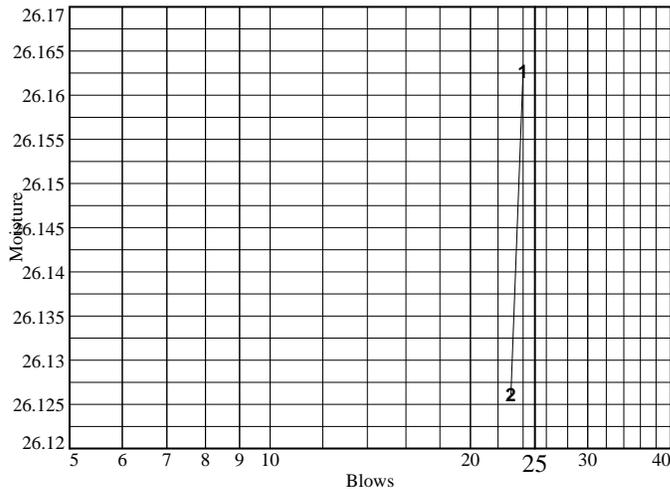
Project Number: 909

Sample Number: B-62-1 S-11 35-37'

Material Description: Gray Clay & Silt, trace cmf Sand (visual)

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	7.79	8.34				
Dry+Tare	6.44	6.89				
Tare	1.28	1.34				
# Blows	24	23				
Moisture	26.2	26.1				



Liquid Limit= 26
Plastic Limit= 18
Plasticity Index= 8

Plastic Limit Data

Run No.	1	2	3	4	
Wet+Tare	9.98	9.14			
Dry+Tare	8.65	7.93			
Tare	1.31	1.31			
Moisture	18.1	18.3			

LIQUID AND PLASTIC LIMIT TEST DATA

1/13/2020

Client: MFS Consulting Engineers and Surveyor, DPC

Project: Brooklyn Navy Yard DC Boilers

Project No. 1119060

Project Number: 909

Sample Number: B-234-1C S-7 25-27'

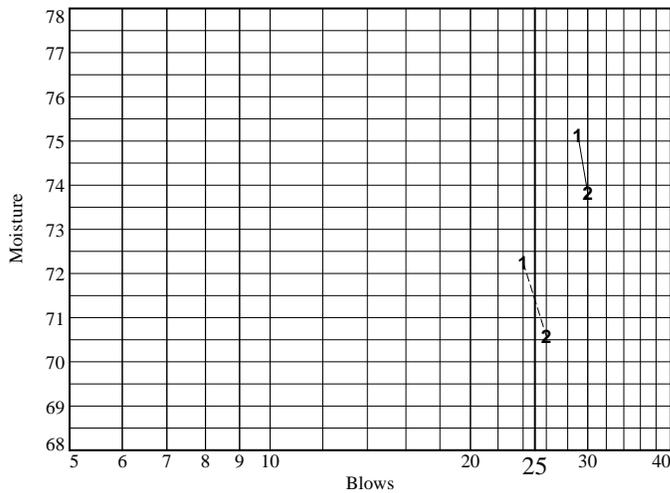
Material Description: Very Dark Brown Clay & Silt, trace cmf Sand, organics (visual)

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	7.71	7.19				
Dry+Tare	4.96	4.68				
Tare	1.30	1.28				
# Blows	29	30				
Moisture	75.1	73.8				

Organics Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	7.53	7.64				
Dry+Tare	4.90	5.00				
Tare	1.26	1.26				
# Blows	24	26				
Moisture	72.3	70.6				

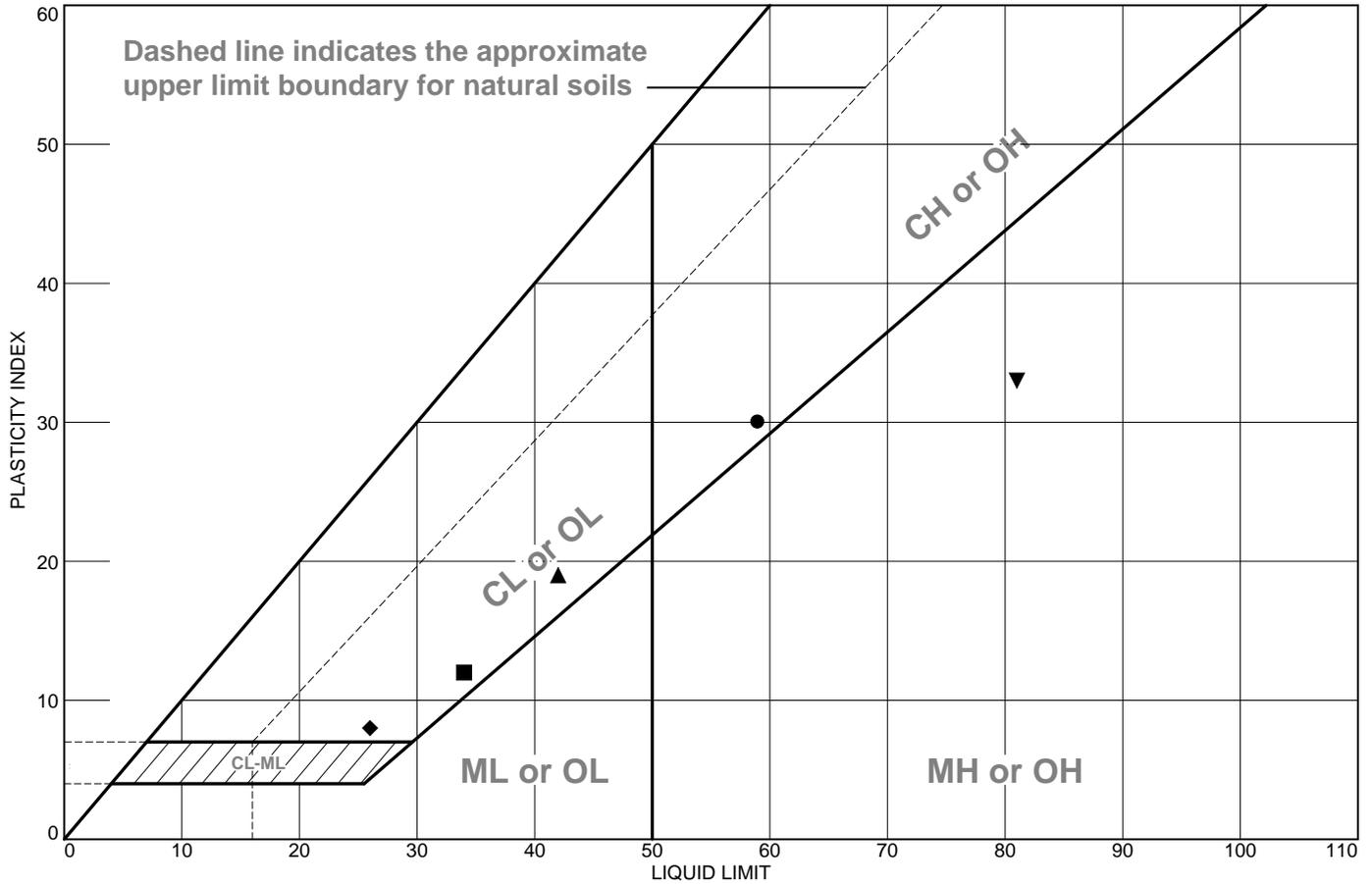


Liquid Limit=	81
Liquid Limit (organics)=	71
Plastic Limit=	48
Plasticity Index=	33

Plastic Limit Data

Run No.	1	2	3	4
Wet+Tare	8.03	9.32		
Dry+Tare	5.85	6.70		
Tare	1.28	1.27		
Moisture	47.7	48.3		

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray Clay & Silt, trace cmf Sand, organics (visual)	59	29	30			
■	Light Yellowish Brown Clay & Silt, trace cmf Sand (visual)	34	22	12			
▲	Gray Clay & Silt, trace cmf Sand, organics (visual)	42	23	19			
◆	Gray Clay & Silt, trace cmf Sand (visual)	26	18	8			
▼	Very Dark Brown Clay & Silt, trace cmf Sand, organics (visual)	81	48	33			

Project No. 909 **Client:** MFS Consulting Engineers and Surveyor, DPC
Project: Brooklyn Navy Yard DC Boilers
 Project No. 1119060
● Sample Number: B-41A-1 S-8 22-24'
■ Sample Number: B-41A-2C S-11 40-42'
▲ Sample Number: B-62-1 S-8 20-22'
◆ Sample Number: B-62-1 S-11 35-37'
▼ Sample Number: B-234-1C S-7 25-27'

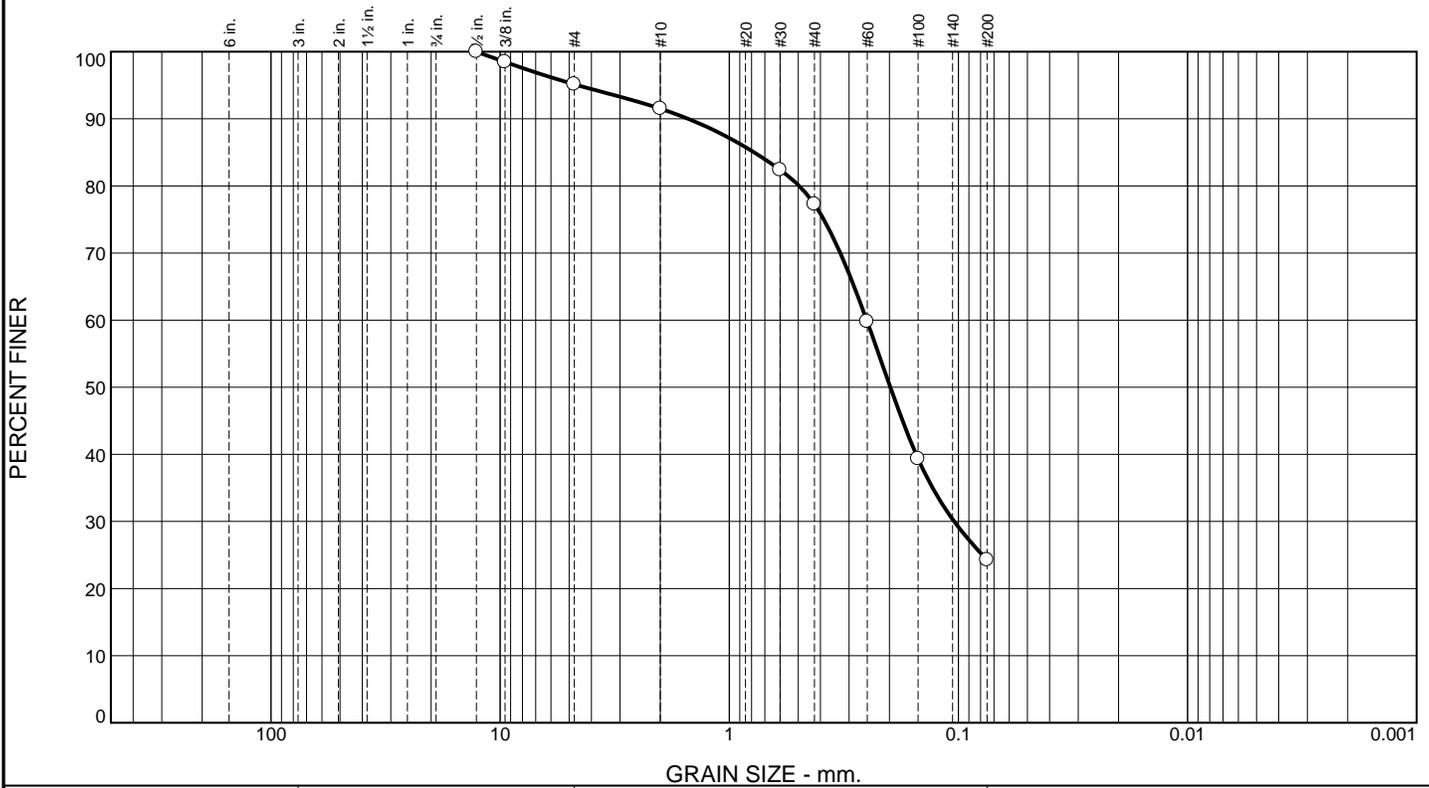
RSA Geolab
 Union, New Jersey

Remarks:
 ● 1-13-20

Figure

Tested By: SD Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.9	3.6	14.2	53.1	24.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5	100.0		
.375	98.5		
#4	95.1		
#10	91.5		
#30	82.4		
#40	77.3		
#60	59.8		
#100	39.3		
#200	24.2		

Material Description

Dark Grayish Brown

PL= **Atterberg Limits** PI=

Coefficients

D₉₀= 1.5124 D₈₅= 0.7788 D₆₀= 0.2514

D₅₀= 0.1981 D₃₀= 0.1044 D₁₅=

D₁₀= C_u= C_c=

USCS= **Classification** AASHTO=

Remarks

* (no specification provided)

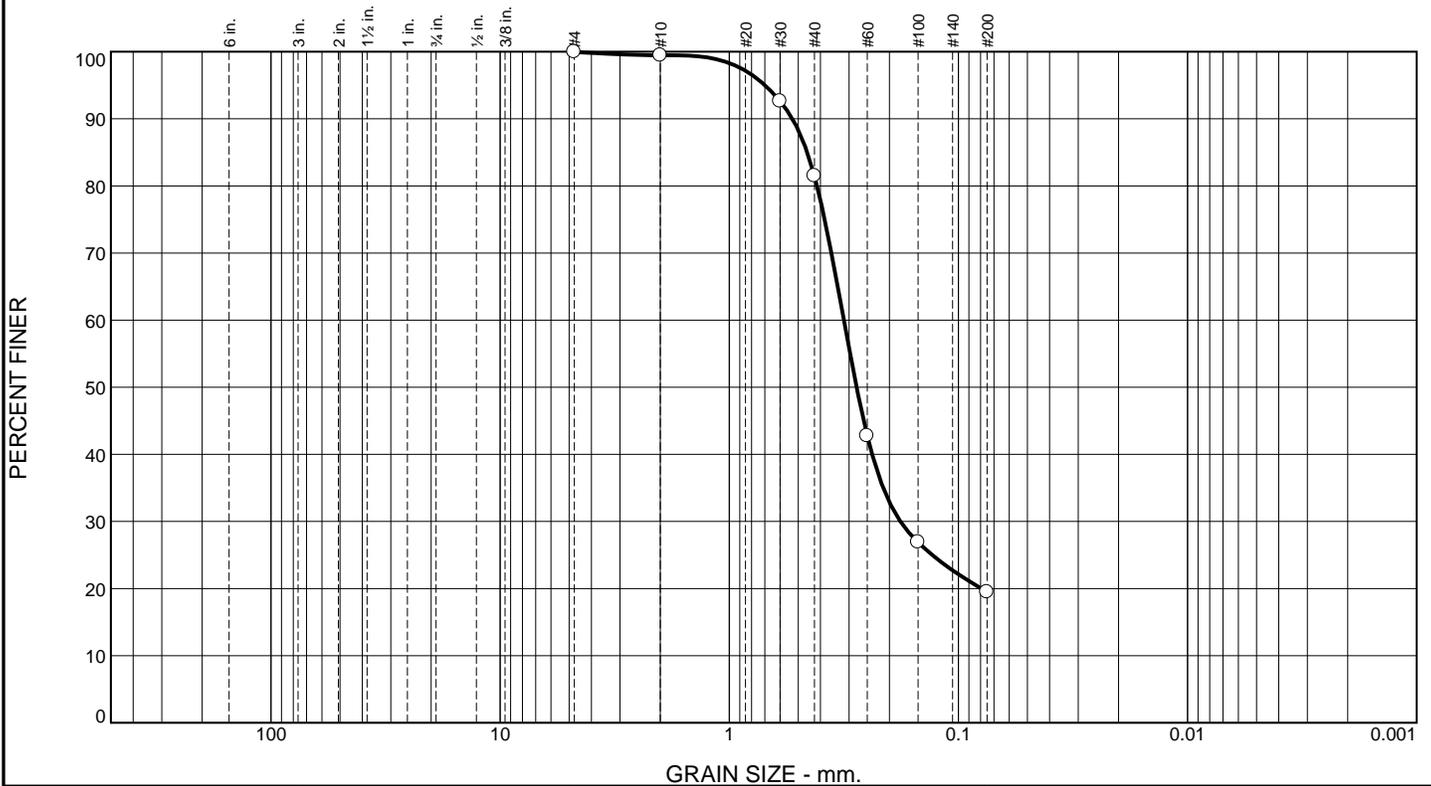
Sample Number: B-41A-1 S-4 6-8'

Date: 1-13-20

<p>RSA Geolab</p> <p>Union, New Jersey</p>	<p>Client: MFS Consulting Engineers and Surveyor, DPC</p> <p>Project: Brooklyn Navy Yard DC Boilers Project No. 1119060</p> <p>Project No: 909</p>
<p>Figure</p>	

Tested By: MF Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
			0.5	18.0	62.0		19.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.5		
#30	92.6		
#40	81.5		
#60	42.8		
#100	26.9		
#200	19.5		

Material Description

Light Yellowish Brown

Atterberg Limits
 PL= LL= PI=

Coefficients
 D₉₀= 0.5305 D₈₅= 0.4566 D₆₀= 0.3161
 D₅₀= 0.2782 D₃₀= 0.1793 D₁₅=
 D₁₀= C_u= C_c=

Classification
 USCS= AASHTO=

Remarks

* (no specification provided)

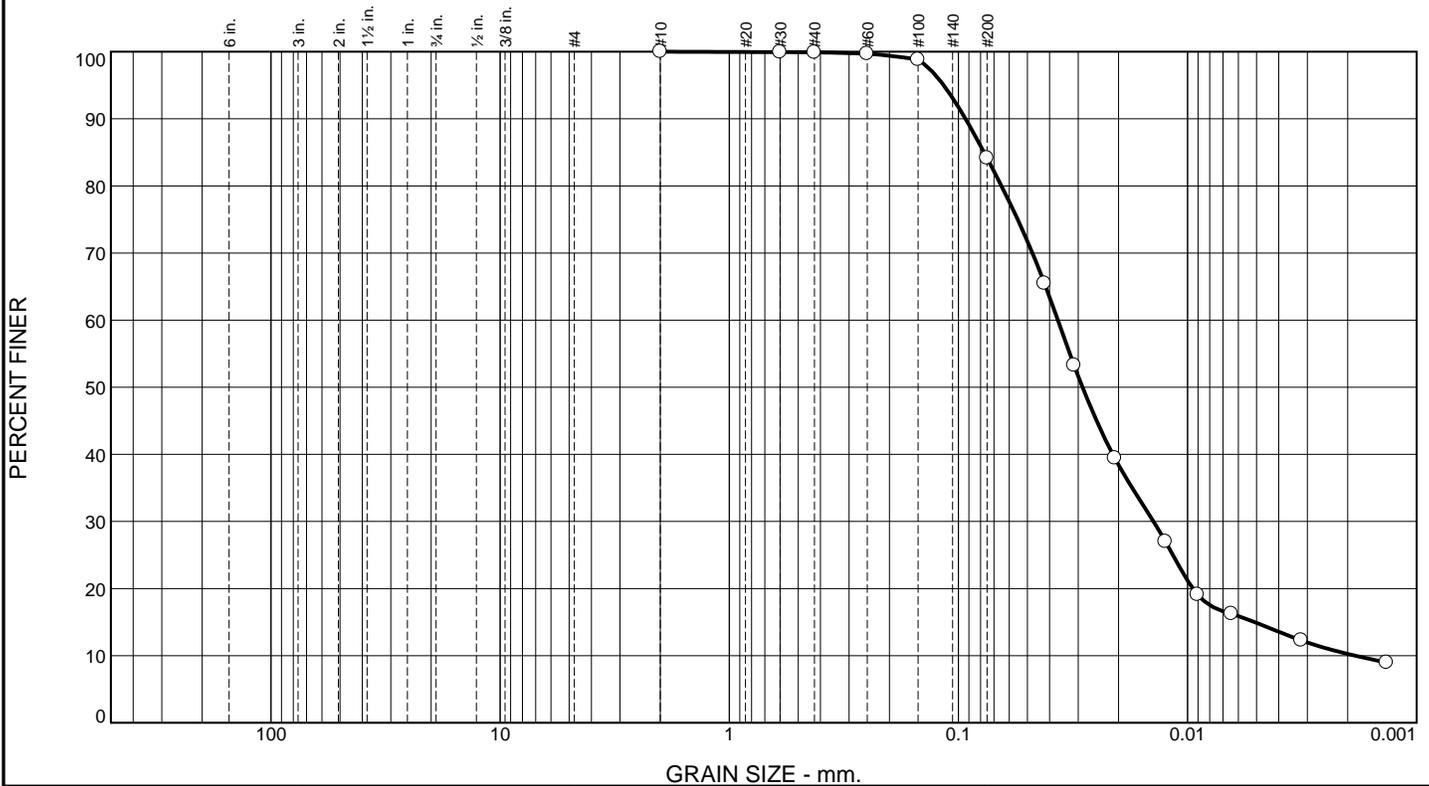
Sample Number: B-41A-1 S-11 35-37'

Date: 1-13-20

RSA Geolab Union, New Jersey	Client: MFS Consulting Engineers and Surveyor, DPC Project: Brooklyn Navy Yard DC Boilers Project No. 1119060 Project No: 909
	Figure

Tested By: MF Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	15.8	69.2	14.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#30	99.9		
#40	99.9		
#60	99.7		
#100	98.8		
#200	84.1		

Material Description

Grayish Brown

PL= **Atterberg Limits** PI=

LL= PI=

Coefficients

D ₉₀ = 0.0932	D ₈₅ = 0.0773	D ₆₀ = 0.0368
D ₅₀ = 0.0287	D ₃₀ = 0.0141	D ₁₅ = 0.0051
D ₁₀ = 0.0019	C _u = 19.83	C _c = 2.91

Classification

USCS= AASHTO=

Remarks

SG Assumed

* (no specification provided)

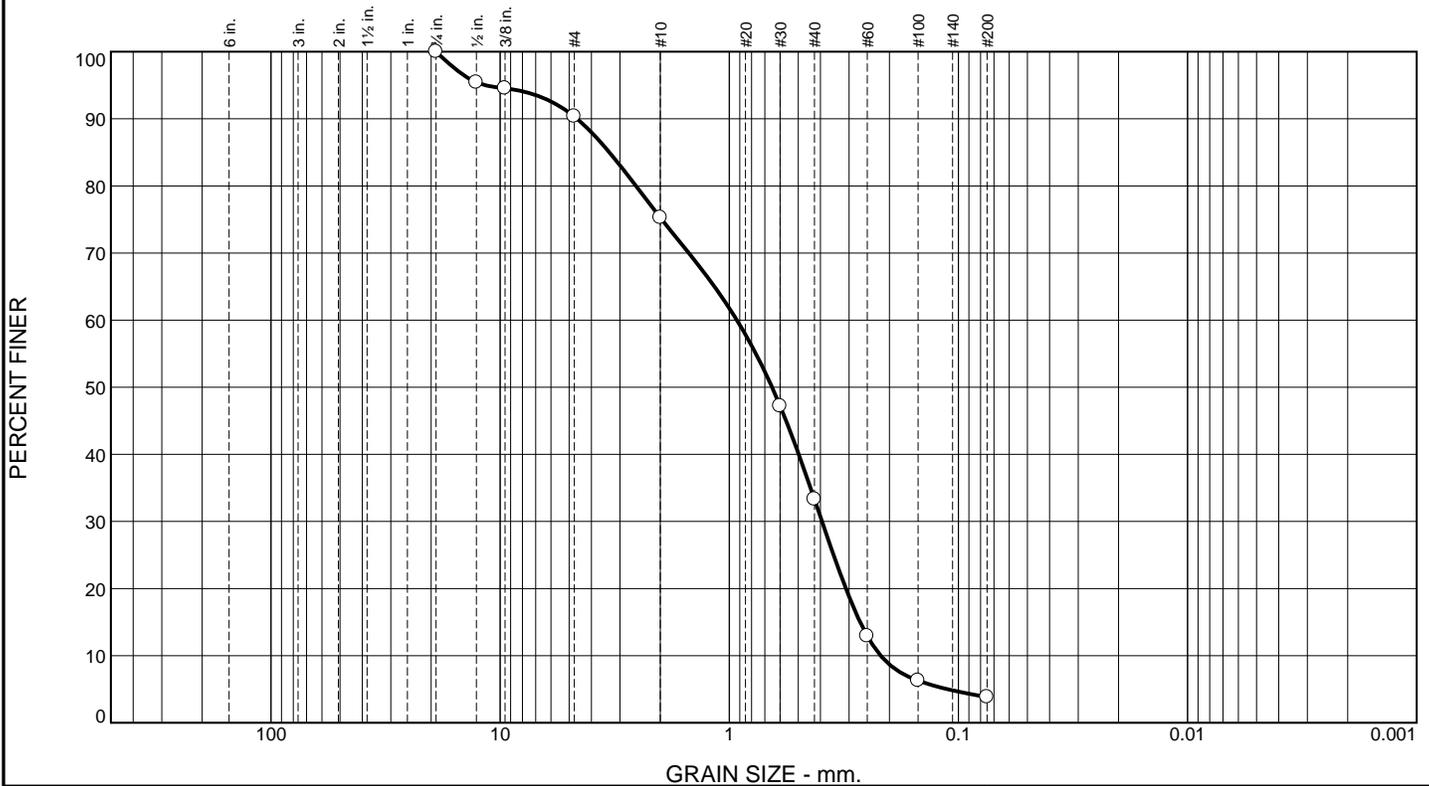
Sample Number: B-41A-1 S-15 55-57'

Date: 1-13-20

<p>RSA Geolab</p> <p>Union, New Jersey</p>	<p>Client: MFS Consulting Engineers and Surveyor, DPC</p> <p>Project: Brooklyn Navy Yard DC Boilers Project No. 1119060</p> <p>Project No: 909</p>
<p>Figure</p>	

Tested By: EE Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	9.7	15.0	42.0	29.5	3.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	95.4		
.375	94.6		
#4	90.3		
#10	75.3		
#30	47.2		
#40	33.3		
#60	12.9		
#100	6.3		
#200	3.8		

Material Description

Very Dark Grayish Brown

PL= **Atterberg Limits** PI=

Coefficients

D₉₀= 4.6166 D₈₅= 3.3372 D₆₀= 0.9266

D₅₀= 0.6508 D₃₀= 0.3939 D₁₅= 0.2687

D₁₀= 0.2183 C_u= 4.24 C_c= 0.77

USCS= SP **Classification** AASHTO=

Remarks

* (no specification provided)

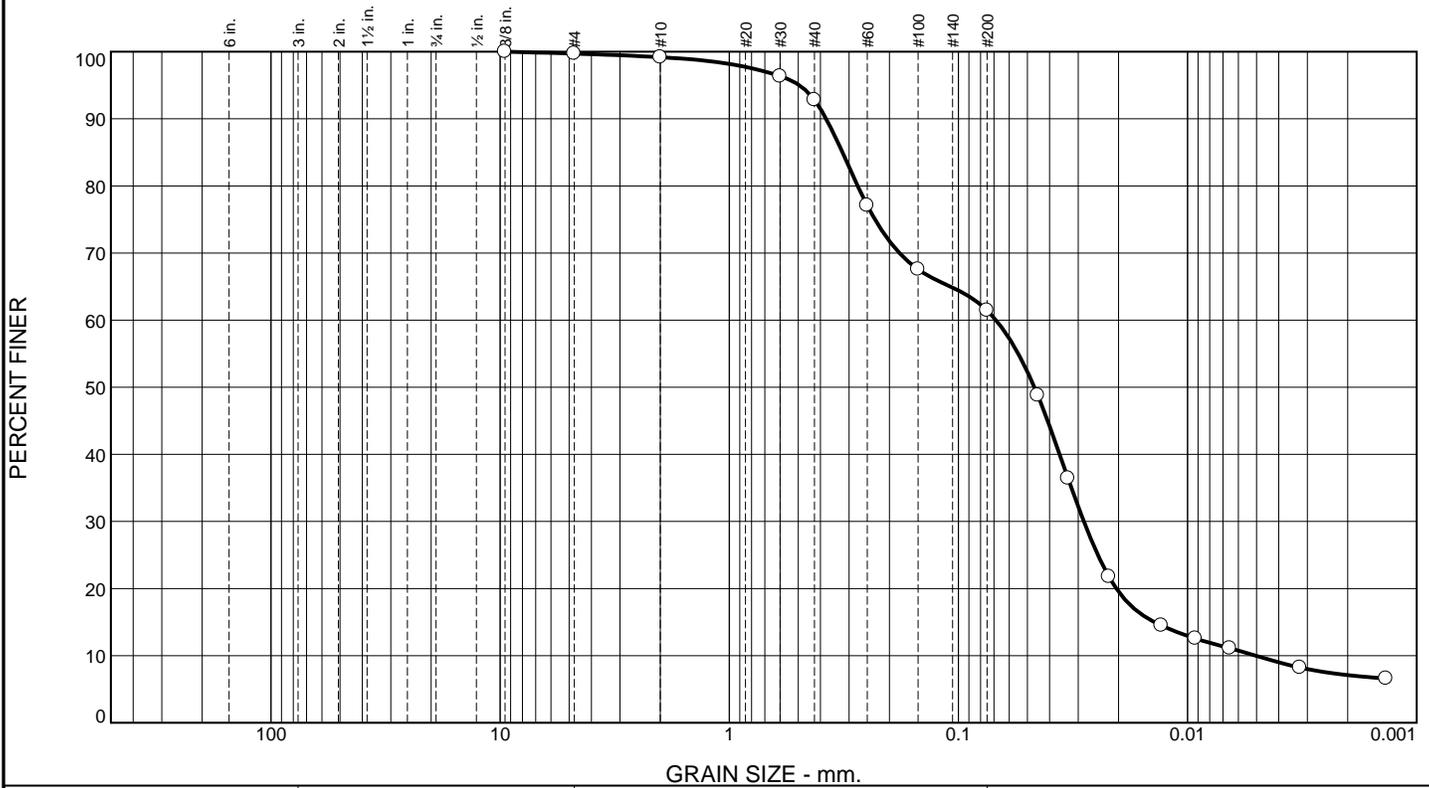
Sample Number: B-41A-2C S-5 10-12'

Date: 1-13-20

<p>RSA Geolab</p> <p>Union, New Jersey</p>	<p>Client: MFS Consulting Engineers and Surveyor, DPC</p> <p>Project: Brooklyn Navy Yard DC Boilers Project No. 1119060</p> <p>Project No: 909</p>
<p>Figure</p>	

Tested By: EE Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	0.5	6.4	31.4	51.4	10.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.7		
#10	99.2		
#30	96.3		
#40	92.8		
#60	77.1		
#100	67.6		
#200	61.4		

Material Description

Light Olive Brown

PL= **Atterberg Limits** PI=

Coefficients

D₉₀= 0.3778 D₈₅= 0.3207 D₆₀= 0.0685

D₅₀= 0.0466 D₃₀= 0.0283 D₁₅= 0.0139

D₁₀= 0.0050 C_u= 13.58 C_c= 2.32

USCS= **Classification** AASHTO=

Remarks

SG Assumed

* (no specification provided)

Sample Number: B-41A-2C S-10 35-37'

Date: 1-13-20

<p>RSA Geolab</p> <p>Union, New Jersey</p>	<p>Client: MFS Consulting Engineers and Surveyor, DPC</p> <p>Project: Brooklyn Navy Yard DC Boilers Project No. 1119060</p> <p>Project No: 909</p>
<p>Figure</p>	

Tested By: EE Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.6	0.5	30.0	62.4	6.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.4		
#10	98.9		
#30	91.5		
#40	68.9		
#60	21.1		
#100	10.9		
#200	6.5		

Material Description

Yellowish Brown

PL= **Atterberg Limits** PI=

LL=

Coefficients

D ₉₀ = 0.5806	D ₈₅ = 0.5294	D ₆₀ = 0.3862
D ₅₀ = 0.3492	D ₃₀ = 0.2827	D ₁₅ = 0.2183
D ₁₀ = 0.1208	C _u = 3.20	C _c = 1.71

USCS= **Classification** AASHTO=

Remarks

* (no specification provided)

Sample Number: B-41A-2C S-13 50-52'

Date: 1-13-20

<p>RSA Geolab</p> <p>Union, New Jersey</p>	<p>Client: MFS Consulting Engineers and Surveyor, DPC</p> <p>Project: Brooklyn Navy Yard DC Boilers Project No. 1119060</p> <p>Project No: 909</p>
<p>Figure</p>	

Tested By: MF Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.8	2.9	44.3	43.4	7.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5	100.0		
.375	99.2		
#4	98.2		
#10	95.3		
#30	68.3		
#40	51.0		
#60	30.3		
#100	12.6		
#200	7.6		

Material Description

Yellowish Brown

PL= **Atterberg Limits** PI=

LL=

Coefficients

D ₉₀ = 1.2321	D ₈₅ = 0.9642	D ₆₀ = 0.5081
D ₅₀ = 0.4159	D ₃₀ = 0.2483	D ₁₅ = 0.1640
D ₁₀ = 0.1043	C _u = 4.87	C _c = 1.16

Classification

USCS= AASHTO=

Remarks

* (no specification provided)

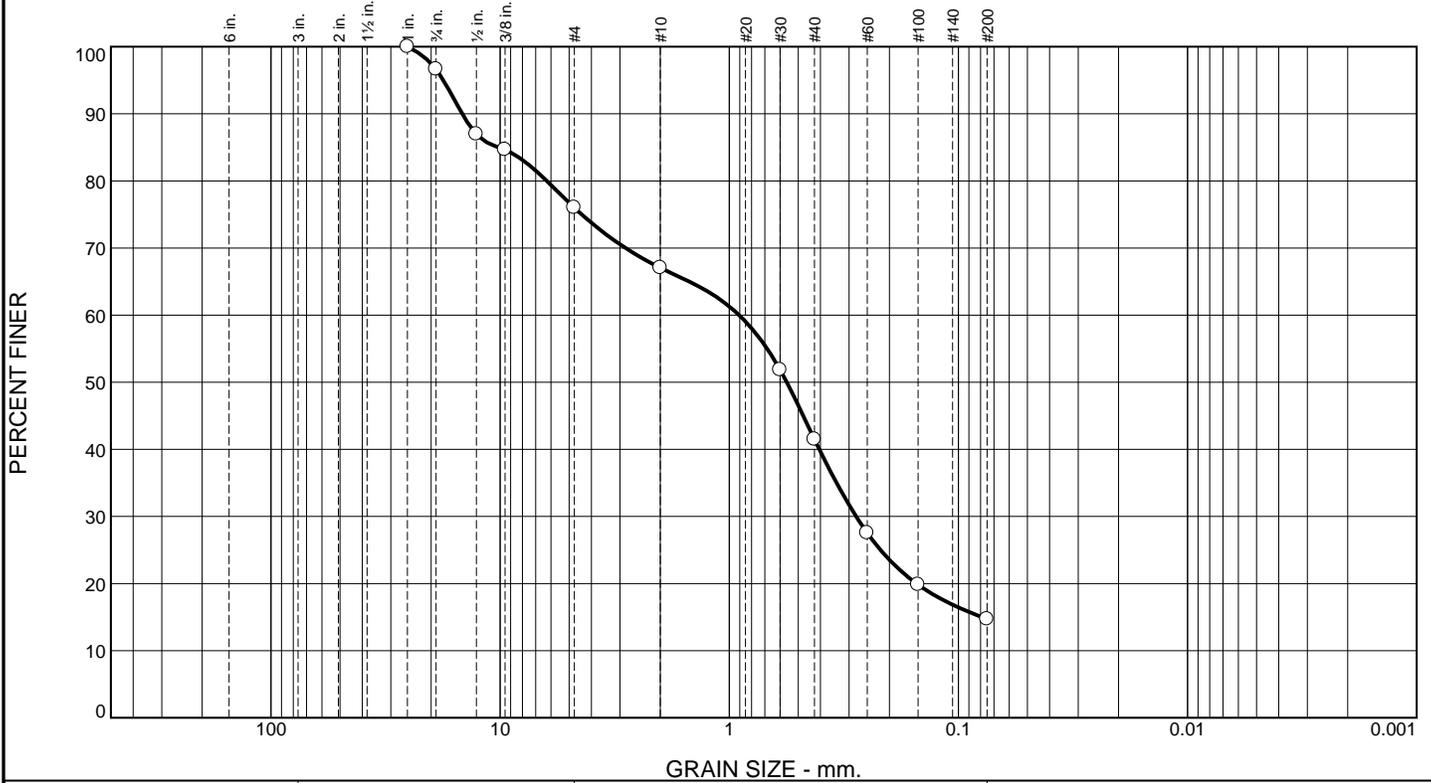
Sample Number: B-41A-2C S-15 58-60'

Date: 1-13-20

<p>RSA Geolab</p> <p>Union, New Jersey</p>	<p>Client: MFS Consulting Engineers and Surveyor, DPC</p> <p>Project: Brooklyn Navy Yard DC Boilers Project No. 1119060</p> <p>Project No: 909</p>
<p>Figure</p>	

Tested By: MF Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.4	20.6	9.0	25.5	26.8	14.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	96.6		
.5	86.9		
.375	84.7		
#4	76.0		
#10	67.0		
#30	51.8		
#40	41.5		
#60	27.5		
#100	19.8		
#200	14.7		

Material Description

Dark Yellowish Brown

PL=	Atterberg Limits	PI=
	LL=	
	Coefficients	
D ₉₀ = 14.6343	D ₈₅ = 10.1383	D ₆₀ = 0.9057
D ₅₀ = 0.5612	D ₃₀ = 0.2796	D ₁₅ = 0.0790
D ₁₀ =	C _u =	C _c =
	Classification	
USCS=	AASHTO=	
	Remarks	

* (no specification provided)

Sample Number: B-62-1 S-3 4-6'

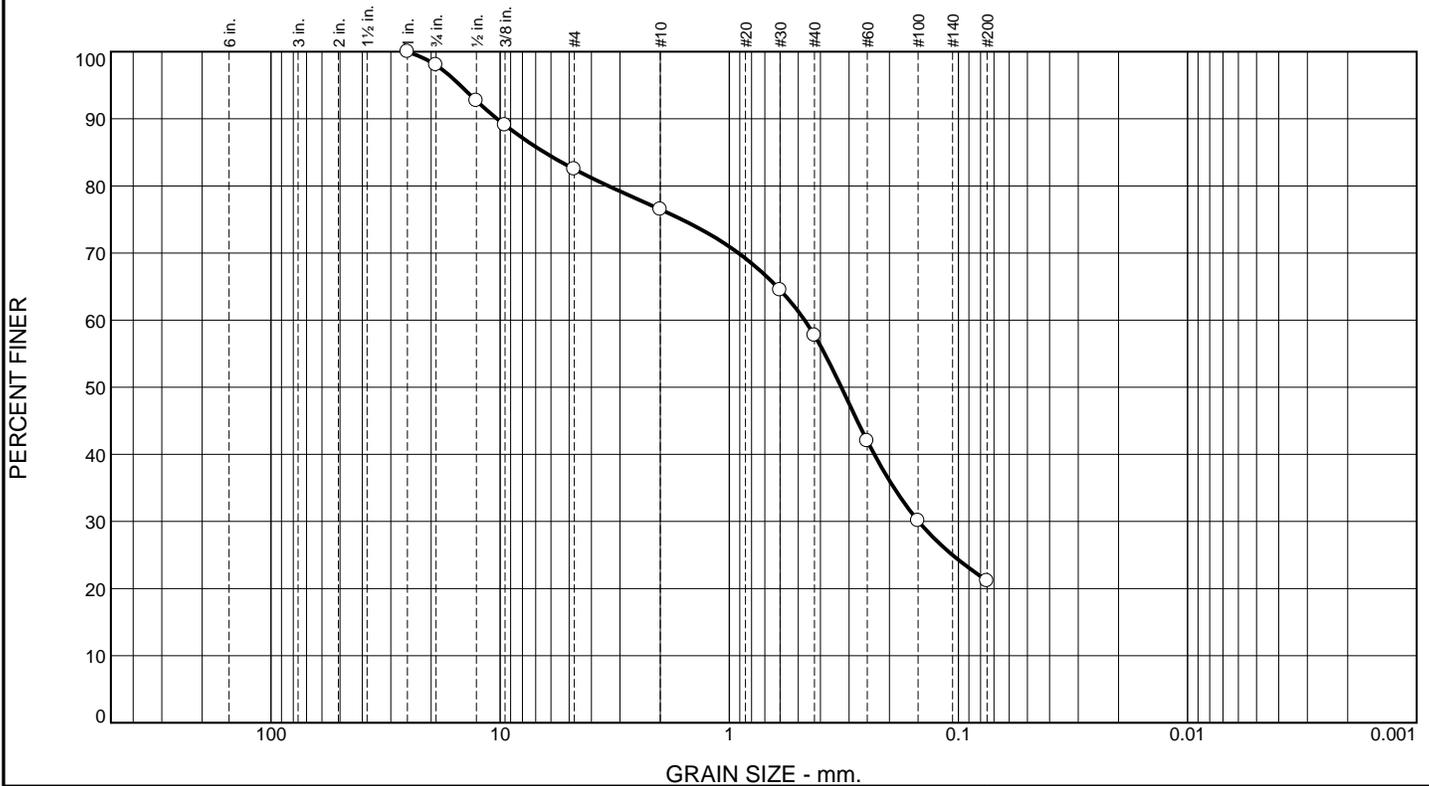
Date: 1-13-20

<p>RSA Geolab</p> <p>Union, New Jersey</p>	<p>Client: MFS Consulting Engineers and Surveyor, DPC</p> <p>Project: Brooklyn Navy Yard DC Boilers Project No. 1119060</p> <p>Project No: 909</p>
----------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Figure

Tested By: MF _____ Checked By: KP _____

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	2.0	15.5	6.0	18.8	36.6	21.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	98.0		
.5	92.7		
.375	89.1		
#4	82.5		
#10	76.5		
#30	64.5		
#40	57.7		
#60	42.0		
#100	30.1		
#200	21.1		

Material Description

Dark Grayish Brown

PL= **Atterberg Limits** PI=

Coefficients

D₉₀= 10.3186 D₈₅= 6.4009 D₆₀= 0.4690

D₅₀= 0.3245 D₃₀= 0.1492 D₁₅=

D₁₀= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

* (no specification provided)

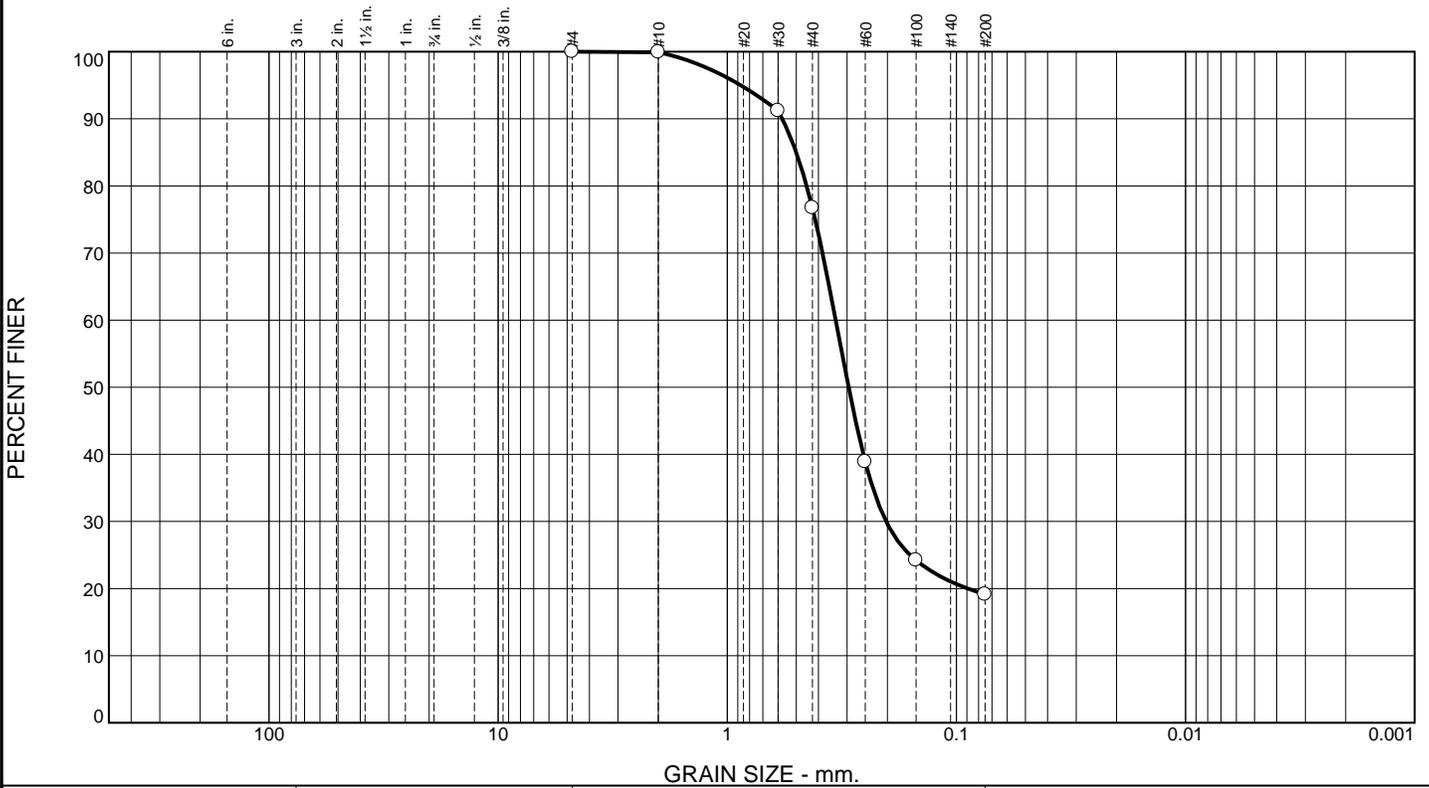
Sample Number: B-62-1 S-5 8-10'

Date: 1-13-20

<p>RSA Geolab</p> <p>Union, New Jersey</p>	<p>Client: MFS Consulting Engineers and Surveyor, DPC</p> <p>Project: Brooklyn Navy Yard DC Boilers Project No. 1119060</p> <p>Project No: 909</p>
<p>Figure</p>	

Tested By: EE Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	23.2	57.6	19.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#30	91.2		
#40	76.7		
#60	38.9		
#100	24.2		
#200	19.1		

Material Description

Dark Gray

Atterberg Limits
 PL= LL= PI=

Coefficients
 D₉₀= 0.5756 D₈₅= 0.5003 D₆₀= 0.3365
 D₅₀= 0.2954 D₃₀= 0.2026 D₁₅=
 D₁₀= C_u= C_c=

Classification
 USCS= AASHTO=

Remarks

* (no specification provided)

Sample Number: B-62-1 S-10B 30-32'

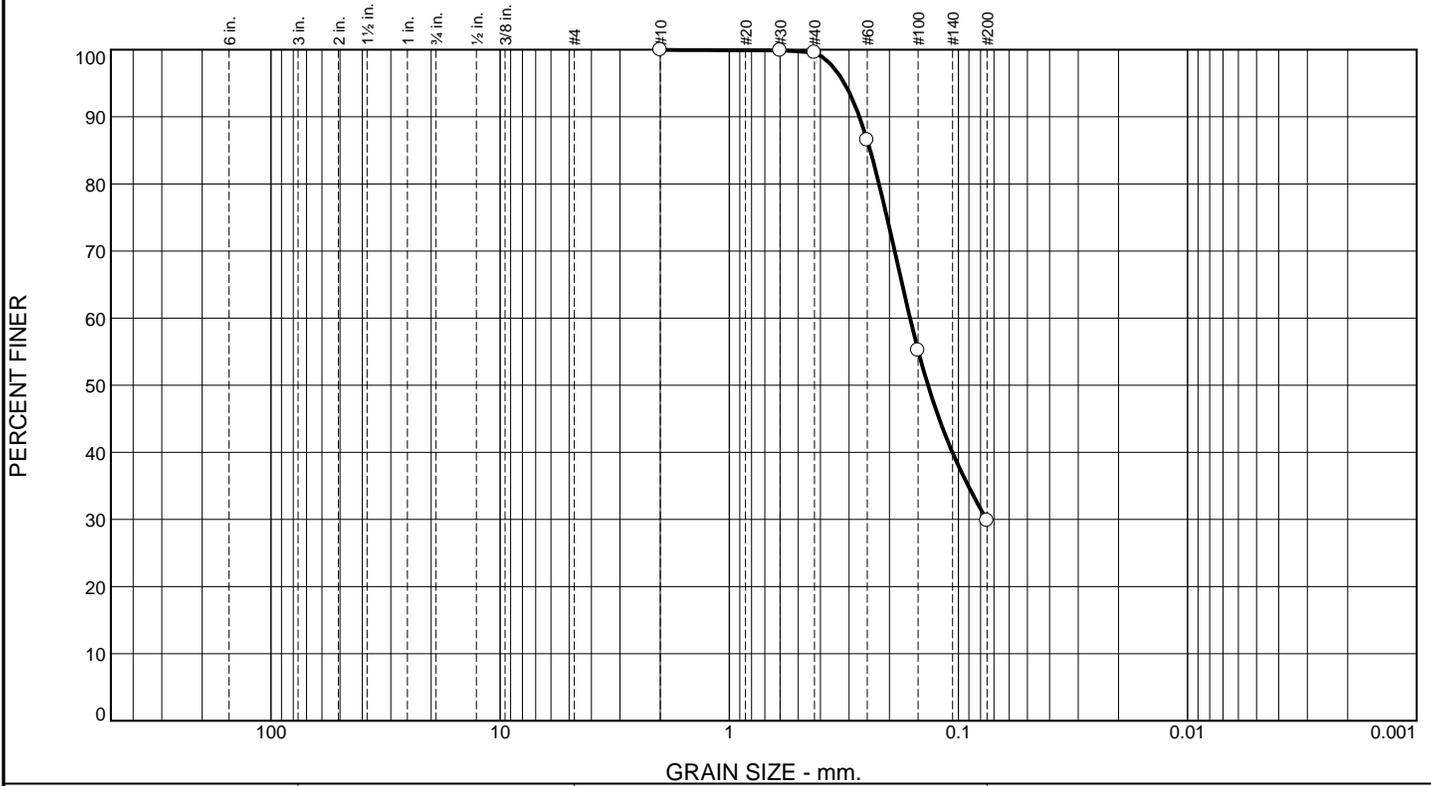
Date: 1-13-20

<p>RSA Geolab</p> <p>Union, New Jersey</p>	<p>Client: MFS Consulting Engineers and Surveyor, DPC</p> <p>Project: Brooklyn Navy Yard DC Boilers Project No. 1119060</p> <p>Project No: 909</p>
----------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Figure

Tested By: MF Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
				0.4	69.8		29.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#30	99.9		
#40	99.6		
#60	86.5		
#100	55.2		
#200	29.8		

Material Description

Grayish Brown

Atterberg Limits
 PL= LL= PI=

Coefficients
 D₉₀= 0.2701 D₈₅= 0.2426 D₆₀= 0.1626
 D₅₀= 0.1358 D₃₀= 0.0755 D₁₅=
 D₁₀= C_u= C_c=

Classification
 USCS= AASHTO=

Remarks

* (no specification provided)

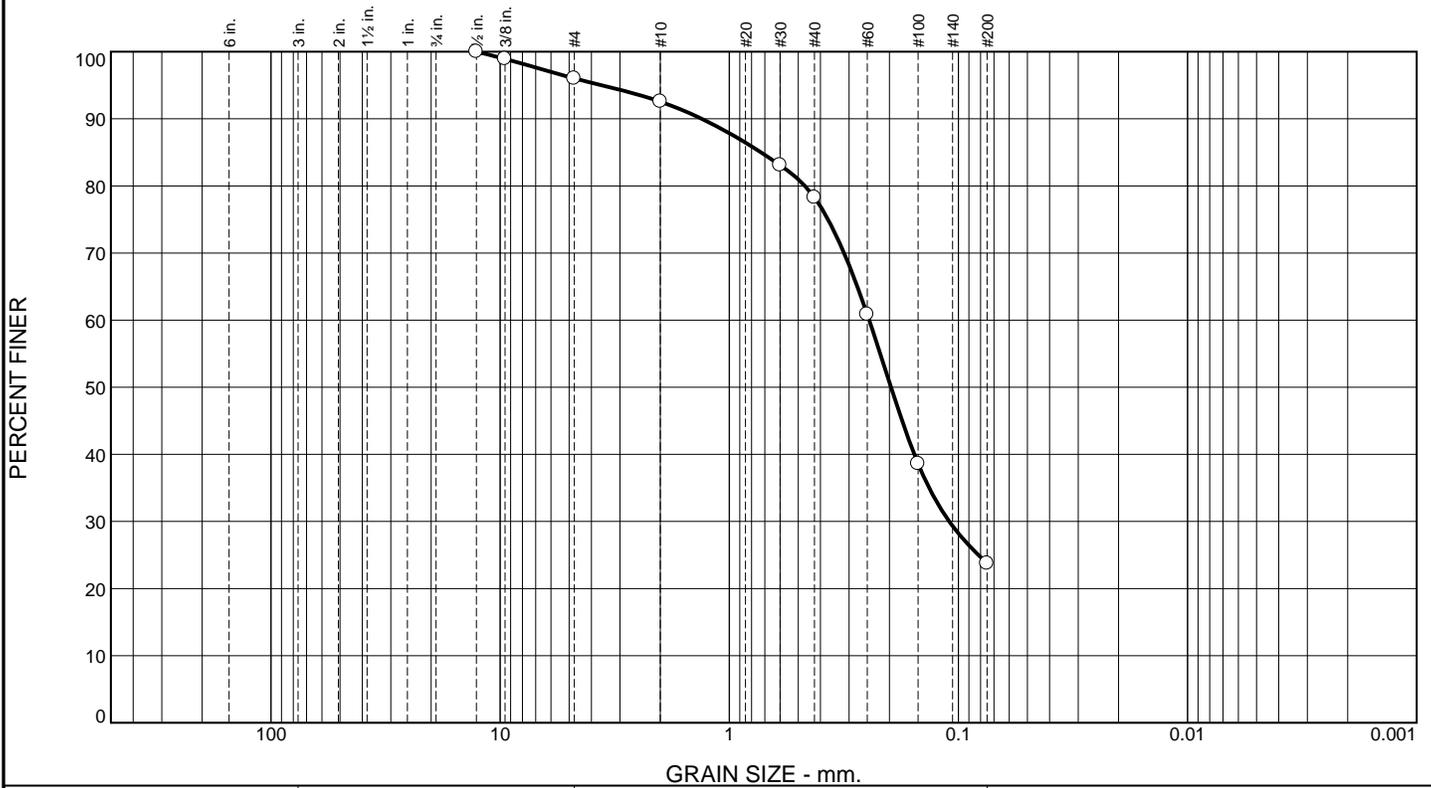
Sample Number: B-62-1 S-16 58-60'

Date: 1-13-20

RSA Geolab Union, New Jersey	Client: MFS Consulting Engineers and Surveyor, DPC Project: Brooklyn Navy Yard DC Boilers Project No. 1119060 Project No: 909
Figure	

Tested By: MF Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.0	3.4	14.3	54.5	23.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5	100.0		
.375	98.9		
#4	96.0		
#10	92.6		
#30	83.1		
#40	78.3		
#60	60.9		
#100	38.6		
#200	23.8		

Material Description

Light Grayish Brown

Atterberg Limits
 PL= LL= PI=

Coefficients
 D₉₀= 1.3188 D₈₅= 0.7273 D₆₀= 0.2451
 D₅₀= 0.1969 D₃₀= 0.1097 D₁₅=
 D₁₀= C_u= C_c=

Classification
 USCS= AASHTO=

Remarks

* (no specification provided)

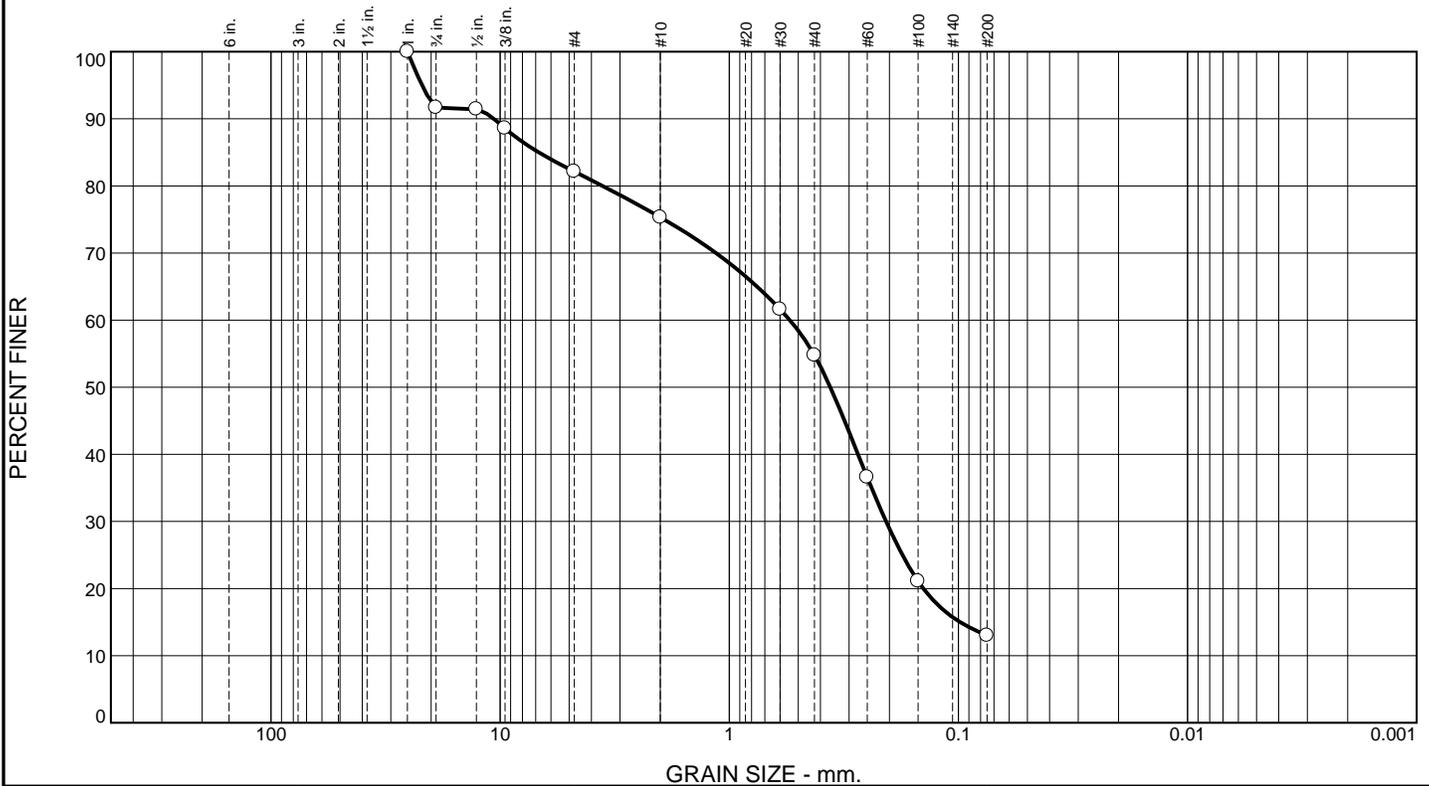
Sample Number: B-234-1C S-3 6-8'

Date: 1-13-20

RSA Geolab Union, New Jersey	Client: MFS Consulting Engineers and Surveyor, DPC Project: Brooklyn Navy Yard DC Boilers Project No. 1119060 Project No: 909
Figure	

Tested By: EE _____ **Checked By:** KP _____

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	8.3	9.5	6.9	20.5	41.8	13.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	91.7		
.5	91.4		
.375	88.6		
#4	82.2		
#10	75.3		
#30	61.6		
#40	54.8		
#60	36.6		
#100	21.1		
#200	13.0		

Material Description

Dark Grayish Brown

PL= **Atterberg Limits** PI=

Coefficients

D₈₅= 10.6593 D₈₅= 6.7851 D₆₀= 0.5443

D₅₀= 0.3624 D₃₀= 0.2068 D₁₅= 0.0983

D₁₀= C_u= C_c=

USCS= **Classification** AASHTO=

Remarks

* (no specification provided)

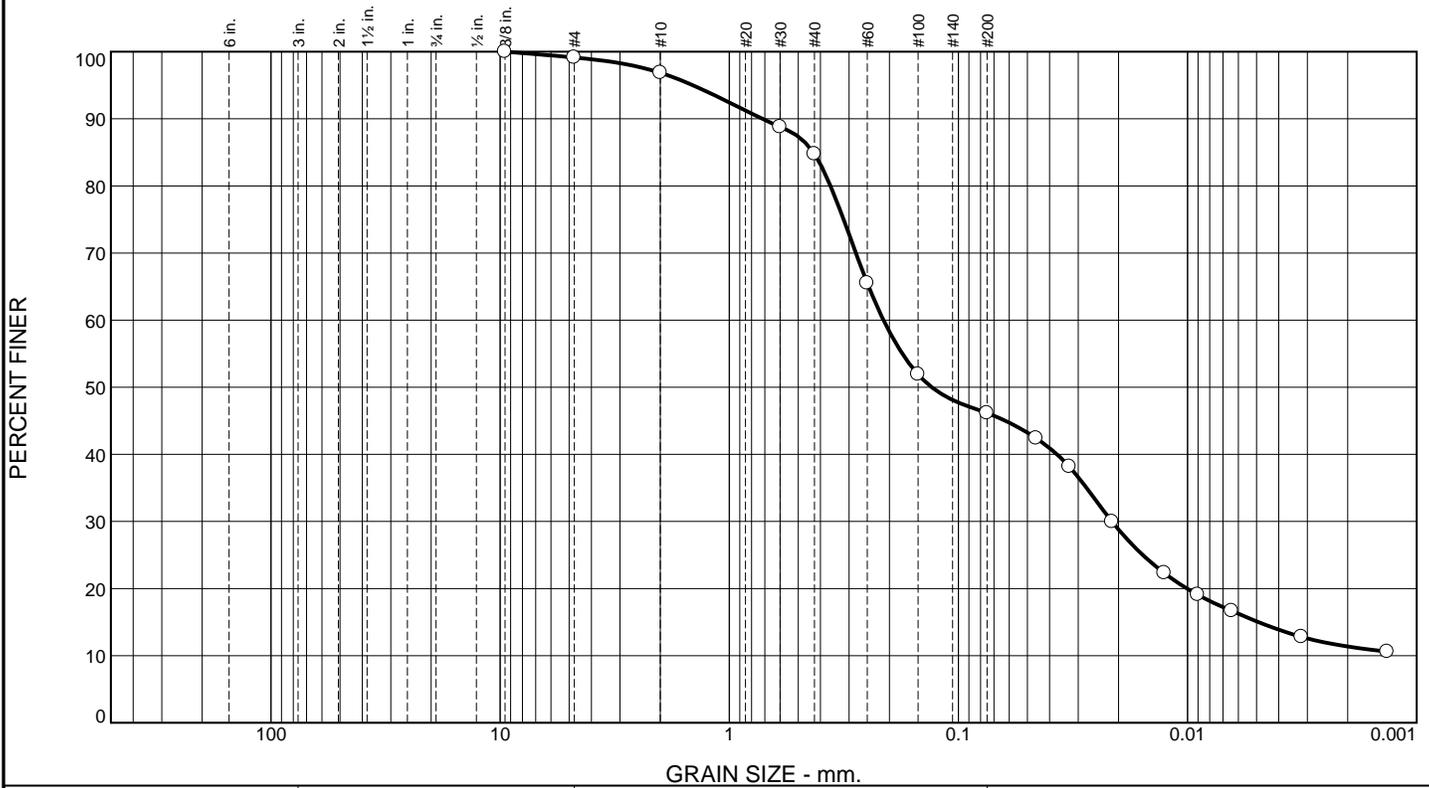
Sample Number: B-234-1C S-5 10-12'

Date: 1-13-20

<p>RSA Geolab</p> <p>Union, New Jersey</p>	<p>Client: MFS Consulting Engineers and Surveyor, DPC</p> <p>Project: Brooklyn Navy Yard DC Boilers Project No. 1119060</p> <p>Project No: 909</p>
<p>Figure</p>	

Tested By: MF Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.9	2.2	12.2	38.5	31.1	15.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.1		
#10	96.9		
#30	88.8		
#40	84.7		
#60	65.5		
#100	51.9		
#200	46.2		

Material Description

Gray

PL= **Atterberg Limits** PI=

LL= PI=

Coefficients

D ₉₀ = 0.7167	D ₈₅ = 0.4299	D ₆₀ = 0.2123
D ₅₀ = 0.1307	D ₃₀ = 0.0214	D ₁₅ = 0.0049
D ₁₀ =	C _u =	C _c =

Classification

USCS= AASHTO=

Remarks

SG Assumed

* (no specification provided)

Sample Number: B-234-1C S-9 35-37'

Date: 1-13-20

<p>RSA Geolab</p> <p>Union, New Jersey</p>	<p>Client: MFS Consulting Engineers and Surveyor, DPC</p> <p>Project: Brooklyn Navy Yard DC Boilers Project No. 1119060</p> <p>Project No: 909</p>
<p>Figure</p>	

Tested By: MF Checked By: KP

RSA Geolab

LOSS ON IGNITION (ASTM D2974)

Project: Brooklyn Navy Yard DC Boilers
Project#1119060

Project #: 909

Client: MFS Consulting Engineers and Surveyor, DPC

Date: 1-13-20

HOLE #/ SAMPLE #	B-234-1C S-3	B-234-1C S-5	B-234-1C S-7			
DEPTH	6-8'	10-12'	25-27'			
OVEN DRIED SAMPLE + TARE (gms.)	63.73	82.47	88.99			
AFTER IGNITION SAMPLE + TARE (gms.)	63.19	81.66	81.36			
LOSS ON IGNITION (gms.)	0.54	0.81	7.63	0.00	0.00	0.00
TARE (gms.)	31.22	52.10	57.20			
INITIAL WGT. OF OVEN DRIED SAMPLE (gms.)	32.51	30.37	31.79	0.00	0.00	0.00
LOSS ON IGNITION (%)	1.66	2.67	24.00	0.00	0.00	0.00

Performed by: EE

Entered by: KH

Checked by: KP



RSA GEOLAB, LLC

1017 Greeley Avenue North
Union, New Jersey 07083
908-964-0786 (P)
www.RSAGEOLAB.com

Letter of Transmittal

Date: 1-14-20

Job No.: 909

Lab Log: 19-563

Attention: Jacob Fradkin
MFS Consulting Engineers and Surveyor, DPC
2780 Hamilton Boulevard
South Plainfield, NJ 07080

CC:

Re: Brooklyn Navy Yard DC Boilers
Project#1119060

Sample(s) ID: **B-234-1C S-12 thru B-386-2 S-15B**

Dear Mr. Fradkin,

Please find attached results for the samples referenced above. The following lab testing was performed:

- ASTM D2216 Moisture Content (19 tests)
- ASTM D4318 Atterberg Limits (3 tests)
- ASTM D422 Washed Sieve Analysis (16 tests)

Regards,
RSA Geolab, LLC

Remarks: If you have any questions, please call 908-964-0786.

Signed: _____

Dr. Raza S. Ahmed
President RSA Geolab, LLC

RSA's Geolab's Geotechnical Laboratory testing was performed and results reported in accordance with ASTM standards and accepted industry standards. No other representations or warranties either express or implied are given. RSA Geolab, LLC neither accepts responsibility for nor makes claim to the final use and purpose of the material tested. RSA Geolab, LLC owns all rights, title and interest of the work product. This report is intended for client's sole and exclusive use and not for the benefit of others and may not be used or relied upon by others. These documents must be considered proprietary information and should not be reproduced without the written approval of RSA Geolab, LLC.

RSA Geolab	MOISTURE CONTENTS			
	TEST METHOD ASTM D-2216			
CLIENT:	MFS Consulting Engineers and Surveyor, DPC	DATE:	14-Jan-20	
PROJECT:	Brooklyn Navy Yard DC Boilers Project#1119060	PROJECT #	909	

HOLE #/ SAMPLE #	B-234-1C S-12	B-234-1C S-14	B-293-1 S-2	B-293-1 S-5	B-293-1 S-9
DEPTH	50-52'	60-62'	4-6'	10-12'	30-32'
WET WGT. + tare (gms.)	116.2	414.9	357.3	435.4	408.0
DRY WGT. + tare (gms.)	87.6	349.0	334.0	380.2	351.6
WGT. WATER (gms.)	28.6	65.9	23.3	55.2	56.4
TARE (gms.)	8.2	6.9	6.9	6.9	7.0
DRY WGT. (gms.)	79.4	342.1	327.1	373.3	344.6
MOISTURE CONTENT	36.0%	19.3%	7.1%	14.8%	16.4%

HOLE #/ SAMPLE #	B-293-1 S-13	B-293-1 S-15	B-293-1 S-16	B-293-1 S-17	B-386-1B S-1
DEPTH	50-52'	58-60'	65-67'	68-70'	6-8'
WET WGT. + tare (gms.)	389.3	349.8	151.3	379.3	469.9
DRY WGT. + tare (gms.)	312.8	288.1	110.9	309.5	413.8
WGT. WATER (gms.)	76.5	61.7	40.4	69.8	56.1
TARE (gms.)	7.0	7.1	8.3	7.0	7.1
DRY WGT. (gms.)	305.8	281.0	102.6	302.5	406.7
MOISTURE CONTENT	25.0%	22.0%	39.4%	23.1%	13.8%

Performed by: EE Entered by: KH Checked by: KP

RSA Geolab	MOISTURE CONTENTS			
	TEST METHOD ASTM D-2216			
CLIENT:	MFS Consulting Engineers and Surveyor, DPC	DATE:	14-Jan-20	
PROJECT:	Brooklyn Navy Yard DC Boilers Project#1119060	PROJECT #	909	

HOLE #/ SAMPLE #	B-386-1B S-5	B-386-1B S-8	B-386-1B S-11	B-386-1B S-13	B-386-1B S-15
DEPTH	20-22'	35-37'	50-52'	60-62'	68-70'
WET WGT. + tare (gms.)	430.6	297.5	381.5	139.4	408.8
DRY WGT. + tare (gms.)	378.7	263.8	330.1	103.2	332.7
WGT. WATER (gms.)	51.9	33.7	51.4	36.2	76.1
TARE (gms.)	7.0	7.0	6.9	7.1	7.0
DRY WGT. (gms.)	371.7	256.8	323.2	96.1	325.7
MOISTURE CONTENT	14.0%	13.1%	15.9%	37.7%	23.4%

HOLE #/ SAMPLE #	B-386-2 S-3	B-386-2 S-8	B-386-2 S-11	B-386-2 S-15B	
DEPTH	6-8'	25-27'	40-42'	58-60'	
WET WGT. + tare (gms.)	402.4	324.4	424.0	428.0	
DRY WGT. + tare (gms.)	352.7	279.2	342.9	348.6	
WGT. WATER (gms.)	49.7	45.2	81.1	79.4	0.0
TARE (gms.)	7.1	8.2	8.6	7.2	
DRY WGT. (gms.)	345.6	271.0	334.3	341.4	0.0
MOISTURE CONTENT	14.4%	16.7%	24.3%	23.3%	

Performed by: EE Entered by: KH Checked by: KP

LIQUID AND PLASTIC LIMIT TEST DATA

1/14/2020

Client: MFS Consulting Engineers and Surveyor, DPC

Project: Brooklyn Navy Yard DC Boilers

Project No. 1119060

Project Number: 909

Sample Number: B-234-1C S-12 50-52'

Material Description: Weak Red Clay & Silt, trace cmf Sand (visual)

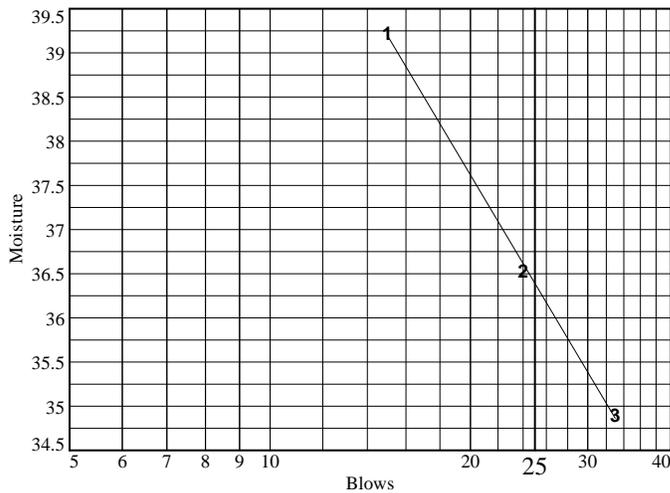
Tested by: SD

Checked by: KP

Testing Remarks: 1-14-20

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	9.21	8.23	9.27			
Dry+Tare	6.97	6.37	7.20			
Tare	1.26	1.28	1.27			
# Blows	15	24	33			
Moisture	39.2	36.5	34.9			

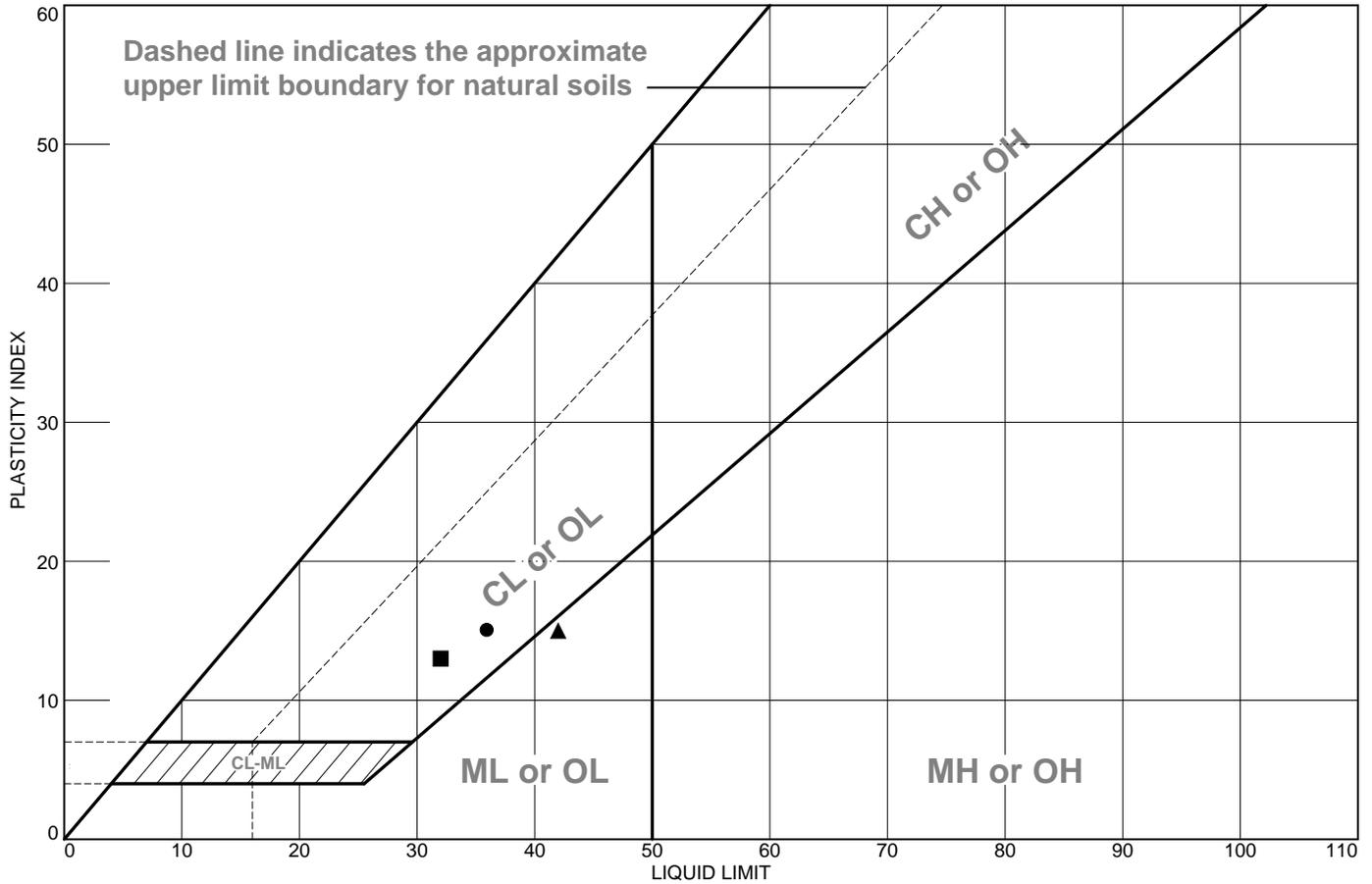


Liquid Limit= 36
Plastic Limit= 21
Plasticity Index= 15

Plastic Limit Data

Run No.	1	2	3	4	
Wet+Tare	6.34	7.60			
Dry+Tare	5.43	6.52			
Tare	1.26	1.26			
Moisture	21.8	20.5			

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Weak Red Clay & Silt, trace cmf Sand (visual)	36	21	15			
■	Weak Red Clay & Silt, trace cmf Sand (visual)	32	19	13			
▲	Weak Red Clay & Silt, trace cmf Sand (visual)	42	27	15			

Project No. 909 **Client:** MFS Consulting Engineers and Surveyor, DPC
Project: Brooklyn Navy Yard DC Boilers
 Project No. 1119060
● Sample Number: B-234-1C S-12 50-52'
■ Sample Number: B-293-1 S-16 65-67'
▲ Sample Number: B-386-1B S-13 60-62'

RSA Geolab
 Union, New Jersey

Remarks:
 ● 1-14-20

Figure

Tested By: SD **Checked By:** KP

LIQUID AND PLASTIC LIMIT TEST DATA

1/14/2020

Client: MFS Consulting Engineers and Surveyor, DPC

Project: Brooklyn Navy Yard DC Boilers

Project No. 1119060

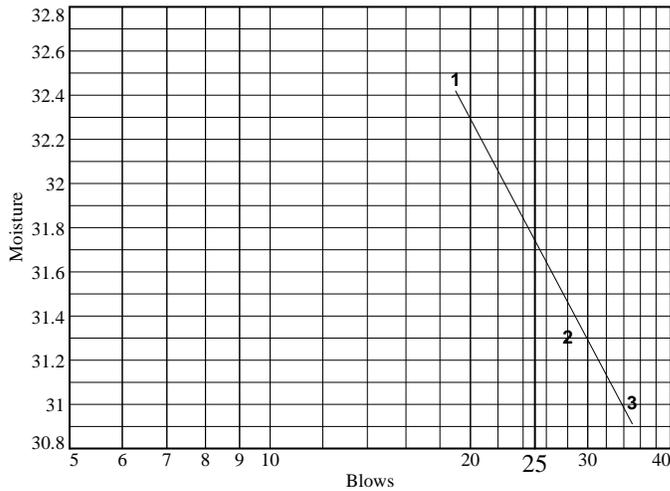
Project Number: 909

Sample Number: B-293-1 S-16 65-67'

Material Description: Weak Red Clay & Silt, trace cmf Sand (visual)

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	9.51	8.39	8.78			
Dry+Tare	7.49	6.69	7.00			
Tare	1.27	1.26	1.26			
# Blows	19	28	35			
Moisture	32.5	31.3	31.0			



Liquid Limit= 32
Plastic Limit= 19
Plasticity Index= 13

Plastic Limit Data

Run No.	1	2	3	4
Wet+Tare	9.51	8.88		
Dry+Tare	8.21	7.65		
Tare	1.26	1.26		
Moisture	18.7	19.2		

LIQUID AND PLASTIC LIMIT TEST DATA

1/14/2020

Client: MFS Consulting Engineers and Surveyor, DPC

Project: Brooklyn Navy Yard DC Boilers

Project No. 1119060

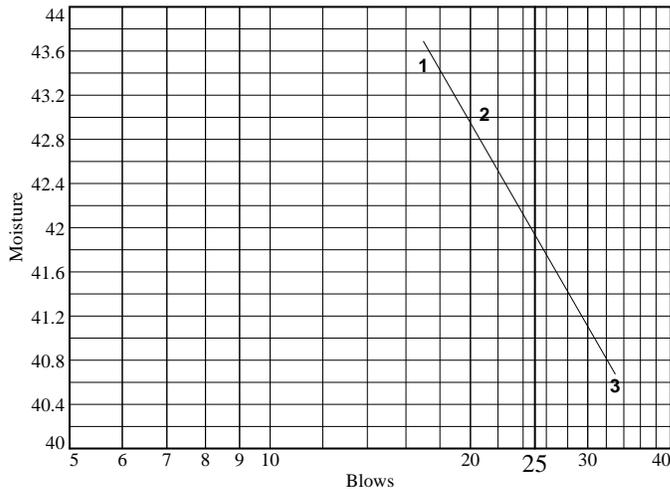
Project Number: 909

Sample Number: B-386-1B S-13 60-62'

Material Description: Weak Red Clay & Silt, trace cmf Sand (visual)

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	9.52	9.29	8.58			
Dry+Tare	7.02	6.88	6.47			
Tare	1.27	1.28	1.27			
# Blows	17	21	33			
Moisture	43.5	43.0	40.6			



Liquid Limit= 42
Plastic Limit= 27
Plasticity Index= 15

Plastic Limit Data

Run No.	1	2	3	4	
Wet+Tare	9.62	8.38			
Dry+Tare	7.86	6.86			
Tare	1.27	1.25			
Moisture	26.7	27.1			

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	12.0	63.0	25.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#30	95.8		
#40	88.0		
#60	62.6		
#100	43.8		
#200	25.0		

Material Description

Dark Reddish Brown

Atterberg Limits

PL= LL= PI=

Coefficients

D₉₀= 0.4513 D₈₅= 0.3930 D₆₀= 0.2362

D₅₀= 0.1825 D₃₀= 0.0911 D₁₅=

D₁₀= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

* (no specification provided)

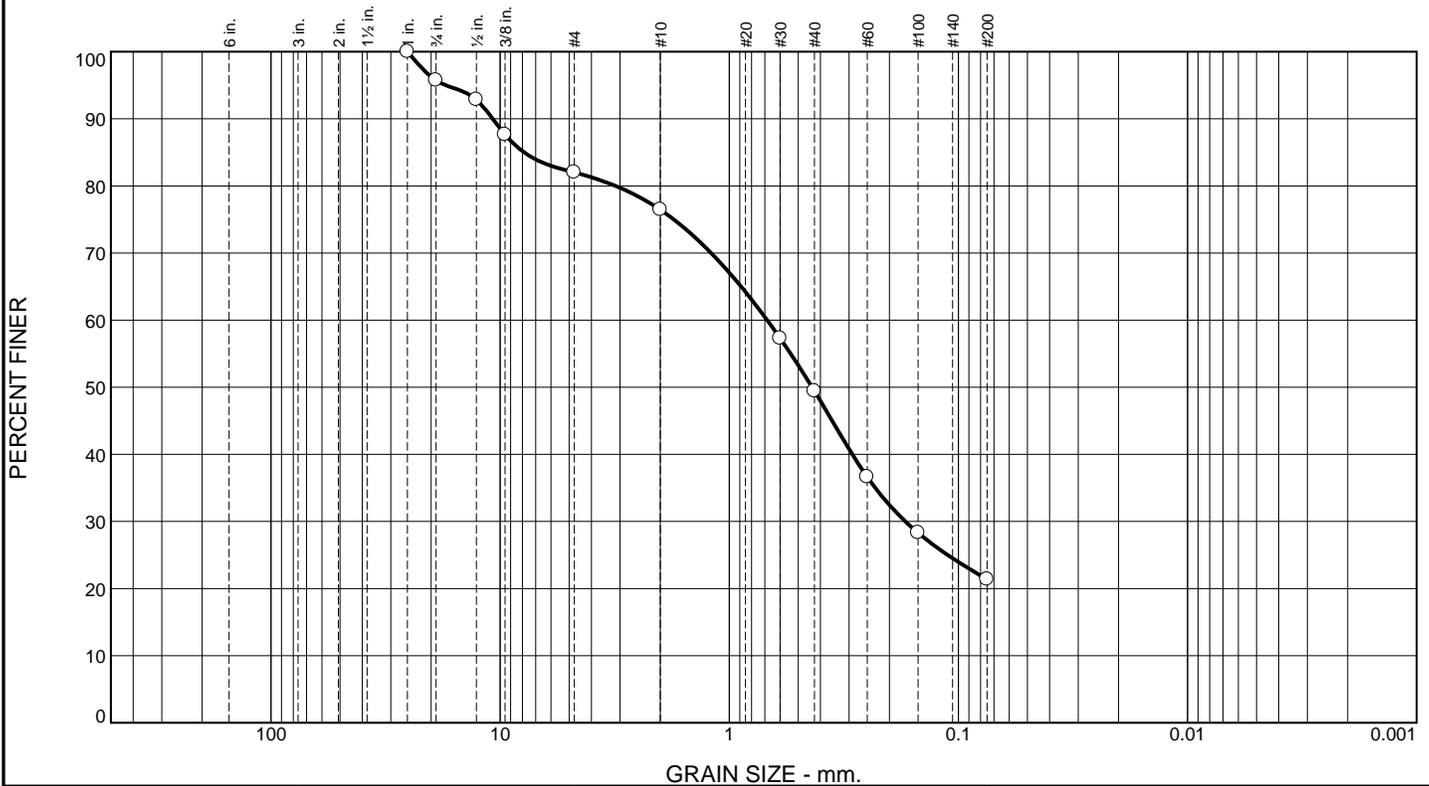
Sample Number: B-234-1C S-14 60-62'

Date: 1-14-20

<p>RSA Geolab</p> <p>Union, New Jersey</p>	<p>Client: MFS Consulting Engineers and Surveyor, DPC</p> <p>Project: Brooklyn Navy Yard DC Boilers Project No. 1119060</p> <p>Project No: 909</p>
<p>Figure</p>	

Tested By: MF **Checked By:** KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	4.3	13.7	5.5	27.1	28.0	21.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	95.7		
.5	92.8		
.375	87.6		
#4	82.0		
#10	76.5		
#30	57.3		
#40	49.4		
#60	36.6		
#100	28.3		
#200	21.4		

Material Description

Strong Brown

PL= **Atterberg Limits** PI=

LL= LL= PI=

Coefficients

D₉₀= 10.7740 D₈₅= 7.8674 D₆₀= 0.6836

D₅₀= 0.4350 D₃₀= 0.1704 D₁₅=

D₁₀= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

* (no specification provided)

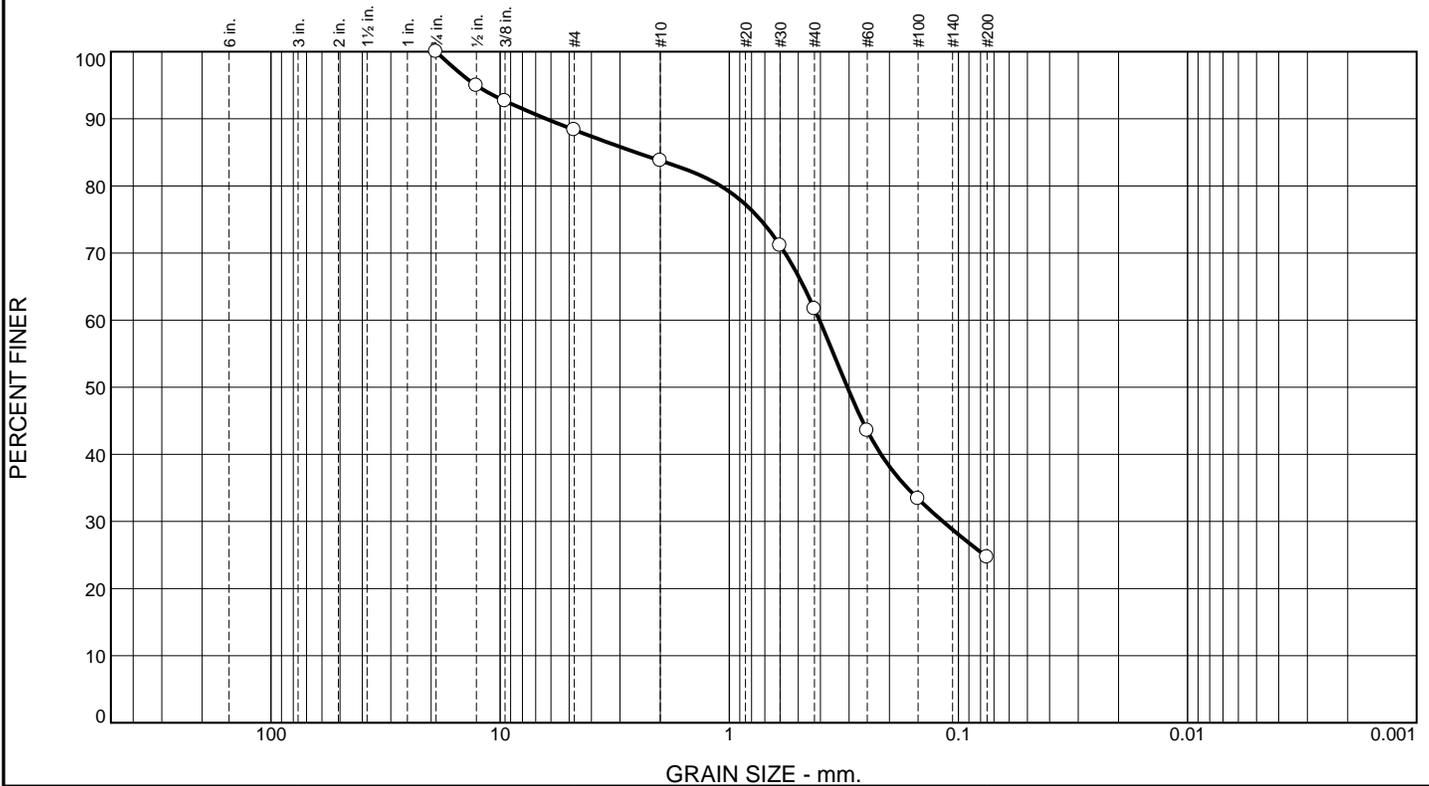
Sample Number: B-293-1 S-2 4-6'

Date: 1-14-20

<p>RSA Geolab</p> <p>Union, New Jersey</p>	<p>Client: MFS Consulting Engineers and Surveyor, DPC</p> <p>Project: Brooklyn Navy Yard DC Boilers Project No. 1119060</p> <p>Project No: 909</p>
<p>Figure</p>	

Tested By: MF Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	11.7	4.5	22.1	37.0	24.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	95.0		
.375	92.7		
#4	88.3		
#10	83.8		
#30	71.1		
#40	61.7		
#60	43.5		
#100	33.4		
#200	24.7		

Material Description

Light Olive Brown

Atterberg Limits

PL= LL= PI=

Coefficients

D₉₀= 6.2991 D₈₅= 2.5574 D₆₀= 0.4044

D₅₀= 0.3053 D₃₀= 0.1169 D₁₅=

D₁₀= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

* (no specification provided)

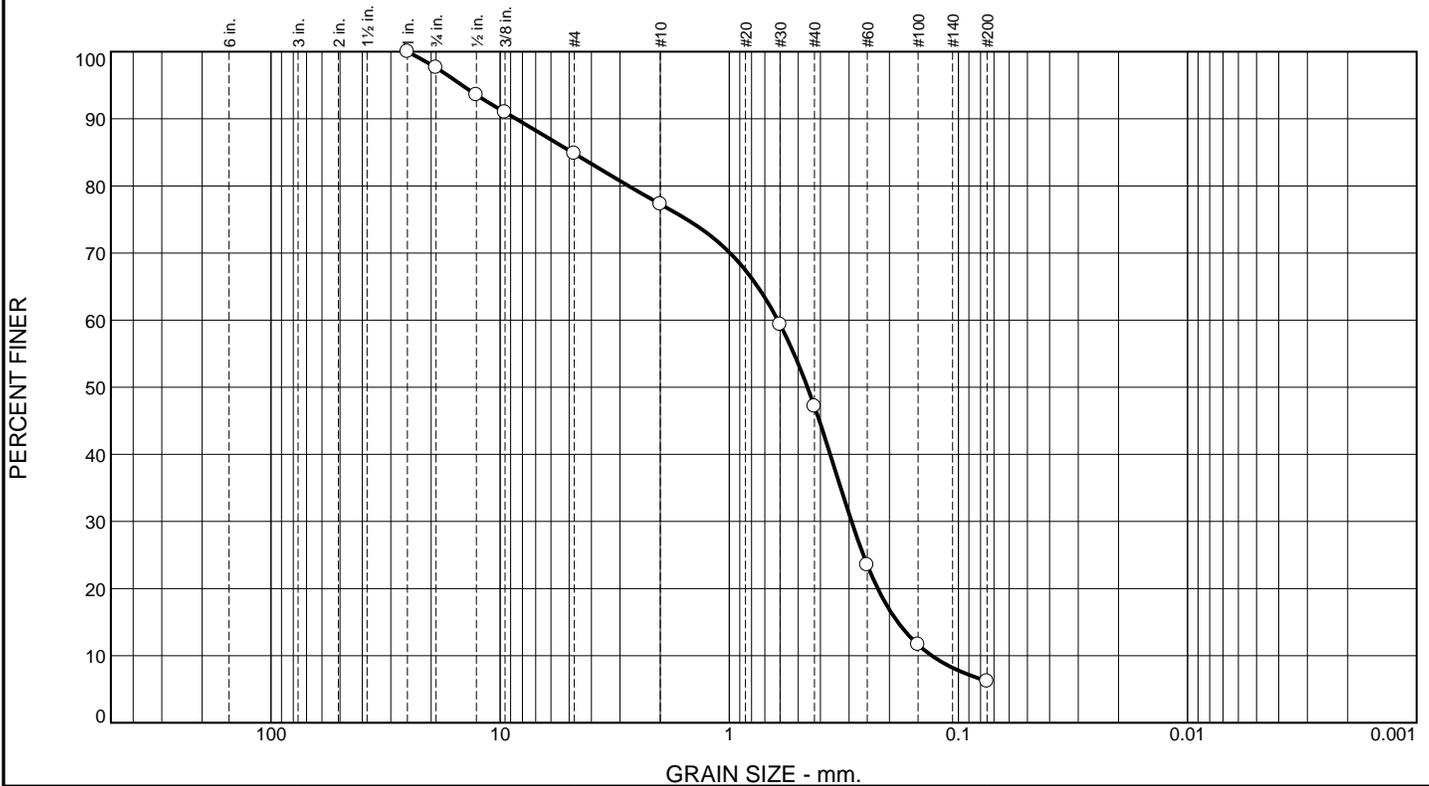
Sample Number: B-293-1 S-5 10-12'

Date: 1-14-20

<p>RSA Geolab</p> <p>Union, New Jersey</p>	<p>Client: MFS Consulting Engineers and Surveyor, DPC</p> <p>Project: Brooklyn Navy Yard DC Boilers Project No. 1119060</p> <p>Project No: 909</p>
<p>Figure</p>	

Tested By: MF **Checked By:** KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	2.4	12.8	7.5	30.1	41.0	6.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	97.6		
.5	93.6		
.375	91.0		
#4	84.8		
#10	77.3		
#30	59.3		
#40	47.2		
#60	23.5		
#100	11.6		
#200	6.2		

Material Description

Yellowish Brown

Atterberg Limits
 PL= LL= PI=

Coefficients
 D₉₀= 8.5175 D₈₅= 4.8453 D₆₀= 0.6141
 D₅₀= 0.4555 D₃₀= 0.2928 D₁₅= 0.1840
 D₁₀= 0.1307 C_u= 4.70 C_c= 1.07

Classification
 USCS= AASHTO=

Remarks

* (no specification provided)

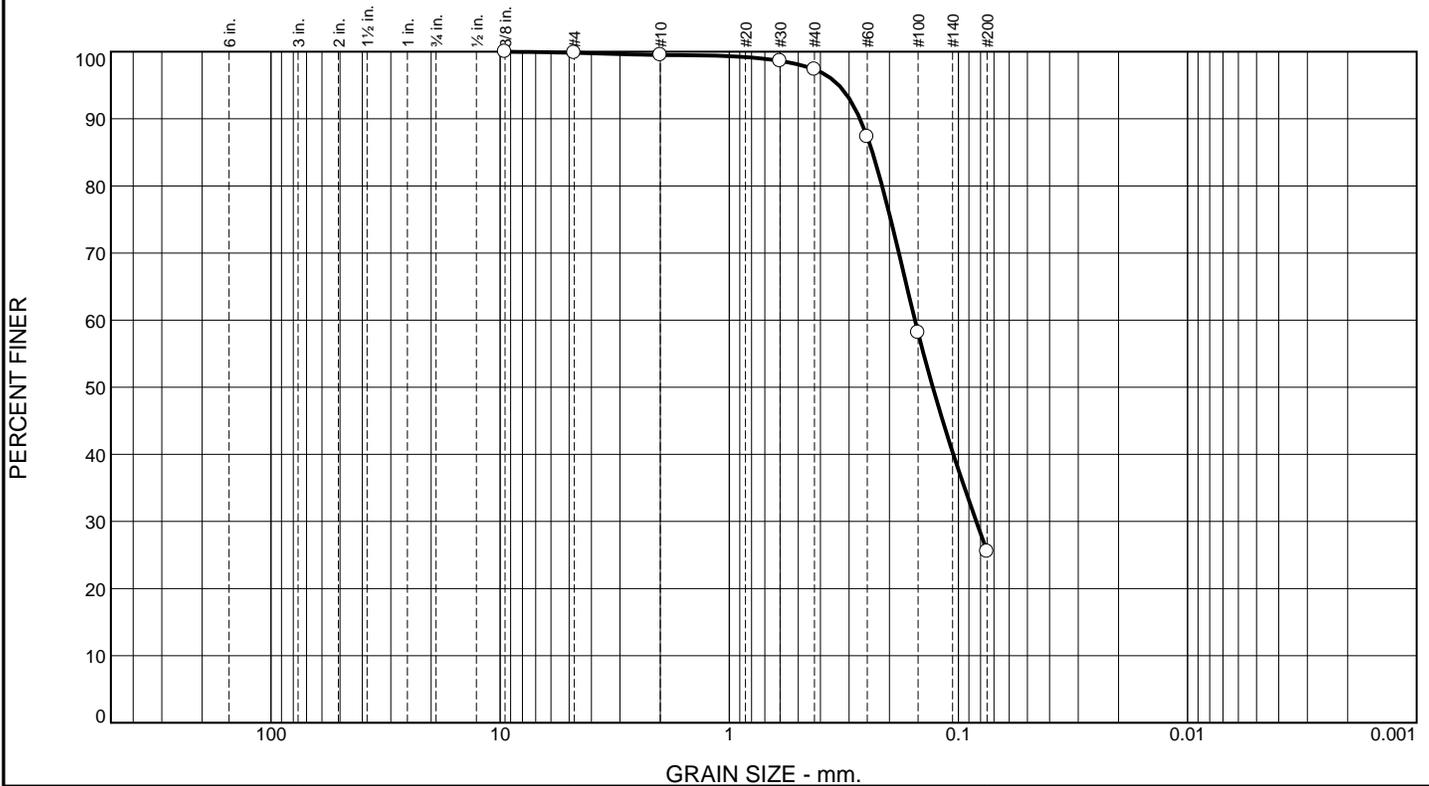
Sample Number: B-293-1 S-9 30-32'

Date: 1-14-20

RSA Geolab Union, New Jersey	Client: MFS Consulting Engineers and Surveyor, DPC Project: Brooklyn Navy Yard DC Boilers Project No. 1119060 Project No: 909
Figure	

Tested By: MF Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.3	2.1	71.9	25.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.8		
#10	99.5		
#30	98.6		
#40	97.4		
#60	87.3		
#100	58.1		
#200	25.5		

Material Description

Dark Yellowish Brown

Atterberg Limits

PL= LL= PI=

Coefficients

D₉₀= 0.2688 D₈₅= 0.2373 D₆₀= 0.1548
D₅₀= 0.1294 D₃₀= 0.0835 D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

* (no specification provided)

Sample Number: B-293-1 S-13 50-52'

Date: 1-14-20

<p>RSA Geolab</p> <p>Union, New Jersey</p>	<p>Client: MFS Consulting Engineers and Surveyor, DPC</p> <p>Project: Brooklyn Navy Yard DC Boilers Project No. 1119060</p> <p>Project No: 909</p>
----------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Figure

Tested By: MF Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.6	21.0	71.6	5.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	98.4		
#30	89.4		
#40	77.4		
#60	35.1		
#100	14.1		
#200	5.8		

Material Description

Grayish Brown

Atterberg Limits

PL= LL= PI=

Coefficients

D₉₀= 0.6203 D₈₅= 0.5040 D₆₀= 0.3372

D₅₀= 0.3007 D₃₀= 0.2309 D₁₅= 0.1563

D₁₀= 0.1182 C_u= 2.85 C_c= 1.34

Classification

USCS= AASHTO=

Remarks

* (no specification provided)

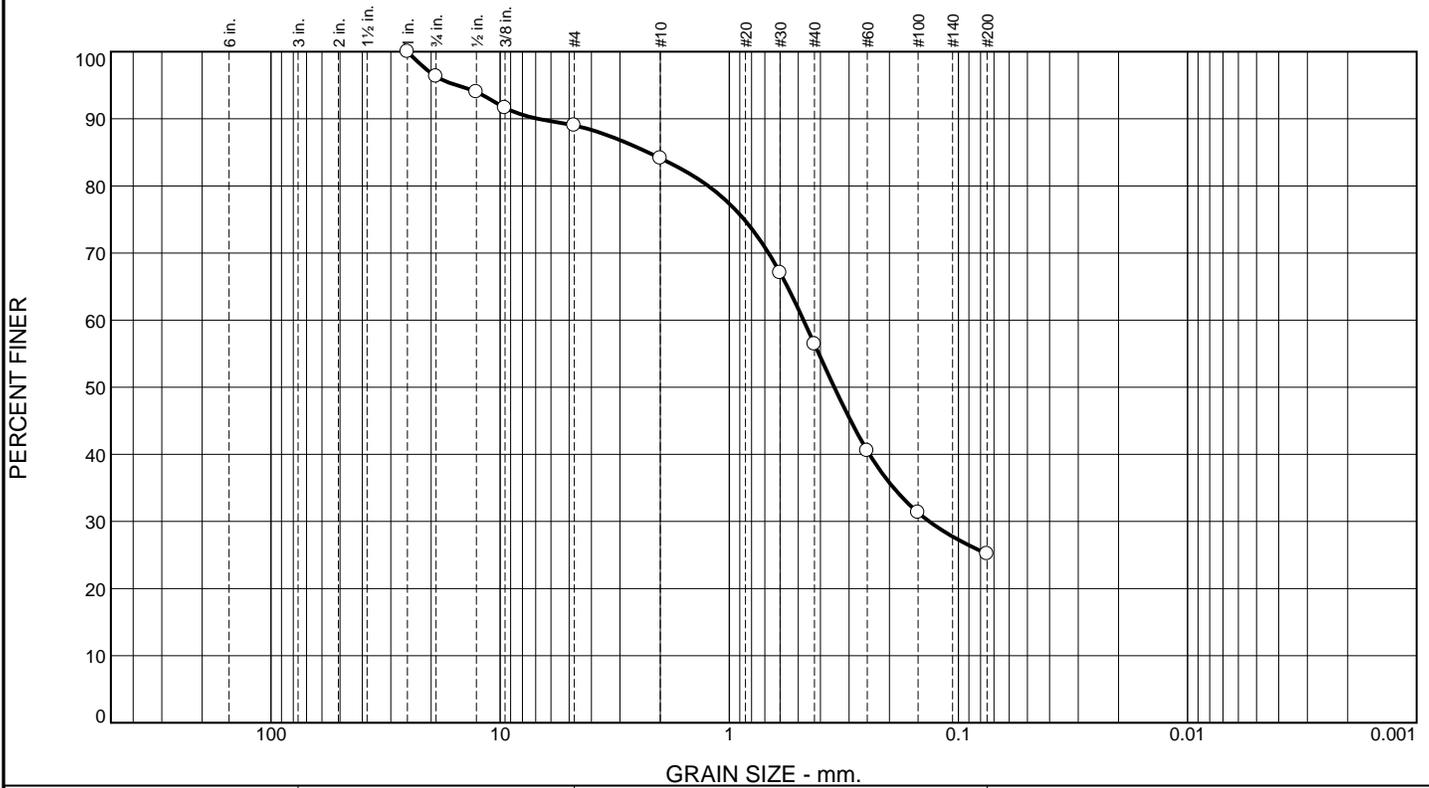
Sample Number: B-293-1 S-17 68-70'

Date: 1-14-20

<p>RSA Geolab</p> <p>Union, New Jersey</p>	<p>Client: MFS Consulting Engineers and Surveyor, DPC</p> <p>Project: Brooklyn Navy Yard DC Boilers Project No. 1119060</p> <p>Project No: 909</p>
<p>Figure</p>	

Tested By: EE Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.7	7.3	4.9	27.7	31.2	25.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	96.3		
.5	94.0		
.375	91.6		
#4	89.0		
#10	84.1		
#30	67.1		
#40	56.4		
#60	40.5		
#100	31.3		
#200	25.2		

Material Description

Brownish Yellow

PL= **Atterberg Limits** PI=

Coefficients

D₉₀= 6.8394 D₈₅= 2.2655 D₆₀= 0.4745

D₅₀= 0.3481 D₃₀= 0.1341 D₁₅=

D₁₀= C_u= C_c=

USCS= **Classification** AASHTO=

Remarks

* (no specification provided)

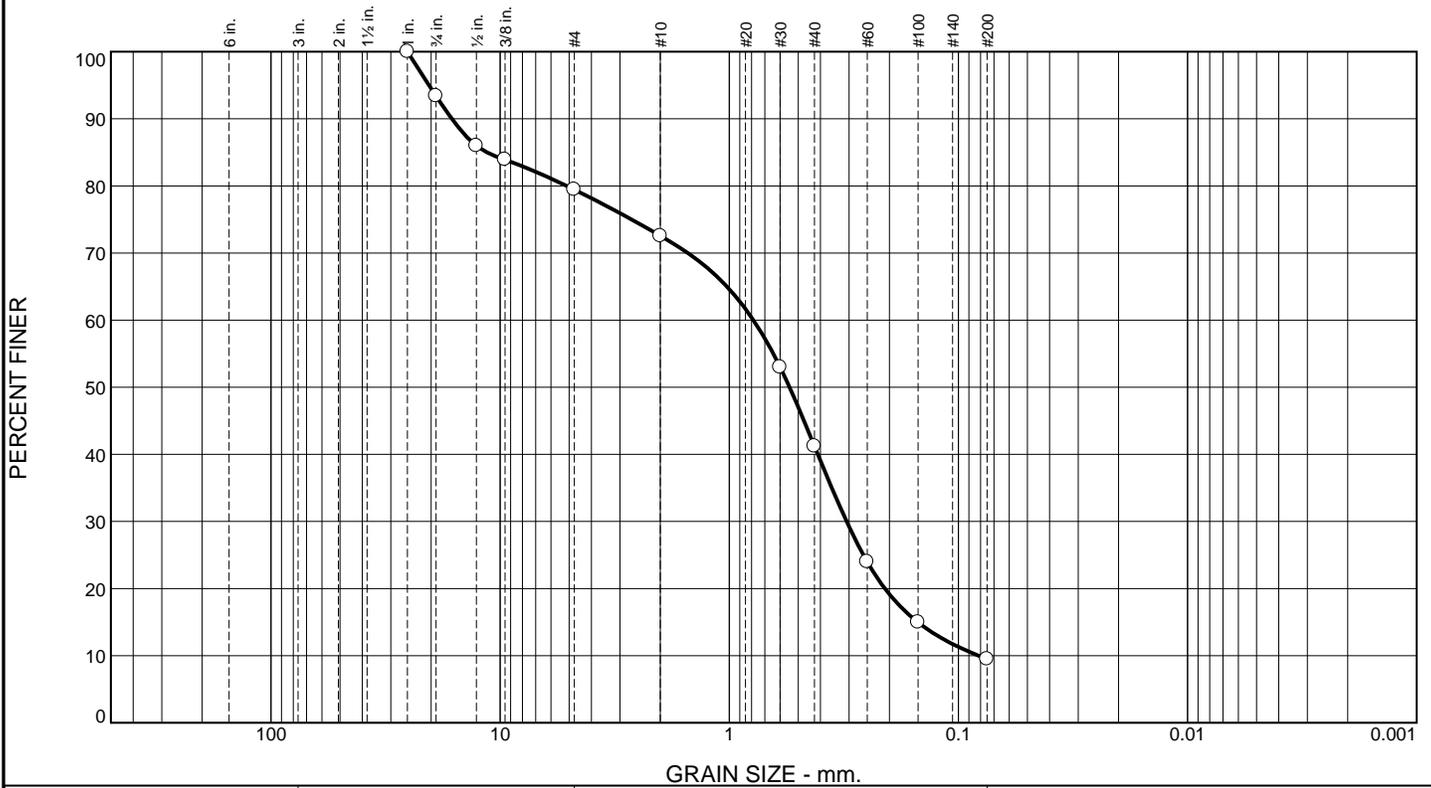
Sample Number: B-386-1B S-1 6-8'

Date: 1-14-20

RSA Geolab Union, New Jersey	Client: MFS Consulting Engineers and Surveyor, DPC Project: Brooklyn Navy Yard DC Boilers Project No. 1119060 Project No: 909
Figure	

Tested By: EE Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	6.6	14.0	6.8	31.4	31.7	9.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	93.4		
.5	86.0		
.375	83.9		
#4	79.4		
#10	72.6		
#30	53.0		
#40	41.2		
#60	24.0		
#100	15.0		
#200	9.5		

Material Description

Dark Olive

PL= **Atterberg Limits** PI=

LL= PI=

Coefficients

D ₉₀ = 16.2462	D ₈₅ = 11.4370	D ₆₀ = 0.7852
D ₅₀ = 0.5459	D ₃₀ = 0.3076	D ₁₅ = 0.1505
D ₁₀ = 0.0818	C _u = 9.60	C _c = 1.47

Classification

USCS= AASHTO=

Remarks

* (no specification provided)

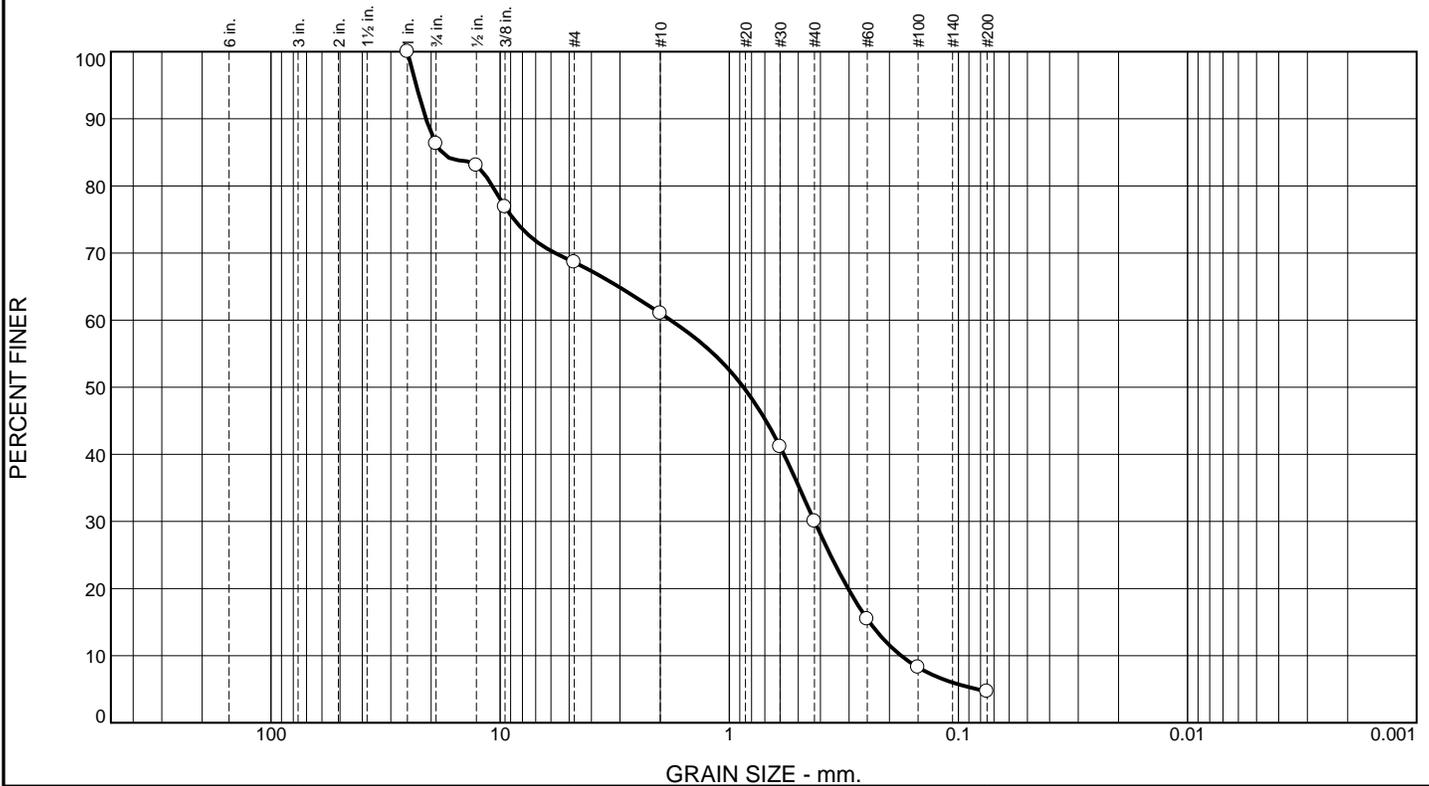
Sample Number: B-386-1B S-5 20-22'

Date: 1-14-20

<p>RSA Geolab</p> <p>Union, New Jersey</p>	<p>Client: MFS Consulting Engineers and Surveyor, DPC</p> <p>Project: Brooklyn Navy Yard DC Boilers Project No. 1119060</p> <p>Project No: 909</p>
<p>Figure</p>	

Tested By: EE Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	13.7	17.7	7.6	31.0	25.3	4.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	86.3		
.5	83.1		
.375	76.9		
#4	68.6		
#10	61.0		
#30	41.1		
#40	30.0		
#60	15.5		
#100	8.3		
#200	4.7		

Material Description

Yellowish Brown

Atterberg Limits
 PL= LL= PI=

Coefficients
 D₉₀= 21.0663 D₈₅= 17.9524 D₆₀= 1.8043
 D₅₀= 0.8670 D₃₀= 0.4247 D₁₅= 0.2444
 D₁₀= 0.1778 C_u= 10.15 C_c= 0.56

Classification
 USCS= SP AASHTO=

Remarks

* (no specification provided)

Sample Number: B-386-1B S-8 35-37'

Date: 1-14-20

RSA Geolab Union, New Jersey	Client: MFS Consulting Engineers and Surveyor, DPC Project: Brooklyn Navy Yard DC Boilers Project No. 1119060 Project No: 909
Figure	

Tested By: EE Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	21.7	4.5	6.1	29.1	32.6	6.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	89.2		
.75	78.3		
.5	78.3		
.375	77.0		
#4	73.8		
#10	67.7		
#30	49.8		
#40	38.6		
#60	20.4		
#100	11.2		
#200	6.0		

Material Description

Grayish Brown

PL= **Atterberg Limits** PI=

LL= LL= PI=

Coefficients

D ₉₀ = 25.9373	D ₈₅ = 22.9793	D ₆₀ = 0.9703
D ₅₀ = 0.6040	D ₃₀ = 0.3357	D ₁₅ = 0.1958
D ₁₀ = 0.1332	C _u = 7.29	C _c = 0.87

Classification

USCS= AASHTO=

Remarks

* (no specification provided)

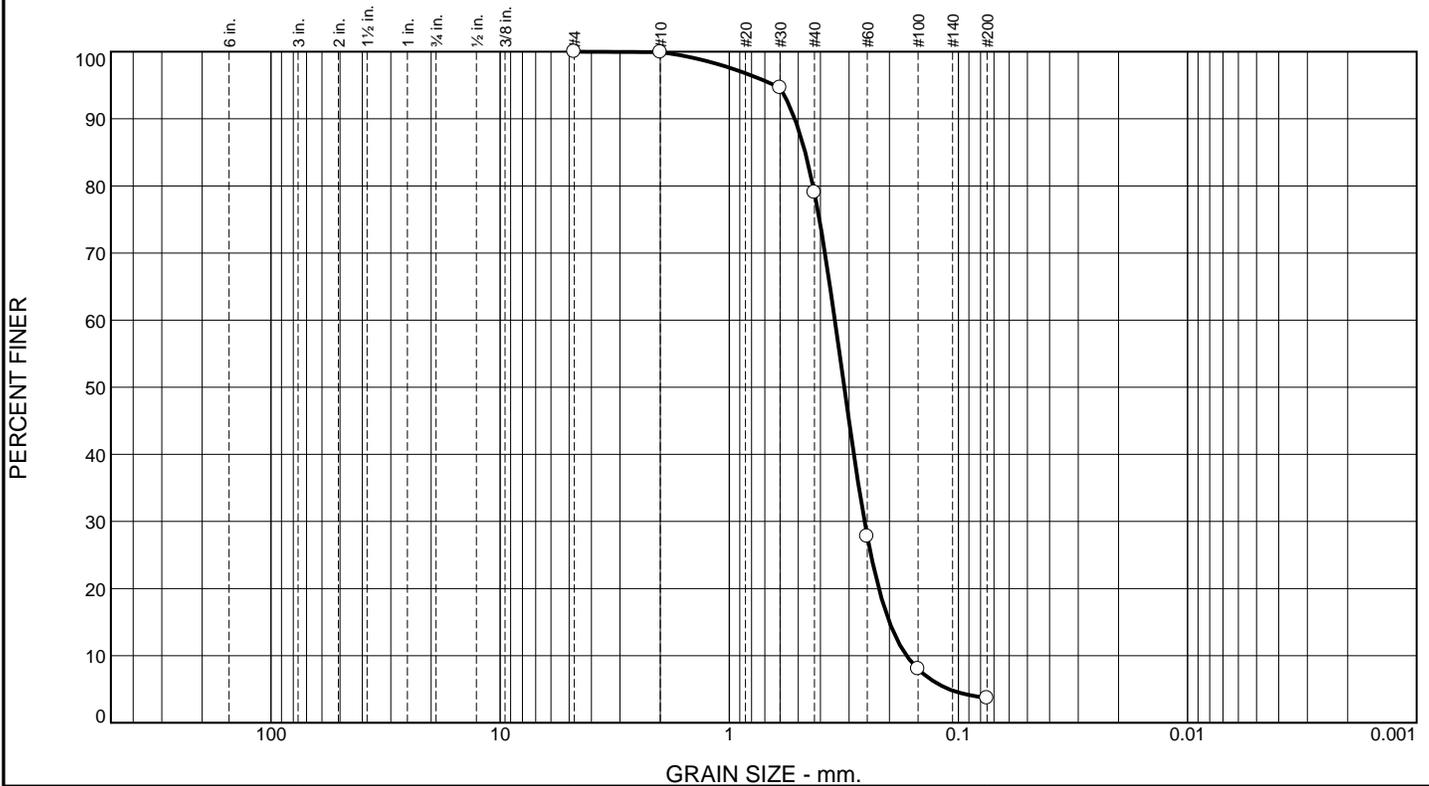
Sample Number: B-386-1B S-11 50-52'

Date: 1-14-20

<p>RSA Geolab</p> <p>Union, New Jersey</p>	<p>Client: MFS Consulting Engineers and Surveyor, DPC</p> <p>Project: Brooklyn Navy Yard DC Boilers Project No. 1119060</p> <p>Project No: 909</p>
<p>Figure</p>	

Tested By: EE Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	20.9	75.3	3.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#30	94.6		
#40	79.0		
#60	27.8		
#100	8.0		
#200	3.7		

Material Description

Light Grayish Brown

PL= **Atterberg Limits** PI=

Coefficients

D₉₀= 0.5179 D₈₅= 0.4658 D₆₀= 0.3461

D₅₀= 0.3150 D₃₀= 0.2569 D₁₅= 0.2001

D₁₀= 0.1684 C_u= 2.05 C_c= 1.13

USCS= SP **Classification** AASHTO=

Remarks

* (no specification provided)

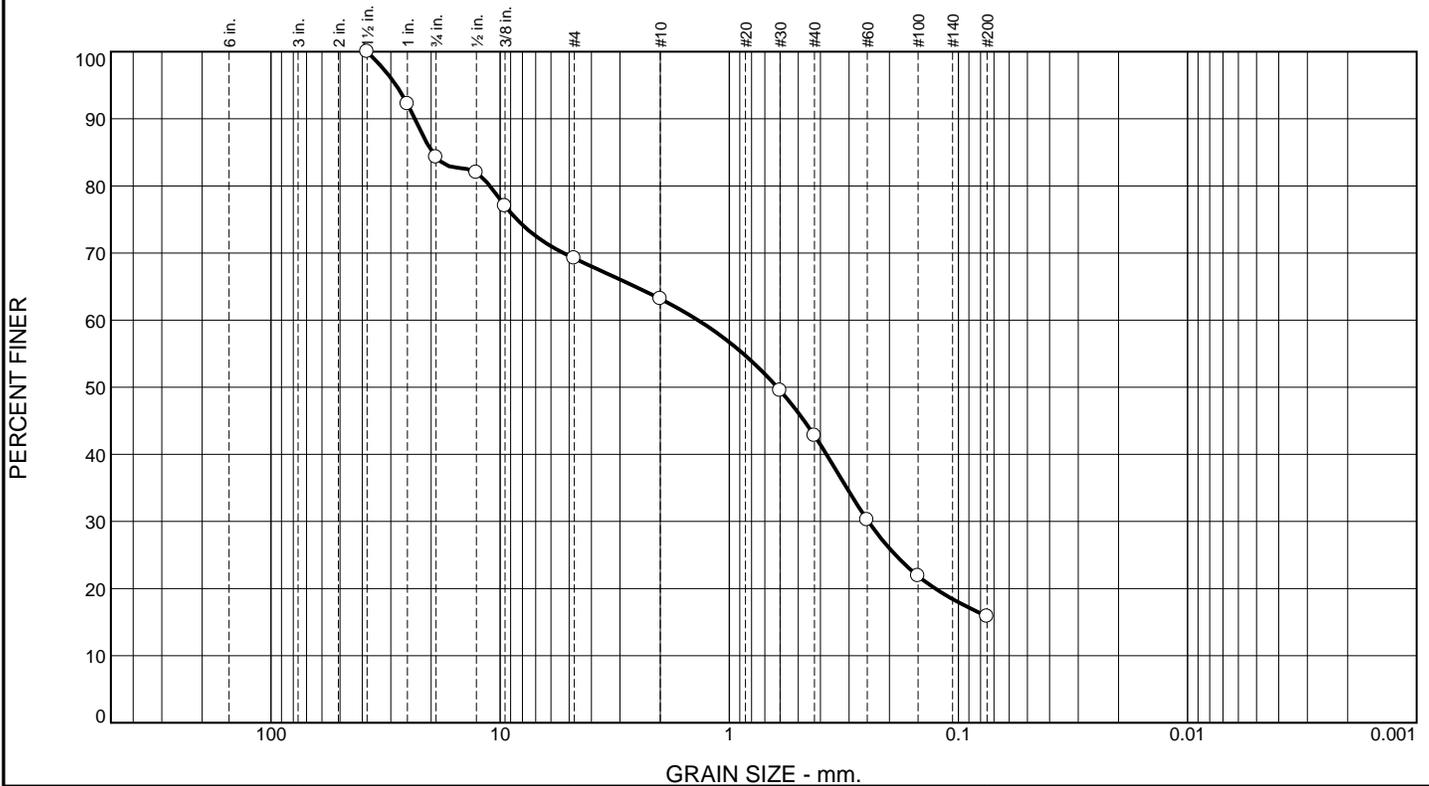
Sample Number: B-386-1B S-15 68-70'

Date: 1-14-20

<p>RSA Geolab</p> <p>Union, New Jersey</p>	<p>Client: MFS Consulting Engineers and Surveyor, DPC</p> <p>Project: Brooklyn Navy Yard DC Boilers Project No. 1119060</p> <p>Project No: 909</p>
<p>Figure</p>	

Tested By: EE Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	15.7	15.1	6.0	20.4	26.9	15.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	92.2		
.75	84.3		
.5	82.0		
.375	77.0		
#4	69.2		
#10	63.2		
#30	49.5		
#40	42.8		
#60	30.2		
#100	21.9		
#200	15.9		

Material Description

Yellowish Brown, Dark Olive Brown

Atterberg Limits

PL= LL= PI=

Coefficients

D₉₀= 23.5712 D₈₅= 19.7441 D₆₀= 1.3703
D₅₀= 0.6178 D₃₀= 0.2472 D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

* (no specification provided)

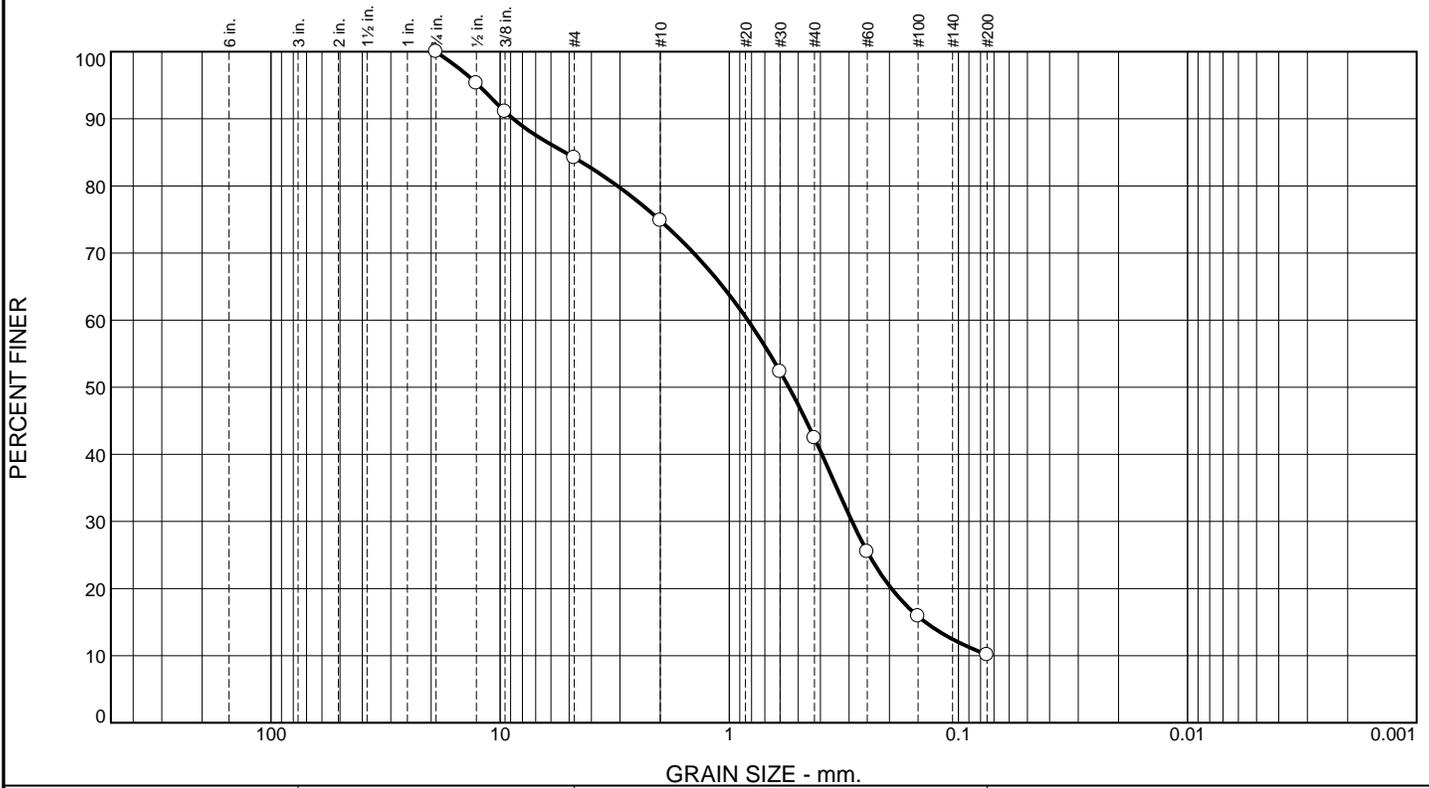
Sample Number: B-386-2 S-3 6-8'

Date: 1-14-20

<p>RSA Geolab</p> <p>Union, New Jersey</p>	<p>Client: MFS Consulting Engineers and Surveyor, DPC</p> <p>Project: Brooklyn Navy Yard DC Boilers Project No. 1119060</p> <p>Project No: 909</p>
<p>Figure</p>	

Tested By: EE Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	15.8	9.4	32.4	32.3	10.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	95.3		
.375	91.1		
#4	84.2		
#10	74.8		
#30	52.3		
#40	42.4		
#60	25.5		
#100	15.9		
#200	10.1		

Material Description

Dark Olive

PL= **Atterberg Limits** PI=

LL= LL= PI=

Coefficients

D₈₅= 8.7740 D₈₅= 5.2137 D₆₀= 0.8309

D₅₀= 0.5496 D₃₀= 0.2914 D₁₅= 0.1394

D₁₀= C_u= C_c=

USCS= **Classification** AASHTO=

Remarks

* (no specification provided)

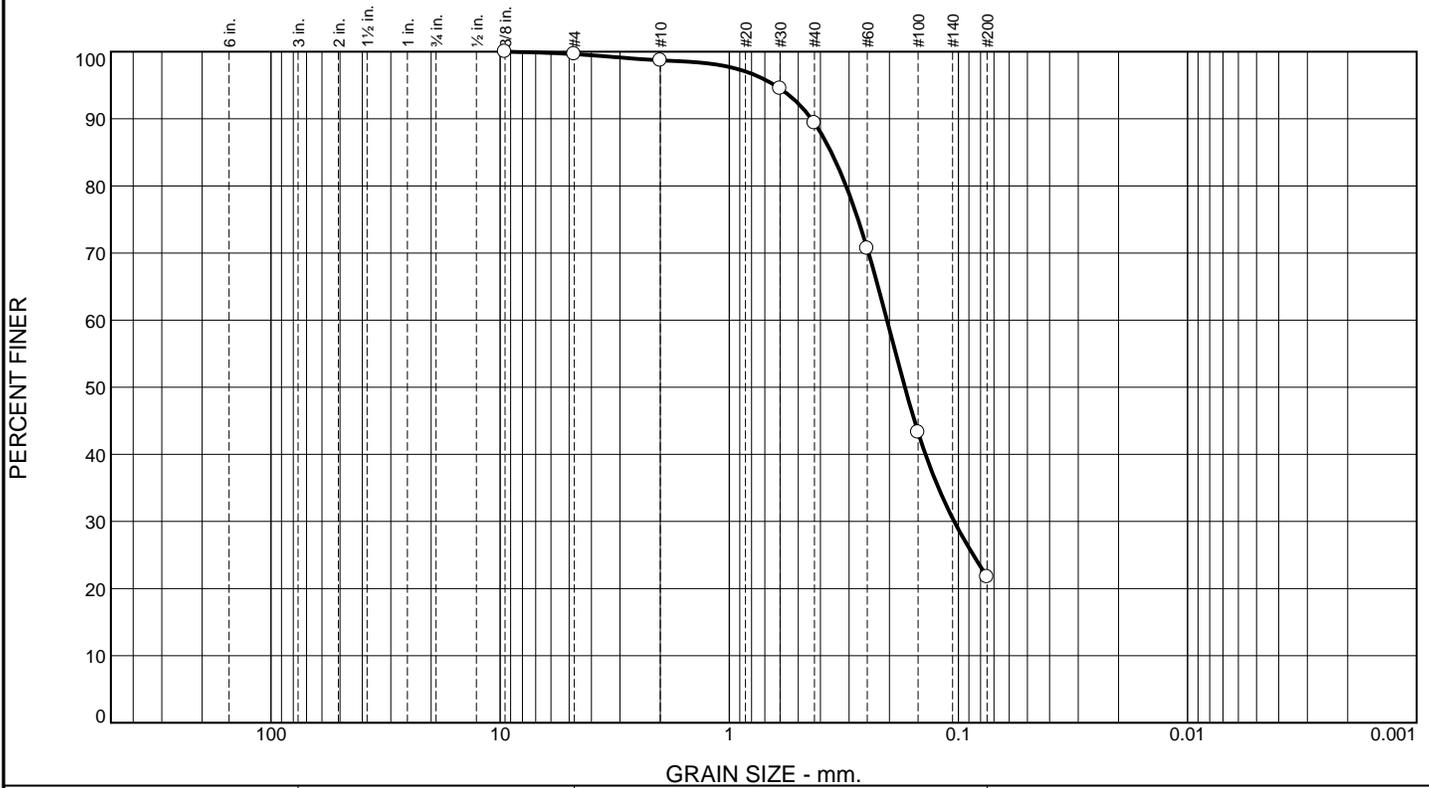
Sample Number: B-386-2 S-8 25-27'

Date: 1-14-20

<p>RSA Geolab</p> <p>Union, New Jersey</p>	<p>Client: MFS Consulting Engineers and Surveyor, DPC</p> <p>Project: Brooklyn Navy Yard DC Boilers Project No. 1119060</p> <p>Project No: 909</p>
<p>Figure</p>	

Tested By: EE Checked By: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.4	0.9	9.3	67.7	21.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.6		
#10	98.7		
#30	94.5		
#40	89.4		
#60	70.7		
#100	43.3		
#200	21.7		

Material Description

Dark Grayish Brown

PL= **Atterberg Limits** PI=

LL= **Coefficients** D₆₀= 0.2050

D₉₀= 0.4379 D₈₅= 0.3585 D₁₅=

D₅₀= 0.1713 D₃₀= 0.1044 C_c=

D₁₀= C_u= **Classification**

USCS= AASHTO=

Remarks

* (no specification provided)

Sample Number: B-386-2 S-11 40-42'

Date: 1-14-20

<p>RSA Geolab</p> <p>Union, New Jersey</p>	<p>Client: MFS Consulting Engineers and Surveyor, DPC</p> <p>Project: Brooklyn Navy Yard DC Boilers Project No. 1119060</p> <p>Project No: 909</p>
<p>Figure</p>	

Tested By: EE Checked By: KP



1017 Greeley Avenue North
Union, New Jersey 07083
908-964-0786 (P)
www.RSAGEOLAB.com

Letter of Transmittal

Date: 1-14-20

Job No.: 909

Lab Log: 19-563

Attention: Jacob Fradkin
MFS Consulting Engineers and Surveyor, DPC
2780 Hamilton Boulevard
South Plainfield, NJ 07080

CC:

Re: Brooklyn Navy Yard DC Boilers
Project#1119060

Sample(s) ID: **B-41A-1 U-2, B-62 U-1, B-234-1C U-1**

Dear Mr. Fradkin,

Please find attached results for the samples referenced above. The following lab testing was performed:

- ASTM D4318 Atterberg Limits (3 tests)
- ASTM D2974 Organic Content (2 tests)
- ASTM D7263 Density (3 tests)
- ASTM D2850 UU Triaxial Shear (3 tests)

Regards,
RSA Geolab, LLC

Remarks: If you have any questions, please call 908-964-0786.

Signed: _____

Dr. Raza S. Ahmed
President RSA Geolab, LLC

RSA's Geolab's Geotechnical Laboratory testing was performed and results reported in accordance with ASTM standards and accepted industry standards. No other representations or warranties either express or implied are given. RSA Geolab, LLC neither accepts responsibility for nor makes claim to the final use and purpose of the material tested. RSA Geolab, LLC owns all rights, title and interest of the work product. This report is intended for client's sole and exclusive use and not for the benefit of others and may not be used or relied upon by others. These documents must be considered proprietary information and should not be reproduced without the written approval of RSA Geolab, LLC.

LIQUID AND PLASTIC LIMIT TEST DATA

1/14/2020

Client: MFS Consulting Engineers and Surveyor, DPC

Project: Brooklyn Navy Yard DC Boilers

Project No. 1119060

Project Number: 909

Sample Number: B-41A-1 U-2 24-26'

Material Description: Dark Brown, Light Gray Clay & Silt, trace cmf Sand, organics (visual)

Tested by: SD

Checked by: KP

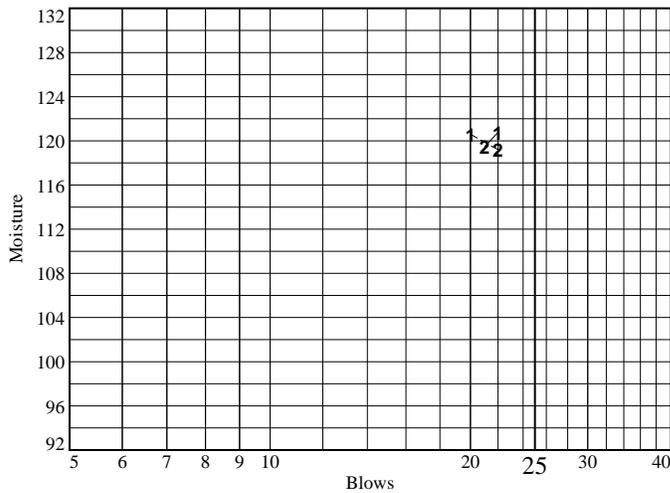
Testing Remarks: 1-14-20

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	8.19	8.61				
Dry+Tare	4.41	4.62				
Tare	1.28	1.28				
# Blows	22	21				
Moisture	120.8	119.5				

Organics Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	8.71	8.50				
Dry+Tare	4.67	4.59				
Tare	1.32	1.31				
# Blows	20	22				
Moisture	120.6	119.2				



Liquid Limit= 124
Liquid Limit (organics)= 117
Plastic Limit= 109
Plasticity Index= 15

Plastic Limit Data

Run No.	1	2	3	4	
Wet+Tare	8.22	7.69			
Dry+Tare	4.61	4.34			
Tare	1.28	1.28			
Moisture	108.4	109.5			

LIQUID AND PLASTIC LIMIT TEST DATA

1/14/2020

Client: MFS Consulting Engineers and Surveyor, DPC

Project: Brooklyn Navy Yard DC Boilers

Project No. 1119060

Project Number: 909

Sample Number: B-62-1 U-1 22-24'

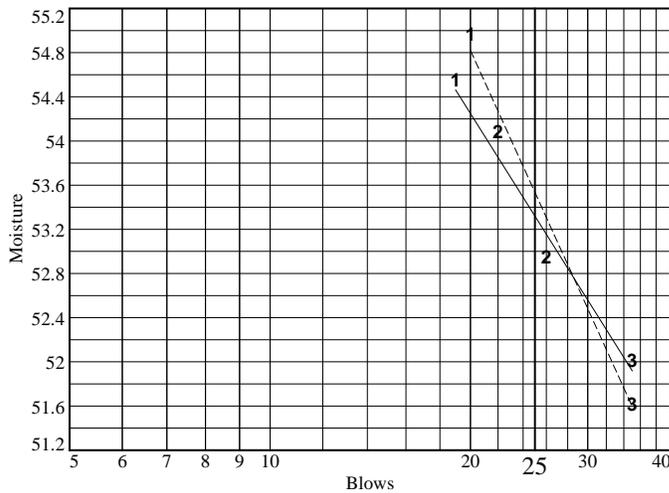
Material Description: Gray Clay & Silt, trace cmf Sand, organics (visual)

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	9.69	9.61	9.59			
Dry+Tare	6.76	6.74	6.76			
Tare	1.39	1.32	1.32			
# Blows	19	26	35			
Moisture	54.6	53.0	52.0			

Organics Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	9.83	8.60	8.76			
Dry+Tare	6.79	6.02	6.22			
Tare	1.26	1.25	1.30			
# Blows	20	22	35			
Moisture	55.0	54.1	51.6			



Liquid Limit= 53
Liquid Limit (organics)= 54
Plastic Limit= 27
Plasticity Index= 26

Plastic Limit Data

Run No.	1	2	3	4
Wet+Tare	8.73	9.25		
Dry+Tare	7.16	7.53		
Tare	1.39	1.32		
Moisture	27.2	27.7		

LIQUID AND PLASTIC LIMIT TEST DATA

1/14/2020

Client: MFS Consulting Engineers and Surveyor, DPC

Project: Brooklyn Navy Yard DC Boilers

Project No. 1119060

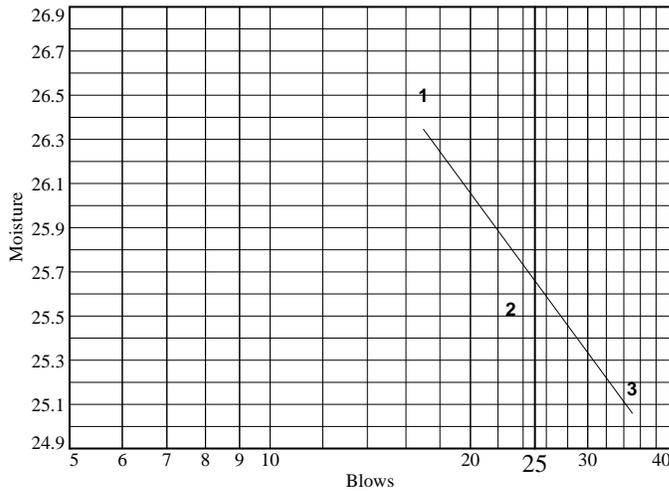
Project Number: 909

Sample Number: B-234-1C U-1 27-29'

Material Description: Gray Clay & Silt, trace cmf Sand (visual)

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	9.06	9.48	8.47			
Dry+Tare	7.43	7.81	7.02			
Tare	1.28	1.27	1.26			
# Blows	17	23	35			
Moisture	26.5	25.5	25.2			

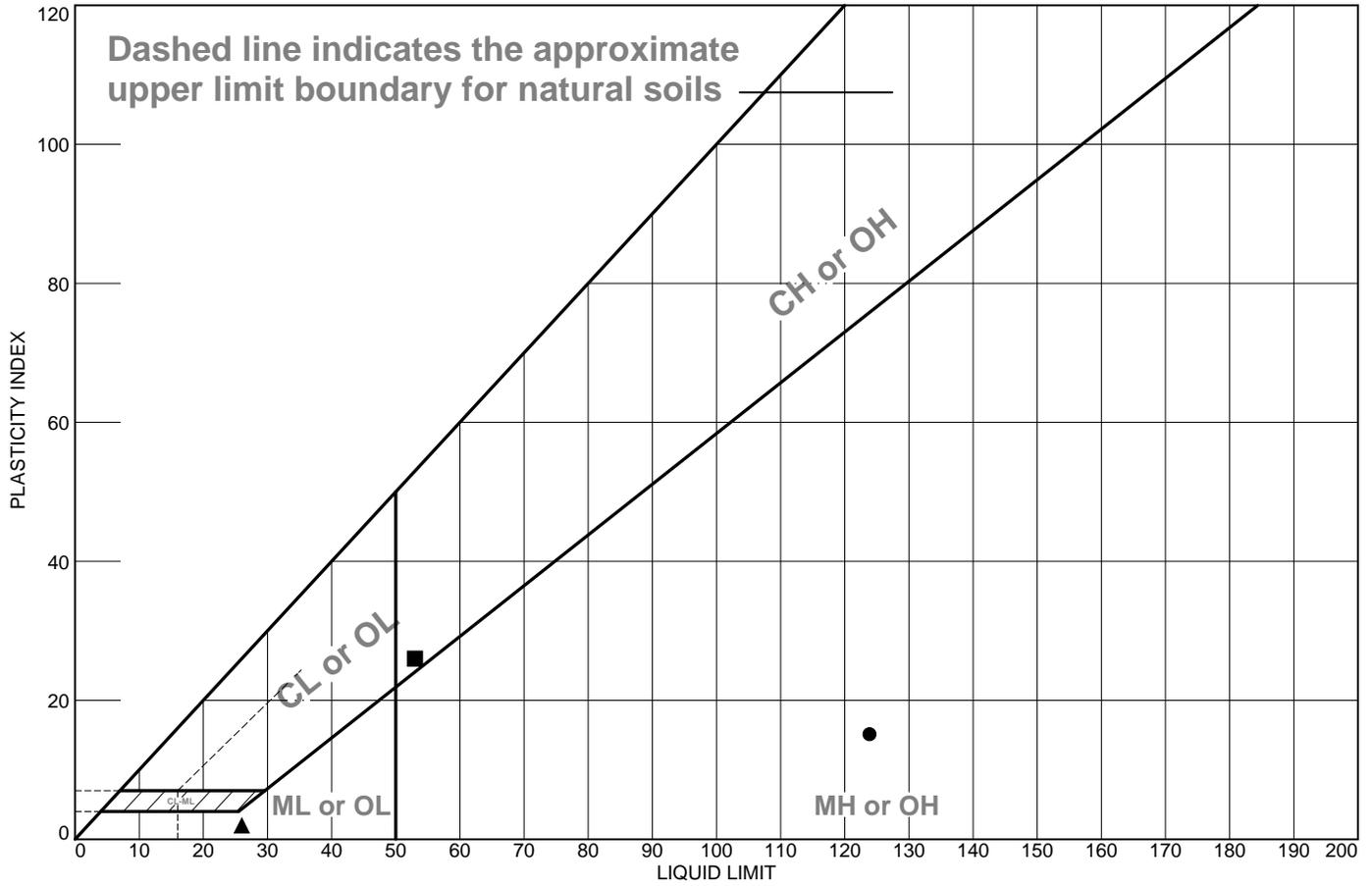


Liquid Limit= 26
Plastic Limit= 24
Plasticity Index= 2

Plastic Limit Data

Run No.	1	2	3	4	
Wet+Tare	7.35	7.59			
Dry+Tare	6.20	6.38			
Tare	1.28	1.28			
Moisture	23.4	23.7			

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Dark Brown, Light Gray Clay & Silt, trace cmf Sand, organics (visual)	124	109	15			
■	Gray Clay & Silt, trace cmf Sand, organics (visual)	53	27	26			
▲	Gray Clay & Silt, trace cmf Sand (visual)	26	24	2			

Project No. 909 **Client:** MFS Consulting Engineers and Surveyor, DPC
Project: Brooklyn Navy Yard DC Boilers
 Project No. 1119060
● Sample Number: B-41A-1 U-2 24-26'
■ Sample Number: B-62-1 U-1 22-24'
▲ Sample Number: B-234-1C U-1 27-29'

RSA Geolab
 Union, New Jersey

Remarks:
 ● 1-14-20

Figure

Tested By: SD Checked By: KP

RSA Geolab

LOSS ON IGNITION (ASTM D2974)

Project: Brooklyn Navy Yard DC Boilers
Project#1119060

Project #: 909

Client: MFS Consulting Engineers and Surveyor, DPC

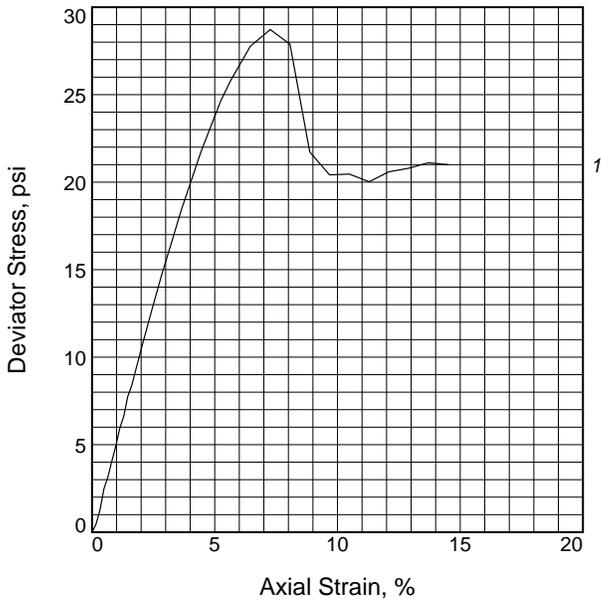
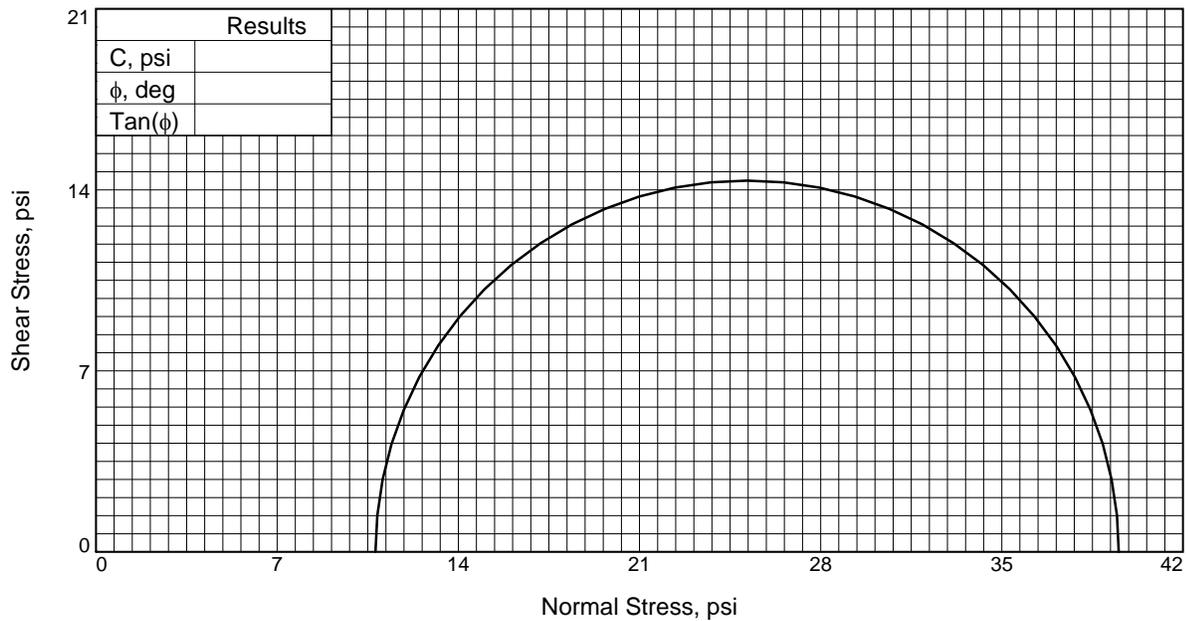
Date: 1-14-20

HOLE #/ SAMPLE #	B-62-1 U-1	B-234-1C U-1				
DEPTH	22-24'	27-29'				
OVEN DRIED SAMPLE + TARE (gms.)	57.67	87.09				
AFTER IGNITION SAMPLE + TARE (gms.)	56.52	86.65				
LOSS ON IGNITION (gms.)	1.15	0.44	0.00	0.00	0.00	0.00
TARE (gms.)	26.97	52.10				
INITIAL WGT. OF OVEN DRIED SAMPLE (gms.)	30.70	34.99	0.00	0.00	0.00	0.00
LOSS ON IGNITION (%)	3.75	1.26	0.00	0.00	0.00	0.00

Performed by: EE

Entered by: KH

Checked by: KP



Sample No.	1	
Initial	Water Content, %	231.1
	Dry Density, pcf	21.2
	Saturation, %	90.6
	Void Ratio	6.3759
	Diameter, in.	2.84
	Height, in.	6.20
At Test	Water Content, %	255.0
	Dry Density, pcf	21.2
	Saturation, %	100.0
	Void Ratio	6.3759
	Diameter, in.	2.84
	Height, in.	6.20
Strain rate, in./min.	0.050	
Back Pressure, psi	0.0	
Cell Pressure, psi	10.8	
Fail. Stress, psi	28.7	
Ult. Stress, psi	21.0	
σ_1 Failure, psi	39.5	
σ_3 Failure, psi	10.8	

Type of Test:

Unconsolidated Undrained

Sample Type: ASTM D2850

Description: Dark Brown, Light Gray Clay & Silt, trace cmf Sand, organics (visual)

LL= 124 **PL=** 109 **PI=** 15

Assumed Specific Gravity= 2.5

Remarks: H/D = 2.19

Sample contains large amount of Peat, decayed wood.

Client: MFS Consulting Engineers and Surveyor, DPC

Project: Brooklyn Navy Yard DC Boilers

Project No. 1119060

Sample Number: B-41A-1 U-2 24-26'

Proj. No.: 909

Date Sampled: 1-14-20

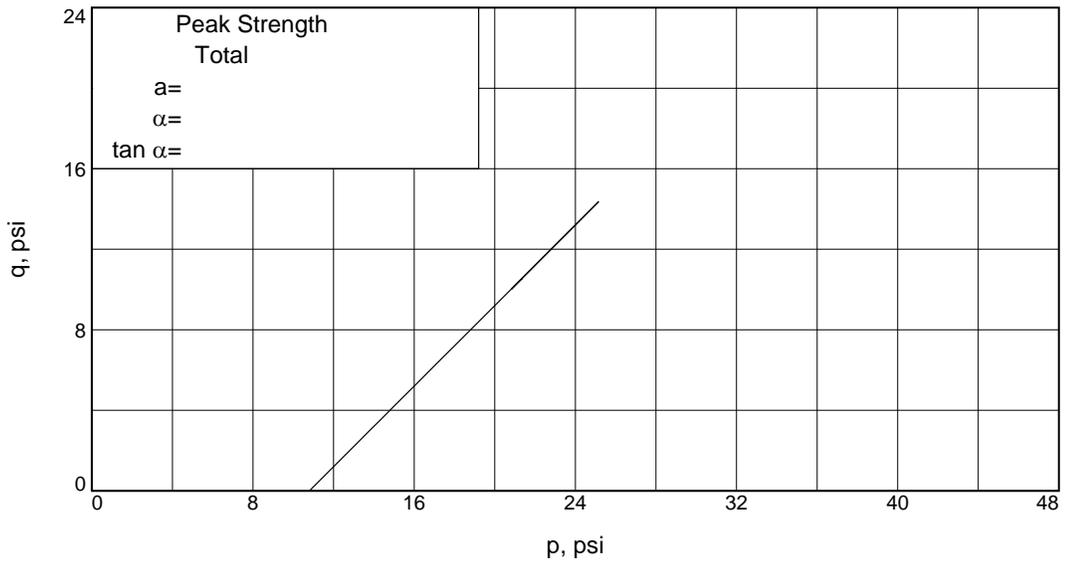
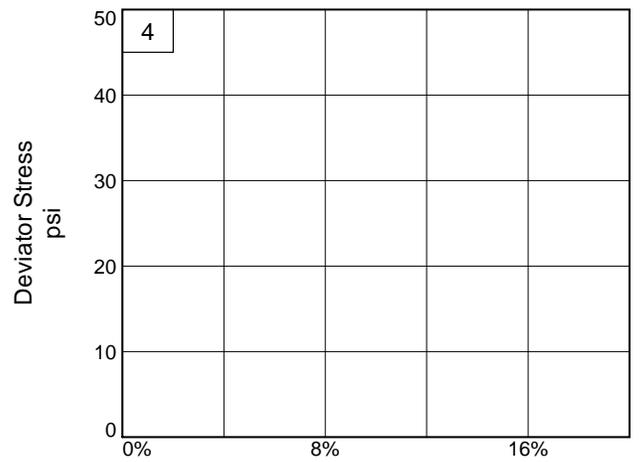
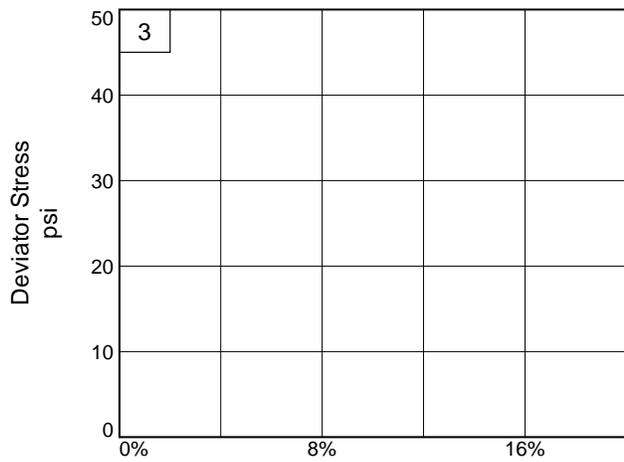
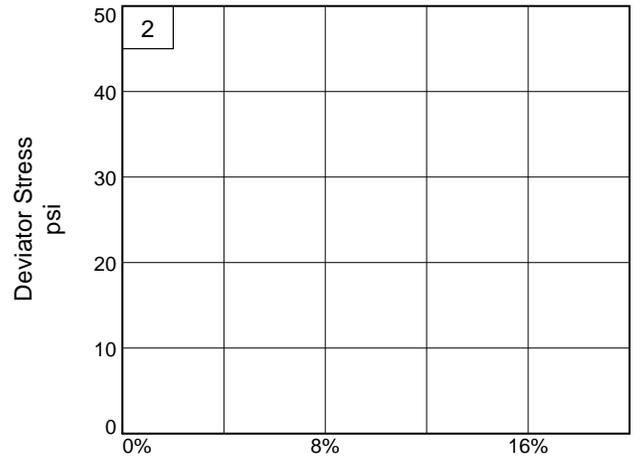
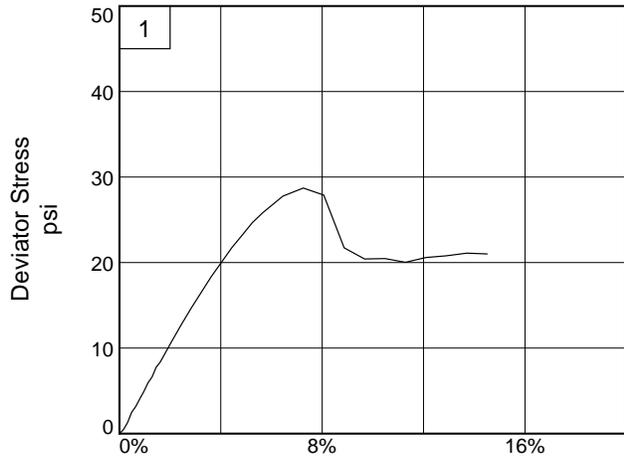
TRIAXIAL SHEAR TEST REPORT

RSA Geolab

Union, New Jersey

Figure _____

Tested By: MF _____



Client: MFS Consulting Engineers and Surveyor, DPC

Project: Brooklyn Navy Yard DC Boilers

Sample Number: B-41A-1 U-2 24-26'

Project No.: 909

Figure _____

RSA Geolab

Tested By: MF _____

TRIAxIAL COMPRESSION TEST
Unconsolidated Undrained

1/14/2020
10:35 AM

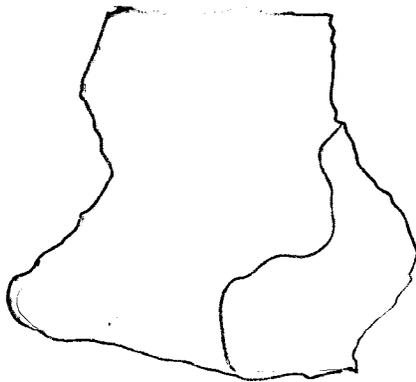
Date: 1-14-20
Client: MFS Consulting Engineers and Surveyor, DPC
Project: Brooklyn Navy Yard DC Boilers
 Project No. 1119060
Project No.: 909
Sample Number: B-41A-1 U-2 24-26'
Description: Dark Brown, Light Gray Clay & Silt, trace cmf Sand, organics (visual)
Remarks: H/D = 2.19
 Sample contains large amount of Peat, decayed wood.
Type of Sample: ASTM D2850
Assumed Specific Gravity=2.5 **LL**=124 **PL**=109 **PI**=15
Test Method: COE uniform strain

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Final
Moisture content: Moist soil+tare, gms.	720.400		720.400
Moisture content: Dry soil+tare, gms.	217.600		217.600
Moisture content: Tare, gms.	0.000		0.000
Moisture, %	231.1	255.0	231.1
Moist specimen weight, gms.	720.4		
Diameter, in.	2.84	2.84	
Area, in. ²	6.32	6.32	
Height, in.	6.20	6.20	
Net decrease in height, in.		0.00	
Wet density, pcf	70.1	75.1	
Dry density, pcf	21.2	21.2	
Void ratio	6.3759	6.3759	
Saturation, %	90.6	100.0	

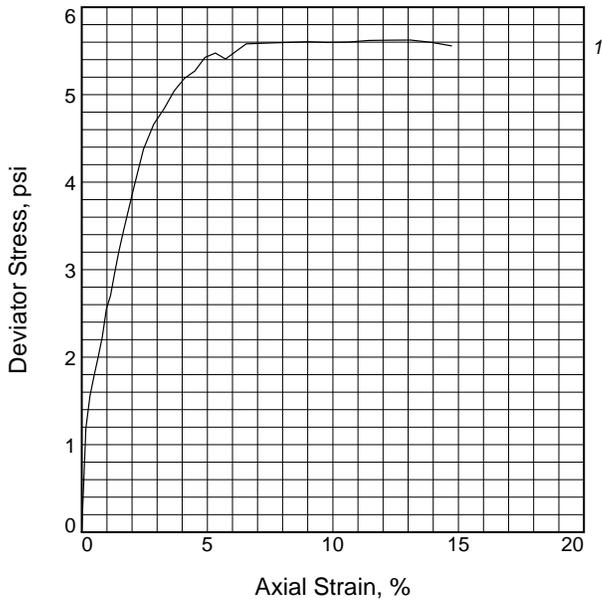
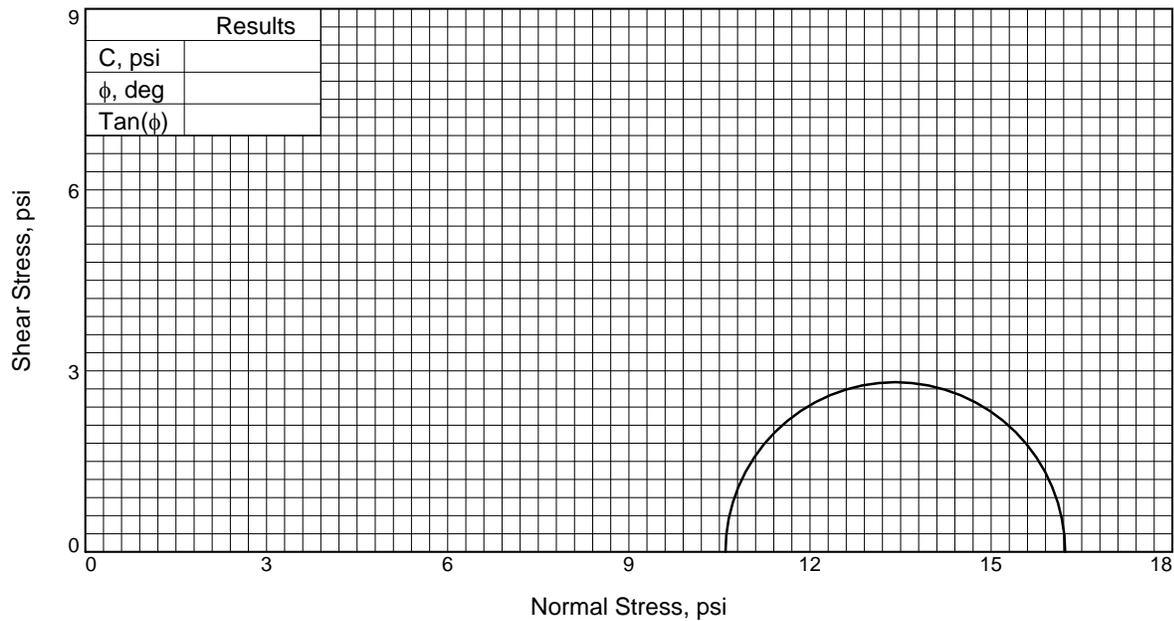
Test Readings for Specimen No. 1

Cell pressure = 10.80 psi
Back pressure = 0.00 psi
Strain rate, in./min. = 0.050
Fail. Stress = 28.72 psi at reading no. 22
Ult. Stress = 21.00 psi at reading no. 31



Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psi	Minor Princ. Stress psi	Major Princ. Stress psi	1:3 Ratio	P psi	Q psi
0	0.0000	3.400	0.0	0.0	0.00	10.80	10.80	1.00	10.80	0.00
1	0.0100	6.300	2.9	0.2	0.46	10.80	11.26	1.04	11.03	0.23
2	0.0200	11.500	8.1	0.3	1.28	10.80	12.08	1.12	11.44	0.64
3	0.0300	19.200	15.8	0.5	2.49	10.80	13.29	1.23	12.04	1.24
4	0.0400	23.500	20.1	0.6	3.16	10.80	13.96	1.29	12.38	1.58
5	0.0500	29.400	26.0	0.8	4.08	10.80	14.88	1.38	12.84	2.04
6	0.0600	34.800	31.4	1.0	4.92	10.80	15.72	1.46	13.26	2.46
7	0.0700	41.300	37.9	1.1	5.93	10.80	16.73	1.55	13.77	2.97
8	0.0800	45.800	42.4	1.3	6.63	10.80	17.43	1.61	14.11	3.31
9	0.0900	53.100	49.7	1.5	7.75	10.80	18.55	1.72	14.68	3.88
10	0.1000	57.200	53.8	1.6	8.38	10.80	19.18	1.78	14.99	4.19
11	0.1250	71.300	67.9	2.0	10.53	10.80	21.33	1.98	16.07	5.27
12	0.1500	85.100	81.7	2.4	12.62	10.80	23.42	2.17	17.11	6.31
13	0.1750	98.500	95.1	2.8	14.63	10.80	25.43	2.35	18.12	7.32
14	0.2000	111.100	107.7	3.2	16.50	10.80	27.30	2.53	19.05	8.25
15	0.2250	123.800	120.4	3.6	18.37	10.80	29.17	2.70	19.98	9.18
16	0.2500	135.400	132.0	4.0	20.05	10.80	30.85	2.86	20.83	10.03
17	0.2750	147.100	143.7	4.4	21.74	10.80	32.54	3.01	21.67	10.87
18	0.3000	157.300	153.9	4.8	23.18	10.80	33.98	3.15	22.39	11.59
19	0.3250	167.700	164.3	5.2	24.65	10.80	35.45	3.28	23.12	12.32
20	0.3500	176.100	172.7	5.6	25.80	10.80	36.60	3.39	23.70	12.90
21	0.4000	190.900	187.5	6.4	27.77	10.80	38.57	3.57	24.68	13.88
22	0.4500	199.000	195.6	7.3	28.72	10.80	39.52	3.66	25.16	14.36
23	0.5000	195.000	191.6	8.1	27.89	10.80	38.69	3.58	24.74	13.94
24	0.5500	154.000	150.6	8.9	21.73	10.80	32.53	3.01	21.66	10.86
25	0.6000	146.200	142.8	9.7	20.42	10.80	31.22	2.89	21.01	10.21
26	0.6500	147.800	144.4	10.5	20.46	10.80	31.26	2.89	21.03	10.23
27	0.7000	146.000	142.6	11.3	20.03	10.80	30.83	2.85	20.81	10.01
28	0.7500	151.400	148.0	12.1	20.60	10.80	31.40	2.91	21.10	10.30
29	0.8000	154.200	150.8	12.9	20.79	10.80	31.59	2.93	21.20	10.40
30	0.8500	157.900	154.5	13.7	21.11	10.80	31.91	2.95	21.35	10.55
31	0.9000	158.600	155.2	14.5	21.00	10.80	31.80	2.94	21.30	10.50



Sample No.	1	
Initial	Water Content, %	58.8
	Dry Density, pcf	64.6
	Saturation, %	101.1
	Void Ratio	1.5131
	Diameter, in.	2.85
At Test	Height, in.	6.11
	Water Content, %	58.2
	Dry Density, pcf	64.6
	Saturation, %	100.0
	Void Ratio	1.5131
Strain rate, in./min.	Diameter, in.	2.85
	Height, in.	6.11
	Back Pressure, psi	0.0
	Cell Pressure, psi	10.6
	Fail. Stress, psi	5.6
Ult. Stress, psi	5.6	
σ_1 Failure, psi	16.2	
σ_3 Failure, psi	10.6	

Type of Test:

Unconsolidated Undrained

Sample Type: ASTM D2850

Description: Gray Clay & Silt, trace cmf Sand, organics (visual)

LL= 53 **PL=** 27 **PI=** 26

Assumed Specific Gravity= 2.6

Remarks: H/D = 2.14

Client: MFS Consulting Engineers and Surveyor, DPC

Project: Brooklyn Navy Yard DC Boilers

Project No. 1119060

Sample Number: B-62-1 U-1 22-24'

Proj. No.: 909

Date Sampled: 1-14-20

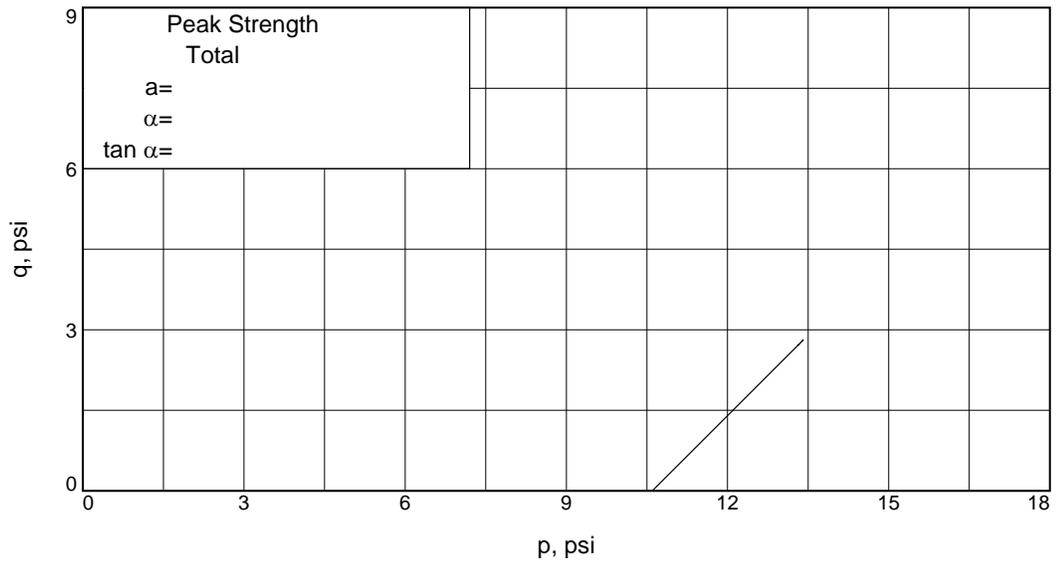
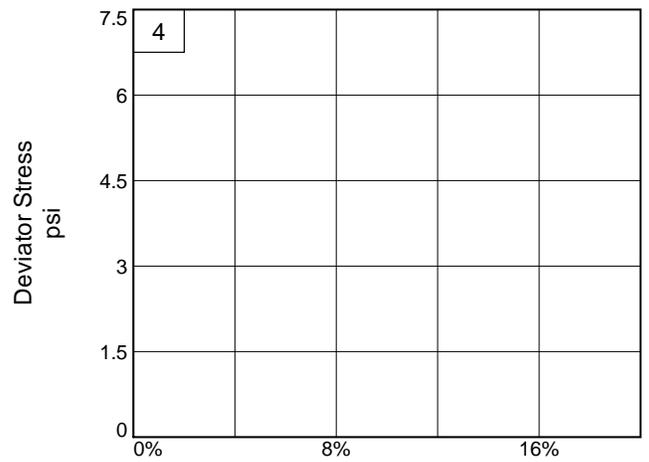
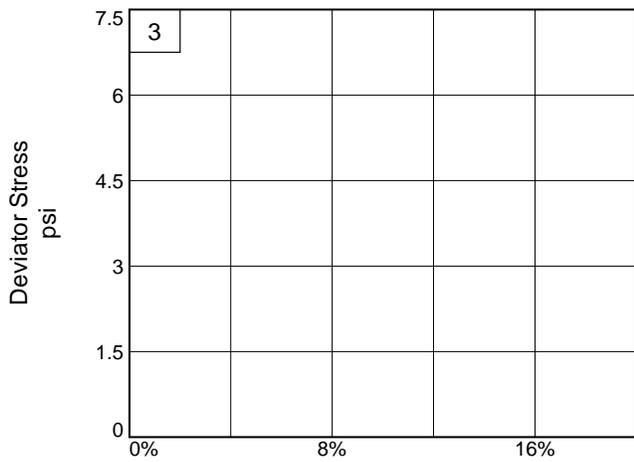
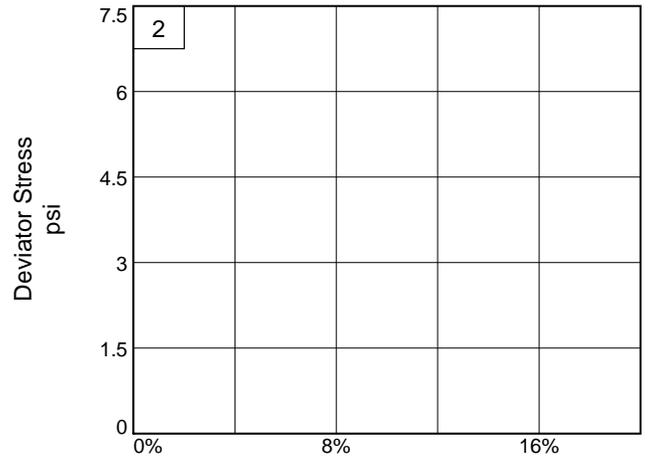
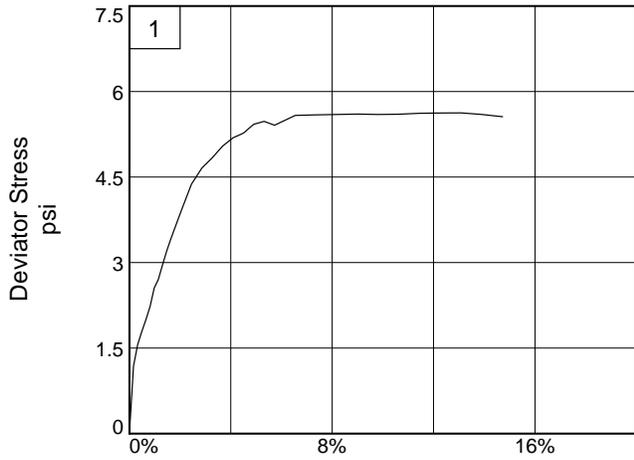
TRIAXIAL SHEAR TEST REPORT

RSA Geolab

Union, New Jersey

Figure _____

Tested By: MF _____



Client: MFS Consulting Engineers and Surveyor, DPC

Project: Brooklyn Navy Yard DC Boilers

Sample Number: B-62-1 U-1 22-24'

Project No.: 909

Figure _____

RSA Geolab

Tested By: MF _____

TRIAXIAL COMPRESSION TEST
Unconsolidated Undrained

1/14/2020
10:48 AM

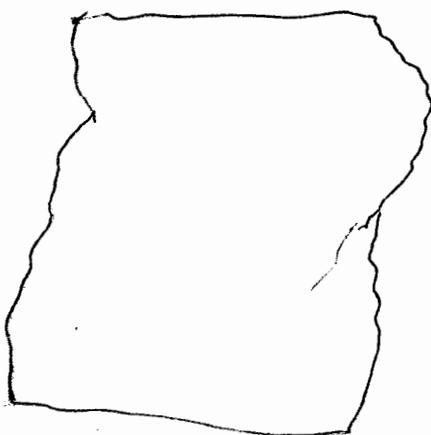
Date: 1-14-20
Client: MFS Consulting Engineers and Surveyor, DPC
Project: Brooklyn Navy Yard DC Boilers
 Project No. 1119060
Project No.: 909
Sample Number: B-62-1 U-1 22-24'
Description: Gray Clay & Silt, trace cmf Sand, organics (visual)
Remarks: H/D = 2.14
Type of Sample: ASTM D2850
Assumed Specific Gravity=2.6 **LL**=53 **PL**=27 **PI**=26
Test Method: COE uniform strain

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Final
Moisture content: Moist soil+tare, gms.	1053.000		1053.000
Moisture content: Dry soil+tare, gms.	662.900		662.900
Moisture content: Tare, gms.	0.000		0.000
Moisture, %	58.8	58.2	58.8
Moist specimen weight, gms.	1053.0		
Diameter, in.	2.85	2.85	
Area, in. ²	6.40	6.40	
Height, in.	6.11	6.11	
Net decrease in height, in.		0.00	
Wet density, pcf	102.6	102.2	
Dry density, pcf	64.6	64.6	
Void ratio	1.5131	1.5131	
Saturation, %	101.1	100.0	

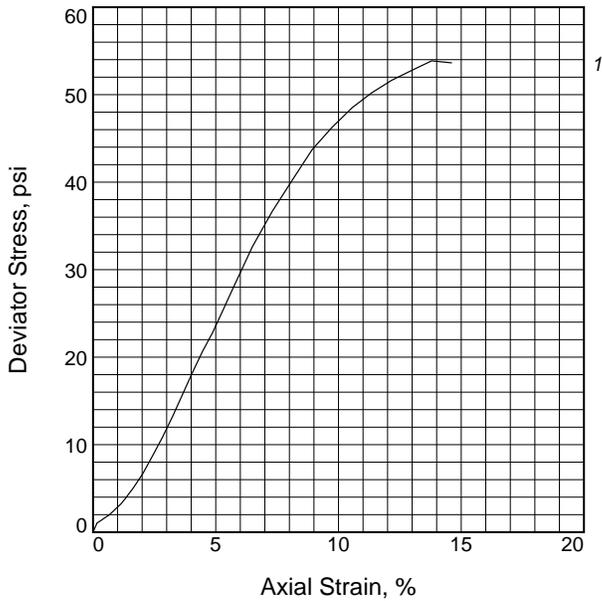
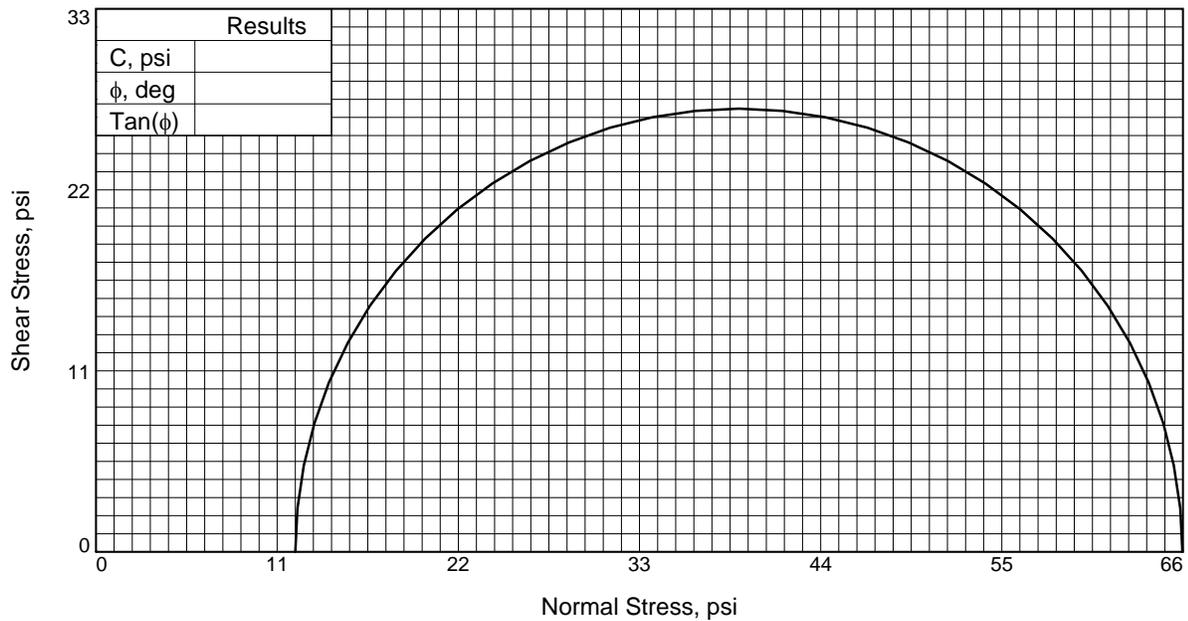
Test Readings for Specimen No. 1

Cell pressure = 10.60 psi
 Back pressure = 0.00 psi
 Strain rate, in./min. = 0.050
 Fail. Stress = 5.62 psi at reading no. 29
 Ult. Stress = 5.56 psi at reading no. 31



Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psi	Minor Princ. Stress psi	Major Princ. Stress psi	1:3 Ratio	P psi	Q psi
0	0.0000	2.800	0.0	0.0	0.00	10.60	10.60	1.00	10.60	0.00
1	0.0100	10.400	7.6	0.2	1.19	10.60	11.79	1.11	11.19	0.59
2	0.0200	12.800	10.0	0.3	1.56	10.60	12.16	1.15	11.38	0.78
3	0.0300	14.300	11.5	0.5	1.79	10.60	12.39	1.17	11.49	0.89
4	0.0400	15.700	12.9	0.7	2.00	10.60	12.60	1.19	11.60	1.00
5	0.0500	17.200	14.4	0.8	2.23	10.60	12.83	1.21	11.72	1.12
6	0.0600	19.300	16.5	1.0	2.55	10.60	13.15	1.24	11.88	1.28
7	0.0700	20.300	17.5	1.1	2.70	10.60	13.30	1.26	11.95	1.35
8	0.0800	22.000	19.2	1.3	2.96	10.60	13.56	1.28	12.08	1.48
9	0.0900	23.600	20.8	1.5	3.20	10.60	13.80	1.30	12.20	1.60
10	0.1000	25.000	22.2	1.6	3.41	10.60	14.01	1.32	12.31	1.71
11	0.1250	28.300	25.5	2.0	3.90	10.60	14.50	1.37	12.55	1.95
12	0.1500	31.500	28.7	2.5	4.38	10.60	14.98	1.41	12.79	2.19
13	0.1750	33.500	30.7	2.9	4.66	10.60	15.26	1.44	12.93	2.33
14	0.2000	34.800	32.0	3.3	4.84	10.60	15.44	1.46	13.02	2.42
15	0.2250	36.300	33.5	3.7	5.04	10.60	15.64	1.48	13.12	2.52
16	0.2500	37.400	34.6	4.1	5.19	10.60	15.79	1.49	13.19	2.59
17	0.2750	38.100	35.3	4.5	5.27	10.60	15.87	1.50	13.23	2.63
18	0.3000	39.300	36.5	4.9	5.43	10.60	16.03	1.51	13.31	2.71
19	0.3250	39.800	37.0	5.3	5.48	10.60	16.08	1.52	13.34	2.74
20	0.3500	39.500	36.7	5.7	5.41	10.60	16.01	1.51	13.30	2.70
21	0.4000	41.000	38.2	6.5	5.58	10.60	16.18	1.53	13.39	2.79
22	0.4500	41.400	38.6	7.4	5.59	10.60	16.19	1.53	13.39	2.79
23	0.5000	41.800	39.0	8.2	5.60	10.60	16.20	1.53	13.40	2.80
24	0.5500	42.200	39.4	9.0	5.60	10.60	16.20	1.53	13.40	2.80
25	0.6000	42.500	39.7	9.8	5.60	10.60	16.20	1.53	13.40	2.80
26	0.6500	42.900	40.1	10.6	5.60	10.60	16.20	1.53	13.40	2.80
27	0.7000	43.400	40.6	11.5	5.62	10.60	16.22	1.53	13.41	2.81
28	0.7500	43.800	41.0	12.3	5.62	10.60	16.22	1.53	13.41	2.81
29	0.8000	44.200	41.4	13.1	5.62	10.60	16.22	1.53	13.41	2.81
30	0.8500	44.400	41.6	13.9	5.60	10.60	16.20	1.53	13.40	2.80
31	0.9000	44.500	41.7	14.7	5.56	10.60	16.16	1.52	13.38	2.78



Sample No.		1
Initial	Water Content, %	25.5
	Dry Density, pcf	99.7
	Saturation, %	105.4
	Void Ratio	0.6282
	Diameter, in.	2.82
At Test	Height, in.	6.16
	Water Content, %	24.2
	Dry Density, pcf	99.7
	Saturation, %	100.0
	Void Ratio	0.6282
	Diameter, in.	2.82
	Height, in.	6.16
	Strain rate, in./min.	0.050
	Back Pressure, psi	0.0
	Cell Pressure, psi	12.1
	Fail. Stress, psi	53.9
	Ult. Stress, psi	53.6
	σ_1 Failure, psi	66.0
	σ_3 Failure, psi	12.1

Type of Test:

Unconsolidated Undrained

Sample Type: ASTM D2850

Description: Gray Clay & Silt, trace cmf Sand (visual)

LL= 26 PL= 24 PI= 2

Assumed Specific Gravity= 2.6

Remarks: H/D = 2.19

Client: MFS Consulting Engineers and Surveyor, DPC

Project: Brooklyn Navy Yard DC Boilers

Project No. 1119060

Sample Number: B-234-1C U-1 27-29'

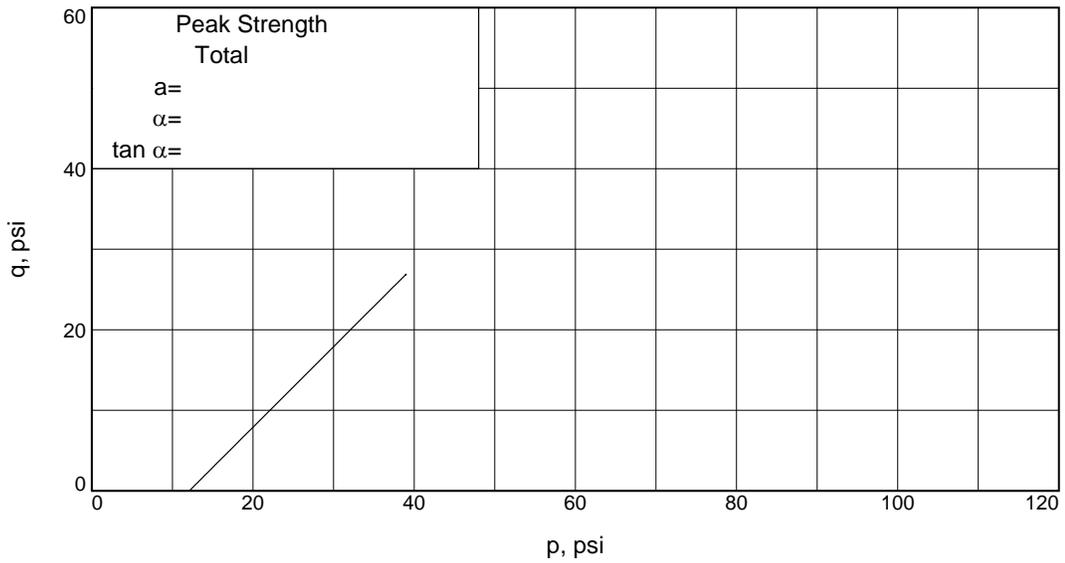
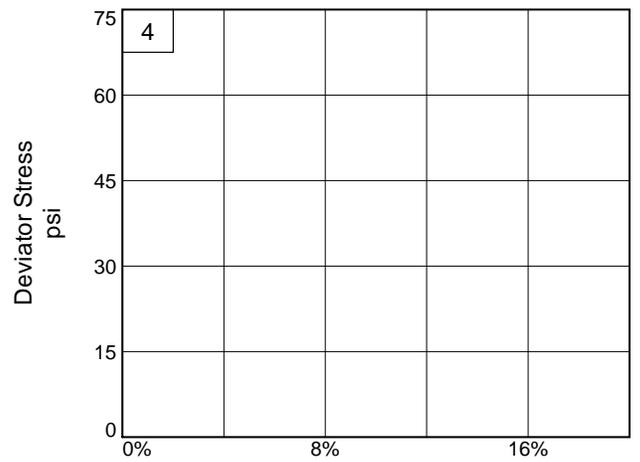
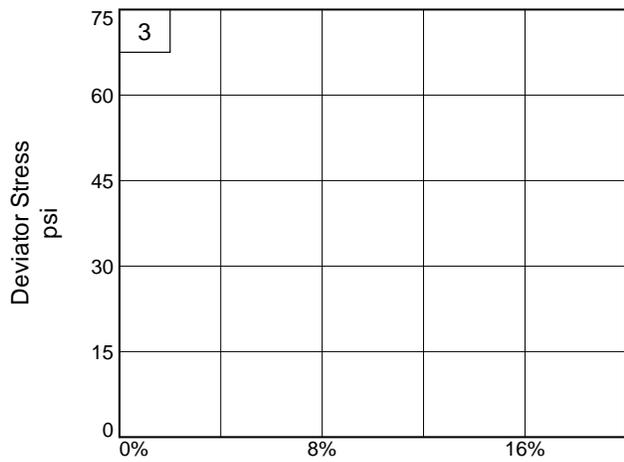
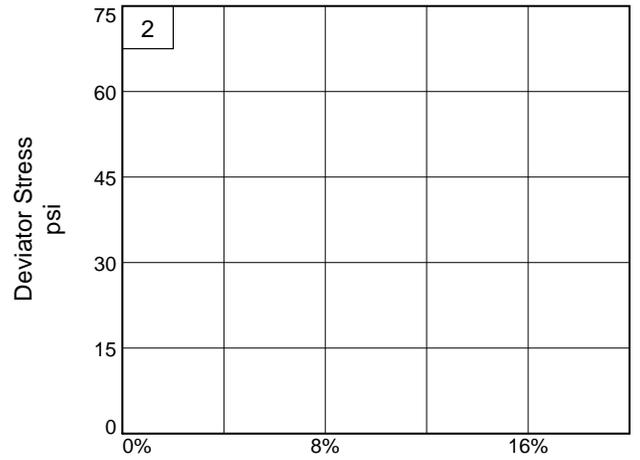
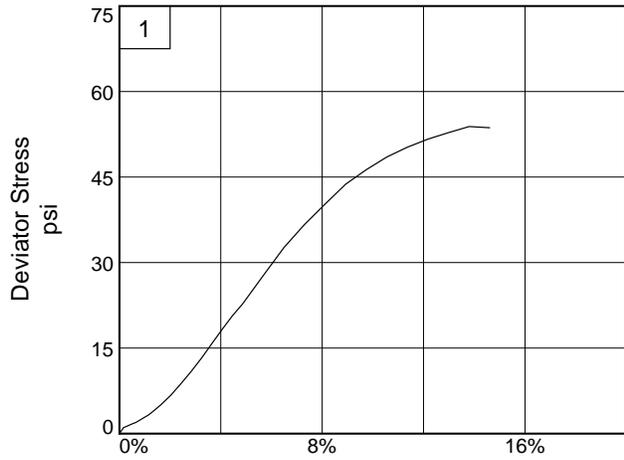
Proj. No.: 909

Date Sampled: 1-14-20

TRIAXIAL SHEAR TEST REPORT
 RSA Geolab
 Union, New Jersey

Figure _____

Tested By: EE



Client: MFS Consulting Engineers and Surveyor, DPC

Project: Brooklyn Navy Yard DC Boilers

Sample Number: B-234-1C U-1 27-29'

Project No.: 909

Figure _____

RSA Geolab

Tested By: EE _____

TRIAXIAL COMPRESSION TEST
Unconsolidated Undrained

1/14/2020
10:59 AM

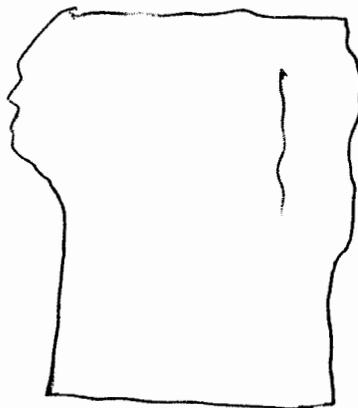
Date: 1-14-20
Client: MFS Consulting Engineers and Surveyor, DPC
Project: Brooklyn Navy Yard DC Boilers
 Project No. 1119060
Project No.: 909
Sample Number: B-234-1C U-1 27-29'
Description: Gray Clay & Silt, trace cmf Sand (visual)
Remarks: H/D = 2.19
Type of Sample: ASTM D2850
Assumed Specific Gravity=2.6 **LL**=26 **PL**=24 **PI**=2
Test Method: COE uniform strain

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Final
Moisture content: Moist soil+tare, gms.	1261.600		1261.600
Moisture content: Dry soil+tare, gms.	1005.500		1005.500
Moisture content: Tare, gms.	0.000		0.000
Moisture, %	25.5	24.2	25.5
Moist specimen weight, gms.	1261.6		
Diameter, in.	2.82	2.82	
Area, in. ²	6.24	6.24	
Height, in.	6.16	6.16	
Net decrease in height, in.		0.00	
Wet density, pcf	125.1	123.8	
Dry density, pcf	99.7	99.7	
Void ratio	0.6282	0.6282	
Saturation, %	105.4	100.0	

Test Readings for Specimen No. 1

Cell pressure = 12.10 psi
 Back pressure = 0.00 psi
 Strain rate, in./min. = 0.050
 Fail. Stress = 53.86 psi at reading no. 30
 Ult. Stress = 53.64 psi at reading no. 31



Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psi	Minor Princ. Stress psi	Major Princ. Stress psi	1:3 Ratio	P psi	Q psi
0	0.0000	1.800	0.0	0.0	0.00	12.10	12.10	1.00	12.10	0.00
1	0.0100	8.400	6.6	0.2	1.06	12.10	13.16	1.09	12.63	0.53
2	0.0200	10.300	8.5	0.3	1.36	12.10	13.46	1.11	12.78	0.68
3	0.0300	12.300	10.5	0.5	1.68	12.10	13.78	1.14	12.94	0.84
4	0.0400	14.100	12.3	0.6	1.96	12.10	14.06	1.16	13.08	0.98
5	0.0500	16.800	15.0	0.8	2.39	12.10	14.49	1.20	13.29	1.19
6	0.0600	19.600	17.8	1.0	2.83	12.10	14.93	1.23	13.51	1.41
7	0.0700	22.300	20.5	1.1	3.25	12.10	15.35	1.27	13.72	1.62
8	0.0800	25.800	24.0	1.3	3.80	12.10	15.90	1.31	14.00	1.90
9	0.0900	29.700	27.9	1.5	4.41	12.10	16.51	1.36	14.30	2.20
10	0.1000	33.500	31.7	1.6	5.00	12.10	17.10	1.41	14.60	2.50
11	0.1250	44.600	42.8	2.0	6.72	12.10	18.82	1.56	15.46	3.36
12	0.1500	58.000	56.2	2.4	8.79	12.10	20.89	1.73	16.50	4.40
13	0.1750	72.000	70.2	2.8	10.94	12.10	23.04	1.90	17.57	5.47
14	0.2000	87.400	85.6	3.2	13.28	12.10	25.38	2.10	18.74	6.64
15	0.2250	104.000	102.2	3.7	15.79	12.10	27.89	2.30	19.99	7.89
16	0.2500	120.800	119.0	4.1	18.31	12.10	30.41	2.51	21.25	9.15
17	0.2750	136.800	135.0	4.5	20.68	12.10	32.78	2.71	22.44	10.34
18	0.3000	151.300	149.5	4.9	22.80	12.10	34.90	2.88	23.50	11.40
19	0.3250	168.100	166.3	5.3	25.26	12.10	37.36	3.09	24.73	12.63
20	0.3500	185.300	183.5	5.7	27.75	12.10	39.85	3.29	25.98	13.88
21	0.4000	219.400	217.6	6.5	32.62	12.10	44.72	3.70	28.41	16.31
22	0.4500	248.500	246.7	7.3	36.67	12.10	48.77	4.03	30.43	18.33
23	0.5000	275.000	273.2	8.1	40.25	12.10	52.35	4.33	32.22	20.12
24	0.5500	301.300	299.5	8.9	43.73	12.10	55.83	4.61	33.97	21.87
25	0.6000	321.600	319.8	9.7	46.28	12.10	58.38	4.82	35.24	23.14
26	0.6500	340.000	338.2	10.6	48.50	12.10	60.60	5.01	36.35	24.25
27	0.7000	355.200	353.4	11.4	50.22	12.10	62.32	5.15	37.21	25.11
28	0.7500	368.600	366.8	12.2	51.65	12.10	63.75	5.27	37.93	25.83
29	0.8000	380.100	378.3	13.0	52.78	12.10	64.88	5.36	38.49	26.39
30	0.8500	391.500	389.7	13.8	53.86	12.10	65.96	5.45	39.03	26.93
31	0.9000	393.600	391.8	14.6	53.64	12.10	65.74	5.43	38.92	26.82



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EXHIBIT N

ADDITIONAL M/WBE PROVISIONS

A. Pre-award waiver of the Participation Goals.

1. A Bidder may seek a pre-award full or partial waiver of the Participation Goals in accordance with Section 6-129, which requests that BNYDC change the Participation Goal on the grounds that the Participation Goal is unreasonable in light of the availability of certified firms to perform the services required, or by demonstrating that it has legitimate business reasons for proposing a lower level of subcontracting in its M/WBE Utilization Plan.
2. To apply for a full or partial waiver of the Participation Goal, a bidder must complete Part B of Exhibit O and submit such request no later than seven (7) calendar days prior to the date and time the bids are due, in writing to the BNYDC by email at hchau@bnydc.org and mwbe@bnydc.org. Full or partial waiver requests that are received later than seven (7) calendar days prior to the date and time the bids are due may be rejected as untimely. Bidders who have submitted timely requests will receive a BNYDC response by no later than two (2) calendar days prior to the due date for bids; provided, however, that if that date would fall on a weekend or holiday, a BNYDC response will be provided by close-of-business on the business day before such weekend or holiday date.
3. If BNYDC determines that the Participation Goal is unreasonable in light of the availability of certified firms to perform the services required, it shall revise the solicitation and extend the deadline for bids.
4. BNYDC may grant a full or partial waiver of the Participation Goal to a bidder who demonstrates—before submission of the bid—that it has legitimate business reasons for proposing the level of subcontracting in its M/WBE Utilization Plan. In making its determination, BNYDC shall consider factors that shall include, but not be limited to, whether the bidder has the capacity and the bona fide intention to perform the Contract without any subcontracting, or to perform the Contract without awarding the amount of subcontracts represented by the Participation Goal. In making such determination, BNYDC may consider whether the M/WBE Utilization Plan is consistent with past subcontracting practices of the bidder whether the bidder has made efforts to form a joint venture with a certified firm, and whether the bidder has made good faith efforts to identify other portions of the Contract that it intends to subcontract.

B. Modification of M/WBE Utilization Plan.

1. A Contractor may request a modification of its M/WBE Utilization Plan (a “Modification”) after award of this Contract. BNYDC may grant a request for Modification of a Contractor’s M/WBE Utilization Plan if it determines that the Contractor has established, with appropriate documentary and other evidence, that it made reasonable, good faith efforts to meet the Participation Goal. In making such determination, BNYDC shall consider evidence of the following efforts, as applicable, along with any other relevant factors:



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- a. The Contractor advertised opportunities to participate in the Contract, where appropriate, in general circulation media, trade and professional association publications and small business media, and publications of minority and women's business organizations;
- b. The Contractor provided notice of specific opportunities to participate in the Contract, in a timely manner, to minority and women's business organizations;
- c. The Contractor sent written notices, by certified mail or facsimile, in a timely manner, to advise MBEs or WBEs that their interest in the Contract was solicited;
- d. The Contractor made efforts to identify portions of the work that could be substituted for portions originally designated for participation by MBEs and/or WBEs in the M/WBE Utilization Plan, and for which the Contractor claims an inability to retain MBEs or WBEs;
- e. The Contractor held meetings with MBEs and/or WBEs prior to the date their bids were due, for the purpose of explaining in detail the scope and requirements of the work for which their bids were solicited;
- f. The Contractor made efforts to negotiate with MBEs and/or WBEs as relevant to perform specific subcontracts, or act as suppliers or service providers;
- g. Timely written requests for assistance made by the Contractor to BNYDC's M/WBE liaison officer at mwbe@bnydc.org and to DSBS and DMWBD;
- h. Description of how recommendations made by DSBS, DMWBD and BNYDC were acted upon and an explanation of why action upon such recommendations did not lead to the desired level of participation of MBEs and/or WBEs.

BNYDC's M/WBE liaison officer shall provide written notice to the Contractor of the determination.

2. BNYDC may modify the Participation Goal when the scope of the work has been changed by BNYDC in a manner that affects the scale and types of work that the Contractor indicated in its M/WBE Utilization Plan would be awarded to subcontractors.

C. Substitutions

Substitutions to the MBEs and/or WBEs that Contractor identified as firms they intended to use in connection with the performance of the Contract may only be made with the approval of BNYDC, which shall only be given when the Contractor has proposed to use a firm that would satisfy the Participation Goal to the same extent as the firm previously identified, unless BNYDC determines that the Contractor has established, with appropriate documentary and other evidence, that it made reasonable, good faith efforts. In making such determination, BNYDC shall require evidence of the efforts listed in Section B(1) above, as applicable, along with any other relevant factors.

D. Indefinite Quantity Contracts

If this Contract is for an indefinite quantity of construction or is a requirements type contract and the Contractor has submitted an M/WBE Utilization Plan and has committed to subcontract work to



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Brooklyn, NY 11205

MBEs and/or WBEs in order to meet the Participation Goal, the Contractor will not be deemed in violation of the M/WBE Program requirements for this Contract with regard to any work which was intended to be subcontracted to an MBE and/or WBE to the extent that BNYDC has determined that such work is not needed.

E. Progress Review, Evaluation and Assessment

At least once annually during the term of the Contract, BNYDC shall review the Contractor's progress toward attainment of its M/WBE Utilization Plan, including but not limited to, by reviewing the percentage of work the Contractor has actually awarded to MBE and/or WBE subcontractors and the payments the Contractor made to such subcontractors.

BNYDC shall evaluate and assess the Contractor's performance in meeting those goals, and such evaluation and assessment shall become part of the Contractor's overall contract performance evaluation.

F. Miscellaneous Provisions

1. The Contractor shall take notice that the resulting contract may be audited. Furthermore, such resulting contract may also be examined by the City's Comptroller to assess compliance with its M/WBE Utilization Plan.
2. DSBS and DMWBD are available to assist contractors and potential contractors in determining the availability of MBEs and/or WBEs to participate as subcontractors, and in identifying opportunities that are appropriate for participation by MBEs and/or WBEs in contracts.
3. Prospective contractors are encouraged to enter into qualified joint venture agreements with MBEs and/or WBEs as defined by Section 6-129(c)(30).
4. By submitting a bid the Contractor hereby acknowledges its understanding of the M/WBE Program requirements set forth herein, and if awarded this Contract, the Contractor hereby agrees to comply with the M/WBE Program requirements of this Contract, all of which shall be deemed to be material terms of this Contract. The Contractor hereby agrees to make all reasonable, good faith efforts to solicit and obtain the participation of MBEs and/or WBEs to meet the required Participation Goals.

G. Enforcement

1. If BNYDC determines that a bidder has, in relation to this procurement, violated the M/WBE Program requirements of this Contract, BNYDC may disqualify such bidder from competing for this Contract and BNYDC may revoke such bidder's prequalification status, if applicable.
2. Whenever BNYDC believes that the Contractor or a subcontractor is not in compliance with the M/WBE Program or its M/WBE Utilization Plan, BNYDC shall send a written notice to the Contractor describing the alleged noncompliance and offering the Contractor an opportunity to be heard. BNYDC shall then conduct an investigation to determine whether such Contractor or subcontractor is in compliance.
3. In the event that the Contractor has been found to have violated the M/WBE Program or



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Brooklyn, NY 11205

its M/WBE Utilization Plan, BNYDC may determine that one of the following actions should be taken:

- a. entering into an agreement with the Contractor allowing the Contractor to cure the violation;
 - b. revoking the Contractor's pre-qualification to bid for future contracts;
 - c. making a finding that the Contractor is in default of the Contract;
 - d. terminating the Contract;
 - e. declaring the Contractor to be in breach of Contract;
 - f. withholding payment or reimbursement;
 - g. determining not to renew the Contract;
 - h. assessing actual and consequential damages;
 - i. assessing liquidated damages or reducing fees, provided that liquidated damages may be based on amounts representing costs of delays in carrying out the purposes of the M/WBE Program, or in meeting the purposes of the Contract, the costs of meeting utilization goals through additional procurements, the administrative costs of investigation and enforcement, or other factors set forth in the Contract;
 - j. exercising rights under the Contract to procure goods, services or construction from another contractor and charge the cost of such contract to the Contractor that has been found to be in noncompliance; or
 - k. taking any other appropriate remedy.
4. If the Contractor has been found to have failed to fulfill its Participation Goals contained in its M/WBE Utilization Plan or the Participation Goal as modified by BNYDC pursuant to Section B of this Exhibit N, BNYDC may assess liquidated damages in the amount of ten percent (10%) of the difference between the dollar amount of work required to be awarded to MBE and/or WBE firms to meet the Participation Goal and the dollar amount the Contractor actually awarded and paid, and/or credited, to MBE and/or WBE firms. In view of the difficulty of accurately ascertaining the loss which BNYDC will suffer by reason of Contractor's failure to meet the Participation Goal, the foregoing amount is hereby fixed and agreed as the liquidated damages that BNYDC will suffer by reason of such failure, and not as a penalty. BNYDC may deduct and retain out of any monies which may become due under this Contract the amount of any such liquidated damages; and in case the amount which may become due under this Contract shall be less than the amount of liquidated damages suffered by BNYDC, the Contractor shall be liable to pay the difference.
5. Whenever BNYDC has reason to believe that an MBE and/or WBE is not qualified for certification, or is participating in a contract in a manner that does not serve a commercially useful function (as defined in Section 6-129(c)(8)), BNYDC shall notify the Commissioner of DSBS or DMWBD, as applicable, who shall determine whether the certification of such business enterprise should be revoked.



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6. Statements made in any instrument submitted to BNYDC pursuant to the M/WBE Program shall be submitted under penalty of perjury and any false or misleading statement or omission shall be grounds for the application of any applicable criminal and/or civil penalties for perjury. The making of a false or fraudulent statement by an MBE and/or WBE in any instrument submitted pursuant the M/WBE Program shall, in addition, be grounds for revocation of its certification.
7. The Contractor's record in implementing its M/WBE Utilization Plan shall be a factor in the evaluation of its performance. Whenever BNYDC determines that a Contractor's compliance with an M/WBE Utilization Plan has been unsatisfactory, BNYDC shall, after consultation with the BNYDC M/WBE liaison officer, file an advice of caution form for inclusion in PASSPort as caution data.



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EXHIBIT O
M/WBE UTILIZATION PLAN

[to attach]

EXHIBIT O
M/WBE Utilization Plan

(To be completed by the bidder/proposer unless granted a full waiver, which must be submitted with the bid/proposal in lieu of this form)

Project name: Restoration of Substation at Building 386

Total MWBE Participation Goal for this Project: 8%

PART A

Section 1: Prime Contractor Contact Information

Tax ID# _____

FMS Vendor ID# _____

Business Name _____

Business Name Contact Person _____

Business Address _____ City _____ State _____ ZIP _____

Telephone _____ Email _____

Section 2: M/WBE Utilization Goal Calculation

Prime Contractor Adopting M/WBE Participation Goals

For Prime Contractors (including Qualified Joint Ventures and M/WBE firms) adopting M/WBE Participation Goals.

Total Bid/Proposal Value \$ _____

multiplied by x

Total Participation Goal 8 % for this IFB

Calculated M/WBE Participation Amount \$ _____

Section 3: Contractor M/WBE Utilization Plan

Please review the IFB for more information on how to obtain credit for M/WBE participation. Check applicable box. The Proposer or Bidder will fulfill the M/WBE Participation Goals:

- As an M/WBE Prime Contractor that will self-perform and/or subcontract to other M/WBE firms a portion of the contract the value of which is at least the Calculated M/WBE Participation Amount set forth in Section 2. The value of any work subcontracted to non-M/WBE firms will not be credited towards fulfillment of M/WBE Participation Goals.

Please check all that apply to Prime Contractor: MBE WBE

- As a Qualified Joint Venture with an M/WBE partner, in which the value of the M/WBE partner's participation and/or the value of any work subcontracted to other M/WBE firms is at least the Calculated M/WBE Participation Amount set forth in Section 2. The value of any work subcontracted to non-M/WBE firms will not be credited towards fulfillment of M/WBE Participation Goals.
- As a non-M/WBE Prime Contractor that will enter into subcontracts with M/WBE firms the value of which is at least the Calculated M/WBE Participation Amount set forth in Section 2.

Section 4: General Contract Information

Enter a brief description of the type(s) and dollar value of subcontracts for all services you plan to subcontract if awarded this contract, along with the anticipated start and end dates for such subcontracts. For each item, indicate whether the work is designated for participation by an M/WBE. **For all M/WBE subcontractors listed below, please also include as attachments to this M/WBE Utilization Plan, a printout of the certification by DSBS or DMWBD given to such subcontractor.**

What is the expected percentage of the total contract dollar value that you expect to award in subcontracts for services, regardless of M/WBE status? _____%

	Description of Work	Start Date	End Date	Planned	Designated for M/WBE?		Vendor Name	Address	Telephone
		(MM/YY)	(MM/YY)	\$ Amount	Y	N			
1	_____	_____	_____	\$ _____	___	___	_____	_____	_____
2	_____	_____	_____	\$ _____	___	___	_____	_____	_____
3	_____	_____	_____	\$ _____	___	___	_____	_____	_____
4	_____	_____	_____	\$ _____	___	___	_____	_____	_____
5	_____	_____	_____	\$ _____	___	___	_____	_____	_____
6	_____	_____	_____	\$ _____	___	___	_____	_____	_____
7	_____	_____	_____	\$ _____	___	___	_____	_____	_____
8	_____	_____	_____	\$ _____	___	___	_____	_____	_____
9	_____	_____	_____	\$ _____	___	___	_____	_____	_____
10	_____	_____	_____	\$ _____	___	___	_____	_____	_____

Section 5: Vendor Certification and Required Affirmations

I hereby:

1. *acknowledge my understanding of the M/WBE participation requirements as set forth herein and the pertinent provisions of Section 6-129 of the Administrative Code of the City of New York ("Section 6-129"), and the rules promulgated thereunder;*
2. *affirm that the information supplied in support of this M/WBE Utilization Plan is true and correct;*
3. *agree, if awarded this Contract, to comply with the M/WBE participation requirements of this Contract, the pertinent provisions of Section 6-129, and the rules promulgated thereunder, all of which shall be deemed to be material terms of this Contract;*
4. *agree and affirm that it is a material term of this Contract that the Vendor will award the total dollar value of the M/WBE Participation Goals to certified MBEs and/or WBEs, unless a full waiver is obtained or such Goals are modified by BNYDC; and*
5. *agree and affirm, if awarded this Contract, to make all reasonable, good faith efforts to meet the M/WBE Participation Goals, or If a partial waiver is obtained or such Goals are modified by BNYDC, to meet the modified Participation Goals by soliciting and obtaining the participation of certified MBE and/or WBE firms.*

Signature _____ Date _____

Print Name _____ Title _____

REQUEST OF WAIVER OF M/WBE PARTICIPATION REQUIREMENTS

PART B – To be completed ONLY if requesting a full or partial waiver of the M/WBE Participation requirements. This waiver request must be submitted at least 7 calendar days prior to the Bid Submission Deadline.

Section 1. Contractor Contact Information

Tax ID# _____
FMS Vendor ID# _____
Business Name _____
Business Name Contact Person _____
Business Address _____ City _____ State _____ ZIP _____
Telephone _____ Email _____
Bid Due Date _____

Section 2. Basis for Waiver Request

Check appropriate box & explain in detail below (attach additional pages if needed)

- Vendor does not subcontract services, and has the capacity and good faith intention to perform all such work itself with its own employees.
- Vendor subcontracts some of this type of work but at a lower % than bid/solicitation describes, and has the capacity and good faith intention to do so on this contract. Identify your subcontracting plan in Section 4, Vendor Certification below.
- Vendor has other legitimate business reasons for proposing the M/WBE Participation Goal requested here.

Explain below (or on additional pages, as needed)

please provide a description and value of all work subcontracted to other vendors.

_____	\$
_____	\$
_____	\$
_____	\$
_____	\$
_____	\$
_____	\$
_____	\$
Percentage of total contract value subcontracted to other vendors	_____ %

If you performed as the Subcontractor, please provide a description and value of work areas you self-performed.

_____ \$ _____

Reference 3

Agency/Organization _____ Contract # _____

Reference Contact _____ Telephone _____ Email _____

Contract Start Date _____ Contract End Date _____ Total Contract Value \$ _____

Prime Contract description

Did the vendor perform as a Prime Contractor or as a Subcontractor? Prime Contractor Subcontractor

Was the Prime Contract subject to any Goals? City M/WBE Goals State Goals Federal Goals No Applicable Goals

Did the Prime Contractor meet Goal requirements? Yes No N/A

If the Prime Contractor did not meet Goal requirements or contract is still ongoing, please explain

If you performed as the Prime Contractor, please provide a description and value of all work subcontracted to other vendors.

_____	\$
_____	\$
_____	\$
_____	\$
_____	\$
_____	\$
_____	\$
_____	\$
_____	\$
_____	\$
Percentage of total contract value subcontracted to other vendors	_____ %

If you performed as the Subcontractor, please provide a description and value of work areas you self-performed.

_____ \$ _____

Reference 4

Agency/Organization _____ Contract # _____

Reference Contact _____ Telephone _____ Email _____

Contract Start Date _____ Contract End Date _____ Total Contract Value \$ _____

Prime Contract description

Did the vendor perform as a Prime Contractor or as a Subcontractor? Prime Contractor Subcontractor
Was the Prime Contract subject to any Goals? City M/WBE Goals State Goals Federal Goals No Applicable Goals

Did the Prime Contractor meet Goal requirements? Yes No N/A

If the Prime Contractor did not meet Goal requirements or contract is still ongoing, please explain

If you performed as the Prime Contractor, please provide a description and value of all work subcontracted to other vendors.	_____	\$ _____
	_____	\$ _____
	_____	\$ _____
	_____	\$ _____
	_____	\$ _____
	_____	\$ _____
	Percentage of total contract value subcontracted to other vendors	_____ %

If you performed as the Subcontractor, please provide a description and value of work areas you self-performed.

\$ _____

Reference 5

Agency/Organization _____ Contract # _____

Reference Contact _____ Telephone _____ Email _____

Contract Start Date _____ Contract End Date _____ Total Contract Value \$ _____

Prime Contract description

Did the vendor perform as a Prime Contractor or as a Subcontractor? Prime Contractor Subcontractor
Was the Prime Contract subject to any Goals? City M/WBE Goals State Goals Federal Goals No Applicable Goals

Did the Prime Contractor meet Goal requirements? Yes No N/A

If the Prime Contractor did not meet Goal requirements or contract is still ongoing, please explain

If you performed as the Prime Contractor, please provide a	_____	\$ _____
	_____	\$ _____
	_____	\$ _____

