HARRISON RECREATION & COMMUNITY CENTER

PHASE 1

270 Harrison Avenue, Harrison, NY 10528

Town / Village of Harrison
One Heineman Place, Harrison, NY 10528

RICHARD DIONISIO	**SUPERVISOR/MAYOR**
FRED SCILIANO	**DEPUTY SUPERVISOR/MAYOR**
LIZ BROWN	**COUNCILWOMAN/TRUSTEE**
GINA EVANGELISTA	**COUNCILWOMAN/TRUSTEE**
LAUREN LEADER	**COUNCILWOMAN/TRUSTEE**
MICHAEL J. AMODEO, P.E., CFM	**TOWN ENGINEER**

ARCHITECT:	**KG+D ARCHITECTS, PC** 285 Main Street Mount Kisco, NY 10549
STRUCTURAL ENGINEER:	**THE DISALVO ENGINEERING GROUP** 93 Lake Avenue, Suite 201 Danbury, CT 06810
MECHANICAL ENGINEER:	**OLA CONSULTING ENGINEERS** 50 Broadway Hawthorne, NY 10532
CIVIL ENGINEER: ENGINEERING	**WOODARD & CURRAN** 800 Westchester Ave, Suite N507 Rye Brook, NY 10573
ISSUE FOR BID:	**12 JULY 2023**

CONFORMED SPECIFICATIONS (INCL 3 ADDENDA, LAST DATED AUGUST 11, 2023)

A D D E N D U M 1

The items set forth herein, whether of omission, addition, substitution, or clarification are to be included in and form a part of the construction documents for the project listed above.

This Addendum consists of the following information:

Part 1 **Division #0, Bidding and Contract Requirements**
Part 2 Technical Changes, Architectural, Structural and Civil …… NOT USED
Part 3 Technical Changes, Mechanical, Electrical and Plumbing …… NOT USED
Part 4 **Drawing Changes, Architectural, Civil and Landscape**
Part 5 **Drawing Changes, Structural**
Part 6 **Drawing Changes, Mechanical, Electrical and Plumbing**
Part 7 **Clarifications**
Part 8 **List of Included Documents**

Part 1 Division #0, Bidding and Contract Requirements

1) **DEADLINE TO RECEIVE BIDS FOR HARRISON RECREATION & COMMUNITY CENTER PHASE 1 SHALL BE EXTENDED UNTIL TUESDAY, AUGUST 15, 2023, at 11:00 AM. LOCATION & INSTRUCTIONS SHALL REMAIN THE SAME.**

2) **DEADLINE TO RECEIVE REQUESTS FOR INFORMATION FOR HARRISON RECREATION & COMMUNITY CENTER PHASE 1 SHALL BE 5 WORKING DAYS PRIOR TO THE DESIGNATED DATE FOR RECEIPT OF BIDS.**

3) Specification Section 004100 - Proposal Form
   a. REPLACE Attachment #2 -- Unit Price Schedule and ADD Attachment #3 – List of Participating Subcontractors.

4) REPLACE 006301 Request for Information Form
   a. RFI Request for Information Form should be emailed to KG+D Architects: **rdavidson@kgdarchitects.com** and **fwells@kgdarchitects.com.**

5) ADD 003132.1 Geotechnical Report dated 07/20/2023. Report provides additional soil boring data in the area of the proposed modular block wall and geotechnical assessment for the wall.

6) REPLACE Specification Section 033000 – Cast-in-Place Concrete with Section 033000 included in this Addendum.

Part 4 Drawings Changes, Architectural, Civil and Landscape

1) Drawing G-100 - Existing Conditions & Removals Plan
   a. Perimeter fence removals have been amended.

2) Drawing C-200 – Utilities Plan
   a. Amended to include primary electric service line.

Part 5 Drawing Changes, Structural

1) Drawing S-100 – Lower Level Foundation Plan and Drawing S-211 – Foundation Sections
   a. Amended to show wall penetrations for storm drain.

Part 6 Drawings Changes, Mechanical, Electrical and Plumbing

1) Drawing M-101 – Parking Floor Plan Phase 1
   a. Amended note regarding above-ground gas service line into the building.

Part 7 Clarifications

1) Is Hazardous Material Coverage necessary for this project?
   a. Yes. Coverage is necessary for unforeseen conditions.

2) Drawings indicate certain work will be completed in Phase 2. Explain.

   The following work is indicated in the drawings for reference and is EXCLUDED from the Phase 1 work:
   a. Asphalt paving and curbs of the parking lot
      i. The drawings call for gravel fill to the finish grade elevation in Phase 1.
   b. Concrete transformer pad.
   c. Concrete floor slabs.
   d. Light fixtures.
   e. Permanent fencing on top of retaining walls.
   f. Stairs and railings in garage.
   g. Concrete wall for planter at southwest building corner.
   h. Site benches.
   i. Topsoil plant beds and plants.

3) The following work related to the above list is INCLUDED in the Phase 1 work:
   a. Concrete foundation walls, piers and footings for the building. Refer to the structural drawings in the bid documents.
   b. Footings for site lighting fixtures with conduit (no wiring).
   c. Concrete walls for planter and areaways at southeast building corner. Refer to wall sections, details 1/S211 and 2/S211.

4) Will specs be provided for the lower-level foundation structural steel?
   a. Construction documents will be issued for coordination of shop drawings with the successful bidder.

5) What is desired texture for the gravity Redi-rock wall?
   a. Texture for the modular block wall shall be Cobblestone.

6) What utilities are coming from Harrison Ave?
   a. Refer to revised drawing C-200 showing all connections to in-street utilities for Phase 1 work.

7) Confirm the existing basketball courts, perimeter fencing and row of cypress trees at the North end of the site will be removed by others.
   a. Refer to revised drawing G-100 Existing Conditions & Removals Plan. Phase 1 work shall INCLUDE removal of the existing basketball courts, perimeter fencing on the property, all trees and other vegetation existing on the site.

8) Please provide an ALLOWANCE for rock removal to be carried by all bidders AND a Unit Price cost for same.
   a. There will be no Allowance provided nor Unit Price for rock removal. In accordance with section 312000, the price bid shall account for Unclassified Excavation, defined as

excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavation materials may include rock, soil materials, and obstructions. **No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.**

b. Bidders are referred to the soil boring data and subsurface conditions described in Sections 003132 and 003132.1, and Foundation Notes on drawing S-001.

9) Proposal Form 004100-6 includes Attachment #1 Schedule of Alternates, please provide description of alternates.
   a. Proposal Form Attachment #1 is not applicable to bids for Phase 1.

10) Proposal Form 004100-7 includes Attachment #2 Schedule of Unit Prices, please provide description of the unit prices.
   a. Proposal Form Attachment #2 is amended to include Unit Price for ADDITION OR REDUCTION of Modular Block Wall (Redi-Rock).

11) Regarding the Plumbing/Gas - You're just looking for the individual stubs sticking out of the building five feet? The building code prohibits a gas line from entering the building wall below grade.
   a. Refer to amended drawing M-101 – Parking Floor Plan Phase 1. The Plumbing/Gas connection into the building shall be above grade.

12) Concrete Topping Compound (Section 033543) is NOT required for Phase 1 work.

13) Provide more information on the geothermal well such as the size of the air handlers and total tonnage needed.
   a. Refer to drawing M-201 and detail 5/M-701 for number and depth of the geothermal wells. The requested information is not pertinent to the Phase 1 work. The geothermal system is being designed to augment the building HVAC needs but design of the building mechanical systems is not yet finalized.

14) When will updated topographic survey be available?
   a. Updated topographic survey following demolition of the existing Recreation Center building will not be completed prior to the bid due date but will be provided to the successful bidder as soon as available.

Part 8 List of Included Documents

Addendum 1	(4 pages)
Specification Section 000001 Table of Contents	(3 pages)
Specification Section 003132.1 Geotechnical Report 07/2023	(25 pages)
Specification Section 004100 Proposal Form	(8 pages)
Specification Section 006301 Request for Information Form	(1 page)
Specification Section 033000 Cast-in-Place Concrete	(7 pages)
Specification Section 312000 Earth Moving (page 5)	(1 page)

(Total 49 pages)

Drawing G-100 - Existing Conditions & Removals Plan
Drawing C-200 – Utilities Plan
Drawing C-501 - Site Details
Drawing C-502 - Utility Coordination Plan
Drawing M-101 – Parking Floor Plan Phase 1
Drawing S-100 – Lower Level Foundation Plan
Drawing S-211 – Foundation Sections
(Total 7 drawings)

End of Addendum

A D D E N D U M 2

The items set forth herein, whether of omission, addition, substitution, or clarification are to be included in and form a part of the construction documents for the project listed above.

This Addendum consists of the following information:

Part 1	**Division #0, Bidding and Contract Requirements**	
Part 2	**Technical Changes, Architectural, Structural and Civil**	
Part 3	Technical Changes, Mechanical, Electrical and Plumbing …….	NOT USED
Part 4	Drawing Changes, Architectural, Civil and Landscape …….	NOT USED
Part 5	Drawing Changes, Structural ……..…….	NOT USED
Part 6	**Drawing Changes, Mechanical, Electrical and Plumbing**	
Part 7	**Clarifications**	
Part 8	**List of Included Documents**	

Part 1 Division #0, Bidding and Contract Requirements

1) 011000 **WORK PERIOD AND MILESTONES SHALL BE EXTENDED TO THE FOLLOWING DATES:**

Award of Contract	**On or about September 15, 2023**
Substantial Competition	**March 15, 2024**
Final Completion	**April 12, 2024**

Part 2 Technical Changes, Architectural, Structural and Civil

1) 232113.33 RFI: Statements under "Vertical Borehole Heat Exchanger" and 1.01 Summary contradict each other and contradict earlier requirements to use PEXa material.
a) **At end of section 1.04, ADD: "HDPE and PEXa are both acceptable materials for the vertical closed loop wells."**
b) **AMEND section 2.02 under Vertical Borehole Heat Exchanger, paragraph 2, to read: "The vertical borehole heat exchanger shall be a premanufactured single U-bend and be one continuous 1-1/4" pipe for the depth of the well."**

2) 323215 **Modular Block Retaining Wall, section 2.04, ADD paragraph: "D. The engineered design for the Modular Block Retaining Wall prepared by the Retaining Wall Design Engineer (RWDE). including depth and composition of the leveling pad shall take precedence over recommendations in the Geotechnical Report of July 2023."**

Part 6 Drawing Changes, Mechanical, Electrical and Plumbing

1) M-201 **Callout note referencing '1" GWS&R to geothermal well…' to each well shall be amended to state '1-1/4" GWS&R…' (not 1" as indicated).**

2) M-701 **Detail # 5 shall be amended to state '1-1/4" HDPE pipe…', (not 1" as indicated).**

Part 7 Clarifications

1) RFI: Would you be willing to accept a Direct Exchange Geothermal Well, as opposed to the Water Based Well? Direct Exchange is supposedly more efficient.

Answer: A DX Geothermal system will not be accepted. While more efficient, the negative aspects including reduced longevity, corrosion of copper tubing, and refrigerant leaks outweigh the increased efficiencies. The geothermal system shall be vertical closed loop wells as per the Construction Documents.

2) RFI: Thermal Conductivity Report: The Test well and Thermal Conductivity testing utilized a 1.25" loop as the heat-exchanger. The specification refers to a "PEX" style heat exchanger.

1.Can alternative heat-exchangers and laterals be used?

2. Is this design /Build?

Answer: Geothermal wells shall be vertical closed loop as per the Construction Documents. This Contract is not design/build. See also Part 2 of this Addendum, amendment to section 232113.33.

3) RFI: 1.05 SUBMITTALS: This statement implies that this is a design bid (sic) project – please provide clarity if bore field layout, and M-701 drawings is to be utilized?

Answer: This Contract is not design/build. Bore Field layouts and details provided in the construction drawings shall be utilized.

4) RFI: Having a hard time interpreting the response for Addendum #1. Can you clarify, are the geothermal wells not a part of phase 1 work?

Answer: Drilling all the wells and installing the required piping into the foundation, testing and then capping the "headers", and all necessary backfill, is to be included in Phase 1 work.

5) **Construction drawings including, but not limited to, plumbing, mechanical and electrical drawings may be diagrammatic. All bends, elbows, fittings and other component parts necessary to complete the specified mechanical, electrical, plumbing, and stormwater systems shall be included in the bid.**

Part 8 List of Included Documents

Addendum 2 (2 pages)

End of Addendum

A D D E N D U M 3

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Part 2	Technical Changes, Architectural, Structural and Civil ……	NOT USED
Part 3	Technical Changes, Mechanical, Electrical and Plumbing …..……	NOT USED
Part 4	Drawing Changes, Architectural, Civil and Landscape ……..……	NOT USED
Part 5	Drawing Changes, Structural ……..….	NOT USED
Part 6	Drawing Changes, Mechanical, Electrical and Plumbing…….….	NOT USED
Part 7	Clarifications ……..…….	NOT USED
Part 8	**List of Included Documents**	

Part 1	**Division #0, Bidding and Contract Requirements**
1)	**DEADLINE TO RECEIVE BIDS FOR HARRISON RECREATION & COMMUNITY CENTER PHASE 1 SHALL BE EXTENDED UNTIL THURSDAY, AUGUST 17, 2023, at 11:00 AM. LOCATION & INSTRUCTIONS SHALL REMAIN THE SAME.**

Part 8	**List of Included Documents**
Addendum 3	(1 page)

End of Addendum

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TOWN OF HARRISON
VILLAGE OF HARRISON
ALFRED F. SULLA JR. MUNICIPAL BUILDING
1 HEINEMAN PLACE
HARRISON, NEW YORK 10528
Telephone: (914) 670-3110

LEGAL NOTICE
PUBLIC BID

Sealed bids for the ***PHASE ONE CONSTRUCTION – NEW RECREATION CENTER*** for the Town of Harrison and Village of Harrison, New York will be received by the Purchasing Department of the **Town of Harrison and Village of Harrison**, **New York** until 11:00 A.M on **Thursday, August 3rd, 2023** at which time, the sealed bids will be opened and publicly read aloud in the Law Conference Room, located on the second floor of the Alfred F. Sulla, Jr. Municipal Building, 1 Heineman Place, Harrison, New York.

A Certified Check or Bid Bond for **five (5%) percent** of the total amount of the proposal must accompany each bid. Bids or proposals shall remain firm for a period of **ninety days (90) days** from the date of opening. All checks, except those of the three (3) lowest bidders, will be returned within **five (5) days** after opening of bids.

Plans, Specifications, and Bid Documents may be obtained at www.bidnetdirect.com beginning on **Wednesday, July 12, 2023** to the closing time and date of bid opening.

A **MANDATORY PRE-BID MEETING** has been scheduled for **Thursday, July 20, 2023 at 11:00 A.M. at the project site on the corner of Calvert Street and Harrison Avenue**, Harrison, New York.

The **Town of Harrison and Village of Harrison Board** reserves the right to accept or reject any and all bids; to waive any informalities, to re-advertise for new bids or to accept any bid, which is in the best interest of the **Town of Harrison and Village of Harrison, New York.**

Dated: July 3, 2023
Harrison, New York
Purchasing Department

SECTION 002100 - INVITATION AND INSTRUCTIONS TO BIDDERS

1.1 OWNER, PROJECT, ARCHITECT, BID PROCEDURE

A. The Owner, Town/Village of Harrison; invites sealed bids for the Harrison Recreation & Community Center Phase 1 and related work all as described in the accompanying contract documents as prepared by KG+D Architects, P.C. 285 Main Street, Mt. Kisco, NY 10549

B. Bids shall be received in accordance with the New York State Public Bidding Laws, this project will be executed under SINGLE CONTRACT as enumerated in the Notice To Bidders and as identified noted below:

Contract #1	General Construction – Phase 1

C. The attention of all bidders is directed to the fact that a single set of documents exists for the construction of the Project as a whole. Work on each sheet, or within any technical specification section may or may not have an effect on the work of any single Prime Contractor. Failure on the part of any single Prime Contractor to examine all documents will not be cause for additional cost to the Owner.

1.2 DISCREPANCY

A. Should any bidder find any discrepancies in, or omission from, the Contract Documents, or should the bidder be in doubt as to the meaning of any portion of said documents, they shall at once notify the Architect and obtain an interpretation or clarification prior to submission of their bid.

B. Any request for interpretation or clarification given in accordance with this provision shall be in writing.

C. The bidder may, during the bidding period, be advised by addendum of additions, deletions, or alterations in any of the documents forming a part of this Contract. All such additions, deletions or alterations shall be included in the work covered by the bid and shall become a part of this Contract. Upon such mailing or delivery and making available for inspection, such addendum shall become a part of the Contract Documents and shall be binding on all Bidders whether or not the Bidder receives or acknowledges the actual notice of such addendum. The requirements contained in all Contract Documents shall apply to all addenda.

CUTOFF DATE FOR RECEIPT OF REQUESTS FOR INFORMATION (RFI'S) SHALL BE 5 WORKING DAYS PRIOR TO THE DESIGNATED DATE FOR RECEIPT OF BIDS.

D. Only interpretations, corrections or additional Contract provisions made in writing by the Architect as addenda shall be binding. No officer, agent or employee of the Owner or the Architect is authorized to explain or to interpret the Contract Documents by any other method and any such explanation or interpretation, if given, shall not be relied upon by the Bidder.

1.3 REPRESENTATION - Each bidder, by making their bid, represents that -

A. They have read and understand the Bidding Documents (consisting of the Project Manual, Drawings and Addenda (if any)) and their Bid is made in accordance therewith.

B. They have visited the site and have familiarized themselves with the conditions under which the work is to be performed.
C. All materials to be incorporated in the work shall be "asbestos free" in their manufacture.
D. To protect the interest of the Town of Harrison and Village of Harrison, New York, bidders must guarantee that the material offered is standard new material, latest model, regular stock products.

1.4 DOCUMENTS

A. Bidders may obtain the Plans, Specifications, and Bid Documents starting **Wednesday, July 12, 2023**, at www.bidnetdirect.com.

1.05 INFORMATIONAL MEETING - All bidders are advised to attend a **MANDATORY PRE-BID MEETING** which will be held as follows:

A. Date – **Thursday, July 20, 2023**
B. Local Prevailing Time – **11:00 AM**
C. Location: **Corner of Calvert & Harrison Avenue, Harrison, New York**
D. All questions that may arise as a result of this meeting will be recorded and answered by the Addendum process.

NOTE: ALL BIDDERS WILL BE PRESUMED TO HAVE FULL KNOWLEDGE OF THE SITE, AND ALL THE INFORMATION AVAILABLE AT THE PRE-BID WALK THROUGH. NO EXTRA COST OR TIME EXTENSIONS WILL BE GRANTED BECAUSE OF A LACK OF KNOWLEDGE OF ON SITE CONDITIONS, APPARENT, OR DATA AVAILABLE DURING THE WALK THROUGH.

1.06 BIDDING

A. Sealed bids will be received by the Purchasing Department of the **Town of Harrison and Village of Harrison, New York, until 11:00 AM**, local Prevailing Time, on **Thursday, August 3, 2023** located on the second floor of the Alfred F. Sulla, Jr. Municipal Building, 1 Heineman Place, Harrison, New York at which time all bids will be opened publicly and read aloud.
B. The Bidder must submit bid prices on the enclosed Bid Form (Section 004100)
C. The signed Bid Form and Certified Check must be returned in a sealed envelope clearly marked: **"HARRISON RECREATION & COMMUNITY PHASE 1"**
D. All spaces on Proposal Form must be completed. All signatures shall be in ink and in longhand.
E. No oral or telephonic proposals or modifications of proposals will be considered.
F. Any proposals containing exceptions or modifications may, at the Owner's option, be disqualified.
G. The Contractors Qualifications, Certification of Compliance with the Iran Divestment Act, and Non-Collusive Bidding Certification must be signed, notarized, and attached to your bid. No bid will be accepted without these Certifications.
H. Every bid must be accompanied by a Certified Check or Bid Bond in the amount of five (5%) percent of the Contract Sum drawn by a recognized surety authorized to conduct business in the State of New York and made payable to the Town of Harrison and Village of Harrison.
I. Bidders must carefully examine the specifications and accompanying drawings, if

any, and examine the site of work and employ such means as they deem necessary to completely satisfy themselves as to the actual condition, quantities of materials, and the requirements of the work.

1.07 QUALIFICATIONS OF BIDDER

A. The Owner may make such investigation as the Owner deems necessary to determine the responsibility of any Bidder or to determine the ability of any Bidder to perform the Work.

B. Bidders shall furnish to the Owner all information and data required by the Owner, including complete financial data, within the time and in the form and manner required by the Owner.

C. The Owner reserves the right to reject any bid if the evidence required by the Owner is not submitted as required or if the evidence submitted by or the investigation of any Bidder fails to satisfy the Owner that the Bidder is responsible or is able or qualified to carry out the obligations of the Contract or to complete the Work as contemplated.

1.08 POST BID PROCEDURES

A. The responsibility of bidders and of their proposed subcontractors will be considered in making the award. The Owner through the Architect may make such investigation as the Owner deems necessary to determine the responsibility of any bidder or to determine the ability of any bidder to perform the Work.

B. When requested by the Architect, bidders shall furnish all information and data required by the Owner, including financial data, within the time and in the form and manner required by the Owner. Upon notification from the Architect, the three apparent low bidders shall furnish within three (3) working days after the bid opening four (4) copies of the following information in writing:

1. a signed and notarized bidder qualification statement (see Section 004513);
2. the names, addresses and phone numbers of the subcontractors and suppliers that the bidder proposes to use on the project;
3. the bidder's proposed site safety plan;
4. a bar chart (see paragraph 1.03, Section 013200 of the General Requirements) showing the bidders' proposed plan and schedule to complete the bidder's work in accordance with the phasing milestones outlined in Section 011000;
5. the insurance certificates required by the Bid Documents;
6. a proposed schedule of values for the bidder's work;
7. a proposed list of submittals and a proposed schedule for making them, all keyed to the bar chart.

C. After receipt of the above information, the Architect will designate a time and place for a meeting between the Owner, the Architect and the apparent low bidder. The apparent low bidder's principal, project manager and site superintendent will attend that meeting, at which time the parties will discuss the bidder's responsiveness, responsibility, and qualifications.

D. The Owner reserves the right to disapprove the use of any proposed Subcontractor and in such event the bidder shall submit the name of another Subcontractor in like manner within the time specified by the Architect.

E. To the fullest extent allowed by law, the Town and Village Board of Harrison reserves the right to reject any bid if the evidence required by the Owner is not

submitted or fails to satisfy the Owner that the bidder is responsible, able and qualified to carry out the obligations of the Contract or to complete the Work as contemplated. The Owner will consider the information received under paragraphs A through D above in determining whether or not to accept a proposal.

F. The Town and Village Board of Harrison reserves the right to accept or reject any and all bids; to re-advertise for new bids, to waive any informalities and to accept any bid which is in the best interest of the Town of Harrison and Village of Harrison, New York.

G. Acceptance of a proposal will be a notice in writing signed by a duly authorized representative of the Owner.

H. Any bidder whose proposal is accepted will be required to sign the Trade Contract within ten (10) days after receiving notice of acceptance.

I. In the event that the Owner should reject the proposal of a bidder as provided above or otherwise, at the Owner's option, the Owner may elect to meet with the next lowest bidder and to consider the information as provided in paragraphs A through D above. In the event that the proposal of the next lowest bidder is rejected as provided above or otherwise, at the Owner's option, the Owner may elect to meet with the third lowest bidder and repeat the above process. At all times the Owner retains the right to reject all bids.

1.09 APPROVAL OF SUBCONTRACTORS

A. When requested by the Owner, Bidders shall, within the time specified by the Owner, submit to the Owner the names of the Subcontractors which the Bidder proposes to use on the project.

B. The Owner reserves the right to disapprove the use of any proposed Subcontractor and in such event the Bidder shall submit the name of another Subcontractor in like manner within the time specified by the Owner.

C. The Owner reserves the right to reject any bid if the names of proposed Subcontractors are not submitted as required.

1.10 SECURITY AND BONDS (Coordinate with Section 006100)

A. Every bid must be accompanied by a Certified Check or Bid Bond in the amount of five (5%) percent of the Contract Sum drawn by a recognized surety authorized to conduct business in the State of New York and made payable to the Town of Harrison and Village of Harrison.

1. Bid Security shall be submitted in a separate sealed envelope clearly identifying the company and project as well as the name and address of the Surety Company.

2. Each Bond must be accompanied by a Power of Attorney, giving names of Attorneys-in-fact, and the extent of their bonding authority. All bonds shall be countersigned by a resident Agent and with a Surety Company or Corporation meeting the following qualifications:

a. Surety must be licensed to do business in the State of New York.

b. Surety shall be listed on the current U.S. Treasury Department Circular 570 entitled "Companies Holding Certificates of Authority" from the Secretary of the Treasury under the Act of Congress approved July, 30, 1974 (6 U.S.C., Sec. 6-13), as Acceptable Sureties on Federal Bonds.

c. Surety must meet minimum rating requirements as published in current "Best's Key Rating Guide" as listed below:

1. For contracts not exceeding $250,000, the following shall apply for all bonding companies holding a certified guarantee agreement form, the Small Business Administration (a copy of said agreement must accompany the bond.)

Contract Amount	Financial Size Category	Policy Holder Rating
$0- (But not including) $100,000	Class VI	B
$100,000-(But not including) $250,000	Class X	A-

2. On all bonds, the Surety shall be rated as equal to “A-” or better as to “Policy Holder Ratings” and “X” or better as to “Financial Size Category” by “Best’s Key Rating Guide.”
3. Limitations:
   a. Bonding limits or bonding capacity refers to the limit or amount of bond acceptable on any one project.
   b. The bonding limit for each contractor shall not exceed the amount listed on the above referenced U.S. Treasury Department List for the Surety issuing the bond.
4. All Surety companies are subject to approval and may be rejected by the Owner without cause, in the same manner that bids may be rejected.
5. Compliance: In the event any of the requirements outlined herein are not complied with, the Owner shall have the right to reject the bid or annul the Award of the Contract.

B. Bid security will be returned within five (5) days to all except the three lowest bidders, after formal analysis and evaluation of bids. All bids shall remain firm for a period of ninety (90) days from the date of opening. All checks, except those of the three (3) bidders, will be returned within five (5) days after opening of bid.

C. Remaining bid security will be returned to bidders after Owner and successful bidder have executed the Agreement and the Owner has received and approved performance and payment bonds.

D. If the required agreement has not been executed within the specified period of time after the bid opening, bid security of any bidder will be returned upon his request, provided he has not been notified of acceptance of his bid prior to the date of his request.

E. Separate Performance and Payment Bonds will be required for the work. Each shall be in the amount of 100% of the Contract price.

F. The Contractors shall include in their proposal amounts the total premiums for the performance and labor and material payment bonds as set forth in Section 0061 00.

1.11 TAX STATUS (Coordinate with Article 3.6 of Section 007000)

A. The Owner, Town of Harrison and Village of Harrison, is a NYS municipality and is therefore "tax-exempt" in accordance with the applicable laws of the State of New York and with Chapter 32 of the Internal Revenue Code, as most recently

amended, for collection of all sales and excise taxes.

B. Exemption Certificates will be furnished to the Respective Prime Contractor.

1.12 INSURANCE

A. Insurance as required by Article 11 of the General Conditions and as set forth in the Insurance Rider (Section 007002) shall be required of each Respective Prime Contractor and shall be of forms and limits required therein.

1.13 EQUIVALENCY CLAUSE (Coordinate with Section 012500)

A. When in the project manual/specifications, two or more kinds, types, brands, or manufacturers of materials are named they are regarded as establishing the required standard of quality and not for the purpose of limiting competition.

B. The contractor may select one of these items or, if the contractor desires to use any kind, type, brand, manufacturer or material other than those named in the specification, he shall, in accordance with the instructions set forth in “Post-Bid Requirements” herein, identify within three (3) days after bid submission, but in any event prior to award of contract, what kind, type, brand, or manufacturer is included in the base bid for the specified item following procedures set forth in Section 012500.

C. Failure to so identify the perceived “equivalencies” will not relieve contractor from providing the specified items.

1.14 AWARD OF CONTRACT

A. This notice is an offer to receive proposals for a contract and not an offer of a contract.

B. The award of the Contract shall be made to the Bidder submitting the lowest bid if, in the opinion of the Owner, such Bidder is qualified to perform the Work involved, is responsible and reliable.

C. Alternates, if stated in the Proposal Form, shall be chosen at the discretion of the Owner when awarding the Contract. The lowest bid will then be determined by adding to, or subtracting from, to the bidder's total base bid, all Alternates chosen by the Owner.

D. The Bidder agrees to commence work within ten (10) days of receipt of a Notice to Proceed, Letter of Intent, and/or Execution of Contract whichever is earlier.

E. The Owner reserves the right to reject any bid or all bids, to waive any informalities or irregularities or omissions in any bid received or to afford any Bidder an opportunity to remedy any informality or irregularity if it is in the Owner's interest to do so.

F. The award of the Contract shall not be construed as a guarantee by the Owner that the plant, equipment and the general scheme of operations of a Bidder is either adequate or suitable for the satisfactory performance of the Work or that other data supplied by a Bidder is accurate.

G. Award, if made, will take into consideration the responsibility of the bidder and the materials, supplies or equipment deemed to be best adapted to the use of the Town of Harrison and Village of Harrison, New York. Proper consideration will be given to modern accepted practice, engineering design, efficiency and workmanship, serviceability and other pertinent data. No award will be made on equipment, which does not adequately meet the requirements of the Town of Harrison and Village of Harrison, New York.

H. Acceptance of materials provided shall be visual and, if required, testing will be

done in accordance with New York State Department of Transportation Standard Specifications.

I. Prior to the expiration date of this contract and upon the mutual, written consent of both parties, this contract may be extended for a period of one (1) year from the date of award, using the quoted prices, subject to the required approvals.

1.15 LAWS AND REGULATIONS

A. All applicable Federal, State, County, Municipal or other laws, orders, ordinances, rules and regulations of all Authorities having jurisdiction over construction work in the locality of the project shall apply to the Contract and shall be deemed to be included in the Contract as if fully set forth therein at length.

B. This project is subject to wage determination as issued by the Department of Labor. Reference Section 004643.

C. In accordance with the requirements of General Municipal Law §103-g, the bidder is required to include with its bid either (1) the “Certification of Compliance with the Iran Divestment Act” or, in the case where the bidder is unable to make such certification, (2) the form titled “Declaration of Bidder’s Inability to Provide Certification of Compliance with the Iran Divestment Act”.

1.16 ARREARS

A. No bids will be accepted from, or contracts awarded to, any person, persons, firms or vendors who are in arrears to the Municipality upon debt, or contract, or who is a defaulter as surety or otherwise upon obligations to the Municipality.

1.17 NONDISCRIMINATION

A. Notwithstanding implementation of the Owner's Affirmative Action Plan, if any, all Contractors and Subcontractors of all tiers and vendors will be required to comply with all provisions of the Civil Rights Act of 1964, Executive Order 11246 of 24 September 1965 and the relevant "Laws", "Acts" rules, regulations and orders of the Labor Department of the State of New York as amended.

1.18 TIME OF COMPLETION AND LIQUIDATED DAMAGES

A. Work set forth in the Contract Documents shall be commenced as stated in written Notice to Proceed, Letter of Intent or execution of the Contract (whichever is earlier) and shall be completed within the time stated in Section 011000 from said Notice, Letter, or Execution (whichever is earlier).

B. Liquidated Damages may be assessed for each and every calendar day that the work is not complete, after the above stated time for total completion of the work at the rates set forth in Section 007000.

END OF SECTION 002100

Preliminary Geotechnical Report

Town/Village of Harrison
Sollazzo Recreation Center

270 Harrison Avenue
Harrison, New York

April 19, 2019

Prepared for:

Kaeyer, Garment + Davidson Architects
285 Main Street
Mount Kisco, NY 10549

Prepared by:

SKYLANDS ENGINEERING, LLC
124 Milton Road
Sparta, NJ 07871

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Sparta, NJ 07871
Certificate of Authorization No. 0013524

STATE OF NEW YORK ★ EUGENE J. SCHWARZROCK ★ LICENSED PROFESSIONAL ENGINEER 077007

Eugene J. Schwarzrock, Professional Engineer — Date: 4-19-2019
New York License No. 077007-1

Note: it is a violation of NY Education Law Section 7209 for any person to alter any item in this report in any way, unless they are acting under the direction of a Professional Engineer registered in New York. The altering engineer shall affix to this page their seal, the notation "altered by" followed by their signature, date of alteration, and a specific description of the alteration(s) made.

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INTRODUCTION

This project consists of the redevelopment of the Sollazzo Recreation Center situated at 270 Harrison Avenue, between Orchard Street and Calvert Street, in the Town/Village of Harrison, Westchester County, New York. At present the project limits contain the 2-sty ±5,500 SF Frank P. Sollazzo Sr. Recreation Center building near the center of the site, a 2.5-sty 1,200 SF frame building in the southeast corner of the site, a 3-sty 1,300 SF masonry residential building in the southcentral area along Calvert Street, and a 2-sty ±1,300 SF stucco residential building in the southwest corner, also along Calvert Street. Asphalt basketball courts are present in the north portion of the site along Orchard Street and Harrison Avenue. Asphalt parking lots and landscaped areas occupy the remainder of the properties.

Based on the preliminary site layout plans, most, if not all, of the existing buildings will be removed to accommodate the new facility layout. The proposed addition will likely run the entire length of Harrison Avenue between Orchard and Calvert Streets, and extend 140 ft. deep/wide in the east-west direction, encompassing ±30,500 SF in plan area. A 1-sty steel frame building with shallow basement may be constructed in the north area of the site, and a 2-sty steel frame building with full basement may be constructed in the south area. Below-ground parking is planned beneath the southeast portion of the proposed building, and at-grade parking is planned for the southwest area of the project.

Based on the partial survey of the eastern portion of the project provided by Kaeyer, Garment + Davidson Architects, the majority of the site is generally level, with grades in the north and east generally varying from El. 77 to El. 78. Across the southern portion of the site, grades drop from El. ±77.2 at Harrison Avenue to El. ±73.0 near the middle of the proposed project, where the survey ends. By observation, grades continue dropping further to the west.

This report presents the findings of a subsurface investigation prepared and conducted by others, as well as preliminary recommendations for design and construction of the proposed redeveloped recreation center.

GEOLOGY

Based on our review of topographic maps and published geologic data for this area of Harrison, including the *Surficial Geologic Map of New York - Lower Hudson Sheet*, 1989, by Caldwell, Connally, et. al., this site is expected to be underlain by glacial till consisting of a mixture of grain sizes ranging from clay and silt, to sand, cobbles and boulders. Underlying bedrock is expected to be relatively shallow and consist of granitic gneiss beneath the majority of the project limits, and schist beneath the southeast corner based on the *Bedrock Geology of the Mamaroneck Quadrangle, N.Y.*, 1977, by Pelligrini.

SUBSURFACE INVESTIGATION

Soiltesting, Inc. of Oxford, CT performed seven (7) borings on March 22 and March 28, 2019 as part of a preliminary subsurface investigation program to identify the subsurface conditions present beneath the project site. Borings B-1 thru B-4, including B-1A and B-3A, were located near in four (4) corners of the existing basketball court, while boring B-5 was located in the southeast corner of the project near Harrison Avenue and Calvert Street. All borings were drilled using a nominal 3-¼ in. hollow stem auger to advance and maintain the hole, with samples collected continuously from the ground surface to spoon and/or auger refusal, except at B-1A and B-3A. These two (2) borings were drilled ahead without

sampling the soil, and bedrock was cored upon reaching auger refusal. Auger drilling/probing was typically continued below the last soil sample to estimate depths of weathered and/or more competent bedrock. Boring depths ranged from 6.5 ft. to 17 ft. Sampling was performed using a 2 in. O.D. split spoon sampler driven by a 140 lb. safety hammer with a 30 in. drop and the number of blows for each 6 in. increment was recorded, in accordance with procedures outlined in ASTM D1586 - Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils. Bedrock was cored using an N-size, double tube core barrel in accordance with ASTM D 2113 - Standard Practice for Rock Core Drilling and Sampling. Soil samples were classified by an experienced geologist, generally in accordance with D.M. Burmister's "Suggested Test Methods for Identification of Soils" (ASTM, 1958). Bedrock samples were classified according to their geologic origin and measured rock quality designation (RQD).

Groundwater was not encountered in any of the seven (7) borings.

A Boring Location Plan and boring logs are presented in the Appendix. The boring logs are as presented by Soiltesting, Inc. with boring elevations and recovery percentages added by Skylands Engineering based on the boring location plan, site survey, and recorded recovery amounts.

SUBSURFACE CONDITIONS

The subsurface conditions encountered beneath this site are generally consistent with the published geologic literature. Beneath the surficial asphalt or concrete, the northern four (4) borings generally encountered between 3.5 ft. and 6 ft. of brown, medium dense to very dense, medium to fine sand with significant minor percentages of silt and gravel, and trace amount of clay. Boring B-3 encountered loose possible fill to a depth of 4.5 ft. Beneath these surficial sands, between 6 in. and 5 ft. of weathered bedrock was present, as determined by auger drilling. The top of more competent/unweathered bedrock was estimated by auger refusal at depths ranging from 6 ft. to 10 ft., or from El. ±72 to El. ±67.2. Recorded SPT N-values ranged from 8 blows per foot (bpf) to 9 bpf in the possible fills encountered at boring B-3, and from 12 bpf to 39 in the natural sands. Bedrock core samples obtained from borings B-1A, B-2 and B-3A revealed the bedrock to be schist. Measured recoveries and RQDs ranged from 73% to 83% recovery, and 45% to 57% RQD, indicative of poor to fair quality rock.

Similar conditions were encountered in the southeast boring, B-5, with the only significant difference being a somewhat thicker depth of native sands before encountering bedrock. Beneath the surficial topsoil, boring B-5 encountered 10.5 ft. of brown, medium dense to very dense, mostly medium to fine sand with significant gravel and varying silt content. Weathered bedrock was encountered at a depth of 10.5 ft. (El. ±65.8), and more competent bedrock as determined by auger refusal was recorded at a depth of 12 ft. (El. ±64.3). SPT N-values ranged from 12 bpf to 100+ bpf in the native sands. A bedrock core sample revealed excellent quality schist, with 100% recovery and 98% RQD.

Groundwater was not encountered above bedrock in any boring at the time of drilling; however, wet soil was present in boring B-5 below a depth of 6 ft.

PRELIMINARY DESIGN RECOMMENDATIONS

Based on our review of the findings of this preliminary subsurface investigation program, it is preliminarily recommended that conventional shallow foundations are suitable for support of the proposed recreation center building(s). The recommended footing/frost depth for Harrison is 42 in.

below final exterior grade therefore bottoms of footings should be located at or below this depth to prevent frost heave damage. Since all buildings are expected to have a basement, it is expected that all basements/footings will be constructed on or in unweathered bedrock, since the depth to unweathered bedrock is close to that required for a fully-depressed basement. Allowable bearing capacities of 4 tons per square foot (tsf), 6 tsf, and 10 tsf are preliminarily recommended for footings founded on the dense sands, weathered bedrock, and unweathered bedrock, respectively. These recommendations will be confirmed/updated following the completion of the final subsurface investigation program and an analysis of the design loads. A coefficient of base sliding of 0.45 is recommended for footings founded on the dense soils, or 0.65 for footings founded on weathered or unweathered bedrock. Minimum footing widths of 24 in. for wall footings and 30 in. for column footings are recommended to limit settlements of any footings on soil. Similarly, minimum footing widths of 18 in. and 24 in. are recommended for footings founded on weathered or unweathered bedrock in order to accommodate construction tolerances.

The following in situ soil properties are recommended for design of the basement walls:

Moist unit weight of retained soil,	γ_t = 125 pcf
Angle of internal friction,	ϕ = 36°
Lateral earth pressure coefficients:	
Active,	K_a = 0.26
Passive,	K_p = 3.85
At-rest,	K_o = 0.41
Coeff. of friction (sliding),	tan δ = 0.45 (CIP concrete on compacted silty sand)
	= 0.65 (CIP concrete on bedrock)

Following the above recommendations, it is estimated that maximum post construction foundation settlement will be negligible, and no more than ⅛ in. total settlement, and <⅛ in. differential settlement between adjacent columns. These values are within generally accepted tolerance limits for this type of structure/use. Settlement will be elastic (instantaneous), with no long-term settlement occurring. Settlement estimates will be updated following the final subsurface investigation and an analysis of design loads.

Basement slabs may be constructed as slabs-on-grade atop either native sands, or weathered or unweathered bedrock. It is expected that a modulus of subgrade reaction equal to 250 pci to 350 pci will be suitable for slabs founded on in situ sands and bedrock.

Waterproofing and/or underslab drainage should be considered for basement slabs and walls that are deeper than 5 ft. Even though static groundwater was not measured in any boring during the preliminary investigation, wet soils, as opposed to moist soils, were recorded below a depth of 6 ft. (El. 70.3) in boring B-5. Based on these preliminary borings, it is assumed that static groundwater levels may be present at or near this elevation. *It is recommended that at least 2 groundwater observation wells be installed in the southern portion of the site during the next phase of the subsurface investigation so that groundwater may be accurately measured.*

In accordance with the provisions of Section 1613.3.2 of the New York 2015 Building Code, and ASCE 7 Chapter 20, along with the consistent findings of auger refusal indicating unweathered bedrock within 10 ft. of the anticipated footing bottoms, a seismic site class of B, rock, is recommended for design of

the proposed addition. Based on the project location, in conjunction with the above site class, the following seismic parameters follow from the Code:

S_s =	0.269	S_1 =	0.071
F_a =	1.0	F_v =	1.0
S_{MS} =	0.269	S_{M1} =	0.071
S_{DS} =	0.18	S_{D1} =	0.047

Seismic Design Category Based on Short Period Response Accelerations = B*†
Seismic Design Category Based on 1-sec Period Response Accelerations = A*

* based on assumed Risk Category II or III

† governs

There is no evidence of past slope instability and none is expected under static or seismic loading.

The soils at this site are non-liquefiable based on their suitably high relative density, silt content, and lack of groundwater.

It is anticipated that the areas of the project not investigated by these preliminary borings are underlain by similar soils and bedrock. These areas include the central and southwest portions of the project, including where existing buildings need to be removed. It is recommended that if any existing buildings are removed prior to the start of construction of this project, the contents and building materials be removed completely from the site, no construction debris be buried on site, and any basement walls and slabs be broken up and/or removed to allow uninterrupted drainage of any groundwater or potential stormwater management facility flows. Design recommendations for pavements or other improvements will be made following the collection of subsurface information in these areas.

Recommendations for additional borings, including the number, depth and sampling criteria, will be developed after the site and building plans are advanced further and the project moves closer to the final design phase.

PRELIMINARY CONSTRUCTION RECOMMENDATIONS

Footings shall not be constructed on frozen or wet soils or ice. All frozen or saturated subgrade soil should be removed and replaced with compacted structural fill or clean crushed stone.

Any loosened soil present at the bottom of footing excavations should be compacted using a jumping jack, vibratory plate, or similar vibratory compactor. Such compaction should continue until all visible settlement is complete.

If any portion of the existing recreation center is left in place, care should be taken during compaction and construction of new footings, especially near any stone walls or any walls with unknown foundation conditions. A pre-construction condition assessment of all portions of the recreation center which may remain is recommended so that new movements may be detected, and corrective actions taken, as early as possible. If any cracks exist prior to the start of construction, crack gages should be installed and monitored through the time of foundation construction.

Organic soils were not encountered within the borings; however, if organic soils are encountered they should be removed completely from beneath the limits of any building and replaced with compacted

structural fill. Organic soils should not be used as site or structural backfill, but should be removed offsite.

Cobbles and boulders are expected to be encountered within the excavation depths. Any cobbles or boulders encountered during construction should be removed so that no part protrudes into the bottom or sides of foundation excavations. Extreme care should be exercised when removing such obstacles near adjacent foundations, sidewalks, and any potential underground utilities.

Dewatering will likely be needed during foundation and basement construction since groundwater is expected to be present at El. ±70.5.

Structural fill material should consist of predominately well-graded, coarse to fine sand and/or gravel with a maximum 10% non-plastic fines (material passing a No. 200 sieve) and be free of organics and other deleterious materials. Aggregate size should be limited to no bigger than 1 in. in the largest dimension. Based on the findings of this subsurface investigation, it is estimated that less than 25% of the in situ materials may be suitable for reuse as structural fill. Additionally, the limited project area and anticipated staging issues will likely preclude the economic reuse of in-situ soils. Representative samples of imported fill materials should be tested for gradation and moisture-density relationship prior to use to confirm their suitability.

Structural fill should be placed in maximum 10 in. loose lifts and compacted to 95% of its maximum dry density at optimum moisture content as determined by the Modified Proctor Density Test (ASTM D 1557). These operations should be performed under full-time geotechnical inspection and testing by either the Sand Cone Method (ASTM D 1556), Nuclear Density Gauge (ASTM D 2922 and D 3012), or other moisture/density test methods. These density tests should be performed by an experienced geotechnical inspector at sufficient frequency and spacing to ensure proper compaction, with the following criteria suggested as guidelines:

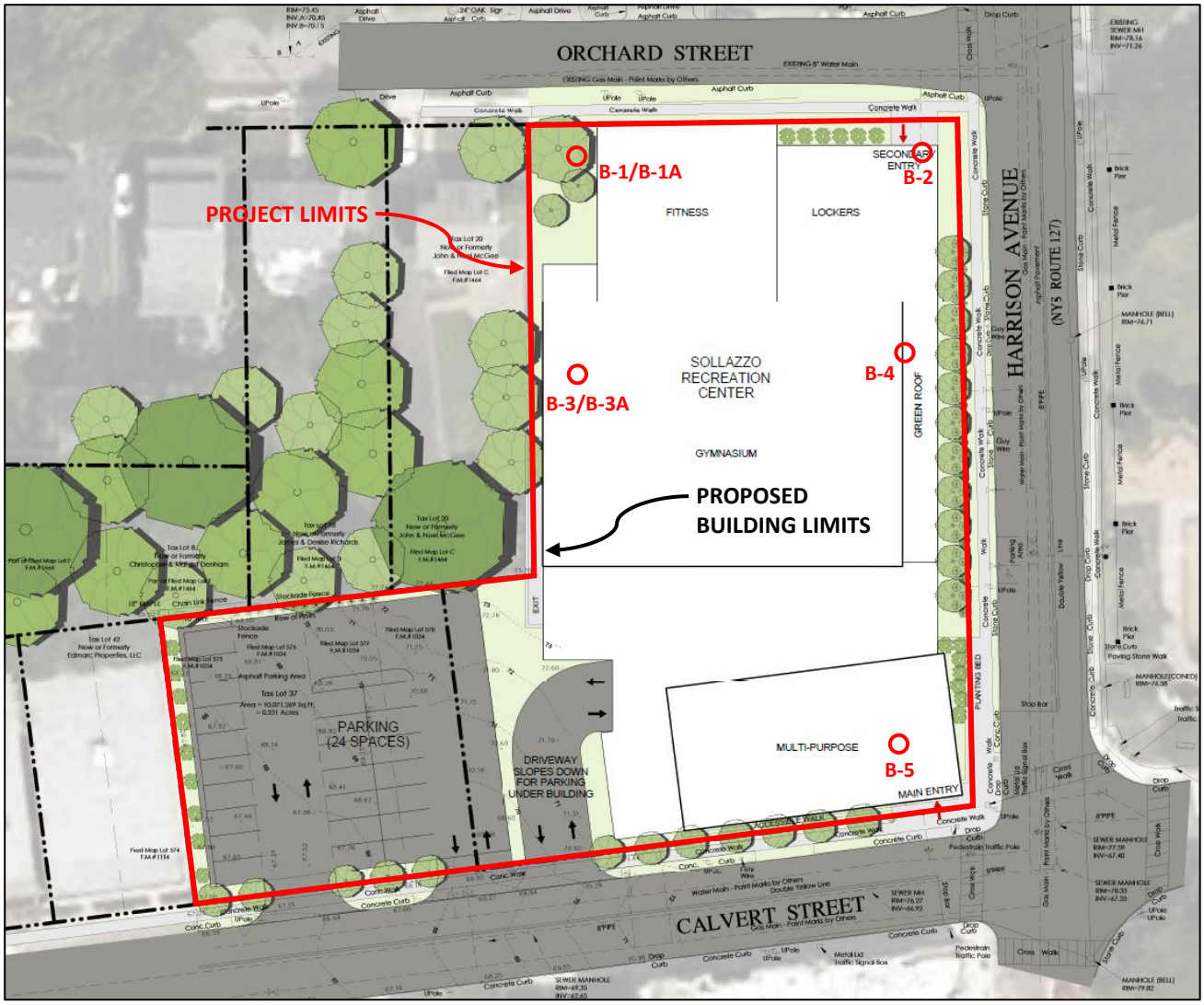
Location	Frequency of Testing
Structural fill beneath foundations, adjacent to structures & beneath slabs-on-grade	1 test every 2,500 SF min. 1 test per lift
Utility trenches	1 test every 50-100 LF per lift min. 3 tests per day
General site fill (beyond building limits)	1 test every 5,000 SF per lift min. 1 test per lift

For excavations that extend deeper than 5 ft., sheeting, shoring, sloping, or benching of the excavation sidewalls is required per OSHA standards. Considering the limited space and shallow bedrock at this site, benching and sheeting will likely not be suitable in many places, and shoring may be required. Based upon the material characteristics and estimated strength of the soils encountered during the subsurface exploration, the soil present on site may be assumed to be Type C and should be sloped at a 1.5H:1V (34°) per OSHA requirements. For the design of temporary sheeting or shoring, the soil properties listed above for retaining wall design are recommended.

All sheeting, shoring and bracing shall be designed by a professional engineer licensed in the State of New York. Shorter, unbraced excavations will experience localized instability (i.e., sloughing) if left open for more than one (1) day due to the gradation of the material and lack of moisture in the soil. To reduce the severity of this sloughing, such excavations should be covered with plastic sheeting for protection from rainfall and moisture changes.

It is recommended that all foundation construction and subgrade preparation procedures be inspected by a qualified geotechnical engineer experienced with this type of construction.

APPENDIX



SCALE

N.T.S.

LEGEND

B-1 BORING

NOTES:

1. BASE PLAN PROVIDED BY KAEYER, GARMENT + DAVIDSON ARCHITECTS
2. BORING LOCATIONS PROVIDED BY SOILTESTING, INC.

BORING LOCATION PLAN

SOLLAZZO RECREATION CENTER

270 HARRISON AVENUE
HARRISON, NEW YORK

SKYLANDS ENGINEERING, LLC

124 MILTON ROAD
SPARTA, NJ 07871
CERTIFICATE OF AUTHORIZATION NO. 0013524

DATE: 4-19-2019

Boring Logs

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: KG&D Architects	SHEET 1 OF 1 HOLE NO. B-1 &B-1A
	PROJECT NO. G46-1223-19	
	PROJECT NAME Harrison Recreation Center	BORING LOCATIONS per Plan
FOREMAN - DRILLER MK/ao	LOCATION 1 Heineman Place, Harrison , NY	
INSPECTOR SD		OFFSET
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT __FT AFTER __HOURS	TYPE: CASING HSA; SAMPLER SS; CORE BAR NQ SIZE I.D.: 3 ¼"; 1 3/8"; 2" HAMMER WT.: 140#; BIT HAMMER FALL: 30"; dia	DATE START 3/22/19 DATE FINISH 3/22/19 SURFACE ELEV. El. 77.3 GROUND WATER ELEV. Dry

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC.	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
0		1	ss	24"	10"	2'0"	23 / 25		dry/moist dense		2" Asphalt; GRAVEL & SAND
							14 / 11				
		2	ss	13"	1"	3'1"	18 / 46		dry/moist v dense		Brn FM SAND, lit VFF SAND, tr FC gravel, clay
							50/1"				Brn/Blk FMC SAND, sm FC gravel, lit VF sand, tr clay
5		3	ss	17"	14"	5'5"	19 / 48		dry/moist v dense		Cobbles/BOULDERS
							50/5"			5'6"	Brn FM SAND, sm VF sand, lit FC gravel, tr clay
										6'6"	Partly decomposed/fractured BEDROCK Auger refusal
10											**E.O.B 6'6"**
15											

GROUND WATER OBSERVATIONS
AT none FT AFTER __HOURS
AT __FT AFTER __HOURS

El. 77.3

DEPTH											
0	**B-1A**										
5											**offset 5' North of B-1**
										5'6"	See B-1
		1	c	60"	44"	11'6"	RQD= 57%	3		6'6"	Fractured BEDROCK Auger refusal
							Rec.= 73%	5			
								7			BEDROCK (schist)
10								7			
								8		11'6"	
15											**E.O.B 11'6"**
20											

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. B-1 &B-1A**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE
M = MEDIUM
F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: KG&D Architects	SHEET 1 OF 1 HOLE NO. B-2
	PROJECT NO. G46-1223-19	
	PROJECT NAME Harrison Recreation Center	BORING LOCATIONS per Plan
FOREMAN - DRILLER MK/ao	LOCATION 1 Heineman Place Harrison , NY	
INSPECTOR SD		

	CASING	SAMPLER	CORE BAR
TYPE	HSA	SS	NQ
SIZE I.D.	3 ¼"	1 3/8"	2"
HAMMER WT.		140#	BIT
HAMMER FALL		30"	dia

OFFSET	
DATE START	3/22/19
DATE FINISH	3/22/19
SURFACE ELEV.	El. 78.0
GROUND WATER ELEV.	Dry

GROUND WATER OBSERVATIONS
AT none FT AFTER 0 HOURS
AT __FT AFTER __HOURS

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC.	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6	6 - 12	12- 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	16"	2'0"	7	4			dry compact		5" Concrete; BrnRed FM SAND, sm VF sand, tr F gravel, tr clay
							8				v dense	4'0"	Grey FMC SAND, lit FM sand, tr VF sand, tr gravel
		2	ss	11"	11"	2'11"	15	50/5"				4'6"	Brn VFF SAND, lit M sand, tr gravel/clay
5		3	ss	17"	17"	5'5"	45	49			dry	5'0"	Brn FM SAND, sm VF sand, lit C sand, tr gravel
							50/5"				v dense	5'6"	Partly decomposed BEDROCK
		1	c	60"	50"	11'0"	RQD= 54%			3		6'0"	Fractured BEDROCK Auger refusal
							Rec.= 83%			6			BEDROCK (schist)
										7			
10										8			
										8		11'0"	
													E.O.B 11'0"
15													
20													
25													
30													
35													
40													

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. B-2**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST
WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS
SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER
PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE
M = MEDIUM
F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: KG&D Architects	SHEET 1 OF 1 HOLE NO. B-3 & B-3A
	PROJECT NO. G46-1223-19	
	PROJECT NAME Harrison Recreation Center	BORING LOCATIONS per Plan
FOREMAN - DRILLER MK/ao	LOCATION 1 Heineman Place Harrison , NY	
INSPECTOR SD		
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT FT AFTER HOURS		

	CASING	SAMPLER	CORE BAR
TYPE	HSA	SS	NQ
SIZE I.D.	3 ¼"	1 3/8"	2"
HAMMER WT.		140#	BIT
HAMMER FALL		30"	dia

OFFSET	
DATE START	3/22/19
DATE FINISH	3/22/19
SURFACE ELEV.	El. 77.0
GROUND WATER ELEV.	Dry

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC.	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 6 - 12 12- 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	16"	2'0"	12 5		moist	1'0"	4" Asphalt; BlkBrn F SAND, sm FC gravel (FILL)
							3 2		loose		
		2	ss	24"	10"	4'0"	3 4		dry		Brn F SAND & SILT, tr F gravel
							5 32		loose	4'6"	(possible FILL)
5		3	ss	14"	12"	5'2"	24 26		moist		Brn FM SAND, lit silt, lit FC gravel, cobbles
							50/2"		v dense	6'0"	
											Fractured partially decomposed BEDROCK
										8'6"	Auger refusal
10											
											E.O.B 8'6"
15											

GROUND WATER OBSERVATIONS
AT none FT AFTER 0 HOURS
AT FT AFTER HOURS

0	B-3A										Offset 6' North of B-3 El. 77.2
										1'0"	BlkBrn F SAND, sm FC gravel
										4'6"	Brn F SAND & SILT, tr F gravel (possible FILL)
5										5'0"	Brn FM SAND, lit silt, lit FC gravel, tr cobbles
											Partly decomposed/fractured BEDROCK
10		4	ss	0"	0"	10'0"	50/0"		v dense	10'0"	No recovery Auger refusal
		1	c	60"	48"	15'0"	RQD= 45%	3			BEDROCK (schist)
							Rec.= 80%	4			
								6			
								7			
15								8		15'0"	
											E.O.B 15'0"
20											

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. B-3 & B-3A**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST
WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS
SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER
PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE
M = MEDIUM
F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: KG&D Architects	SHEET 1 OF 1 HOLE NO. B-4
	PROJECT NO. G46-1223-19	
	PROJECT NAME Harrison Recreation Center	BORING LOCATIONS per Plan
FOREMAN - DRILLER MK/ao	LOCATION 1 Heineman Place Harrison , NY	
INSPECTOR SD	CASING / SAMPLER / CORE BAR TYPE HSA / SS SIZE I.D. 3 ¼" / 1 3/8" HAMMER WT. 140# BIT HAMMER FALL 30"	OFFSET DATE START 3/22/19 DATE FINISH 3/22/19 SURFACE ELEV. El. 77.4 GROUND WATER ELEV. Dry
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT __FT AFTER __HOURS		

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC.	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12- 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
	B-4	1	ss	24"	6"	2'0"	9 / 8		dry/moist		5" Asphalt/concrete
							9 / 9		compact		Brn VFF SAND, lit FM sand, tr F gravel, clay
		2	ss	13"	12"	3'1"	6 / 11		dry/moist	3'6"	Brn VFF SAND, sm FM sand, lit C sand, tr gravel
							50/1"		v dense		BOULDERS/cobbles & fractured BEDROCK
5											SAME
										6'6"	Auger refusal
											E.O.B 6'6"
10											
15											
20											
5											

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. B-4**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE
M = MEDIUM
F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: KG&D Architects	SHEET 1 OF 1 HOLE NO. B-5
	PROJECT NO. G46-1223-19	
	PROJECT NAME: Harrison Recreation Center	BORING LOCATIONS: per Plan
FOREMAN - DRILLER: MK/ao	LOCATION: 1 Heineman Place, Harrison , NY	
INSPECTOR		OFFSET

	CASING	SAMPLER	CORE BAR
TYPE	HSA	SS	NQ
SIZE I.D.	3 ¼"	1 3/8"	2"
HAMMER WT.		140#	BIT
HAMMER FALL		30"	dia

DATE START	3/28/19
DATE FINISH	3/28/19
SURFACE ELEV.	El. 76.3
GROUND WATER ELEV.	Dry

GROUND WATER OBSERVATIONS
AT none FT AFTER 0 HOURS
AT __FT AFTER __HOURS

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC.	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6	6 - 12	12- 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	12"	2'0"	5	5			dry compact		8" Topsoil; Brn FM SAND, lit FC gravel
							7	8				2'0"	
		2	ss	24"	14"	4'0"	11	7			moist compact		Brn F SAND & SILT, tr F gravel
							18	9				4'0"	
5		3	ss	21"	20"	5'9"	18	60			dry v dense		Brn FM SAND, sm FC gravel, tr silt
							62	50/3"					
		4	ss	24"	22"	9'0"	28	37			wet		Brn FM SAND, sm FC gravel, tr silt, tr cobbles
							66	45			v dense		Brn FMC SAND, sm FC gravel
10												10'6"	
		5	ss	7"	4"	10'7"	27	50/1"			wet		Partly decomposed BEDROCK
												12'0"	Auger refusal
		1	c	60"	60"	17'0"	RQD= 98%			8			BEDROCK (schist)
							Rec.= 100%			6			
15										3			
										3			
										3		17'0"	
													E.O.B 17'0"
20													
25													
30													
35													
40													

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. B-5**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE
M = MEDIUM
F = FINE

LIMITED GEOTECHNICAL REPORT

Proposed Retaining Wall

270 Harrison Avenue
Harrison, New York 10528

Report Date:
July 19, 2023

Project No.
23-00002

Prepared For:
KG+D Architects, PC
285 Main Street,
Mount Kisco, New York 10549

Prepared By:
Siamak Koochak, PE

Source: Drawing Plan – Harrison Recreation & Community Center – Prepared by KG+D Architects, PC – Plan Dated July 12, 2023

Siamak Koochak, P.E. 908-456-0026 Skoochak@siamakkoochak.com

July 19, 2023

KG+D Architects, PC
Frederick P. Wells
285 Main Street,
Mount Kisco, New York 10549

Subject: Limited Geotechnical Report
Proposed Retaining Wall
270 Harrison Avenue
Harrison, New York 10528

Dear Frederick P. Wells:

We are pleased to present this Limited Geotechnical Report (the "report") which summarizes the results of our geotechnical investigation and recommendations conducted for the proposed retaining wall located at the aforementioned location. This report is intended for the use of KG+D Architects, PC (the "client") in its entirety for the proposed project as described in the text

The purpose of this geotechnical study is to investigate the subsurface conditions at the proposed site with exploratory borings, evaluate the engineering properties of the subsurface materials, and perform engineering analyses for developing design and construction recommendations for the proposed project.

Thank you for the opportunity to be of service to you in this phase of the project. If you have any questions, please contact us at (908)456-0026 and/or skoochak@siamakkoochak.com

We appreciate the opportunity to be of service to you during this phase of the work.

Sincerely,

Siamak Koochak, P.E.
Geotechnical Engineer

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- Site Vicinity Plan
- Approximate Site Location
- Boring Location Plan
- Proposed Retaining Wall Elevation
- Geologic Map

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1.0 EXECUTIVE SUMMARY

A total of four (4) exploration borings, designated as B-101 through B-104 were advanced to depths ranging from about 6.5 to 12 feet below existing site grades throughout the project site and in vicinity of the proposed retaining wall to be located within the northwest portion of the site. Engineering analyses were performed to evaluate the foundation system for the planned structure and develop recommendations for foundation design and construction, utility support and earthwork. A description of the site conditions and our evaluation is presented in the following report.

The following summarizes the main findings of the exploration, particularly those that may have a cost impact on the planned development. Further, our principal foundation recommendations are summarized. The executive summary is meant to consolidate information provided in more detail in the body of this report. This summary in no way replaces or overrides the detailed sections of the report. The principal conclusions are described below:

- **Excavation Conditions:** We anticipate excavations on the site to a depth of up to 9 feet for retaining wall foundations. Based on our boring data, conventional construction equipment in good working condition should be able to perform the planned excavations within the existing fill soils. However, boulders were encountered across the site. The contractor should be prepared to handle hard dig excavation conditions as well as boulder removal, if encountered during the site excavation. Additionally, shallow bedrock may encounter during the foundation excavation. As such, the contractor should be prepared to handle rock excavation if needed. Furthermore, given the previous use of the property, the site is impacted by undocumented fills, utility lines as well as vegetation and which could cave or be difficult to remove and require additional planning and equipment.

- **Groundwater:** Groundwater was not encountered at the time of drilling. However, groundwater levels fluctuate over time and may be different at the time of construction and during the project life. The contractor should be prepared to handle dewatering during site excavation.

- **Foundation/Slab Support:** We recommend the proposed retaining wall be supported on conventional spread foundations bearing on compacted structural fill or a layer of mud-mat extending to competent bedrock. Within the footprint of the retaining wall and extending 3 feet beyond, we recommend stripping of all existing pavement and crushed stone subgrade material and debris, if any. Below foundations and slabs, we recommend the subgrade be evaluated and repaired under the direction of the geotechnical engineer. Loose or otherwise unsuitable materials encountered during proofrolling, or foundation preparation should be over excavated and replaced with compacted structural fill.

- **Soil Reuse and Structural Fill:** On-site soils will generally be suitable for re-use as structural fill within the proposed retaining wall area. Structural fill should consist of predominately well-graded, coarse to fine sand and/or gravel with a maximum 20% non-plastic fines (material passing a No. 200 sieve) and be free of organic matter and other deleterious materials. Aggregate size should be limited to no bigger than 1 in. in the largest dimension.

2.0 PROJECT INFORAMTION

2.1 Project Location

The site is located on an approximate 1.5-acre parcel of land within a commercial and residential area of Harrison, New York. The site currently occupied with one (1) two-story recreation center building near the center of the site, one (1) multi-story frame building in the southeast corner of the site, one (1) Three-story masonry residential building in the southcentral area along Calvert Street, and one (1) two-story stucco residential building in the southwest corner, also along Calvert Street. Asphalt basketball courts are present in the north portion of the site along Orchard Street and Harrison Avenue. Asphalt parking lots and landscaped areas occupy the remainder of the properties. Figure 2 presents the approximate site limits.

Adjoining Properties	
North:	Orchard Street and Single-Family Homes
East:	Harrison Avenue
South:	Calvert Street
West:	Commercial Buildings

2.2 Historical Land Use

According to historical aerial photographs and topographic maps, the site has been developed to its current state since 1954.

Historical Use Information		
Period/Date	**Source**	**Description/Use**
1954 – Present	Aerial Photographs, Topographic Maps	Single Family Homes and Commercial Building

2.3 Proposed Construction Development

The proposed construction (as part of the scope of this report) will be approximately 100 linear feet of Modular Block Retaining Wall with 4 to 8 feet in height which is part of the larger development. The proposed retaining wall will be located to northwestern portion of the property. According to the proposed drawing plans provided to us, the bottom of the wall elevations will range from 66.9 to 67.5 feet and the top of the wall elevations will range from 70 to 73 feet.

2.4 Geologic Setting and Hazard

The subject property is situated within the New England physiographic province of the State of New York. According to the Surficial Geologic Map of New York – Lower Hudson Sheet - 1989, surficial site soil is mapped as Till. Till generally consists of sand, silt, and clay with boulders. Underlying bedrock is expected to be relatively shallow and consist of granitic gneiss beneath the majority of the project limits, and schist beneath the southeast corner based on the Bedrock Geology of the Mamaroneck Quadrangle, N.Y.

Based on information obtained from the United States Department of Agriculture (USDA) Natural Resources Conservation Service Web Soil Survey online database, the subject property is mapped as Urban Land and Urban Land-Paxton complex. Urban Land is described as an area where more than 85% of the surface is covered by asphalt, concrete, buildings, or other impervious surfaces. Soils and foundation materials are highly variable. Urban

structures and works cover so much of this land type that identification of the soils is not practical. Most areas have been smoothed and the original soil material has been disturbed, filled over, or otherwise destroyed. Urban Land-Paxton complex generally consists of well drained fine sandy loam and gravelly fine sandy loam formed from Coarse-loamy lodgment till derived from gneiss, granite, and/or schist. Slopes range from 8 to 15 percent.

Geologic hazards with the potential to affect development in the State of New York are earthquakes, landslides, oil and gas wells, and mine fields. New York is generally considered to have a low seismic risk per the USGS 2014 Hazard Risk Map. Additionally, this site is located in an area of New York which is generally comprised of relatively flat terrain that is not at a high-risk for landslide activity. This region of New York is not within an area of abandoned oil and gas wells or mine fields.

Geologic Data		
Parameter	**Value**	**Source**
Physiographic Province	New England	USGS
Ground Elevation	Approx. 73 to 78 feet above MSL	USGS
Flood Elevation	Zone X (0.2% Flood Hazard)	FEMA
Seismic Hazard Zone	Low	USGS
Geologic/Site Hazards	N/A	Boring Logs
Surficial Geology	Till	USGS
Depth to Bedrock	Approx. 3 to 6.5 feet	Boring Logs
Groundwater Depth	Not Encountered	Boring Logs

3.0 GEOTECHNICAL EXPLORATION

Our evaluation of soils on the site included field exploration and laboratory testing. The field exploration and laboratory testing programs are briefly described below. Data reports from the field exploration and laboratory testing are provided in Appendix A.

3.1 Field Exploration

On June 21, 2023, a total of four (4) exploration borings, designated B-101 through B-104, were advanced to depths ranging from about 6.5 to 12 feet below existing site grades. Auger refusal on a possible boulder/bedrock was encountered at depths ranging from about 6.5 to 8 feet in Borings B-101 and B-102, respectively. Additionally, rock core samples were obtained in Borings B-103 and B-104 upon reaching auger refusal. The approximate locations of the exploratory borings are shown on Figure 3.

Drilling was performed by SoilTesting, Inc. of Oxford, CT using a truck-mounted Dietrich D-50 drill rig fitted with an automatic hammer. The borings were advanced using Hollow-Stem Auger (HSA) drilling techniques with a 4¼ -inch inside diameter auger. Soil samples were obtained in all borings in accordance with the American Society for Testing and Materials (ASTM) Standard D1586. The Standard Penetration Test (SPT) consists of driving a 2-inch outside diameter (OD) split spoon sampler for a depth of 24 inches with repeated blows of a 140-pound hammer free-falling 30 inches. The standard penetration resistance, or N-value, is defined as the number of hammer blows required to drive the sampler for a 12-inch interval after an initial 6 inches of penetration and is measured in blows per foot (bpf). Bedrock was cored using an N-size, double tube core barrel in accordance with ASTM D 2113. Soil samples were classified by an experienced geologist, generally in accordance with ASTM, 1958. Bedrock samples were classified according to their geologic origin and measured rock quality designation (RQD). The soil samples obtained from the borings were visually classified using the Unified Soil Classification System and in accordance with ASTM Standard D2488.

Logs of subsurface conditions encountered in the boings were prepared in the field. Boring logs were prepared from the field logs and are presented in Appendix A.

4.0 GENERALIZED SUBSURFACE CONDITION

The following section is a generalized subsurface condition which was encountered at the time of site investigation.

4.1.1 Surface Cover

An approximately 6-in. thick layer of asphalt concrete pavement over crushed stone aggregate was encountered in all the borings.

4.1.2 Undocumented Fill

A layer of uncontrolled fill material was encountered in all the borings. The fill generally consists of brown sand with varying amounts of silt, gravel. The fill ranged in thickness varying between about 2.5 to 8 feet below existing site grades at the time of drilling. Uncorrected SPT N-values ranged from 5 Below Per Foot (bpf) to spoon refusal (N-value>100 bpf). The variation in SPT N-values indicates that the fill was likely placed in an uncontrolled manner. The fill is characterized as very loose to very dense in terms of relative density.

4.1.3 Bedrock

Bedrock was encountered in all of the borings at depths ranging from 3 to 6.5 feet below the existing site grades. Rock core samples were obtained in Borings B-103 and B-104 upon reaching Auger refusal. Measured rock recovery ranged 100% and Rock Quality Designation (RQD) ranged from 71% to 75% which is indicative of good quality rock.

4.1.4 Groundwater

Groundwater was not encountered at the time of drilling across the site. However, groundwater levels fluctuate over time and may be different at the time of construction and during the project life.

5.0 DESIGN RECOMMENDATIONS

The following discussion of findings for the site is based on the assumed construction, geologic review, results of the field exploration, and laboratory testing programs.

5.1 Retaining Wall Consideration

According to the proposed grading plan, the proposed bottom of the wall elevations will range from 66.9 to 67.5 feet. The current site grades in vicinity of the proposed retaining wall range from about 71 to 75 feet. Figure 4 presents the proposed retaining wall elevations. As such, we anticipate excavation up to 9 feet will be needed to achieve the proposed bottom of wall elevation as well as bottom of the wall foundation subgrade elevations.

A retaining wall is planned to support soils between the subject property and properties to the north. The soil parameters used for the design of site retaining walls are provided in table below. Based on discussions with the project team, we understand that the proposed retaining wall system will consist of a Modular Block type wall constructed from the bottom up.

The wall designer/engineer should check the wall for sliding, overturning, and internal stability. Based on the soils encountered in our borings, an allowable bearing pressure of 3,000 psf, assuming foundation bear on rock, may be used for design of the wall foundations. This value may be increased by 1/3 for wind and seismic loading. The retaining wall foundation should be supported on a 12-inch-thick base layer of consolidated, open-graded gravel, such as ASTM C-33 #57 stone or similar material. Alternatively, a thin layer of concrete (mud mats) at the foundation subgrade elevation to protect the subgrade may be considered. We recommend that the retaining wall in this location have a foundation embedded to at least 3.5 feet below grades for adequate frost protection.

Proper back drainage behind the proposed retaining wall should be considered to collect water that could potentially increase the hydrostatic pressure and should discharge to an approved storm drain. Additionally, surficial grading around the top of the walls should be considered in the design to prevent water flows over the wall from causing soil erosion. Weep holes should also be provided along the retaining wall. We recommend a minimum 16 inches of open-graded gravel, such as ASTM C-33 #57 stone or similar material be placed directly behind the wall to provide free drainage layer. We recommend a layer of non-woven geotextile fabric should be placed between the existing soil and newly placed structural fill. A minimum 2-ft overlap is recommended between adjoining geotextile sheets. The type of geofabric textile should be determined by the wall designer and manufacturer.

We recommend existing structures such as asphalt pavement and crushed stone subgrade be removed within the proposed retaining wall extending to 3 feet beyond the limits. Prior to the placement of the wall foundation and the base units, the subgrade should be evaluated by the geotechnical engineer. We recommend any loose or fractured pieces of bedrock be removed to expose a clean bedrock bearing surface. The foundation subgrade should be prepared to create a flat horizontal bearing level. In areas where the foundations bear partially on bedrock and soils, we recommend the rock be excavated to a depth of minimum 12 inches and backfilled with structural fill to create a uniform bearing stratum.

The excavation and retaining wall construction should be continuously monitored in the field by a representative of the geotechnical engineer or a geologist.

5.2 Laterally Earth Pressure Parameters

Depending on the types of structures and soil types encountered, different lateral stress distributions may be needed. For this project we anticipate the below information will be used to design shoring systems, if needed. We

recommend that a specialty contractor with in-house engineering capability perform the design of temporary shoring. Values provided in this table are unfactored. The designer should select appropriate safety factors for their design.

Lateral Earth Pressures [ab]						
Soil Type	**Total Unit Weight (γ)**	**Friction Angle (°)**	**Coefficient of Friction (μ)**	**Static Fluid Pressure (pcf)**	**Active Fluid Pressure (pcf)**	**Passive Fluid Pressure pcf)**
Fill Soils [a]	125	32	0.40	55	35	375
In-site Site Soils	120	35	0.40	50	60	400

[a] *Groundwater was not encountered at the time of drilling.*

6.0 SITE PREPARATION AND EARTHWORK CONSIDERATION

6.1 Excavation

We anticipate excavations on the site to depths of up to 9 feet for retaining wall foundations. However, deeper excavation may be needed, if unsuitable material is encountered at the base of the excavation.

Based on our boring data, conventional construction equipment in good working condition should be able to perform the planned excavations within the existing fill soils. However, boulders were encountered across the site. The contractor should be prepared to handle hard dig excavation conditions as well as boulder removal, if encountered during the site excavation. Additionally, shallow bedrock may encounter during the foundation excavation. As such, the contractor should be prepared to handle rock excavation if needed. Furthermore, given the previous use of the property, the site is impacted by undocumented fills, utility lines as well as vegetation and which could cave or be difficult to remove and require additional planning and equipment.

All excavations that extend deeper than 5 ft. shall be benched, sloped, sheeted, or shored to a safe condition per OSHA requirements. While an OSHA-competent person has to confirm and assign soil type(s) during construction, for estimating and scheduling purposes the soil present on site may be assumed to be Type C and should be sloped at a 1.5H:1V (34°) per OSHA requirements. For the design of temporary sheeting or shoring, the soil properties listed above may be used for design. All sheeting, shoring and/or bracing shall be designed by a professional engineer registered in the State of New York. Given limited space behind the proposed retaining wall, we recommend the excavation and installation of the wall be completed in sections and phases.

For new fill zones along the existing slope and free drainage stone layer behind the retaining walls, we recommend the backfill soils should consist of free-draining, non-expansive soils. Structural fill should be placed in maximum 8 in. loose lifts and compacted to 95% of its maximum dry density and within 3% of the optimum moisture content as determined by the Modified Proctor Density Test (ASTM D1557). Only smaller hand-held compacting equipment such as a vibratory plate tamper or dual drum walk behind Remex Roller should not used within 3 feet of the walls to avoid additional temporary or long-term lateral pressure and movement. Larger ride on heavy compaction equipment may be used outside of this zone. Finished site slopes should be protected from erosion as described above.

These operations should be performed under the direction of a full-time geotechnical inspection and testing agency utilizing by either the Sand Cone Method (ASTM D1556), Nuclear Density Gauge (ASTM D6938), or other industry approved moisture/density test methods. These density tests should be performed by an experienced geotechnical engineering field technician at sufficient frequencies to ensure proper compaction.

6.2 Soil Reuse and Structural Fill Consideration

On-site soils will generally be suitable for re-use as structural fill within a proposed retaining wall. We recommend structural fill for the site consist of predominately well-graded, coarse to fine sand and/or gravel with a maximum 20% non-plastic fines (material passing a No. 200 sieve), plasticity index less than 20, and be free of organics and other deleterious materials. Aggregate size should be limited to no bigger than 1 in. in the largest dimension.

On site soils can be monitored and screened to remove existing debris and deleterious material prior to use as structural fill. Existing structural materials such as concrete, asphalt, crushed aggregate, or others structural elements could potentially be re-used as site fills if processed to meet fill requirements on the site. Structural elements from the site excavations may call for processing/crushing to remove particles 4 inches or larger in

diameter. Alternatively, off-site borrow material such as granular soils (SM, SP-SM, GM, GP-GM), aggregate material such as ASTM C-33 #57 stone, may be used under the foundations in over-excavated areas.

7.0 REFERENCES

The following references were used to generate this report:

- Federal Emergency Management Agency, FEMA Flood Map Service Center – Accessed on 6/13/2023
- Google Earth Pro (Online) – Accessed on 6/13/2023
- Historic Aerials by NETR Online – Accessed on 6/13/2023
- United States Geological Survey (USGS) – Donald H. Cadwell, 1989, Geologic map of New York: Lower Hudson Sheet, Scale 1:250,000 – Accessed on 6/13/2023
- United States Geological Survey, Lower 48 States 2014 Seismic Hazard Map – Accessed on 6/13/2023
- United States Geological Survey United States Geological Survey (USGS) US Topo 7.5-minute map for Mamaroneck, NY-CT, 2019: USGS - National Geospatial Technical Operations Center (NGTOC) – Accessed on 6/13/2023
- United States Geologic Survey, Earthquake Hazards Program (Online), accessed 6/13/23

8.0 LIMITATION

The conclusions, recommendations, and opinions in this report are based upon soil samples and data obtained in widely spaced locations that were accessible at the time of exploration and collected based on project information available at that time. Our findings are subject to field confirmation that the samples we obtained were representative of site conditions. If conditions on the site are different than what was encountered in our borings, the report recommendations should be reviewed by our office, and new recommendations should be provided based on the new information and possible additional exploration if needed. It should be noted that geotechnical subsurface evaluations are not capable of predicting all subsurface conditions, and that our evaluation was performed to industry standards at the time of the study, no other warranty or guarantee is made.

Likewise, our document review and geologic research study made a good-faith effort to review readily available documents that we could access and were aware of at the time, as listed in this letter. We are not able to guarantee that we have discovered, observed, and reviewed all relevant site documents and conditions. Any changes in the design or location of the proposed structure should be assumed to invalidate the conclusions and recommendations given in this report until we have had the opportunity to review the changes and, if necessary, modify our conclusions and recommendations accordingly. If subsurface conditions different from those encountered in the explorations are observed during construction or appear to be present beneath excavations, we should be advised at once so that the conditions can be reviewed, and recommendations reconsidered where necessary.

If there is a substantial lapse in time between the submission of this report and the start of construction, or if site conditions or the project layout have significantly changed (due to further development of grading plans, natural causes, or construction operations at or adjacent to the site), we recommend that this report be reviewed to determine the applicability of our previous conclusions and recommendations.

This report is intended for the use of the client (KG+D Architects, PC) in its entirety for the proposed project as described in the text. Information from this report is not to be used for other projects or for other sites. All of the report must be reviewed and applied to the project or else the report recommendations may no longer apply. If pertinent changes are made in the project plans or conditions are encountered during construction that appear to be different than indicated by this report, please contact this office for review. Significant variations may necessitate a re-evaluation of the recommendations presented in this report. The findings in this report are valid for one year from the date of the report. This report has been completed under, limitations of liability, indemnification, dispute resolution, and other factors relevant to any reliance on this report.

APPENDIX A

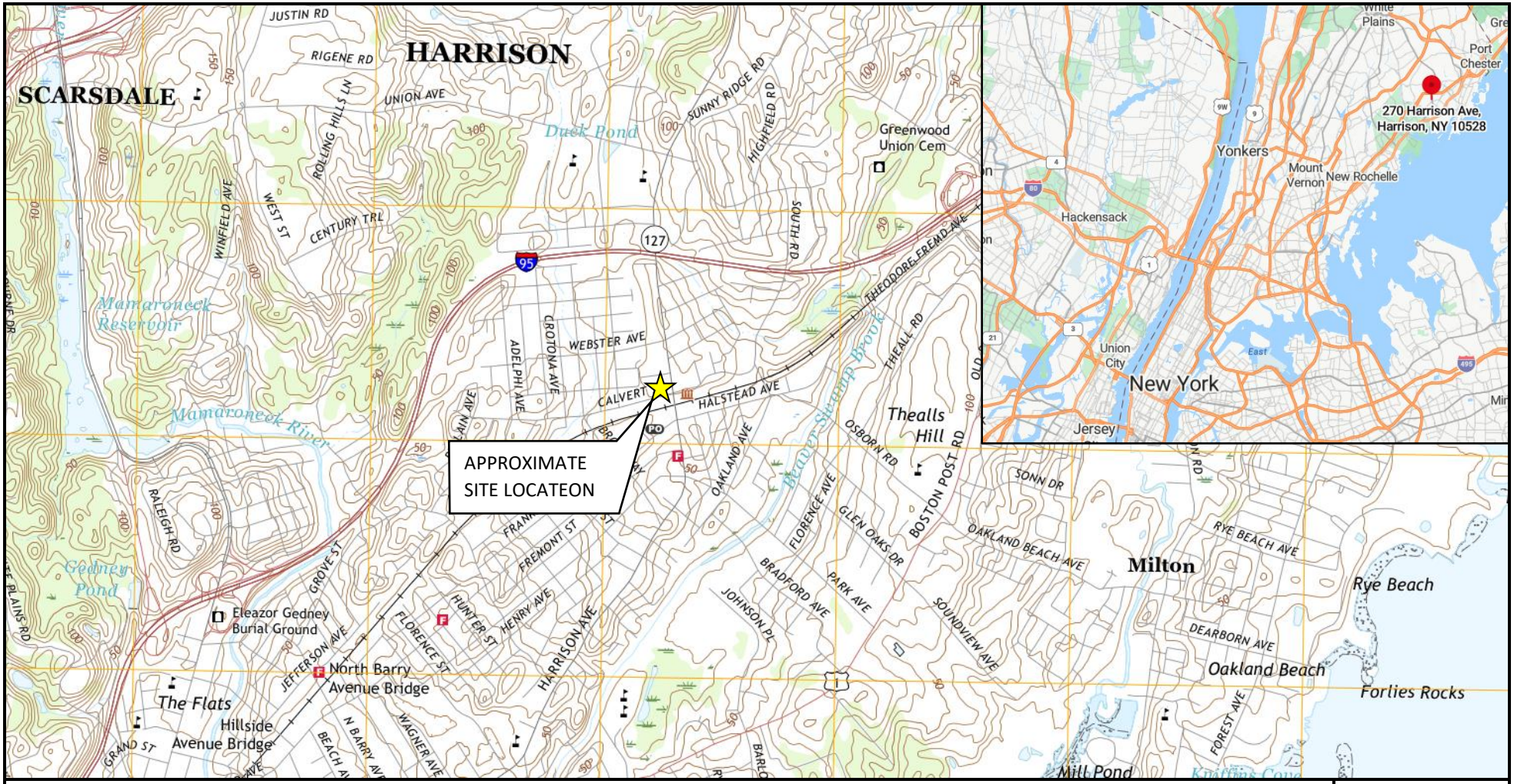
Figure 1: Site Vicinity Plan

Figure 2: Approximate Site Limits

Figure 3: Approximate Boring Location Plan

Figure 4: Proposed Retaining Wall Elevation

Figure 5: Geologic Map



SOURCE: U.S. Geological Survey, USGS US Topo 7.5-minute map for Mamaroneck, NY-CT, 2019: USGS - National Geospatial Technical Operations Center (NGTOC)

KEY

☆ Approximate Site Location

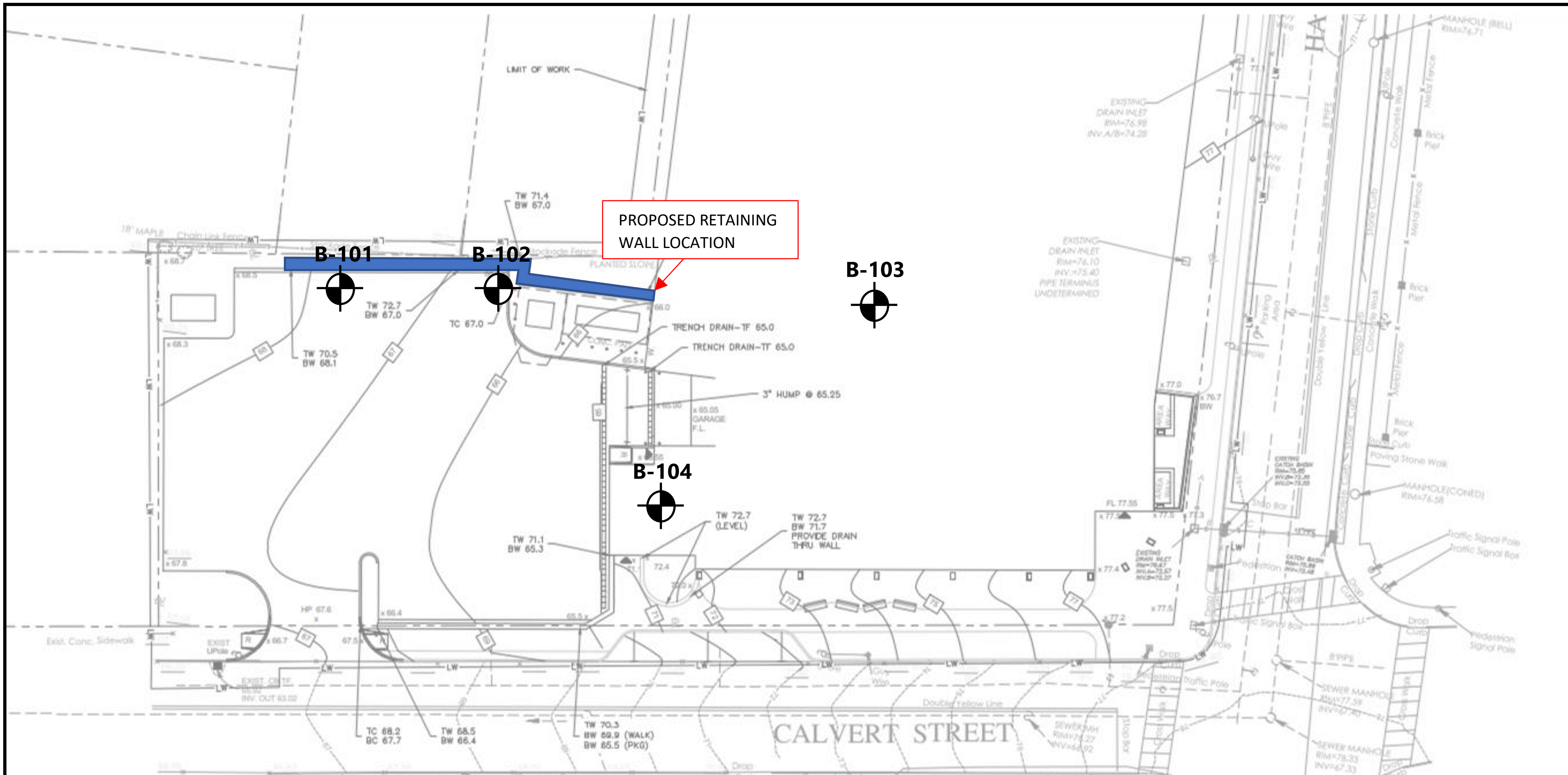
FIGURE 1 – SITE VICINITY PLAN

SOURCE: Google Earth Pro.

KEY

Approximate Site Limits

FIGURE 2 – APPROXIMATE SITE LIMITS

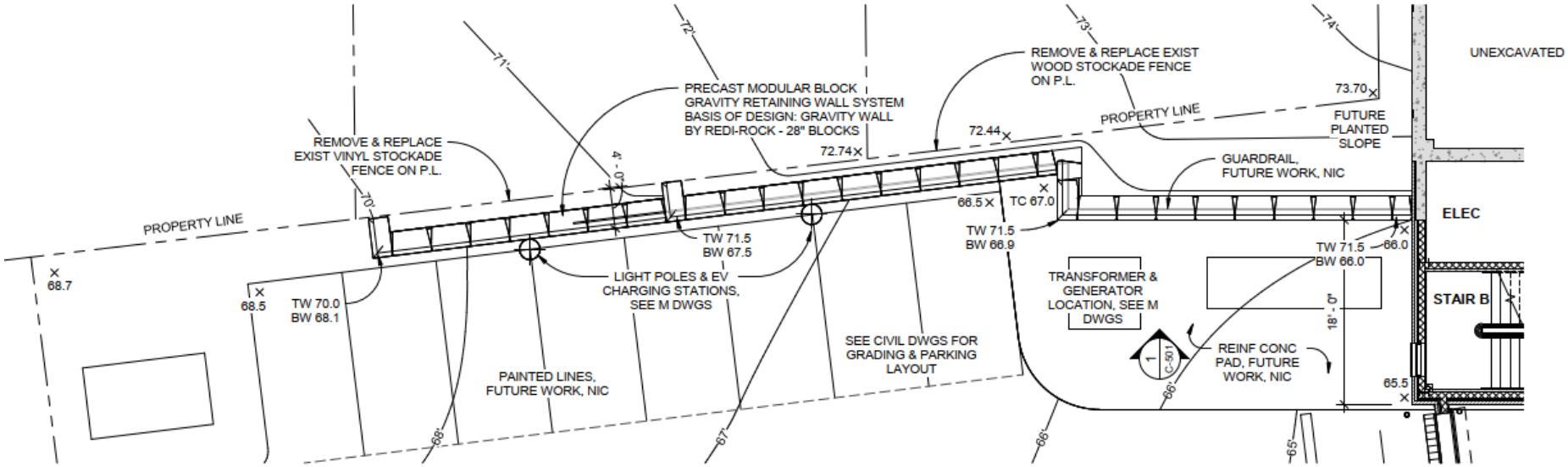


SOURCE: Drawing Plan – Harrison Recreation & Community Center – Prepared by KG+D Architects, PC – Plan Dated July 12, 2023

KEY

Approximate Boring Location

FIGURE 3 – APPROXIMATE BORING LOCATION

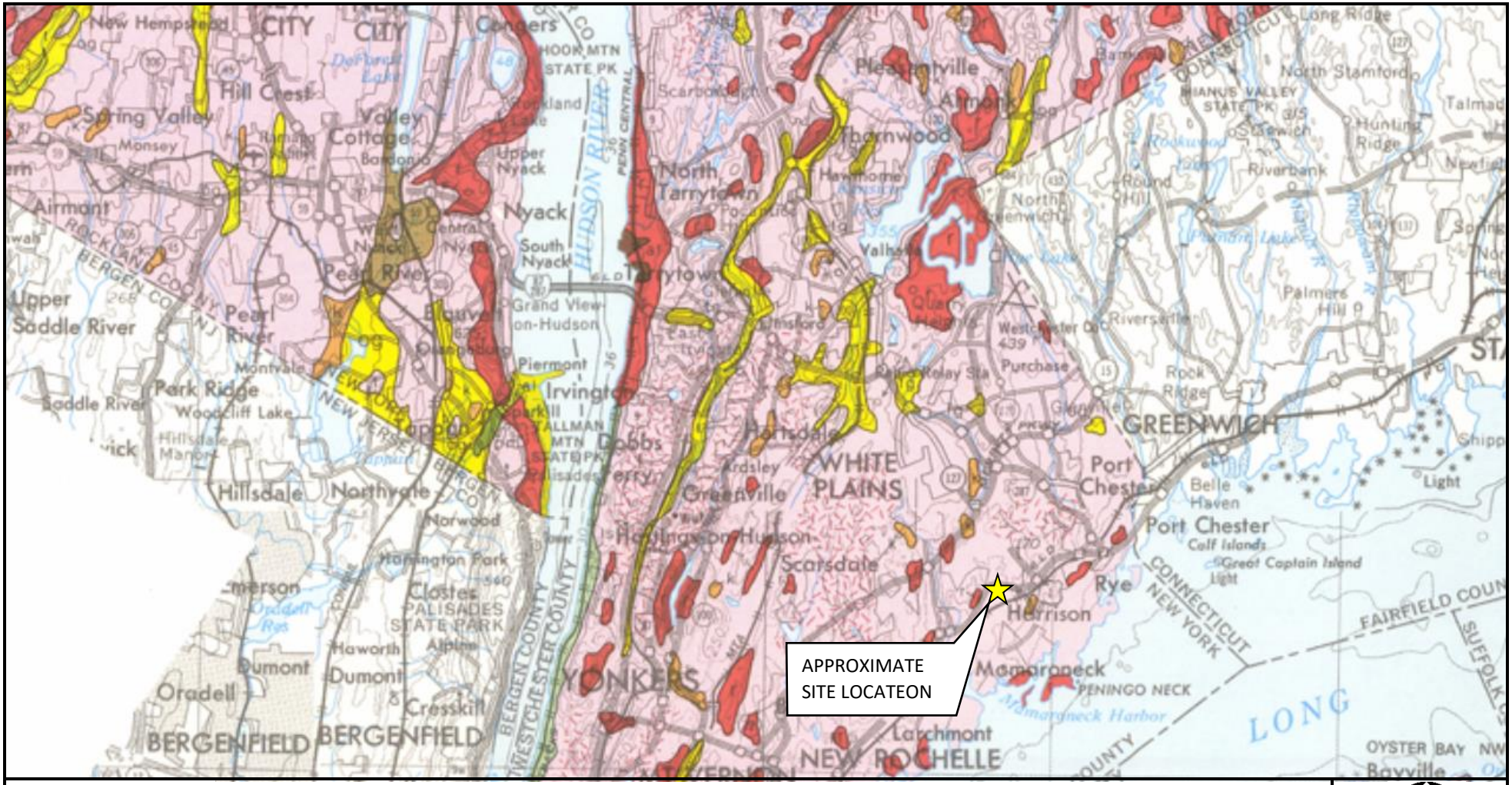


2 NORTH RETAINING WALL PLAN
1/8" = 1'-0"

SOURCE: Drawing Plan – Sheet C-501 - Harrison Recreation & Community Center – Prepared by KG+D Architects, PC – Plan Dated July 12, 2023

KEY

FIGURE 4 – PROPOSED RETAINING WALL ELEVATION



SOURCE: Google Earth Pro

KEY

☆ Approximate Site Location

FIGURE 5 **– GEOLOGIC MAP**

APPENDIX A

Boring Logs

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: KG&D Architects	SHEET 1 OF 1 HOLE NO. B-101
	PROJECT NO. G119-2547-23	
	PROJECT NAME Harrison Recreation Center	BORING LOCATIONS Per Plan
FOREMAN - DRILLER AK/sb	LOCATION 270 Harrison Ave. Harrison NY	
INSPECTOR	CASING / SAMPLER / CORE BAR TYPE: HSA / SS SIZE I.D.: 4 ¼" / 1 3/8" HAMMER WT.: 140# / BIT HAMMER FALL: 30"	OFFSET DATE START 6/21/23 DATE FINISH 6/21/23 SURFACE ELEV. GROUND WATER ELEV.
GROUND WATER OBSERVATIONS AT none_FT AFTER_0_HOURS AT__FT AFTER__HOURS		

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC.	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 6 - 12 12- 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	12"	2'0"	3 4		compact dry		Lt brn/brn F sand & silt, some M-C sand, lit F gravel (fill)
							11 19				
5		2	ss	15"	10"	6'3"	12 25		v dense dry	6'6"	Same, gravel (poss fill) Auger Refusal
							50/3"				
											EOB 6'6"
10											
15											
20											
25											
30											
35											
40											

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. HOLE NO. B-101

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50% F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: KG&D Architects	SHEET 1 OF 1 HOLE NO. B-102
	PROJECT NO. G119-2547-23	
	PROJECT NAME Harrison Recreation Center	BORING LOCATIONS Per Plan
FOREMAN - DRILLER AK/sb	LOCATION 270 Harrison Ave. Harrison NY	
INSPECTOR	CASING / SAMPLER / CORE BAR	OFFSET
	TYPE: HSA / SS	DATE START 6/21/23
GROUND WATER OBSERVATIONS AT none_FT AFTER_0_HOURS AT__FT AFTER__HOURS	SIZE I.D.: 4 ¼" / 1 3/8"	DATE FINISH 6/21/23
	HAMMER WT.: 140# BIT	SURFACE ELEV.
	HAMMER FALL: 30"	GROUND WATER ELEV.

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE Type	SAMPLE PEN	SAMPLE REC.	SAMPLE DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	13"	2'0"	9 / 8		compact / moist		Lt brn F sand & silt, lit C sand, F gravel
							8 / 8				
5		2	ss	24"	6"	7'0"	6 / 8		compact / dry		
							13 / 9				Same, some cobble (partly decomposed Bedrock)
										8'	Auger Refusal
10											EOB 8'
15											
20											
25											
30											
35											
40											

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. HOLE NO. B-102

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50% F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: KG&D Architects	SHEET 1 OF 1 HOLE NO. B-103
	PROJECT NO. G119-2547-23	
	PROJECT NAME Harrison Recreation Center	BORING LOCATIONS Per Plan
FOREMAN - DRILLER AK/sb	LOCATION 270 Harrison Ave. Harrison NY	
INSPECTOR		OFFSET

	CASING	SAMPLER	CORE BAR
TYPE	HSA	SS	NQ2
SIZE I.D.	4 ¼"	1 3/8"	2"
HAMMER WT.		140#	BIT
HAMMER FALL		30"	dia

DATE START 6/21/23
DATE FINISH 6/21/23
SURFACE ELEV.
GROUND WATER ELEV.

GROUND WATER OBSERVATIONS
AT none_FT AFTER_0_HOURS
AT__FT AFTER__HOURS

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC.	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 6 - 12 12- 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	10"	2'0"	2 2		loose		Gry/wht/brn fill
							3 35		moist	2'6"	Gry/wht/brn F-M sand & silt, lit C sand, F gravel
										3'	Fractured Bedrock or Boulders Auger Refusal
		1	c	60"	60"	8'0"	RQD=71%	1.5			Bedrock (Gneiss/Schist)
5								1.4			
								1.3			
								1.4			
								1.3		8'	
											EOB 8'
10											
15											
20											
25											
30											
35											
40											

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. HOLE NO. B-103

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE
M = MEDIUM
F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: KG&D Architects	SHEET 1 OF 1 HOLE NO. B-104
	PROJECT NO. G119-2547-23	
	PROJECT NAME Harrison Recreation Center	BORING LOCATIONS Per Plan
FOREMAN - DRILLER AK/sb	LOCATION 270 Harrison Ave. Harrison NY	
INSPECTOR		OFFSET

	CASING	SAMPLER	CORE BAR
TYPE	HSA	SS	NQ2
SIZE I.D.	4 ¼"	1 3/8"	2"
HAMMER WT.		140#	BIT
HAMMER FALL		30"	dia

DATE START	6/21/23
DATE FINISH	6/21/23
SURFACE ELEV.	
GROUND WATER ELEV.	

GROUND WATER OBSERVATIONS
AT none_FT AFTER_0_HOURS
AT__FT AFTER__HOURS

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC.	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 6 - 12 12- 18			CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	20"	2'0"	10	20			compact		
							10	12			moist		Lt brn F sand & silt, lit M-C sand (fill)
5		2	ss	10"	6"	5'10"	12	50/4"			dense		Lt brn F sand, some silt, M-C sand, lit F gravel (fill)
											moist	7'	Auger Refusal
		1	c	60"	60"	12'0"	RQD=75%			3.2			Bedrock (Gneiss/Schist)
										3.2			
10										2			
										2.04			
										2.5		12'	
													EOB 12'
15													
20													
25													
30													
35													
40													

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. HOLE NO. B-104

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

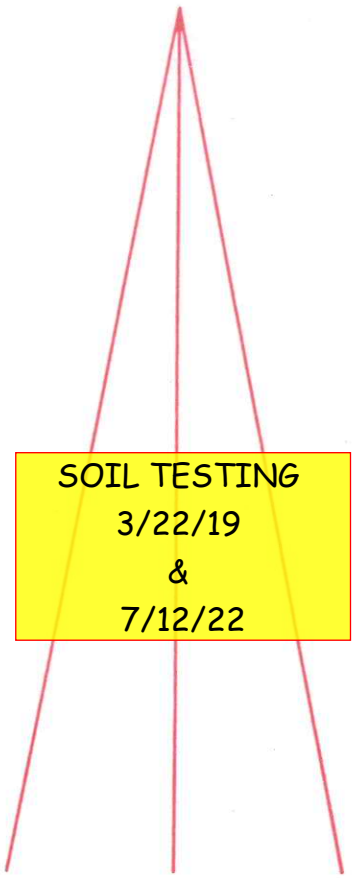
WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50% F = FINE

SOILTESTING, INC.

TO	KG&D Architects	DATE	12-Jul-22
ADDRESS	285 Main St., Mount Kisco NY 10549		
SITE LOCATION	270 Harrison Ave., Harrison NY		
REPORT SENT TO	Lisa DelPercio		
SAMPLES SENT TO	Storage (Max 60 days)		



90 Donovan Road
Oxford, Connecticut 06478-1028
203-262-9328

Branch Office:
White Plains, New York 10607
914-946-4850

JOB NO.
G160-2188-22

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	TEST PITS	CLIENT: KG&D Architects
	PROJECT NO. G160-2188-22	TEST PIT NO.: TP-1 thru TP-4
	PROJECT NAME Subsurface Investigations	
	LOCATION 270 Harrison Ave. Harrison NY	
BACKHOE OPERATOR: SD/cp		
INSPECTOR: Omar - Woodard & Curran		DATE WORK DONE: 7-6-22 & 7-7-22

Test Pit or Probe No.	Water Level / time elapsed	Moisture	Soil Strata in Auger Holes From (ft.)	To (ft.)	Remarks: Include: Groundwater depth, Size of Auger used, description of soil in Auger holes, depth of auger samples
TP-1	None	dry	0	4"	Gravel
		dry	4"	3'6"	Brn silty sand & gravel with bricks
		dry	3'6"	5'6"	Brn silty sand, little clay
		dry/moist	5'6"	9'	Brn sand & gravel
				9'	End of test pit
					Offset & installed 4" PVC pipe to 7' depth. Presoaked 7-6-22
TP-2	None	dry	0	4"	Gravel
		dry	4"	4'6"	Brn silty sand & gravel, little brick
		dry		4'6"	Concrete or Bedrock - refusal at 4'6"
				4'6"	End of test pit
TP-3	None				Same as TP-2
				4'9"	Concrete or Bedrock, refusal at 4'9"
TP-4	None	dry	0	4"	Gravel
		dry	4"	5'	Brn silty sand, wood, brick, concrete
		dry	5'	7'	Brn sand & gravel
				7'	End of test pit
					Installed 4" PVC Pipe to 7' depth
					Presoaked 7-6-22

SOILTESTING, INC.
90 DONOVAN RD.
OXFORD, CT 06478
CT (203) 262-9328
NY (914) 946-4850

TEST PITS

CLIENT: KG&D Architects

PROJECT NO. G160-2188-22

TEST PIT NO.: **TP-5**

PROJECT NAME **Subsurface Investigations**

LOCATION **270 Harrison Ave. Harrison NY**

BACKHOE OPERATOR: **SD/cp**

INSPECTOR: Omar - Woodard & Curran

DATE WORK DONE: 7-6-22 & 7-7-22

Test Pit or Probe No.	Water Level / time elapsed	Moisture	Soil Strata in Auger Holes From (ft.)	To (ft.)	Remarks: Include: Groundwater depth, Size of Auger used, description of soil in Auger holes, depth of auger samples
TP-5	None	dry/moist	0	6"	Topsoil
			6"	5'9"	Brn silty sand, wood, brick, concrete
				5'9"	Concrete of Bedrock. Refusal at 5'9"
				5'9"	End of test pit

Only copies from the original of this topography map marked with an original of the Land Surveyors embossed seal shall be considered to be true, valid copies.

Unauthorized alteration or addition to a map bearing a licensed Land Surveyors seal is a violation of Section 7209, Subdivision 2 of the New York State Education Law.

Possession only where indicated.

Adjacent property lines and easements not surveyed or certified.
Access to adjacent rights of way, easements and public or private lands not guaranteed or certified.

Underground utilities shown hereon are approximate and should be verified before excavating.
Additional underground utilities are not shown or certified.
Encroachments and structures below grade, if any, not shown or certified.

Subject to covenants, easements, restrictions, conditions and agreements of record.

This map is prepared to show topography only and is not to be used for title transfer purposes. Map may not be certified to title companies and/or banks.

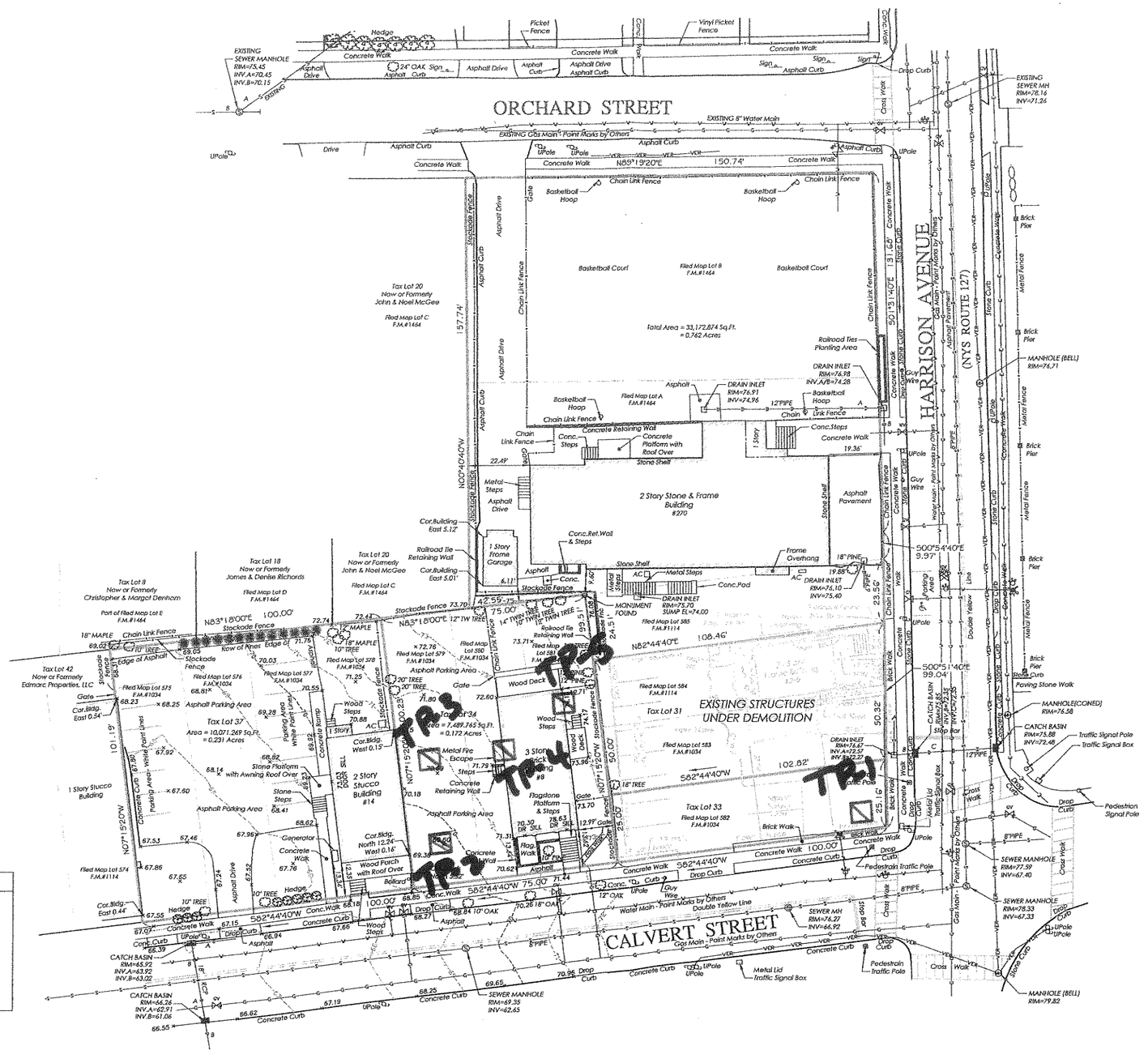
Tree species shown hereon to be verified by a licensed arborist and are not certified by surveyor.

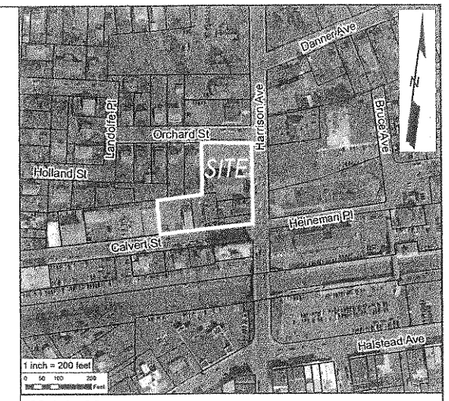
Elevations shown hereon generally in accordance with North American Vertical Datum 88.

LEGEND	
(S)(S)(D)(E)(T)	MANHOLES
□ ○	DRAIN INLETS/CATCH BASINS
GV	GAS VALVE/GAS BOX
WV	WATER VALVE
	HYDRANT
	WATER SHUT OFF VALVE
	UTILITY POLE
	LIGHT POST
TC	TOP OF CURB
BC	BOTTOM OF CURB

LEGEND	
W W W	WATER MAIN
D D D	DRAINAGE PIPE
G G G	GAS MAIN
S S S	SANITARY SEWER MAIN
E E E	ELECTRICAL LINE
VER VER VER	VERIZON LINE

Below ground utilities shown hereon as per delineation by others.
Paint marks set in street by others & drawings supplied by utility companies.
Additional utilities may exist, not shown.





Vicinity Map

TAX LOTS 31 AND 33
Premises hereon being Lots 582 and 583 as shown on a certain map entitled, "2nd Map of Brentwood Plaza."
Said map filed in the Westchester County Clerk's Office, Division of Land Records July 27, 1892 as map number 1034.
Premises hereon being Lot 584 as shown on a certain map entitled, "4th Map of Brentwood Plaza."
Said map filed in the Westchester County Clerk's Office, Division of Land Records May 31, 1894 as map number 1114.

Surveyed in accordance with Deed Control Number 572483257.

Premises shown hereon designated on the Town of Harrison Tax Maps as: Block 253, Lots 31 and 33.

Property Address: 260 Harrison Avenue
Harrison, NY 10528

TAX LOT 28
Premises hereon being Lot 585 as shown on a certain map entitled, "4th Map of Brentwood Plaza."
Said map filed in the Westchester County Clerk's Office, Division of Land Records May 31, 1894 as map number 1114.
Premises hereon being Lots A and B as shown on a certain map entitled, "Map of Lots Belonging to Mary B. Purdy."
Said map filed in the Westchester County Clerk's Office, Division of Land Records February 23, 1905 as map number 1464.

Premises shown hereon designated on the Town of Harrison Tax Maps as: Block 253, Lot 28.

Property Address: 270 Harison Avenue
Harrison, NY 10528

TAX LOT 34
Premises hereon being Lots 579, 580 and 581 as shown on a certain map entitled, "2nd Map of Brentwood Plaza."
Said map filed in the Westchester County Clerk's Office, Division of Land Records July 27, 1892 as map number 1034.

Surveyed in accordance with Deed Control Number 532243364.

Premises shown hereon designated on the Town of Harrison Tax Maps as: Block 253, Lot 34.

Property Address: 8 Calvert Street
Harrison, NY 10528

TAX LOT 37
Premises hereon being Lots 575, 576, 577 and 578 as shown on a certain map entitled, "2nd Map of Brentwood Plaza."
Said map filed in the Westchester County Clerk's Office, Division of Land Records July 27, 1892 as map number 1034.

Premises shown hereon designated on the Town of Harrison Tax Maps as: Block 253, Lot 37.

Property Address: 14 Calvert Street
Harrison, NY 10528

TOPOGRAPHY OF PROPERTY PREPARED FOR TOWN OF HARRISON

SITUATE IN THE
TOWN OF HARRISON
WESTCHESTER COUNTY, NEW YORK

SCALE: 1" = 20'

GRAPHIC SCALE

20 0 10 20 40 60
(IN FEET)
1 inch = 20 ft.

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ALL RIGHTS RESERVED, UNAUTHORIZED DUPLICATION OR ELECTRONIC TRANSMISSION WITHOUT PRIOR PERMISSION IS A VIOLATION OF APPLICABLE LAWS.

TC MERRITTS LAND SURVEYORS
394 BEDFORD ROAD • PLEASANTVILLE • NY 10570
(914) 769-8003 • (203) 622-8899

Surveyed: October 7, 2017
Map Prepared: October 17, 2017
Map Revised: February 18, 2019 to show structures and topography on Tax Lots 34 and 37.

By: Daniel T. Merritts
New York State Licensed Land Surveyor No.050604

Project: Ref.10-216 17-356	Field Survey By: BC/CR
Drawn By: DA	Checked By: DM

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: KG&D Architects	SHEET 1 OF 1 HOLE NO. B-1 &B-1A
	PROJECT NO. G46-1223-19	
	PROJECT NAME Harrison Recreation Center	BORING LOCATIONS per Plan
FOREMAN - DRILLER MK/ao	LOCATION 1 Heineman Place Harrison , NY	
INSPECTOR SD		OFFSET
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT__FT AFTER__HOURS		DATE START 3/22/19 DATE FINISH 3/22/19 SURFACE ELEV. GROUND WATER ELEV.

	CASING	SAMPLER	CORE BAR
TYPE	HSA	SS	NQ
SIZE I.D.	3 ¼"	1 3/8"	2"
HAMMER WT.		140#	BIT
HAMMER FALL		30"	dia

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC.	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6	6 - 12	12- 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	10"	2'0"	23	25			dry/moist		2" Asphalt; GRAVEL & SAND
							14	11			dense		
		2	ss	13"	1"	3'1"	18	46			dry/moist		Brn FM SAND, lit VFF SAND, tr FC gravel, clay
							50/1"				v dense		Brn/Blk FMC SAND, sm FC gravel, lit VF sand, tr clay
5		3	ss	17"	14"	5'5"	19	48			dry/moist		Cobbles/BOULDERS
							50/5"				v dense	5'6"	Brn FM SAND, sm VF sand, lit FC gravel, tr clay
													Partly decomposed/fractured BEDROCK
												6'6"	Auger refusal
10													E.O.B 6'6"
15													

GROUND WATER OBSERVATIONS
AT none FT AFTER__HOURS
AT__FT AFTER__HOURS

0	B-1A												
													offset 5' North of B-1
5												5'6"	See B-1
		1	c	60"	44"	11'6"	RQD= 57%			3		6'6"	Fractured BEDROCK Auger refusal
										5			
										7			BEDROCK (schist)
10										7			
										8		11'6"	
15													E.O.B 11'6"
20													

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. B-1 &B-1A**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST
WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS
SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER
PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE
M = MEDIUM
F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: KG&D Architects	SHEET 1 OF 1 HOLE NO. B-2
	PROJECT NO. G46-1223-19	
	PROJECT NAME Harrison Recreation Center	BORING LOCATIONS per Plan
FOREMAN - DRILLER MK/ao	LOCATION 1 Heineman Place Harrison , NY	
INSPECTOR SD		OFFSET
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT FT AFTER HOURS	TYPE: CASING HSA; SAMPLER SS; CORE BAR NQ SIZE I.D.: 3 ¼"; 1 3/8"; 2" HAMMER WT.: 140#; BIT HAMMER FALL: 30"; dia	DATE START 3/22/19 DATE FINISH 3/22/19 SURFACE ELEV. GROUND WATER ELEV.

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC.	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6	6 - 12	12- 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	16"	2'0"	7	4			dry		5" Concrete; BrnRed FM SAND, sm VF sand, tr F gravel, tr clay
							8				compact		
		2	ss	11"	11"	2'11"	15	50/5"			v dense	4'0"	Grey FMC SAND, lit FM sand, tr VF sand, tr gravel
												4'6"	Brn VFF SAND, lit M sand, tr gravel/clay
5		3	ss	17"	17"	5'5"	45	49			dry	5'0"	Brn FM SAND, sm VF sand, lit C sand, tr gravel
							50/5"				v dense	5'6"	Partly decomposed BEDROCK
		1	c	60"	50"	11'0"	RQD= 54%			3		6'0"	Fractured BEDROCK Auger refusal
										6			BEDROCK (schist)
										7			
10										8			
										8		11'0"	
													E.O.B 11'0"
15													
20													
25													
30													
35													
40													

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. B-2**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50% F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: KG&D Architects	SHEET 1 OF 1 HOLE NO. B-3 & B-3A
	PROJECT NO. G46-1223-19	
	PROJECT NAME Harrison Recreation Center	BORING LOCATIONS per Plan
FOREMAN - DRILLER MK/ao	LOCATION 1 Heineman Place, Harrison , NY	
INSPECTOR SD	TYPE: CASING HSA, SAMPLER SS, CORE BAR NQ	OFFSET
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT __FT AFTER __HOURS	SIZE I.D.: 3 ¼", 1 3/8", 2" HAMMER WT.: 140#, BIT HAMMER FALL: 30", dia	DATE START 3/22/19 DATE FINISH 3/22/19 SURFACE ELEV. GROUND WATER ELEV.

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC.	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	16"	2'0"	12 / 5		moist	1'0"	4" Asphalt; BlkBrn F SAND, sm FC gravel (FILL)
							3 / 2		loose		
		2	ss	24"	10"	4'0"	3 / 4		dry		Brn F SAND & SILT, tr F gravel
							5 / 32		loose	4'6"	(possible FILL)
5		3	ss	14"	12"	5'2"	24 / 26		moist		Brn FM SAND, lit silt, lit FC gravel, cobbles
							50/2"		v dense	6'0"	
											Fractured partially decomposed BEDROCK
										8'6"	Auger refusal
10											E.O.B 8'6"
15											
0	B-3A										Offset 6' North of B-3
										1'0"	BlkBrn F SAND, sm FC gravel
										4'6"	Brn F SAND & SILT, tr F gravel (possible FILL)
5										5'0"	Brn FM SAND, lit silt, lit FC gravel, tr cobbles
											Partly decomposed/fractured BEDROCK
10		4	ss	0"	0"	10'0"	50/0"		v dense	10'0"	No recovery Auger refusal
		1	c	60"	48"	15'0"	RQD= 45%	3			BEDROCK (schist)
								4			
								6			
								7			
15								8		15'0"	
20											E.O.B 15'0"

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. B-3 & B-3A**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50% F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: KG&D Architects	SHEET 1 OF 1 HOLE NO. B-4
	PROJECT NO. G46-1223-19	
	PROJECT NAME Harrison Recreation Center	BORING LOCATIONS per Plan
FOREMAN - DRILLER MK/ao	LOCATION 1 Heineman Place Harrison , NY	
INSPECTOR SD	CASING / SAMPLER / CORE BAR TYPE HSA / SS SIZE I.D. 3 ¼" / 1 3/8" HAMMER WT. 140# / BIT HAMMER FALL 30"	OFFSET DATE START 3/22/19 DATE FINISH 3/22/19 SURFACE ELEV. GROUND WATER ELEV.
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT FT AFTER HOURS		

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE Type	SAMPLE PEN	SAMPLE REC.	SAMPLE DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6	6 - 12	12- 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
	B-4	1	ss	24"	6"	2'0"	9	8			dry/moist		5" Asphalt/concrete
							9	9			compact		Brn VFF SAND, lit FM sand, tr F gravel, clay
		2	ss	13"	12"	3'1"	6	11			dry/moist	3'6"	Brn VFF SAND, sm FM sand, lit C sand, tr gravel
							50/1"				v dense		BOULDERS/cobbles & fractured BEDROCK
5													SAME
												6'6"	Auger refusal
10													E.O.B 6'6"
15													
20													
5													

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. B-4**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE

M = MEDIUM

F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: KG&D Architects	SHEET 1 OF 1 HOLE NO. B-5
	PROJECT NO. G46-1223-19	
	PROJECT NAME Harrison Recreation Center	BORING LOCATIONS per Plan
FOREMAN - DRILLER MK/ao	LOCATION 1 Heineman Place Harrison , NY	
INSPECTOR		OFFSET
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT FT AFTER HOURS	TYPE: CASING HSA, SAMPLER SS, CORE BAR NQ SIZE I.D.: 3 ¼", 1 3/8", 2" HAMMER WT.: 140#, BIT HAMMER FALL: 30", dia	DATE START 3/28/19 DATE FINISH 3/28/19 SURFACE ELEV. GROUND WATER ELEV.

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC.	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6	6 - 12	12- 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	12"	2'0"	5	5			dry		8" Topsoil; Brn FM SAND, lit FC gravel
							7	8			compact	2'0"	
		2	ss	24"	14"	4'0"	11	7			moist		Brn F SAND & SILT, tr F gravel
							18	9			compact	4'0"	
5		3	ss	21"	20"	5'9"	18	60			dry		Brn FM SAND, sm FC gravel, tr silt
							62	50/3"			v dense		
		4	ss	24"	22"	9'0"	28	37			wet		Brn FM SAND, sm FC gravel, tr silt, tr cobbles
							66	45			v dense		Brn FMC SAND, sm FC gravel
10												10'6"	
		5	ss	7"	4"	10'7"	27	50/1"			wet		Partly decomposed BEDROCK
												12'0"	Auger refusal
		1	c	60"	60"	17'0"	RQD= 98%			8			BEDROCK (schist)
										6			
15										3			
										3			
										3		17'0"	
													E.O.B 17'0"
20													
25													
30													
35													
40													

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. B-5**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

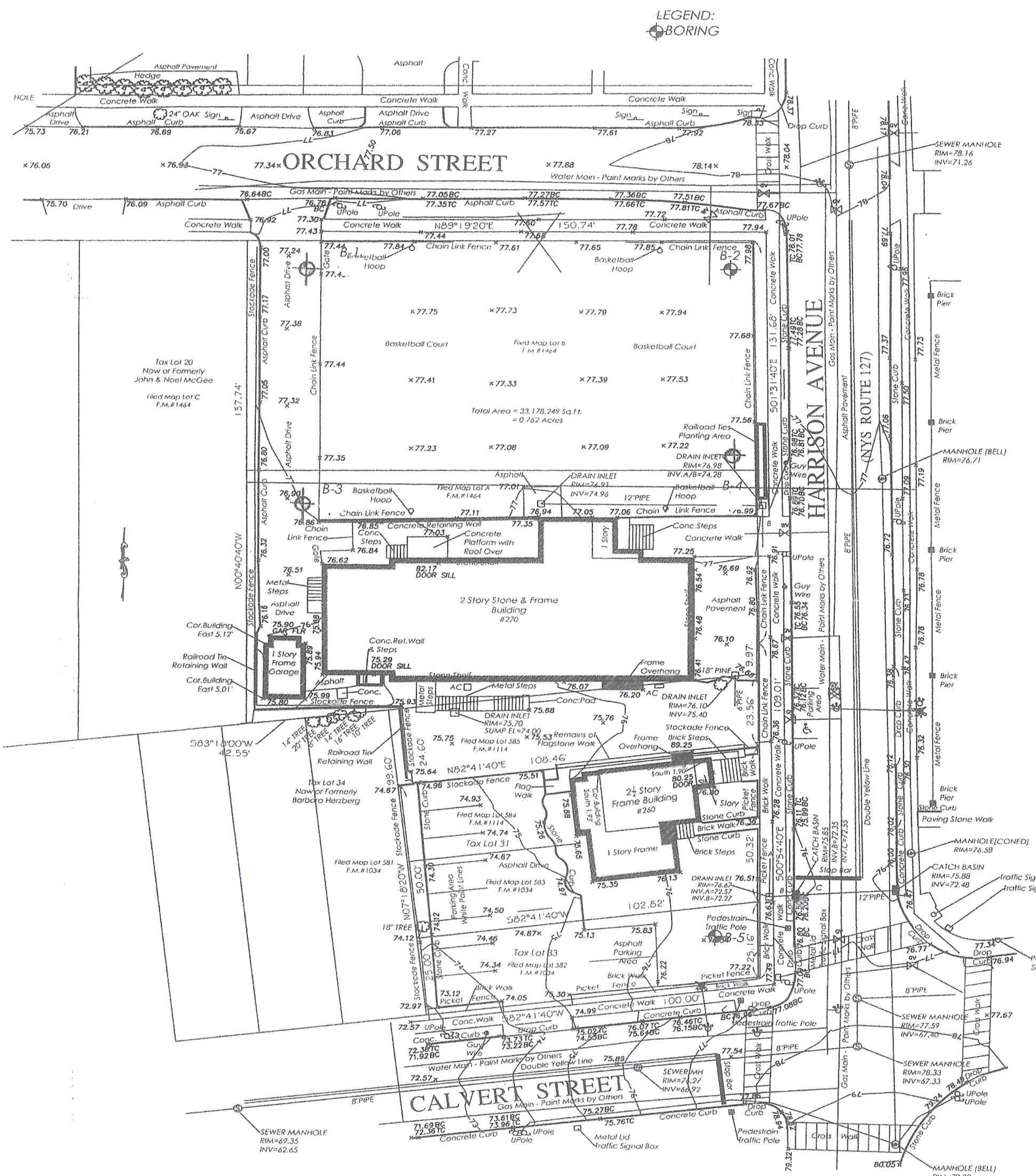
SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE
M = MEDIUM
F = FINE

TEST BORING LOCATIONS

HARRISON, NEW YORK



SCALE: 1 / 32" = 1'

JOB NO.

G46-1223-19

HARRISON RECREATION CENTER

FEBRUARY 4, 2019

KG+D listen imagine build

SOILTESTING, INC.

90 Donovan Road

Oxford, CT 06478

Ground Loop Design

Thermal Conductivity Report - 9/28/2022

Project Name:	**Harrison Avenue Project**				
Project Address:	270 Harrison Avenue				
City:	Harrison	**State:**	NY	**Zip:**	10528
Prepared By:	Bob Dowd				
Email:	redowd1862@gmail.com			**Phone:**	315-246-8724
Drill Date	8/26/2022				
TC Test Date(s)	9/21/2022	>>	9/23/2022		
Client Name:	**Boyde Artesion Well Co.**				
Address Line 1:	1054 NY-52				
Address Line 2:					
City:	Carmel Hamlet			**Phone:**	845-225-3196
State:	NY			**Fax:**	
Zip:	10512			**Email:**	boydeartesian@yahoo.com

Calculation Results

Thermal Conductivity (Btu/(h*ft*°F)) :	**1.67**
Thermal Diffusivity (est.) (ft^2/day) :	**1.03**
Average Heat Flux (W/ft) :	**17.3**
BH Thermal Resist (BTR) (h*ft*°F/Btu) :	**0.23**
Average Flow Rate (gpm) :	**9.52**
Test Duration (hr) :	**36**
Calculation Interval :	**12.0 - 48.0 Hours**

Borehole Input Parameters

Undisturbed Ground Temperature (°F) :	**56.3**	(User-Estimated)
Depth (ft) :	**500.0**	
Borehole Diameter (in) :	**6.00**	
Pipe Size:	**1 1/4 in. (32 mm)**	
Grout Thermal Conductivity (Btu/(h*ft*°F)) :	**1.00**	
Drilling Method :	**Standard**	
Drilling Time (hr) :	**8.0**	

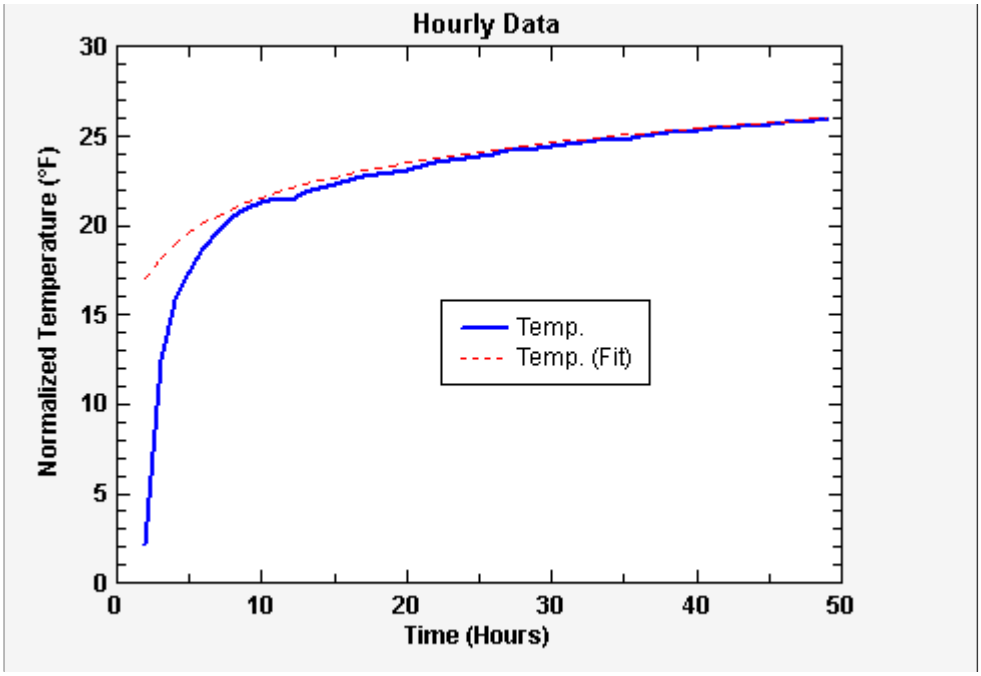
Diffusivity Input Parameters

Soil/Rock Specific Heat - Dry (Btu/(°F*lbm)) :	**N/A**
Soil/Rock Density - Dry (lb/ft^3) :	**N/A**
Moisture (0-100) (%) :	**N/A**

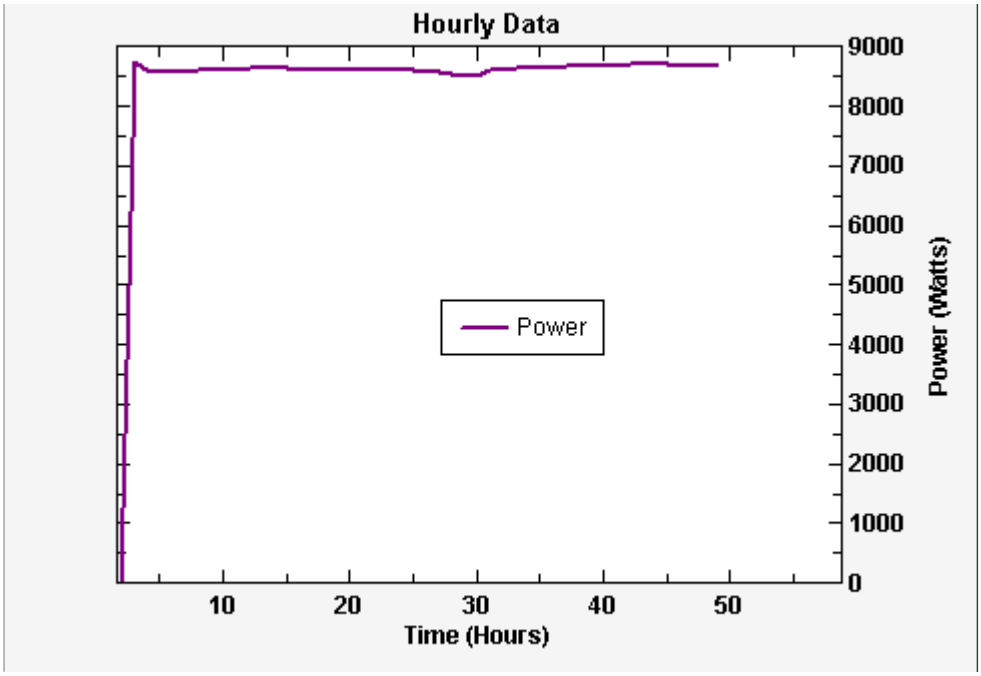
Flow Rate Input Parameters

TC Unit Model Name	**GeoCube Standard**

Temperature vs Time

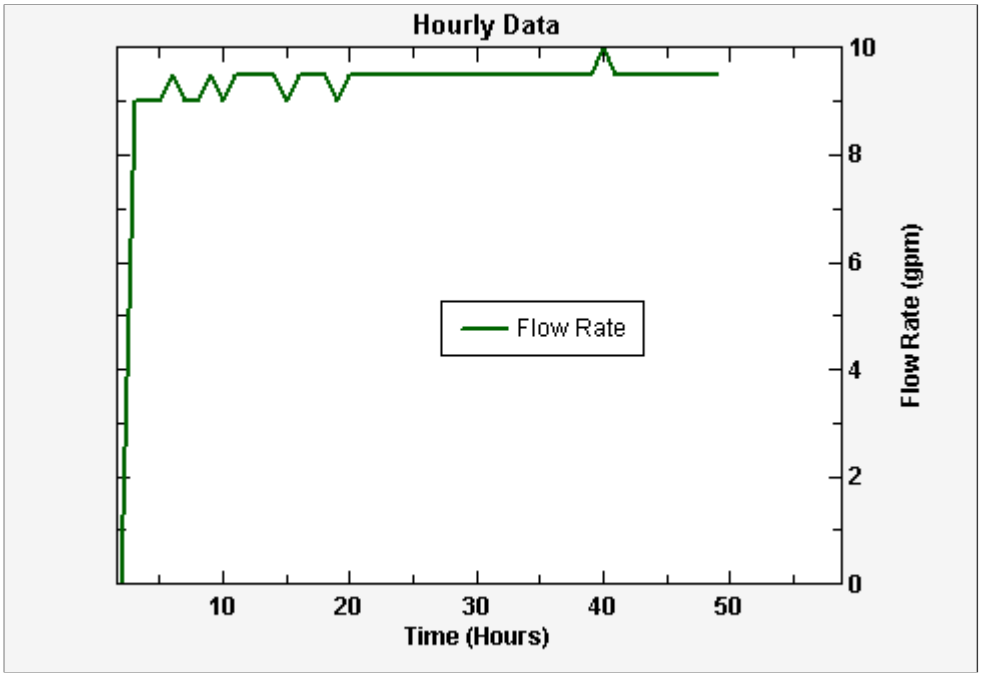


Power vs Time



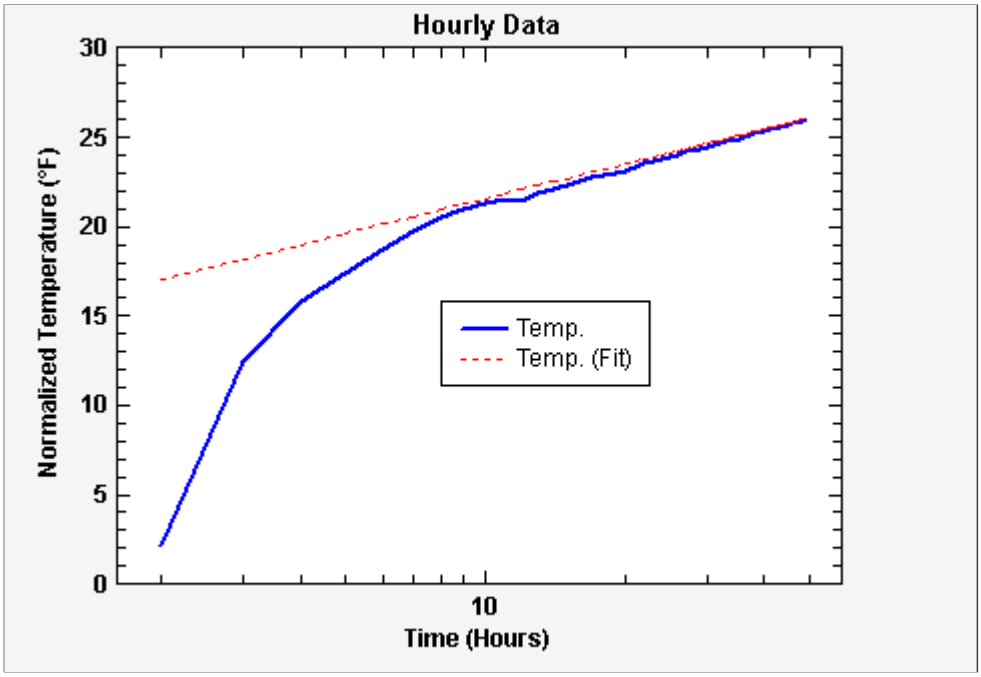
Average Power 8642.6 Watts

Flow Rate vs Time



Average Flow Rate 9.52

Temperature vs ln(Time)



Slope :	**2.82**
Calculation Interval :	**12.0 - 48.0 Hours**

Data Quality

		Threshold			Threshold
Power Standard Deviation :	**Pass**	**1.00 %**	Flow Rate :	**Pass**	**2.25 %**
Power Variation :	**Pass**	**1.75 %**	Slope Stability :	**Pass**	**3.25 %**
Temperature :	**Pass**	**0.30 %**	Water Flow Test :	**Pass**	**1.40 %**

Comments

Comments

Thermal Conductivity Test Overview

The thermal conductivity, or thermal response, test is a way to determine ground thermal properties that are critical for ground source heat pump system design. The test is performed by injecting a known and constant heat power into a borehole heat exchanger and then measuring the temperature response. A competent test can provide the undisturbed formation ground temperature, the calculated thermal conductivity, the calculated borehole thermal resistance and an estimate of the thermal diffusivity. These values, critical for the optimal design of a geothermal system, can be used in a geothermal design program to design an optimized, cost effective system.

Undisturbed Ground Temperature Determination

The undisturbed ground temperature is the constant temperature of the formation. Typically, this temperature is measured before starting the active thermal conductivity test. The TC module automatically estimates this value from the first few temperature measurements collected via the TC test unit data logger. The organization that performs the test also has the option of manually estimating this value with temperature probes or the like. If the TC test is initiated too soon after the installation of the test bore, the undisturbed ground temperature may be inaccurate. In general, it is recommended that the testing company waits a minimum of 3-5 days after installing the borehole before initiating the test so as to ensure that the ground has returned to its native and undisturbed temperature state.

Thermal Conductivity Calculation

Because thermal conductivity cannot be measured directly, The Ground Loop Design Thermal Conductivity Module uses the line source heat transfer model to calculate the required results. The line source model, which assumes an infinitely thin heat source in a homogeneous medium, is very broadly-referenced in the published literature and is considered to be the standard analysis methodology. To analyze test data, the average temperature of the water entering and exiting the heat exchanger is plotted versus the natural log of time. Using regression analysis, a best-fit line is plotted to match the empirical data and the slope of the line is used to calculate the thermal conductivity of the formation. Typically, the data analysis procedure may be repeated several times for several different time intervals to ensure the closest fit between the empirical data and the derived best-fit line. In addition, approximately the first 10 hours of temperature data are not included in the analysis so as to ensure that the conductivity value is determined from steady state rather than transient heat conduction processes.

Borehole Thermal Resistance Calculation

The borehole thermal resistance cannot be measured directly but can be calculated from the recorded in-situ measurements. After determining the thermal conductivity, the resultant value can be used in the line-source equation to calculate the borehole thermal resistance. Note that the calculated borehole thermal resistance is representative of the entire test bore configuration including the pipe type, pipe spacing, grout resistance and borehole diameter, etc. The empirically derived borehole thermal resistance may be entered into a design program such as Ground Loop Design for final loopfield design assuming the parameters for the boreholes in the final installation are equivalent to those in the test bore. Details pertaining to the general equation used for the calculation can be found in the research literature (Mattison, et al., 2007 for example).

Thermal Diffusivity Estimation

Thermal Diffusivity may be estimated from a combination of the calculated thermal conductivity value (which is directly related to the diffusivity) in conjunction with estimates of the specific heat, density and moisture content of the test bore. The thermal diffusivity reflects the rate of conductive heat transfer in the soil and helps determine the impact of neighboring borehole interactions on the final geothermal loopfield design.

Test Procedure Recommendations

The American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) offers a set of procedural recommendations for in-situ thermal conductivity/thermal response tests. These can be found in the ASHRAE 2007 HVAC Applications Handbook. Several of the key recommended procedures are as follows:

A) Time between test bore installation and start of TC test: A 5 day minimum wait time is recommended.

B) Undisturbed ground temperature measurement: The undisturbed ground temperature should be recorded prior to test start up.

C)Test Duration: Test duration typically should be for 48 hours or longer.

D) Power Quality: The power standard deviation should be equal to or less than 1.5% of the average power and the maximum power variation should be less than 10% of the average power. The average heat flux should fall within the 15 W/ft to 25 W/ft range to best simulate the expected peak loads in the borehole.

Westchester gov.com

Westchester County Department Health
Bureau of Environmental Quality

WELL COMPLETION REPORT:

WCDH File No. [ ]

This report is to be completed by well driller and submitted to Health Department, together with laboratory report of analysis of water sample indicating water is of satisfactory bacterial quality, before certificate of construction compliance is issued.

Well construction to be in accordance with Westchester County Health Dept, Rules & Regulations for the Design and Construction of Residential Subsurface Sewage Treatment System and Drilled Wells in Westchester County, NY.

Located at: 270 Harrison Avenue Section: [ ] Block: [ ]

Well Location Municipality: Harrison Lot: [ ]

Owner Last Name: Town of Harrison Owner First Name: [ ]

St. #: 270 Street Name: Harrison Ave Municipality: Harrison State: NY Zip Code: 10528

Well Driller (WD) Company Name: Boyd Artesian Well Co.

Well Pit and Pump Equipment: Pitless Adapter: [ ] Other – Describe [ ]

Pump Make: [ ] Pump Type: [ ] Pump Capacity: [ ] Pump GPM: [ ]

Storage Tank Type: [ ] Storage Tank Capacity: [ ]

Well Details: GEOTHERMAL

Casing Length: 41' Ft. Yield Test Type: NONE Measured from Land

Casing Diameter 6" In. ID Yield Test Duration: [ ] Hrs. Water Level, Static: 22' Ft.

Casing Material: STEEL Well Yield: 1 1/2 G.P.M. Water Level, Pumped: NONE Ft.

Screen Make: [ ] Screen Diameter: [ ] Inches

Screen Length: [ ] Ft. Screen Slot Size: [ ] **TOTAL WELL DEPTH :** 500 Ft.

WELL LOG :

Depth From Ground Surface	Give description of formation penetrated, such as: peat, silt, sand, gravel, clay, hardpan, shale, sandstone, granite, etc. Include size of gravel (diameter) and sand (fine, medium, coarse), color of material, structure (loose, packed, cemented, soft, hard). For example: 0 ft. to 27 ft. fine, packed, yellow sand; 27 ft. to 134 ft. gray granite.
0 Ft. to 22 Ft.	Well Geology, 1st Strata : SAND
22 Ft. to 40 Ft.	Well Geology, 2nd Strata: SAND GRAVEL WATER
40 Ft. to 500 Ft.	Well Geology, 3rd Strata : GNEISS
[ ] Ft. to [ ] Ft.	Well Geology, 4th Strata :
[ ] Ft. to [ ] Ft.	Well Geology, 5th Strata :

I certify that the individual water supply indicated above was installed as per the Westchester County Health Department Rules & Regulations for the Design and Construction of Residential Subsurface Sewage Treatment System and Drilled Wells in Westchester County, NY.

Date Well Was Completed: 8/26/22 Date of Signature 9/26/22

NYSDEC Registration #: 01695 Well Driller Signature : [signature]

Revised 1/18/08

THERMAL GROUT LITE

CALCULATE GROUT VOLUME

GROUT PROPERTIES

Grouting Product	TG Lite
Thermal Enhancement Compound (TEC)	PowerTEC
Target Thermal Conductivity	1.00 Btu/hr-ft-°F
Density	10.5 lb/gal (US)
Percent Solids	32.41 %
Percent Active Solids	26.65 %
Permeability	$<1x10^{-7}$ cm/s

BATCH RECIPE

TG Lite	2 bags
PowerTEC	1 bags
Mix Water	33.0 gal (US)
Yield	38.6 gal (US)

DOCUMENTS

SUBMITTAL

SPECIFICATION

TG LITE SDS

POWERTEC SDS

PERMEABILITY

SECTION 004100 - PROPOSAL FORM

PROJECT: Harrison New Recreation & Community Center Phase 1
270 Harrison Ave.
Harrison, NY 10528

DATED: _____

To (Owner): Town / Village of Harrison
One Heineman Place
Harrison, NY 10528

Attn: Michael Amodeo, P.E., CFM, Town Engineer

The Undersigned, in compliance with the Invitation and Instructions to Bidders, agrees that if this bid is accepted as hereinafter provided he/she will provide all labor, materials, supplies, tools, plant and equipment necessary to perform all work required for the construction of the aforementioned project in accordance with documents as prepared by KG&D Architects, P.C.; 285 Main Street, Mount Kisco, NY, 10549; Telephone: 1-914-666-5900 for the class of work at the aforementioned project as listed below

_____

(Each Bidder shall indicate in line above, class of work the Proposal is being submitted for.)

Contract #1	General Construction – Phase 1

for the following LUMP SUM COST as applicable to the particular contract:

_____

_____Dollars ($_____)

Further, as part of the proposal, the undersigned:

- agrees to execute alternates selected for the sums (additive or deductive) set forth in the attached schedule of Alternate Proposals – if applicable.
- as part of the proposal, the undersigned provides the unit prices indicated on the attached schedule for designated work -if applicable. These unit prices shall be for additions to or deletions from the work to be performed under the basic Contract during the entire life of said Contract but shall be considered as payment forms ONLY and not for the purposes of determining contract award.
- agrees to the stated percentages for extra work if ordered on a Time and Material basis in accordance with Article 7 of the Conditions to cover all overhead and profit allowance.

It is understood that the Owner reserves the right to accept or reject any and all bids that the Owner deems to be in his best interest.

Upon notification of acceptance of this proposal, the undersigned agrees to execute a contract in the form as stated within these contract documents for the amount stated.

Prices quoted shall be guaranteed for ninety (90) days from the date of bid opening.

If written Notice to Proceed, Letter of Intent or Contract is received within ninety (90) calendar days after the opening of bids, the undersigned agrees to execute said contract and furnish to the Owner within ten (10) days after receipt of said notice of award, the executed Contract, together with the Performance Bond, Labor and Material Payment Bonds and Insurance Certificates required herein.

The Undersigned agrees that the Bid Security payable to Owner accompanying this proposal is left in escrow with the Owner; that its' amount is the measure of liquidated damages which the Owner will sustain by the failure of the Undersigned to execute and deliver the above named Bonds and Contract; and that if the undersigned defaults in furnishing said bonds or in executing and delivering said Contract within ten (10) days of written notification of award of the Contract to him/her, then said Security shall be payable to the Owner for its' own account; but if this proposal is not accepted within said forty five (45) days of the time set for submission of Bids, or if the Undersigned executes and delivers said bonds and Contract, the Bid Security shall be returned to the Undersigned.

The following Addenda have been received. The noted modifications to the Bid Documents have been considered and all costs are included in the Bid Sum.

Addendum	Date	Acknowledgment

By submission of this Proposal, the undersigned acknowledges that they have read the milestone and schedule requirements, Section 011000, and agrees to provide sufficient staff and organization as well as to select subcontractors, suppliers and vendors to comply with the requirements for submittals, delivery dates, work periods and completion dates as specified.

The Undersigned hereby certify that they are able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the Work.

NON-COLLUSIVE AFFIDAVIT

Every bid or proposal made to a political subdivision of the State or any public department, agency or official thereof or to a fire district or any agency or official thereof, for work or services performed or to be performed or goods sold to or to be sold, shall contain the following statement subscribed by the bidder and affirmed by such bidder as true under the penalties of perjury and is made pursuant to Section 103d of the General Municipal Law of the State of New York as amended by Laws of 1966.

NON-COLLUSIVE BIDDING CERTIFICATION

a. By submission of this bid each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its' own organization, under penalty of perjury, that to the best of his knowledge and belief:

1. 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;
2. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to the opening, directly or indirectly, to any other bidder or to any competitor; and
3. No attempt has been made or will be made by the bidder to induce any other person, partnership, or corporation to submit or not to submit a bid for the purpose of restricting competition.

b. A bid shall not be considered for award, nor shall any award be made (a)1, 2 and 3 above, have not been complied with; provided, however, that if any case the bidder cannot make the foregoing certification, the bidder shall so state and shall furnish with the bid a signed statement which sets forth in detail the reasons therefore.

Where (a)1, 2 and 3 above have not been complied with, the bid shall not be considered for award nor shall any award be made unless the head of purchasing unit of the political subdivision, public department, agency or official thereof to which bid is made, or his designee, determines that such disclosure was not made for the purpose of restricting competition.

By submission of this Proposal

- each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each bidder is not on the list created pursuant to paragraph (b) of subdivision 3 of Section 165-a of the state finance law."
- the Undersigned acknowledges that they have visited the site, informed themselves of the existing conditions, and have included in the Proposal a sum to cover the costs of all items in the contracts.

Respectfully submitted,

_____
Contractor

By_____Title_____

Business Name:_____

Address:_____

Telephone Number:_____

Attest:_____Title_____

SEAL IF CORPORATION

CERTIFICATION OF COMPLIANCE WITH THE IRAN DIVESTMENT ACT

As a result of the Iran Divestment Act of 2012 (the “Act”), Chapter 1 of the 2012 Laws of New York, a new provision has been added to State Finance Law (SFL) § 165-a and New York General Municipal Law § 103-g, both effective April 12, 2012. Under the Act, the Commissioner of the Office of General Services (OGS) will be developing a list of “persons” who are engaged in “investment activities in Iran” (both are defined terms in the law) (the “Prohibited Entities List"). Pursuant to SFL § 165-a(3)(b), the initial list is expected to be issued no later than 120 days after the Act’s effective date at which time it will be posted on the OGS website.

By submitting a bid in response to this solicitation or by assuming the responsibility of a Contract awarded hereunder, each Bidder/Contractor, any person signing on behalf of any Bidder/Contractor and any assignee or subcontractor and, in the case of a joint bid, each party thereto, certifies, under penalty of perjury, that once the Prohibited Entities List is posted on the OGS website, that to the best of its knowledge and belief, that each Bidder/Contractor and any subcontractor or assignee is not identified on the Prohibited Entities List created pursuant to SFL § 165-a(3)(b).

Additionally, Bidder/Contractor is advised that once the Prohibited Entities List is posted on the OGS Website, any Bidder/Contractor seeking to renew or extend a Contract or assume the responsibility of a Contract awarded in response to this solicitation must certify at the time the Contract is renewed, extended or assigned that it is not included on the Prohibited Entities List.

During the term of the Contract, should the Owner receive information that a Bidder/Contractor is in violation of the above-referenced certification, the Owner will offer the person or entity an opportunity to respond. If the person or entity fails to demonstrate that he/she/it has ceased engagement in the investment which is in violation of the Act within 90 days after the determination of such violation, then the Owner shall take such action as may be appropriate including, but not limited to, imposing sanctions, seeking compliance, recovering damages or declaring the Bidder/Contractor in default. The Owner reserves the right to reject any bid or request for assignment for a Bidder/Contractor that appears on the Prohibited Entities List prior to the award of a contract and to pursue a responsibility review with respect to any Bidder/Contractor that is awarded a contract and subsequently appears on the Prohibited Entities List.

I, _____, being duly sworn, deposes and says

that I am the _____ of the _____

Corporation and that neither the Bidder/ Contractor nor any proposed subcontractor is identified

on the Prohibited Entities List.

_____
SIGNED

SWORN to before me this _____ day of _____ 202___

Notary Public: _____

OR

DECLARATION OF BIDDER'S INABILITY TO PROVIDE CERTIFICATION OF COMPLIANCE WITH THE IRAN DIVESTMENT ACT

Bidders shall complete this form if they cannot certify that the bidder /contractor or any proposed subcontractor is not identified on the Prohibited Entities List. The Owner reserves the right to undertake any investigation into the information provided herein or to request additional information from the bidder.

Name of the Bidder: _____

Address of Bidder _____

Has bidder been involved in investment activities in Iran?_____

Describe the type of activities including but not limited to the amounts and the nature of the investments (e.g., banking, energy, real estate): _____

_____

_____

If so, when did the first investment activity occur? _____

Have the investment activities ended? _____

If so, what was the date of the last investment activity? _____

If not, have investment activities increased or expanded since April 12, 2012? _____

Has the bidder adopted, publicized, or implemented a formal plan to cease the investment activities in Iran and to refrain from engaging in any new investments in Iran? _____

If so, provide the date of the adoption of the plan by the bidder and proof of the adopted resolution, if any and a copy of the formal plan. _____

In detail, state the reasons why the bidder cannot provide the Certification of Compliance with the Iran Divestment Act below (additional pages may be attached): _____

_____

_____

I, _____ being duly sworn, deposes and says that I am the _____ of the _____ Corporation and the foregoing is true and accurate.

_____
SIGNED

SWORN to before me this _____ day of _____202___

Notary Public: _____

ATTACHMENT #1 - SCHEDULE OF ALTERNATE PROPOSALS

In accordance with the terms and conditions of the Contract and the Proposal Form, the undersigned agrees to execute alternates selected for the sums set forth in the following schedule of Alternate Proposals in accordance with the general description outlined below.

ALTERNATE #1 –

ADD _____

_____Dollars ($_____)

ALTERNATE #2 –

ADD _____

_____Dollars ($_____)

ATTACHMENT #2 - SCHEDULE OF UNIT PRICES

In accordance with the terms and conditions of the Contract and as part of the base proposal, the undersigned agrees to the following unit prices for designated work as described below which shall be considered as payment forms and not for purpose of determining contract award.

Unit	Description	Value	Measure
1.	ADDITION OR REDUCTION of Modular Block Wall (Redi-Rock)		SF of vertical face area

End of Unit Price Schedule

Contractor Attestment To Schedules

Contractor _____

By _____

Dated _____

ATTACHMENT #3 – LIST OF PARTICIPATING SUBCONTRACTORS

Bidders shall provide a list of subcontractors' company names and addresses who will be involved in the Phase 1 work.

END OF SECTION 004100

SECTION 004513 - BIDDER QUALIFICATION STATEMENT

After receipt of bids and upon notification from the Architect, the bidder shall answer all questions set forth in the form within the time required in Article 1.07 of the Invitation and Instructions to Bidders. Failure to answer these questions in full may be cause for rejection of the bidder's proposal. If more space is required, please attach additional sheets.

1. How many years has your organization been in business under your present business name? _____

2. How many years' experience in construction work of a similar type has your organization had? _____

3. List below the construction projects your organization has under way as of this date:

Contract Sum	Class of Work/%Complete	Name/Address of Owner	Name & Phone # of Contact at Owner

4. List below a minimum of three (3) projects which your firm, as a firm, has performed in the past five (5) years which you feel will qualify you for this work.

Contract Sum	Class of Work/%Complete	Name/Address of Owner	Name & Phone # of Contact at Owner

5. For each of the projects listed above, indicate whether your firm is/ was a Prime contractor or a Sub-contractor. If your firm was a Sub-contractor, provide the company name and address, and the name and contact phone number of the company Owner.

Name/Address of Owner	Name & Phone # of Contact at Owner

6. Have you ever failed to complete any work awarded to you?
   □ Yes □ No; If Yes, where and why?

   _____

   _____

7. Has any officer or partner of your organization ever been an officer or partner of some other organization that failed to complete a construction contract? □ Yes □ No; If Yes, state:

Name of Individual(s)	Name of Owner(s)	Reason(s)

8. Has any officer or partner of your organization ever failed to complete a construction contract handled in his own name?
□ Yes □ No; If yes, state:

Name of Individual(s)	Name of Owner(s)	Reason(s)

9. Has your firm or organization ever received a Notice of Default or Notice of Termination or ever been defaulted or terminated on a Project.
□ Yes □ No; If yes, state:

Name of Individual(s)	Name of Owner(s)	Reason(s)

The undersigned hereby authorizes and requests any firm, person or corporation to furnish any information requested by the Owner or Architect in verification of the matters contained in the Bidder Qualification Statement.

Dated _____, 20__

_____
(Name of Bidder)

By _____

Title _____

AFFIDAVIT

STATE OF)

S.S.
COUNTY OF)

_____ being duly sworn and says that he/she is _____ of _____
(Name of Organization)

and that the answers to the foregoing interrogatories and all statements therein contained are true and correct.

Subscribed and sworn to before me

this _____ day of _____ 20__ _____
Signature

_____

Notary Public, County of _____

END OF SECTION 004513

SECTION 004643 - WAGE AND HOUR RATES

1.1 GENERAL

A. The following are instructions for obtaining the minimum wage rates, health and welfare and pension fund contributions as determined by the Industrial Commissioner of the State of New York in accordance with the provisions of Section 220 of the Labor Law.

B. All contractors will be bound and obligated by the Laws of New York State to insure payment to all workers involved with the construction of the Project.

1.2 MINIMUM WAGE RATES

A. The current wage and benefit rates are available when following the instructions on the attached page.

B. The "Request for Wage and Supplement Information" (PW 39) you have submitted has been accepted, and a Prevailing Rate Case Number (PRC# 2023006549 - Harrison Rec & Community Cente) has been assigned to the project.

To access the PDF file of your schedule, click on https://apps.labor.ny.gov/wpp/publicViewProject.do?method=showIt&id=1550945 or copy and paste into your browser

END OF SECTION 004643

Prevailing Wage

· Wage Schedule · Submit Notice Of Award · Submit Notice Of Project Completion

PRC#: 2023006549 **Acceptance Status:** Accepted Article 8
Type of Contracting Agency: Town

Contracting Agency

Town of Harrison
Michael Amodeo
Town Engineer
One Heineman Place
Harrison NY 10528

(914) 670-3036
mamodeo@harrison-ny.gov

Send Reply To

Teresa Jarrard
Assist. Project Manager
285 Main Street
Mount Kisco NY 10549

(914) 666 -5900 Ext: 200
tjarrard@kgdarchitects.com

Project Information

Project Title	Harrison Rec & Community Cente
Description of Work	Construction of new recreation center. Multi Prime contracts
Contract Id No.	2020-1005
Project Locations(s)	270 Harrison Ave.
Route No / Street Address	
Village / City	
Town	Harrison
State / Zip	NY 10528
Nature of Project	New Building
Approximate Bid Date	07/15/2023
Checked Occupation(s)	Construction (Building, Heavy & Highway, Sewer, Water, Tunnel)

Applicable Counties

Westchester

AIA® Document A101® – 2017

Standard Form of Agreement Between Owner and Contractor *where the basis of payment is a Stipulated Sum*

AGREEMENT made as of the day of in the year
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

Town/Village of Harrison
One Heineman Place.
Harrison, NY 10528

and the Contractor:
(Name, legal status, address and other information)

for the following Project:
(Name, location and detailed description)

Town/Village of Harrison
Recreation & Community Center – Phase 1
270 Harrison Ave., Harrison, NY 10528

The Architect:
(Name, legal status, address and other information)

KG+D Architects, P.C.
285 Main Street
Mount Kisco, NY 10549

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101®–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201®–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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TABLE OF ARTICLES

1 THE CONTRACT DOCUMENTS

2 THE WORK OF THIS CONTRACT

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4 CONTRACT SUM

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7 TERMINATION OR SUSPENSION

8 MISCELLANEOUS PROVISIONS

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EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[ ] The date of this Agreement.

[ ] A date set forth in a notice to proceed issued by the Owner.

[X] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

Reference Section 011000 – Description of Work – 1.15 - Schedules

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

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[ ] Not later than ( ) calendar days from the date of commencement of the Work.

[ ] By the following date:

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be ($), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

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ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the day of the month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than ( ) days after the Architect receives the Application for Payment. *(Federal, state or local laws may require payment within a certain period of time.)*

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- **.1** That portion of the Contract Sum properly allocable to completed Work;
- **.2** That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- **.3** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- **.3** Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- **.4** For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and
- **.5** Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

Five percent (5%)

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§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

%

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

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§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[ ] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[X] Litigation in a court of competent jurisdiction in Westchester County.

[ ] Other *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

Michael J. Amodeo, P.E., CFM
Town-Village of Harrison
270 Harrison Ave.
Harrison, NY 10528

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

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User Notes: (1450725715)

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A201™–2017, General Conditions of the Contract for Construction
(Insert the date of the E203-2013 incorporated into this Agreement.)

.3 Drawings

Number	Title	Date

.4 Specifications

Section	Title	Date	Pages

.5 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.6 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[ ] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

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[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.7 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
(Printed name and title)	*(Printed name and title)*

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AIA® Document A310™ – 2010

Bid Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)
Town-Village of Harrison Purchasing Department
One Heineman Place, Harrison, NY 10528

BOND AMOUNT: $

PROJECT:
(Name, location or address, and Project number, if any)
Town-Village of Harrison,
Recreation & Community Center - Phase 1
270 Harrison Avenue, Harrison, NY 10528

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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Signed and sealed this day of ,

	(Contractor as Principal) *(Seal)*
(Witness)	*(Title)*
	(Surety) *(Seal)*
(Witness)	*(Title)*

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SECTION 006100 - BOND REQUIREMENTS

SEE SECTION 006101 FOR ACCEPTABLE BONDING COMPANY RATINGS

1.1 Prior to the Owner signing the contract agreement, he will require the Contractor (s) to furnish separate performance and labor and material payment bonds covering the faithful performance of the entire construction contract agreement.

The performance bond and the labor and material payment bond shall each be made out in one hundred percent (100%) of the guaranteed maximum contract amount.

1.2 The "Performance Bond" and "Labor and Material Payment Bond", AIA Document A-312, as published by The American Institute of Architects shall be used and modified, if necessary, to comply with applicable statutes.

NOTE: Date of forms to be used shall be complementary to the date of the contract form and general conditions incorporated within these Bidding and Contract Requirements.

1.3 The bonds shall be signed by an official of the bonding company and shall be accompanied by the bonding agent's written power of attorney.

1.4 Provide four (4) copies of each of the bonds and the power of attorney in order that one (1) copy of each may be attached to each copy of the contract agreement.

1.5 The Contractor (s) shall include in his proposal amount the total premiums for the performance and labor and material payment bonds.

END OF SECTION 006100

Section 006101 - Bonding Requirements

Acceptable Bonding Company Ratings

Contract Amounts ($)	A.M. Best Company Rating							
	A + XII	B + XI	B + X	B X	B IX	B VIII	B VII	B VI
10 Million and Over	▲							
7.5 to 10 Million	▲	▲						
5.0 to 7.5 Million	▲	▲	▲					
2.5 to 5.0 Million	▲	▲	▲	▲				
1.0 to 2.5 Million	▲	▲	▲	▲	▲			
0.5 to 1.0 Million	▲	▲	▲	▲	▲	▲		
0.25 to 0.5 Million	▲	▲	▲	▲	▲	▲	▲	
0.25 and Under	▲	▲	▲	▲	▲	▲	▲	▲

AIA® Document A312® – 2010

Payment Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)

CONSTRUCTION CONTRACT
Date:
Amount: $
Description:
(Name and location)

BOND
Date:
(Not earlier than Construction Contract Date)

Amount: $
Modifications to this Bond: ☐ None ☐ See Section 18

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	

(Any additional signatures appear on the last page of this Payment Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

.2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

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§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- **.1** the name of the Claimant;
- **.2** the name of the person for whom the labor was done, or materials or equipment furnished;
- **.3** a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- **.4** a brief description of the labor, materials or equipment furnished;
- **.5** the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- **.6** the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- **.7** the total amount of previous payments received by the Claimant; and
- **.8** the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

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§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:	_____	Signature:	_____
Name and Title:		Name and Title:	
Address:		Address:	

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User Notes: (1685471844)

AIA® Document A312® – 2010

Performance Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)

CONSTRUCTION CONTRACT
Date:
Amount: $
Description:
(Name and location)

BOND
Date:
(Not earlier than Construction Contract Date)

Amount: $
Modifications to this Bond: ☐ None ☐ See Section 16

CONTRACTOR AS PRINCIPAL	**SURETY**
Company: *(Corporate Seal)*	Company: *(Corporate Seal)*
Signature: _____	Signature: _____
Name and Title:	Name and Title:

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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User Notes: (812871729)

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

.1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

.2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

.3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

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§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

.2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and

.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

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§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:	_____	Signature:	_____
Name and Title:		Name and Title:	
Address:		Address:	

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SECTION 006300 - REQUESTS FOR INFORMATION (RFI)

PART 1 - GENERAL

1.1 This document is for issuance at the Post Bid/Pre-Construction Conference and specifies administrative and procedural requirements for handling requests for information (RFI's) made after award of Contract.

1.2 Attention is directed to Sections 013300 and 013200 of Division #1 as same concerns construction progress schedules, submittal schedules and submittals of shop drawings, samples and product data in general.

1.3 SUBMITTAL PROCEDURES: RFI's shall be submitted in the following manner:

A. One (1) completed copy of form following to Architect with copies to Owner (as directed) and appropriate Consultants with the following minimum information:

1. Work identified by RFI listing affected Drawing(s) and specific detail(s) and Specification paragraph reference(s).
2. Identify specific field conditions and "as-built" conditions on sketches attached to RFI submittal.
3. If RFI addresses conflict(s) in, or between, Contract Documents, describe completely and provide such data necessary to permit thorough and proper response by affected discipline.
4. Indicate proposed solution along with any impacts on cost and construction time.
5. Listing of Trade/Specialty Contractors affected by RFI and indication that RFI proposal has been coordinated with said contractors.

INCOMPLETE RFI's WILL BE RETURNED TO THE CONTRACTOR WITHOUT ACTION TAKEN.

1.4 REVIEW PROCEDURES/ACTIONS

A. Architect/Engineer may request additional information or documentation as may be deemed necessary for fair evaluation of RFI.

B. Architect/Engineer will respond with reasonable promptness as outlined in Section 013300 in writing and may, if deemed appropriate, issue a "Bulletin" as a clarification to the Contract Documents.

END OF SECTION 006300

DRAFT

AIA® Document G716™ – 2004

Request for Information ("RFI")

TO:

KG+D Architects, PC
285 Main Street
Mount Kisco, NY 10549

Russell A. Davidson: rdavidson@kgdarchitects.com
Frederick Wells: fwells@kgdarchitects.com

FROM:

PROJECT:
Harrison, Town-Village Recreation Center Phase 1
270 Harrison Avenue
Harrison, NY 10528

ISSUE DATE:

RFI No. ____

PROJECT NUMBERS: 2018-1062 /

REQUESTED REPLY DATE:

COPIES TO:

RFI DESCRIPTION: *(Fully describe the question or type of information requested.)*

REFERENCES/ATTACHMENTS: *(List specific documents researched when seeking the information requested.)*
SPECIFICATIONS: **DRAWINGS:** **OTHER:**

SENDER'S RECOMMENDATION: *(If RFI concerns a site or construction condition, the sender may provide a recommended solution, including cost and/or schedule considerations.)*

RECEIVER'S REPLY: *(Provide answer to RFI, including cost and/or schedule considerations.)*

BY **DATE** **COPIES TO**

Note: This reply is not an authorization to proceed with work involving additional cost, time or both. If any reply requires a change to the Contract Documents, a Change Order, Construction Change Directive or a Minor Change in the work must be executed in accordance with the Contract Documents.

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AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

Town-Village of Harrison,
Recreation & Community Center – Phase 1
270 Harrison Ave., Harrison, NY 10528

THE OWNER:
(Name, legal status and address)

Town-Village of Harrison
One Heineman Place
Harrison, NY 10528

THE ARCHITECT:
(Name, legal status and address)

KG+D Architects, P.C.
285 Main Street
Mount Kisco, NY 10549

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ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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15 CLAIMS AND DISPUTES

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

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§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document

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G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

(Paragraphs deleted)

§ 2.3 Information and Services Required of the Owner

(Paragraph deleted)

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

(Paragraphs deleted)

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

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ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

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§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Town is tax exempt and certificates to confirm this will be made available to the Contractor.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded. All permit fees for permits issued by the Town of Village of Harrison are waived – no cost – for this project.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in

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construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to

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completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

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§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste

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materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or

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for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

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§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract

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Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

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§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- **.1** The change in the Work;
- **.2** The amount of the adjustment, if any, in the Contract Sum; and
- **.3** The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

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§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

.2 Unit prices stated in the Contract Documents or subsequently agreed upon;

.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

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§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This project is to be completed in accordance with the Milestone Schedule included within Division 1 of the Project Manual. Liquidated damages will be assessed for each and every calendar day after the time allowed for Final Completion in the amount of $350.00 per day. The Contractor realizes that time is of the essence on this contract and the completion dates and milestone date for Substantial and Final Completion shall be no later than the date indicated in these documents. In the event the Contractor fails to complete any work or substantially complete the work under this Contract by said schedule date, the sum per calendar day for each date not met, as delineated above, will be subtracted from the payment due the Contractor. This is in effect except in cases where a delay is due to unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including acts of God, or the public enemy, acts of the Government, in either its sovereign or contractual capacity, fires, flood, epidemics and quarantine restrictions. Freight embargoes will not constitute a delay excusable under this provision unless approved by the Owner in writing. In no case will any Covid 19 related delay or supply chain issue that is known or could be known prior to the bid date be an accepted cause of delay.

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ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage of 5% as provided for in the Contract Documents. Accompanying each payment application the Contractor is to submit:

- AIA G706 – Contractor's Affadavit of Pyament of Debts and Claims
- AIA G706A – Contractor's Affadavit of Release of Liens
- Certified Payroll
- For Final Requisition – AIA G707 – Consent of Surety to Final Payment

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the

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Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- **.7** repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

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§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not

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included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a

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Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- **.1** employees on the Work and other persons who may be affected thereby;
- **.2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- **.3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by

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any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

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§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

Before any Contract shall be binding or obligatory upon the Town Board or Village Board, each Contractor shall file with the Town Board or Village Board satisfactory evidence that it is carrying the various types of insurance hereafter set forth with the limits of liability indicated.

A. The Contractor agrees that it will indemnify and save the Town of Harrison and Village of Harrison harmless from all claims growing out of the demands of the Subcontractors, laborers, workmen, mechanics, material men and furnishers of supplies and equipment.

The Contractor shall furnish satisfactory evidence that all obligations of the nature herein described have been discharged and waived. If the Contractor fails to do so, the Town of Harrison and Village of Harrison may, after having served written notice on said Contractor, either pay the unpaid bills of which the Town of Harrison and Village of Harrison has written notice, deduct or withhold from the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims, until satisfactory evidence is furnished that all liabilities have been fully discharged, whereupon payments to the Contractor shall be resumed in accordance with the terms of this Contract. In no event shall the provisions of this Contract be construed to impose any obligations upon the Town of Harrison and Village of Harrison to the Contractor, and the Town of Harrison and Village of Harrison shall not be liable to the Contractor for any such payment made in good faith.

B. In no event shall the final payment of the Contractor nor any part of the retained percentage be due and payable until the Contractor shall deliver to the Town of Harrison and Village of Harrison, a complete release and discharge of all liens arising out of this Contract, receipts showing payment in full to all Subcontractors and material men and an affidavit that so far as he has knowledge or information, the release and receipts include all the labor and material for which a lien could be filed. The Contractor may, if any Subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to the Town of Harrison and Village of Harrison to indemnify him against any lien, and to discharge any lien that has been filed. If any lien remains unsatisfied after all payments are made, the Contractor shall refund to the Town of Harrison and Village of Harrison all monies that the latter may be compelled to pay in discharging such a lien, including all costs and a reasonable attorney's fee.

General

- All certificates must include policy numbers.
- The policy must be in effect for at least 1 (one) year, the period includes the time for work/performance.
- All certificates must include a description of operations and location(s).

Liability Insurance (Accord 25)

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- Additional Insured must name the 'Town of Harrison' and 'Village of Harrison'.
- All insurers must be licensed to do business in the State of New York
- The cancellation period must be at least 15 days' notice by Certified Mail – Return Receipt Requested.

The Description of Operations/Locations/Vehicles should read as follows:

- "The Town of Harrison and the Village of Harrison, KG+D Architects, PC, and all of the Architect's Consultants and Subconsultants are included and must be named as Additional Insureds. The Insurer must be licensed to do business in the State of New York. The cancellation period must be at least 15 days' notice by Certified Mail - Return Receipt Requested."
- The description section must also include a specific and detailed description of the operation and location of work (i.e. masonry work – 5 Harrison Ave or masonry work - as specified on PO)

Certificate Holder - must list the Town of Harrison and Village of Harrison as shown below:

Town of Harrison
Village of Harrison
1 Heineman Place
Harrison, NY 10528

Limits must meet or exceed the following:

- General Liability $1,000,000; Property, 500k/500k, Bodily - $2,000,000 - Aggregate;
- Auto Liability must be at least $1,000,000

Worker's Compensation (C-105.2) and Disability Benefits (DB 120.1)

- Worker's Compensation and NYS Disability Benefits Law (DBL) as required by New York State.
- Separate certificates must be submitted for Worker's Compensation and Disability. Please list:
  Town of Harrison
  Village of Harrison
  1 Heineman Place
  Harrison, NY 10528
- If exempt from Workers Compensation/Disability Benefits, please provide form CE-200.

The following Indemnification Agreement shall be, and is hereby a provision of the Contract:

"The Contractor agrees to protect, defend, indemnify and hold the Town of Harrison and the Village of Harrison, their officers, agents and employees, free and harmless from and against any and all losses, penalties, damages, settlements, costs, charges, professional fees or other expenses or liabilities of every kind and character arising out of or relating to any and all claims, liens, demands, obligations, actions, proceedings or causes of action of every kind and character in connection with or arising directly or indirectly out of this agreement and/or the performance hereof. Without limiting the generality of the foregoing, and all such claims, etc., relating to personal injury, death, damage to property, defects in material, workmanship, actual or alleged infringement of any patent, trademark, copyright (or application for any thereof) or of any other tangible or intangible personal property or property right, or any alleged violation of any applicable statute, ordinance, administrative order, rule or regulation, or decree of any court shall be included in the indemnity hereunder. The Bidder further agrees to investigate, handle, respond to, provide defense for and defend any such claims, etc. at its sole expense and agrees to bear all other costs and expenses related thereto, even if it (claims, etc.) is groundless, false or fraudulent. Such indemnification shall not be construed to indemnify the Town of Harrison and Village of Harrison for damage arising out of bodily injury to persons or damage to property caused by or resulting from the sole negligence of the Town of Harrison and Village of Harrison or its employees."

The successful Bidder shall include the premium costs of these policies in the Bid price of the work.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

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The successful bidder will be required to furnish Performance and Labor and Material Payment Surety Bonds satisfactory to the **Town of Harrison and Village of Harrison** for a sum equal to **one hundred (100%) percent** of the amount of the Contract, guaranteeing faithful performance and satisfactory completion of the work and further guaranteeing the payment of all Subcontractors, suppliers, material men, etc., in connection with work all in accordance with the Plans and Specifications and in compliance with the terms of the Contract at the time of the signing of the Contract. The bidder's **Bid Bond or Certified Check of five (5%) percent** will be returned at the time of the Contract signing.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance3

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such

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insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed.

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Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

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§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

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.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

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§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

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§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a

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response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing,

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delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

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REQUISITION FOR PARTIAL PAYMENT - WAIVER OF LIENS

PROJECT	**OWNER**
GENERAL CONTRACTOR	**SUBCONTRACTOR/VENDOR**
CONTRACT	**WORK COMPLETE**
PROJECT:	CONTRACT - $
TRADE:	CHANGE ORDERS - $
CONTRACT - $	TOTAL COMPLETE - $
CHANGE ORDERS - $	RETAINAGE (___%) - $
TOTAL CONTRACT - $	LESS PRE. REQ. - $
	THIS REQUISITION - $

Waiver of Lien

The undersigned, upon receipt of the above requisition payment hereby releases and discharges the Owner of and from any liability or obligation in any way related to or arising out of this project up to and including the date of this document.

The undersigned further covenants and agrees that it shall not in any way claim or file a mechanic's or other lien against the premises of the above designated project, or any part thereof, or against any fund applicable thereto for any of the work, labor, materials heretofore furnished by it in connection with the improvement of said premises.

The undersigned further warrants that, in order to induce the Owner to release this partial payment, they have paid all claims for labor, material, insurance, taxes, equipment, etc., employed in the prosecution of the work above, to date of this requisition.

The undersigned hereby releases and agrees to hold the Owner harmless from any and all claims in connection with the furnishing of such labor and materials, etc., for the construction of the aforementioned project.

The undersigned further guarantees that all portions of the work furnished and/or provided by them are in accordance with the contract and that the terms of the contract with respect to these guarantees will hold for the period specified in said contract.

IN WITNESS WHEREOF, we have executed under seal this release on the date below and to be legally bound hereby:

WITNESS: _____ FIRM: _____

BY:_____ DATE: _____
CORPORATE ACKNOWLEDGEMENT

State of
)SS.
)
County of

On the _____ day of _____, before me came _____ to me known and who by me being duly sworn did depose and say that he resides at _____ _____; that he is the officer of the said corporation executing the foregoing instrument, that he knows the seal of said corporation, that the seal affixed to said instrument is such corporate 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

INDIVIDUAL ACKNOWLEDGEMENT

State of
)SS.
)
County of

On the _____ day of _____, before me came _____ to me known and who by me being duly sworn did depose and say that he resides at _____ _____ that he is the individual who executed the foregoing instrument.

_____
Notary Public

PARTNERSHIP ACKNOWLEDGEMENT

State of
)SS.
)
County of

On the _____ day of _____, before me came _____ to me known and who by me being duly sworn did depose and say that he resides at _____ _____; that he is the partner in the firm of _____ doing business under the name of _____ and that he executed the foregoing instrument on behalf of said partnership.

_____
Notary Public

SECTION 007002 - INSURANCE RIDER

(Supplement to Article 11 of Section 007000, AIA A201-2017 General Conditions For Insurance Requirements. for this Project)

Name of Insurance Producer:	
Name of Insured:	

The Contractor shall purchase and maintain during the life of the contract insurance as listed herein. This insurance must be purchased from a New York State licensed, A.M. Best Rated "A" or "A+" carrier. The Owner, the Architect, their Consultants and Subconsultants shall, with the exception of Worker's Compensation and Employer's Liability Insurance, be named as additional named insureds on a primary and non-contributory basis. Contractor must submit additional insured endorsements to the Owner for approval.

At least ten (10) working days prior to the commencement of the Work, the Contractor and all Subcontractors shall submit to the Owner, through the Architect, a Certificate of Insurance (AIA Form G705) or Accord 25-s showing evidence of insurance coverage as required by these documents. The standard Accord Form of Certificate of Insurance or insurance carrier certificate will be acceptable for employer's liability and statutory Disability. Submit all Workers' Compensation Certificates on form C-105.2, or if funded though the New York State Insurance Fund, on form U-26.3.

All Certificates of Insurance must be signed by a licensed agent or authorized representative of the insurance carrier.

The certificate shall be issued to the Owner with a provision that in the event the policies are either canceled or diminished, at least 15 days prior notice thereof shall be given to the Owner.

The insurance required for this project shall be written for not less than limits of liability specified in this attachment or otherwise within the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from date of commencement of the Work until date of final payment and termination of any coverage required to be maintained after final payment.

.1 General Liability:
(Occurrence Form) – Limits Per Project using ISO Form CG 00 01 07 98 or later date

$2,000,000	General Aggregate
$1,000,000	Products/Completed Operations
$ 500,000	Personal and Adv. Injury
$ 500,000	Occurrence
$ 50,000	Fire Damage
$ 5,000	Medical Expense

Coverage to include Broad Form Property Damage, Contractual Liability, Independent Contractors, and Personal Injury. No exclusion for XCU or hazards shall be endorsed to the Policy.

Products and Completed Operations Coverage to be kept in force for 12 months after final payment; a renewal certificate is to be submitted for the project if the coverage renews in less than 12 months following the completion of the project.

Coordinate requirements for additional insurance covering contractual obligations assumed by Contractor as established in Articles 3.18 and 10.3 of these Conditions by using Endorsement ISO Form B, CG2010 11/85 or CG 20 10 10/01 plus CG 20 37 10/01 or equivalent. This endorsement must also reflect that the coverage provided is Primary and Non-Contributory. Waiver of Subrogation applies to all policies for all additional insureds.

.2 Auto Liability to cover ALL autos; or Owned, Hired, Leased and Non-Owned Autos.

$1,000,000	Combined Single Limit or
$ 500,000	Bodily injury (per person)
$ 500,000	Bodily injury (per accident)
$ 500,000	Property Damage
$ 5,000	Medical Payments

.3 Excess Liability: Insurance is to cover all stated insurance coverages listed within this Attachment

$2,000,000	Each Occurrence
$2,000,000	Aggregate
$ 10,000	Retention (Maximum)

.4 Workers' Compensation and Disability Benefits: As required by law.

.5 Hazardous Material Coverage

Hazardous material liability insurance as follows:	$1,000,000 occurrence/$2,000,000 aggregate, including products and completed operations.
Such insurance shall include coverage for the Contractor's operations including, but not limited to, removal, replacement enclosure, encapsulation and/or disposal of asbestos, or any other hazardous material, along with any related pollution events, including coverage for third-party liability claims for bodily injury, property damage and clean-up costs. If a retroactive date is used, it shall pre-date the inception of the Contract.	
If motor vehicles are used for transporting hazardous materials, the Contractor shall provide pollution liability broadened coverage (ISO endorsement CA 9948) as well as proof of M CS 90.	
Coverage shall fulfill all requirements of the Contract and General Conditions and shall extend for a period of three (3) years following acceptance by the Owner of the Certificate of Completion.	

Further, Contractor shall require all Subcontractors to carry similar insurance coverages and limits of liability as set forth above and adjusted to the nature of Subcontractors' operations and submit same to Owner for approval prior to start of any Work.

Further, it is not the intention of these insurance requirements to require each Subcontractor, vendor or material man involved in the work to provide “excess” coverage in the amounts stated herein but the “excess” limit shall be at least 2 times the contract sum entered into between the individual Contractor and the particular Subcontractor, vendor or material man but not less than $1,000,000.00, each occurrence, $3,000,000 aggregate and $10,000 retention (Maximum).

In the event Contractor fails to obtain the required certificates of insurance from the Subcontractor and a claim is made or suffered, the Contractor shall indemnify, defend and hold harmless Owner, Architect, Engineers, Consultants and Subconsultants and their agents or employees from any and all claims for which the required insurance would have provided coverage. This indemnity obligation is in addition to any other indemnity obligation provided in the Contract.

The following shall be included as Additional Insureds

- The Town of Harrison and the Village of Harrison
- KG+D Architects and ALL consultants listed on the cover of the PROJECT/SPECIFICATIONS MANUAL

Proof of Insurance shall show the following Insureds and Holder:		
(a)	Certificate Holder:	
(b)	Additional Named Insureds, on a primary basis:	
	Owner	
	Architect	
	Construction Manager	
	Consultants:	

END OF SECTION 007002

SECTION 011000 - DESCRIPTION OF WORK

1.1 GENERAL PROJECT DESCRIPTION

A. The scope of work of this project generally consists of the phase one construction of a New Recreation & Community Center, 270 Harrison Avenue, Harrison, NY 10528 NY all as depicted on the accompanying Contract Drawings and the Technical Specifications. The work included in phase one generally consists of excavation, backfill, concrete footings and walls, gravel sub-base within the building footprint, site retaining walls, installation of a ground source heat pump well field, installation of sub-surface storm drainage system, connection of utilities and placement of piping and conduits all as shown on the drawings.

B. Bids shall be received in accordance with the New York State Public Bidding Laws, this project will be executed under one SINGLE PRIME CONTRACT as noted below:

Contract #1	General Construction – PHASE ONE

One set of Documents is issued covering all of the work of this contract.

C. Definitions as apply to "Contractors" involved with the work of this Project.
   1. "The Contractor" or "Contractor" meaning that one single prime contractor is responsible for all of the work of this contract.

D. Existing conditions are shown on the drawings to the best knowledge of the Architect. The Architect, however, cannot guarantee the correctness of the existing conditions shown and assumes no responsibility, therefore. It shall be the responsibility of the Contractor to visit the site and verify all existing conditions.

E. ADDITIONAL SECURITY PROVISIONS, COORDINATE WITH ARTICLE 3 OF SECTION 007000 AND SECTION 011501
   1. Each Contractor and each Subcontractor shall require his employees, while on the job site, to wear, in a conspicuous location, a Photo I.D. badge bearing the name of the individual and the Contractor for whom working. The badges of each Contractor shall be numbered consecutively. An up-to-date list of all I.D. badges, indicating the name and number along with a copy of the photograph for each employee, shall be furnished to the Owner.

F. Regarding special inspections, the registered design professional in responsible charge shall be the Architect. The Owner shall hire the special inspectors and shall be responsible for the cost of special inspections, but the contractor is responsible for the cost of any re-inspections or retesting. The inspections required are outlined on the Statement of Special Inspection and Tests Form furnished upon award. The Architect shall be responsible for determining the qualifications of the special inspectors, receiving and retaining all reports and assuring that any discrepancies are corrected.

Special inspectors must keep records of inspections and furnish inspection reports to the Architect of record. The reports must indicate that the work inspected was done in conformance with the approved construction documents. Discrepancies must be brought to the attention of the contractor and non-corrected discrepancies must be brought to the attention of the Architect of record. A final report of

inspections documenting required special inspections and correction of any discrepancies noted must be submitted to the registered design professional in responsible charge at the completion of the project. The design professional shall forward a copy of the final report to the Owner for their records.

1.2 REQUIREMENTS INCLUDED IN THIS SECTION

A. Construction time and phasing requirements.
B. Proof of orders and delivery dates.
C. Intent of Documents
D. Field Measurements
E. Initial Submittal Requirements
F. Quality Requirements
G. Testing and Inspection
H. Manufacturers Field Services and Reports
I. Coordination.
J. Field Engineering.
K. Design Responsibility
L. Schedules
M. Additional Requirements
N. Waste Management
O. Use of Premises
P. Owner Occupancy
Q. Payrolls And Payroll Records - Coordinate with Section 017700

1.3 CONSTRUCTION TIME AND PHASING REQUIREMENTS

A. The Contractor is advised the "time is of the essence" of the Contract as defined in Article 8 of the "Conditions". It is understood that the work is to be carried through to completion with the utmost speed consistent with good workmanship. Further, safe and legal ingress and egress shall be maintained at all times to and through the occupied portions of the construction site.
B. All work and storage areas shall be completely enclosed by a fence or barricade at all times so that the public cannot approach the area or the equipment. The Contractor shall maintain fences and barricades at all times and shall -
    - Provide signs posted on fence 50 feet on center that read "Work Area - Keep Out".

Where the barricade is removed for work, the Contractor performing such work shall provide adequate safety personnel to prevent unauthorized persons from approaching the work area.

1. Site development work shall proceed in such a manner to cause the least amount of disruption to the ongoing operations as possible. Coordinate work with facility operating personnel.

1.4 PROOF OF ORDERS AND DELIVERY DATES - Coordinate w/Section 013300 and 013200.

A. Within 2 weeks after the approval of shop drawings, samples, product data and the like, the Contractor shall provide copies of purchase orders for all equipment and materials which are not available in local stock. The Contractor shall submit written statements from suppliers confirming the orders and stating promised delivery dates.
B. This information shall be incorporated within the progress schedules so required

as part of Sections 013300 and 013200 and shall be monitored so as to insure compliance with promised dates.

1.5 INTENT OF DOCUMENTS - See Article 1, Subparagraph 1.2.1 of Section 00700 for resolution of conflicts between drawings and specifications.

Regardless of hierarchy listed in reference paragraph, in cases of conflict as to the type or quality of materials to be supplied, the contractor is to confirm the scope prior to submitting their bid through the RFI and addenda process. If a conflict exists after the contract is executed, the contractor is to follow the direction of the Architect and is obligated to provide the labor and materials as directed by the Architect.

1.6 FIELD MEASUREMENTS

A. The Contractor shall take all necessary field measurements prior to fabrication and installation of work and shall assume complete responsibility for accuracy of same.
B. This project is for Site Preparation and Construction and therefore necessitates additional attention to existing conditions receiving newly fabricated and installed equipment, i.e. note the requirements for field dimensioning of shop fabricated items whether or not so required by each technical section.

1.7 INITIAL SUBMITTAL REQUIREMENTS

A. As outlined in Sections 005000, 007000, 013300, 013200, 015000 and 015719 Contractor shall provide items noted including - bonds, insurance, emergency telephone numbers, progress scheduling, schedules of submittals, subcontractor listings, and the like prior to the start of any work.
B. Schedule of Values
    1. Submit schedule on AIA Form G703.
    2. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement or as established in Notice to Proceed, whichever is earliest.

1.09 QUALITY REQUIREMENTS

A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
B. Comply with manufacturer’s instructions.
C. Comply with specified standards as minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
D. Monitor fabrication and installation tolerance control of installed Products over suppliers, manufacturers, Products, site conditions, and workmanship, to produce acceptable Work. Do not permit tolerances to accumulate.
E. Comply fully with manufacturer’s tolerances.

1.10 TESTING AND INSPECTION LABORATORY SERVICES – Coordinate with Section 014326

A. Owner will appoint, employ, and pay for specified services of independent firm to perform testing and inspection.
B. An independent firm will perform tests, inspections, and other services as required.
C. Cooperate with independent firm; furnish samples as requested.

D. Re-testing required because of non-conformance to specified requirements will be charged to Contractor.

1.11 MANUFACTURER'S FIELD SERVICES AND REPORTS

A. When specified in individual specification sections, require material or Product suppliers or manufacturers to furnish qualified staff personnel to observe site conditions and to initiate instructions when necessary.

B. Report observations and site decisions or instructions that are supplemental or contrary to manufacturer's written instructions.

1.12 COORDINATION

A. Coordinate scheduling, submittals, and Work of various sections of specifications to ensure efficient and orderly sequence of installation of interdependent construction elements.

B. Verify utility requirement characteristics of operating equipment are compatible with building utilities.

C. Coordinate space requirements and installation of mechanical and electrical work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable.

D. In finished areas, conceal pipes, ducts, and wiring within construction.

1.13 FIELD ENGINEERING – Coordinate with Section 017123 of Division #1.

A. Contractor shall establish elevations, lines, and levels and certify elevations and locations of the Work to conform with Contract Documents.

1.14 DESIGN RESPONSIBILITY

A. In accordance with Article 3.2.10 of the General Conditions, attention is directed to the following areas (if any) in which professional certification and/or design requirements are outlined within the technical specifications.

1. Modular Block Retaining Wall – 323215

However, if included, is to be considered as partial only with the burden placed on the Contractor to provide all certifications and/or design information as may be specified and/or required by these Contract Documents in accordance with the applicable laws of the jurisdiction.

1.15 SCHEDULES

A. General

1. The objective of this project is to complete the overall work in the shortest period of time.
2. To meet these objectives, the Contractor shall plan the work, obtain materials, and execute the construction in the most expeditious manner possible in accordance with the requirements listed below.
3. If the Contractor fails to expedite and pursue any part of the work, the Owner may terminate the contract as per Article 14.2 or may carry out the work as per Article 2.4 of the General Conditions.

B. Work Period and Milestones (per Addendum 2)

Award of Contract	On or about September 15, 2023
Substantial Competition	March 15, 2024
Final Completion	April 12, 2024

1.16 ADDITIONAL REQUIREMENTS

A. For all work the Contractor must verify allowable working hours by town ordinance.

B. Project site access is to be from Calvert and Harrison Avenue. No deliveries, parking, staging areas or site access is permitted from Orchard Street on the north of the site.

C. If the Contractor fails to staff the job adequately to meet the completion date, the Owner reserves the right to assume possession of the material and complete installation with the Owner's forces or other Contractors or to require the Contractor to work evenings and weekends.

D. The Contractor is responsible for temporary protection of all work until acceptance.

E. Attention is directed to Sections 06 20 00, 09 51 00 and 09 90 00 for temperature and humidity restrictions prior to start of work and maintenance of work conditions.

F. The Contractor shall be responsible for scheduling and coordinating the work under this Contract with the Town and Village Engineer and with the Contractors performing other work for the Town of Harrison and Village of Harrison.

1.17 WASTE MANAGEMENT PROCEDURES AND DEFINITIONS

A. Waste Management Coordination: Coordinate recycling of materials with Owner and as required to conform to the Construction Waste Management Plan defined in Section 017419.

B. Contractor shall conduct Construction Waste Management meetings as outlined in Section 013119 - Project Meetings. At a minimum, waste management goals and issues shall be discussed at the following meetings:
   1. Pre-bid meeting.
   2. Pre-construction meeting.
   3. Regular job-site meetings.
   4. Job safety meetings.

C. Use on-site waste as primers, sealers, underlayments, supports, backing, blocking, furring, suspension systems, and accessories as required for any purpose in patching work damaged as a result of construction activities.

D. Waste Management Definitions
   1. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
   2. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
   3. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitability, corrosivity, toxicity or reactivity.
   4. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitability, corrosivity, toxicity, or reactivity.
   5. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
   6. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

7. Recycle: To remove a waste material from the Project site to another site for remanufacture into a new product for reuse by others.
8. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
9. Return: To give back reusable items or unused products to vendors for credit.
10. Reuse: To reuse construction waste material in some manner on the Project site.
11. Salvage: To remove waste material from the Project site to another site for resale or reuse by others.
12. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
13. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
14. Toxic: Poisonous to humans either immediately or after a long period of exposure.
15. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
16. Volatile Organic Compounds (VOCs): Chemical compounds common in and emitted by many building products over time through outgassing including - solvents in paints and other coatings; wood preservatives; strippers and household cleaners; adhesives in particleboard, fiberboard, and some plywood; and foam insulation.
17. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.
18. Waste Management Plan: A Project-related plan for the collection, transportation, and disposal of the waste generated at the construction site. The purpose of the plan is to ultimately reduce the amount of material being landfilled.

1.18 USE OF PREMISES

A. Use of Buildings and Sites:

1. Limits: Confine constructions operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated. All areas of the site with the exception of the project area where the Work is being performed are off limits to Contractor and his employees.
2. Owner Occupancy: Allow for Owner occupancy of adjacent buildings and sites and use by the public. Conduct the Work to provide the least possible interference to the activities of the Owner’s personnel and use of the adjacent buildings and sites by the public.
3. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, the public and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
   a. Schedule deliveries to minimize use of driveways and entrances.

b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
c. No parking, staging or project deliveries are allowed from Orchard Street.
d. Coordinate staging, parking and storage areas with the Owner's Representative.

4. Damages: Promptly repair damage caused to adjacent facilities by work of the Contract to a good-as-new condition acceptable to the Owner.
5. Existing Adjacent Facilities: The following facilities are specifically noted as **not** to be used by Contractor or his employees:
   a. Toilet facilities.
   b. Telephones.
6. Utility Shutdowns: Coordinate all utility shutdowns and cross overs with the Owner's Representative, schedule during off hours and non-occupied times only.

1.19 OWNER OCCUPANCY REQUIREMENTS

A. Owner will occupy adjacent sites and existing buildings during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations.

B. Architects will prepare a Certificate of Substantial Completion for each specific portion of the Work once it is suitable for turnover to the phase two construction team. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests, as-built surveys and inspections shall be successfully completed. On occupancy, Owner will provide, operate, and maintain mechanical and electrical systems serving occupied portions of building. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building and site.

C. Comply with standards for construction projects as follows:
   1. Interaction with employees and the public is strictly forbidden.
   2. Use of offensive or inappropriate language is strictly forbidden.
   3. The use of radios, tapes and CD players is prohibited on the site and in the buildings.
   4. Smoking is prohibited on the site and in the buildings.

1.20 PAYROLLS AND PAYROLL RECORDS – See Section 012900 and 012901

A. In accordance with Article 8, Section 220 of the New York State Labor Law and applicable Article in the General Conditions, every contractor and subcontractor must keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. Payrolls must be maintained for at least three years from the project's date of completion. At a minimum, payrolls must show the following information for each person employed on a public work project:
   1. Name
   2. Classification(s) in which the worker was employed
   3. Hourly wage rate(s) paid
   4. Supplements paid or provided
   5. Daily and weekly number of hours worked in each classification.

B. Every contractor and subcontractor shall submit, within thirty (30) days after issuance of its first payroll and every thirty (30) days thereafter, a transcript of the original payrolls, subscribed and affirmed as true under penalty of perjury.

END OF SECTION 011000

SECTION 011500 – SPECIAL CONDITIONS

1. Work for this contract is expected to commence at Award of Contract, August 18, 2023 and Substantial Completion by February 9, 2024

2. Union Avenue, North Street, and Pleasant Ridge Road are highly traveled roadways. The Contractor shall be responsible to post and coordinate the interruption of traffic on these roadways.

3. The use of Recycled Asphalt Product (RAP) shall NOT be permitted.

4. **The Contractor shall not commence any work under the Contract prior to a pre-construction meeting**. The Contractor will be required to meet with The Town and Village of Harrison's representatives, including the Town and Village Engineer, Commissioner of Public Works, the Traffic Control Officer for the Police Department, and other concerned governmental and utility company representatives. At this pre-construction meeting, all special requirements of the work, the scheduling of the work and details for the proper maintenance, and protection of traffic during the work will be fully explained and discussed.

5. Traffic Control. The Contractor shall be responsible for the daily maintenance and protection of traffic through the project site, for the duration of the job. The Contractor shall submit a proposed schedule for maintaining, protecting, and regulating traffic, showing chronologically and in detail the sequence and methods to be followed for approval by the Town and Village of Harrison. Police traffic control will be required on the main streets.

6. Acceptance of materials provided shall be visual and, if required, testing will be done in accordance with New York State Department of Transportation Standard Specifications.

7. Upon milling all exposed structures (manhole rims, catch basin grates, and water and gas valve boxes) shall be protected and made highly visible to traffic. Transition ramps shall be installed to provide for safe passage of vehicular traffic.

END OF SECTION 011500

SECTION 012500 - PRODUCT OPTIONS AND SUBSTITUTIONS

1.1 GENERAL

A. Requirements set forth herein are in addition to and shall be considered as complementary to the Conditions of the Contract and the balance of Division #1 and Technical Specifications.

B. All Contractors, Subcontractors, Sub-subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.

1.2 REQUIREMENTS INCLUDED IN THIS SECTION

A. Approved Equal Clause
B. Substitution Requests
C. Options
D. Contractor's Representation
E. Reimbursements

1.3 APPROVED EQUAL CLAUSE

A. Throughout the Specifications, types of material may be specified by manufacturer's name and catalog number in order to establish standards of quality and performance and not for the purpose of limiting competition.

Inclusion by name, of more than one manufacturer or fabricator, does NOT necessarily imply acceptability of standard products of those named. All manufacturers, named or proposed, shall conform, with modification as necessary, to criteria established by Contract Documents for performance, efficiency, materials and special accessories.

B. Contractor may assume the phrase "or approved equal" except that the burden is upon the Contractor to prove such equality and to satisfy Architect that proposed substitute is equal to, or superior to, the item specified.

1.4 SUBSTITUTION REQUESTS

A. If the Contractor elects to prove such equality, he must request the Architect's and the Owner's approval in writing for substitution of such items for the specified items, stating the differences involved with and submitting supporting data and samples, if required, to permit a fair evaluation of the proposed substitution with respect to -

1. Performance;
2. Delivery times and effect on schedules, if any;
3. Safety;
4. Function;
5. Appearance;
6. Quality and durability;
7. Any required license fees or royalties;
8. Warranty terms and conditions;

The contractor shall submit a separate request for each product, supported with complete data, with drawings and samples as are appropriate to substantiate the above.

B. The Architect, as set forth in the Post Bid Requirements in Section 002100, will review requests for substitutions with reasonable promptness, and notify the Contractor, in writing, of the decision to accept or reject the requested substitution.

1.5 OPTIONS

A. Where Technical Specifications permit Contractor to select optional materials, items, systems, or equipment, the selection of such options is subject to the following conditions:

1. Once an option has been selected and approved, it shall be used for the entire contract.
2. The Contractor shall coordinate his selection with the drawings and specifications and make all necessary adjustments without additional cost to the Owner.

1.6 CONTRACTOR'S REPRESENTATION

A. A request for a substitution constitutes a representation that the Contractor:

1. Has investigated the proposed product and determined that it is equal to or superior in all respects to that specified;
2. Will provide the same warranties or bonds for the substitution as for the product specified;
3. Will coordinate the installation of an accepted substitution in the work, and make such other changes in the work as may be required for installation to make the work complete in all respects;
4. Will waive all claims for additional costs, under its responsibility, which may subsequently become apparent.
5. **Will have coordinated installation with all affected trade contractors, specialty contractors and the like and will be responsible for any and all costs which may arise as a result of this substitution.**

1.7 REIMBURSEMENTS

A. As outlined in Section 013300, when resubmittals of materials, equipment and accessories to be incorporated in the project are necessary due to failure of Contractors to properly coordinate submittals, the submitting Contractor shall compensate the Design Professionals for required re-reviews of said submittals in accordance with the following fee schedule:

Principal's Time ---------- $ 225.00 per hour
Associate Principal ---------- $ 170.00 per hour
Associates/Project Architects ---------- $150.00 per hour

Senior Engineer's Time ---------- $ 270.00 per hour
Senior Project Manager ---------- $190.00 per hour
Project Manager ---------- $170.00 per hour
Senior Project Engineer---------- $145.00 per hour
Project Engineer ---------- $125.00 per hour
CAD Engineer/Engineer/Feld Engineer ------- $110.00 per hour

The charges incurred will be deducted from the ensuing requisition at the direction of the Owner.

END OF SECTION 012500

SUBSTITUTION REQUEST FORM

To:	Project:

Section	Page	Paragraph	Specified Item

THE UNDERSIGNED REQUESTS CONSIDERATION OF THE FOLLOWING SUBSTITUTION:

Attached data shall include, in a tabular format to provide a line by line comparison - product description, specifications, drawings, photographs, performance and laboratory tests and the like with applicable portions of said data clearly identified.

FURTHER, the Proposed Substitution WILL (OR WILL NOT) Affect:

Dimensions indicated on the drawings?_____
Wiring, piping, ductwork, or other building services indicated on the drawings?_____
Other trades and abutting or interconnection work? _____
Manufacturer's guarantees and warranties? _____
The construction schedule? _____
Maintenance and service parts locally available? _____

(NOTE - If Substitution WILL affect any item above, explain in detail.)

In addition to the above, the undersigned agrees to pay for -

1. Any and all changes to the building design, including structural, civil or electro/mechanical systems engineering (if any), detailing; and
2. Any and all additional construction costs caused by the requested substitution.

The undersigned further states that the function, appearance and quality of the Proposed Substitution are equivalent or superior to the Specified Item.

SUBMITTED:	DESIGN PROFESSIONAL'S COMMENTS	
By:	Accepted	Accepted as Noted
Firm: _	Not Accepted	Received Too Late
Address:		
		By:
Date:		Date:
Telephone/Fax:		Remarks:
Approved For Subcontractor Submittal:		
By:	Contractor:	Date:

SECTION 012900 - APPLICATIONS FOR PAYMENT

1.1 GENERAL

A. Requirements set forth herein are in addition to and shall be considered as complementary to the Conditions of the Contract and the balance of Division #1 and Technical Specifications.

B. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment, and supplements provisions of Article 9, Payments and Completion, of the General Conditions of the Contract.

1.2 REQUIREMENTS INCLUDED IN THIS SECTION

A. Schedule of Values

B. Applications for Payment

1.3 SCHEDULE OF VALUES – Article 9.2, General Conditions and Supplements thereto.

A. Coordination: Each prime Contractor shall coordinate preparation of its Schedule of Values for its part of the Work with preparation of the Contractors' Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
    a. Contractor's Construction Schedule.
    b. Application for Payment forms, including Continuation Sheets.
    c. List of subcontractors.
    d. Schedule of alternates.
    e. Schedule of allowances
    f. List of products.
    g. List of principal suppliers and fabricators.
    h. Schedule of submittals.
2. Submit the Schedule of Values to the Architect at the earliest possible date but no later than seven (7) days before the date scheduled for submittal of the initial Applications for Payment.
3. Sub schedules: Where Work is separated into phases requiring separately phased payments, provide sub schedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values. Provide at least one line item for each Specification Section. For major trades with total line items exceeding $25,000, provide a separate, back-up breakdown of each such trade with line items for identifiable units of work within such trade each of which has a value not exceeding $25,000. Provide a computed unit price for each line total.

1. Identification: Include the following Project identification on the Schedule of Values:
    a. Project name and location.
    b. Name of the Architect
    c. Project number.
    d. Contractor's name and address.
    e. Date of submittal.
2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

a. Related Specification Section or Division.
b. Description of Work.
c. Name of subcontractor.
d. Name of manufacturer or fabricator.
e. Name of supplier.
f. Change Orders (numbers) that affect value.
g. Dollar value.
h. Percentage of Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
i. Phase Area (as applicable).

NOTE: Margins of Cost: Show line items for indirect costs and margins on actual costs only when such items are listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete. Include the total cost and proportionate share of general overhead and profit margin for each item.

3. Provide a breakdown of the Contract Sum by Phase Area in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Break principal subcontract amounts down into several line items.
4. Round amounts to nearest whole dollar; the total shall equal the Contract Sum.
5. Provide a separate line item in the Schedule of Values for each part of the Work where Application for Payment may include materials or equipment, purchased or fabricated and stored, but not installed. Differentiate between items stored on-site and items stored off-site. Include requirements for insurance and bonded warehousing, if required.
6. Provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Unit Price Work: Show the line-item value of unit-cost allowances, as a product of the unit multiplied by the measured quantity. Estimate quantities from the best indication in the Contract Documents.
8. Temporary facilities, clean-up and other major cost items and correction of existing conditions are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at the Contractor's option.
9. Project Closeout Expenses including any and all expenses involving project documentation, warranty assembly, inspection costs and fees and the like
10. Schedule Updating: Update and resubmit the Schedule of Values prior to the next Application for Payment when Change Orders result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT - See Article 9.3 of the General Conditions and Supplements thereto.

A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and paid for by the Owner. The initial

Application for Payment, the Application for Payment at time of Substantial Completion and the final Application for Payment involve additional requirements.

B. Payment-Application Times: Each progress-payment date is indicated in the Agreement. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement or in absence thereof the previous month.

C. Payment-Application Forms: Use AIA Document G732-2009 and Continuation Sheets G703 as the form of Applications for Payment.

D. Application Preparation: Complete every entry on the form. Include notarization and execution of person authorized to sign legal documents on behalf of the Contractor. The Architect will reject, and return, incomplete applications without action.
   1. Entries shall match data on the approved Schedule of Values and the Contractor's Construction Schedule. Update schedules if revisions were made.
   2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.
   3. Provide copies of payrolls which are signed and notarized documenting compliance with prevailing wage laws as applicable to particular project.

E. Transmittal: Submit one (1) signed and notarized original of each Application for Payment to the Architect by a method ensuring receipt within 24 hours. One copy shall be complete, including waivers of lien and similar attachments, when required. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application, in a manner acceptable to the Architect.

F. Waivers of Mechanics Lien: With each Application for Payment, submit waivers of mechanics liens from subcontractors, sub subcontractors and suppliers for the construction period covered by the previous application.
   1. Submit partial waivers on each item for the amount requested.
   2. When an application shows completion of an item, submit final or full waivers.
   3. The Owner reserves the right to designate which entities involved in the Work must submit waivers.

      Submit final Applications for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.

   4. Waiver Forms: Submit waivers of lien on forms, and executed in a manner, acceptable to the Owner and/or as included as attachment to Section 007000.

G. Initial Application for Payment: Administrative actions and submittals, that must precede or coincide with submittal of the first Application for Payment, shall include the following prerequisites to processing:
   1. List of subcontractors, approved.
   2. List of principal suppliers and fabricators, approved.
   3. Schedule of Values, approved.
   4. Contractor's Construction Schedule, approved.
   5. Schedule of principal products.
   6. Schedule of unit prices, approved.

7. Submittal Schedule, approved.
8. List of Contractor's staff assignments.
9. List of Contractor's principal consultants.
10. Copies of building permits as applicable to project requirements.
11. Copies of authorizations and licenses from governing authorities for performance of the Work.
12. Initial progress report.
13. Report of pre-construction meeting.
14. Certificates of insurance and insurance policies.
15. Performance and payment bonds.
16. Data needed to acquire the Owner's insurance.
17. Initial settlement survey and damage report, if required by particular project.
18. Safety plan

H. Monthly Application for Payment Administrative actions and submittals, that must precede or coincide with submittal of the periodic Application for Payment, shall include the following:
1. As-built Record documents, required documents and submittal records on site.
2. Contractor's construction schedule, updated, with corrective action plan as applicable.
3. Material Status Report.
4. Stored Materials forms.
5. Submittal Schedule and submittal status reports.
6. RFI submittal and status log.
7. Monthly Progress report, and Notarized Progress Report Statement from each Contractor's manager/superintendent stating that the work is on schedule, and that Contractor will meet the Substantial Completion date for the Work, and the Substantial Completion dates for every portion established under Construction Phasing Schedule Section.

I. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment.
1. This application shall reflect Certificates of Partial Substantial Completion issued previous to Owner occupancy of designated portions of the Work.
2. Administrative actions and submittals that shall precede or coincide with this application include:
   a. Occupancy permits and similar approvals.
   b. Warranties (guarantees) and maintenance agreements.
   c. Test/adjust/balance records.
   d. Maintenance instructions.
   e. Meter readings.
   f. Startup performance reports.
   g. Changeover information related to Owner's occupancy, use, operation, and maintenance
   h. Final cleaning.
   i. Application for reduction of retainage and consent of surety.
   j. Advice on shifting insurance coverages.
   k. Final progress photographs.
   l. List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion.

J. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include the following:
   1. Completion of Project closeout requirements.
   2. Completion of items specified for completion after Substantial Completion.
   3. Ensure that unsettled claims will be settled.
   4. Ensure that incomplete Work is not accepted and will be completed without undue delay.
   5. Transmittal of required Project construction records to the Owner.
   6. Certified property survey as and/if required by project documents.
   7. Proof that taxes, fees, and similar obligations were paid.
   8. Removal of temporary facilities and services.
   9. Removal of surplus materials, rubbish, and similar elements.
   10. Change of door locks to Owner's access.
   11. Consent of Surety to final payment.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 012900

PAYROLL CERTIFICATION

_____ am an officer with the title of _____

in the firm of _____ and am authorized by that firm to sign and swear, under penalty of perjury, to the validity and accuracy of the statements below.

(1) I pay or supervise the payment of laborers, workers and mechanics employed by _____ _____ on the _____ project. During the payroll period commencing on the _____ day of _____ 20___ and ending the _____ day of _____ 20_____ all laborers, workers and mechanics employed on said project were paid the wages and supplements recorded as earned on the attached payroll records. No deductions have been made either directly or indirectly from the wages and supplements other than deductions shown on the payroll records.

(2) The payroll records submitted for the above project and attached hereto are correct and complete, and the wage rates for laborers, workers, and mechanics contained therein are not less than the applicable wage rates stated in the Contract and as designated by the State Labor Department. The number of hours shown for each employee reflects the actual hours worked by that employee. The classification shown for each employee is accurate and conforms with the work he or she performed.

(3) Supplements required in the Contract that are in addition to the basic hourly wages have been or will be paid to the appropriate plans, funds or programs.

(4) Such statement so to be filed shall be verified by the oath of the Contractor that he or she has read such statement subscribed by him or her and knows the content thereof, and that the same is true of his or her own knowledge except with respect to wages and supplements owing by subcontractors which may be certified upon information and belief.

(5) All employees of this firm have submitted completed Form I-9, Employment Eligibility Verification Form which has been reviewed and signed by authorized representatives of the firm and are kept in the employees' file. Also, any and all subcontractors have certified to us that all of their employees have submitted completed Form I-9 Employment Eligibility Verification Form, which have been reviewed and signed by authorized representatives of the firm and are kept in the employees' file.

By: _____

Title: _____

Date: _____

Firm Name _____

Firm Address _____

Prime

Subcontractor

NOTARY

SECTION 013113 - PROJECT COORDINATION

1.1 GENERAL

A. Requirements set forth herein are in addition to and shall be considered as complementary to the Conditions of the Contract and the balance of Division #1 and Technical Specifications.

B. All Contractors, Subcontractors, Sub-subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.

C. Definitions as apply to "Contractors" involved with the work of this Project shall be as set forth in Section 011000, Article 1.01.

1.2 REQUIREMENTS INCLUDED IN THIS SECTION

A. Coordination of Work

B. Trade Contractor Obligations

1.3 COORDINATION OF WORK

A. As required by the General Conditions, and restated herein, each Trade and/or Specialty Contractor or Subcontractor shall compare the architectural, structural, civil/site, mechanical and electrical Drawings and Specifications with those for all other trades and shall report any discrepancies between them to the Architect, thru the General Contractor, and obtain from him written instructions for changes necessary to the work. All work shall be installed in cooperation with other trades installing interrelated work. Before installation, each Trade Contractor shall make proper provisions to avoid interference in a manner approved by the Architect. All changes required in the work caused by neglect to so advise the Architect shall be made by the offending Contractor at his own expense.

B. Each Trade Contractor shall be responsible for exact location of anchor bolts, sleeves, inserts, supports, chases, conduits and openings that may be required for the work.

Attention is directed to Section 01 31 14. Each Trade Contractor shall prepare layout drawings for incorporation of items to be built-in the work, pass through the work and the like in sufficient time so as not to cause any undue delay in the execution of the work.

Built-in items shall be furnished under the same Section of the Specifications as the respective items to be supported, and they shall be installed, except as otherwise specified, by the trade furnishing and installing the material in which they are to be located. The trade responsible for the installation of anchor bolts shall also insure that they are properly installed. Chases, conduits and openings shall be laid out in advance to permit provision in work. Sleeves and inserts shall not be used in any portion of the building, where their use would impair strength or construction features of the building. Sleeves, conduits and inserts shall be set in forms before concrete is poured. Extra work required where anchor bolts, supports, sleeves, chase openings, conduits or inserts have been omitted or improperly placed shall be performed at expense of trade which made error or omission.

C. Slots, chases, openings and recesses through floors, walls, ceilings and roofs as specified will be provided for the various trades in their respective materials under

general construction work, but the trade requiring them shall see that they are properly located and shall do any cutting and patching caused by the neglect to do so.

D. Locations of pipes, ducts, electrical raceways, switches, panels, equipment, fixtures, etc. shall be adjusted to accommodate the work to interferences anticipated and encountered. Each Trade Contractor shall determine, and submit for approval, the exact route and location of each pipe, duct and electrical raceway prior to fabrication.

Approval by the Architect is required prior to any such modifications.

E. Lines which pitch shall have the right of way over those which do not pitch.

For example, plumbing and condensate piping drains shall normally have right of way.

Lines whose elevations cannot be changed shall have the right of way over lines whose elevations can be changed.

F. Offsets, transitions and changes in direction in pipes, ducts and electrical raceways shall be made as required to maintain proper headroom and pitch of sloping lines whether or not indicated on the Drawings. Each Trade Contractor shall provide air vents, sanitary vents, pull boxes, etc.; as required to effect these offsets, transitions and changes in direction.

G. Each Trade Contractor shall install all mechanical and electrical work to permit removal (without damage to other parts) of coils, heat exchanger bundles, fan shafts and wheel, draw-out circuit breakers, filters, belt guards, sheaves and drives and all other parts requiring periodic replacement or maintenance. Each Trade Contractor shall arrange pipes, ducts, raceways, traps, starters, motors, control components, and the like, to clear the openings of swinging and overhead doors and of access panels.

H. In all locations where subjected to public access, or in any occupied spaces, any and all piping systems servicing mechanical delivery systems which run on the face of construction shall be encased in a permanent encasement such as steel studs and drywall; steel framing, lathing and plaster; or other suitable and approved materials.

I. AS REQUIRED BY COORDINATED SCHEDULING, The General Contractor shall provide temporary weathertight and protected openings in structure to facilitate placement of equipment.

1.4 TRADE CONTRACTOR OBLIGATIONS

A. The Trade Contractors are required to supply all necessary supervision and coordination information to any other trades who are supplying work to accommodate the electrical and mechanical installations.

B. Where a trade is required to install items which it does not purchase, it shall include for such items:

1. The coordination of their delivery.
2. Their unloading from delivery trucks driven in to any designated point on the property line at grade level.
3. Their safe handling and field storage up to the time of permanent

placement in the project.

4. The correction of any damage, defacement or corrosion to which they may have been subjected.
5. Their field assembly and internal connection as may be necessary for their proper operation.
6. Their mounting in place including the purchases and installation of all dunnage supporting members and fastenings necessary to adapt them to architectural and structural conditions unless support members are shown on structural or architectural drawings.
7. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.

C. Items which are to be installed but not purchased as part of the work of a particular trade shall be carefully examined by this trade upon delivery to the project.

Claims that any of these have been received in such condition that their installation will require procedures beyond the reasonable scope of the work of the installing trade will be considered only if presented in writing within one week of the date of delivery to the project of the items in question.

The work of the installing trade shall include all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

END OF SECTION 013113

SECTION 013114 - COORDINATION DRAWINGS AND PROCEDURES

1.1 GENERAL

A. Requirements set forth herein are in addition to and shall be considered as complementary to the Conditions of the Contract and the balance of Division #1 and Technical Specifications.

B. All Contractors, Subcontractors, Sub-subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.

C. Definitions as apply to "Contractors" involved with the work of this Project shall be as set forth in Section 01 10 00, Article 1.01.

D. Coordination of the work shall be performed as outlined below.

1.2 REQUIREMENTS INCLUDED IN THIS SECTION

A. Scheduling (Coordinate with Section 01 32 00)

B. Coordination Drawings and Procedures - General Construction Work

C. Meetings

D. Penalties

1.3 SCHEDULING

A. Development of coordination drawings shall begin immediately upon award and shall not be dependent upon structural shop drawings; development shall be based upon structural information included on the Contract Documents.

B. During the “final” review of the coordination drawings, the approved structural shop/fabrication drawings shall be checked and any conflicts identified. General Contractor shall coordinate and insure structural shop drawings are processed so as to meet this requirement. Failure to prosecute same in a timely manner will be cause for implementation of penalties as outlined in 1.07 herein.

C. Sheet metal specialty contractor or subcontractor shall provide initial drawings as indicated in Article 1.05 herein within six (6) weeks of issuance of Letter or Intent or Contract, whichever is earliest. Time to complete all drawings may vary based upon size and complexity of project. Extension to the six (6) weeks for final coordination drawings shall be determined prior to award by the Design Professional Team in consultation with the Contractors.

D. Each subsequent contractor, as listed in 1.05.E shall complete their work within three (3) weeks of receipt of the sheet metal drawings.

E. Progress of coordination drawings must be reported at every project meeting until accepted.

1.4 COORDINATION DRAWINGS AND PROCEDURES - GENERAL CONSTRUCTION WORK

Attention is directed to this Section for coordination drawing requirements for this project. These drawings are critical to the proper execution of the Work and failure to honor these requirements may become the basis for denial of any and all claims for either or both “time” and “money”.

A. The Contractor shall provide fully integrated building, structural, mechanical/electrical coordination drawings and field installation layouts for such

work as directed by the Architect and/or Owner's Representative (based upon construction method) and/or required by job requirements so as to resolve tight field conditions except as modified in Paragraph 1.05 below.

B. These composite shop drawings and field installation layouts shall be coordinated in the field among the Contractors to verify the proper relationship to the work of other trades based on field conditions, and shall be checked for accuracy and approved by the Contractors before submission to the Architect for his review and concurrence and shall become the basis for more specific shop drawing submittals as required by the technical specifications.

CONTRACT DRAWINGS MAY NOT BE USED; Minimum Scale - 1/4 inch = 1 foot

C. Review of coordination drawings shall not diminish responsibility under this Contract for final coordination of installation and maintenance clearances of all systems and equipment with Architectural, Structural, Mechanical, Electrical and other work.

D. After Architect/Engineer Review:
   1. After review of coordination drawings, the method used to resolve interferences not previously identified shall be as in 1.06 "MEETINGS" below.
   2. All changes to reviewed coordination drawings shall be approved in writing by the Architect/Engineer prior to start of work in affected area.

E. Distribution of Coordination Drawings:
   1. The Sheet Metal Subcontractor shall provide the following distribution of documents:
      a. One transparency of each Coordination Drawing to each specialty trade and affected Contractor for their use.
      b. One transparency of each Coordination Drawing to Owner.
      c. One transparency of each coordination drawing to General Trades Contractor.
      d. One transparency of each coordination drawing to the Construction Manager/Owners Representative as applicable to construction contracts.

F. Coordination Drawings include but are not necessarily limited to:
   1. Structure
   2. Partition/room layout.
   3. Ceiling tile and grid.
   4. Light fixtures.
   5. Access panels.
   6. Sheet metal, coils, boxes, grilles, diffusers, etc.
   7. HVAC piping and valves.
   8. Smoke and fire dampers.
   9. Soil, waste and vent piping.
   10. Water piping
   11. Roof drain piping.
   12. Major electrical conduit runs, panel boards, feeder conduit and racks of branch conduit.
   13. Above ceiling miscellaneous metal.
   14. Fire Protection Systems.
   15. Heat tracing of piping.

16. Equipment support, anchors, guides and seismic restraints.

G. All coordination drawings shall be delivered to the Architect at the end of the project as part of the record drawing requirements set forth in Article 3.11 of the General Conditions.

1.5 MEETINGS – Coordinate with Section 01 31 19

A. Coordination meetings to resolve interferences in the work will be held at the project site under the direction of the Architect and Owner's Representative.

Representatives of each Contractor shall be present at each meeting.

Each Contractor shall provide the necessary manpower and/or overtime to insure that the coordination process described herein does not delay the Project Schedule.

1.6 PENALTIES

A. FAILURE OF ANY INDIVIDUAL PRIME CONTRACTOR TO PARTICIPATE IN THE PREPARATION OF SAID COORDINATION DRAWINGS AND TO OBTAIN ARCHITECT'S REVIEW AND CONCURRENCE THEREOF WILL RESULT IN FORFEITURE OF THEIR RIGHT OF PAYMENT UNTIL SAID DRAWINGS ARE ACCEPTED.

B. REPEATED VIOLATIONS OF THIS CONTRACTUAL REQUIREMENT MAY RESULT IN TECHNICAL DEFAULT OF THE AGREEMENT BETWEEN THE OWNER AND THE OFFENDING PRIME CONTRACTOR;

HOWEVER, THE FAILURE OF THE OWNER TO SO TERMINATE SHALL NOT RELIEVE THE CONTRACTOR FROM FUTURE COMPLIANCE WITH THE TERMS AND CONDITIONS OF THIS SECTION.

End of Section

SECTION 013119 - PROJECT MEETINGS

1.1 GENERAL

A. Requirements set forth herein are in addition to and shall be considered as complementary to the Conditions of the Contract and the balance of Division #1 and Technical Specifications.

B. All Contractors, Subcontractors, Sub-subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.

C. Definitions as apply to "Contractors" involved with the work of this Project shall be as set forth in Section 011000, Article 1.01.

1.2 REQUIREMENTS INCLUDED IN THIS SECTION

A. Initial (Kick-Off or Orientation) Meeting
B. Regular Project Meetings
C. Job Progress Meetings
D. Job Coordination Meetings
E. Mockup Review Meetings
F. Pre-Installation Conferences
G. Recording

NOTE: As part of all individual meetings outlined above there shall be a Waste Management program discussion held with all responsible parties in attendance.

1.3 INITIAL (KICK-OFF OR ORIENTATION) MEETING

A. The Owner's Representative will schedule the initial job meeting, prior to the start of any work, at the project site and will notify all parties concerned of the time and place of the meeting.

B. Attendance:
   1. Prime Contractor (s) or Construction Manager if involved
   2. Owner’s Representative or Owner.
   3. Architect and principal consultants.
   4. Major subcontractors and suppliers as deemed appropriate.
   5. Representative of Testing Laboratory if independent.

C. Review and Discuss:
   1. Relation and coordination of various parties, and responsible personnel for each party.
   2. Use of premises, including office and storage areas, temporary controls, and security procedures.
   3. Waste management requirements as outlined in Section 017419.
   4. Construction schedule and critical work sequencing.
   5. Processing of:
      a. Contract modifications.
      b. Shop Drawings, Product Data, and Samples.
      c. Applications for Payment.
      d. Substitutions.
      e. Requests for Information.
      f. Other required submittals.
   6. Adequacy of distribution of Contract Documents.
   7. Procedures for maintaining contract closeout submittals.

8. Installation and removal of temporary facilities.

D. Notification procedures and extent of testing and inspection services

E. The meeting will be conducted by the Architect and Owner's Representative and shall address the conduct of the job, lines of communications, and the like. Discussions on waste management requirements as outlined in Section 017419 shall be part of the agenda.

F. All Contractors are required to attend.

1.4 REGULAR PROJECT MEETING AGENDA

A. Coordinate the Work of the Project (Reference Section 013114).

B. Establish a sound working relationship among the Contractors, the Architect and the Owner.

C. Review and update progress, submittal and delivery schedules.

D. Review job progress.

E. Review progress payment requests; change proposals and change orders.

F. Expedite the work to completion within the project schedule.

G. Provide a 2 week look ahead schedule.

1.5 JOB PROGRESS MEETINGS

A. Unless otherwise directed, bi-weekly job meetings will be held by the Owner's Representative. Present at these meetings shall be EACH CONTRACTOR or a representative authorized to make commitments for action on behalf of the Contractor and the Owner.

B. EACH CONTRACTOR shall arrange for the participation of its Subcontractors when their presence is required by the Owner's Representative and/or the Architect.

C. The minimum agenda will cover:

1. Review minutes of previous meetings.
2. Note field observations, problems, and decisions.
3. Identify present problems and resolve them.
4. Plan work progress during next work period and its effect on the related work of others.
5. Review shop drawings and submittal schedules.
6. Review change order status.
7. Review status of construction progress schedule.
8. Coordinate occupancy arrangements and access requirements with Owner.
9. Discussions on waste management requirements as outlined in Section 01 74 19 shall be part of the agenda.

1.6 JOB COORDINATION MEETINGS (Reference Section 013114)

A. On a bi-weekly basis, either on the day of the schedule job progress meeting, or such other time established, a "working" coordination meeting will be held at the project site. Present at these meetings shall be **each contractor's site supervisor** with men working, or **scheduled to work within the ensuing 2 weeks**, and the Owner's site Representative.

Further, prior to the start of any major trade work, a coordination meeting following the guidelines established herein shall be held subject to the same parties presence as for general meetings.

B. Meeting shall be used to coordinate work between contracts for the ensuing 2 weeks. At the close of the meeting, each supervisor shall, in an agreed format, provide a summarized 2-week work plan to the other contractors and the Owner's Representative.
C. The time and place for the meetings will be as established in the preconstruction meeting.
D. Minutes will be taken by the party designated and distributed to all parties involved and the Owner's Representative or the General Contractor will provide, at the next regular progress meeting, a verbal report of the date and time of the last coordination meeting and a listing of those present.

1.07 PRE-INSTALLATION CONFERENCES
A. Where required in individual specification Section, convene a pre-installation conference at project site or other designated location.
B. Require attendance of parties directly affecting or affected by work of the specific Section.
C. Review conditions of installation, preparation and installation procedures, and coordination with related work.

1.08 MOCKUP REVIEW MEETING (Coordinate with Section 014339)
A. Prior to start of any mockup that may be specified or required herein or within the technical specifications the following shall be accomplished:
1. Submittal of shop drawings for respective mockup;
2. Submittal of samples for respective mockup;
3. Coordination and review meeting between specialty contractors responsible for mockup and Architect and Owner's representative.

1.09 RECORDING: The Owner's Representative or the Architect, as agreed to by contract, shall write minutes of all meetings and distribute them to all parties present and to those on the distribution list given out at the orientation meeting within 48 hours of the meeting.

PART 2 – PRODUCTS

Not used

PART 3 - EXECUTION

Not used

END OF SECTION 013119

SECTION 013200 - SCHEDULING AND PROGRESS

1.1 GENERAL

A. Requirements set forth herein are in addition to and shall be considered as complementary to the "Conditions of the Contract" and the balance of Division #1 and Technical Specifications.

B. All Contractors, Subcontractors, Sub-subcontractors, Vendors, and the like shall be required to familiarize themselves with said provisions.

C. Definitions apply to "Contractors" involved with the work of this Project.

1. "Contractor for General Construction (CGC)" meaning the party responsible for the preparation of, and monitoring of, the coordinated project progress schedule (CPPS) prepared in consort with the "Prime Contractors" as defined below;
2. "The Contractor" or "Contractor" meaning that Prime Contractor normally responsible for that work referenced;
3. "Coordinated Project Progress Schedule (CPPS)" meaning that schedule prepared by the "Contractor for General Construction" with all required input from each of the major Subcontractors employed by the Contractor for General Construction.

D. The requirements set forth within this section are directed to all Contractors involved in the work and shall be considered mandated requirements subject to penalties as defined elsewhere in this Section.

1.2 REQUIREMENTS INCLUDED IN THIS SECTION

A. Preliminary Requirements
B. Commencement, Prosecution and Completion of the work
C. Coordinated Submittal Schedules
D. Proposed Product List and Status Report on Material Orders - See Article 1.11 of Section 013300; failure to comply with these requirements shall result in rejection of schedules and withholding of any requisitions.
E. Coordinated Project Progress Schedule
F. Breach of Contract
G. Time of Completion

1.3 PRELIMINARY REQUIREMENTS (Coordinate with Post-Bid Requirements set forth in Section 002100)

A. Within seven (7) days after bids are opened, and before the Contract is executed, the three (3) apparent low bidders for this Contract must submit to the Architect, in writing, a list of durations and a sequence, in the form of a bar chart, for all activities that are the responsibility of the bidder. The Contractor’s proposed workforce and other resource loading for each activity of the bar chart, broken down by trades, must also be provided. Failure to comply with this requirement may be cause for rejection of the bid.

B. The apparent low bidders, concurrent with the submission of bar chart for each school, shall also submit to the Architect, in writing, the following information:

1. Shop drawing and material sample schedules keyed to the durations submitted in the bar chart. (See Section 013300)

2. Schedules for the award of Subcontractor and equipment contracts keyed to the duration's submitted for the bar chart.
3. The name of the person who, as Scheduling Coordinator for the apparent low bidder, is authorized to act on behalf of the apparent low bidder on all matters of scheduling included in this Section. Once named, the Scheduling Coordinator may only be replaced after written notice is given to the Owner's Representative and Architect. The Contractor agrees, upon the request of either of the two parties, to replace the Scheduling Coordinator.

C. Failure to comply with subsection 1.03 of this Section of the General Requirements may be cause for rejection of the bid and forfeiture of security. (See the "Post-Bid Procedures" in the Instructions to Bidders.)

1.4 COMMENCEMENT, PROSECUTION AND COMPLETION OF THE WORK

A. Contractor shall commence work under this Contract upon receipt by him of Letter of Intent to Award, Notice to Proceed, and/or Execution of the Contract, and shall prosecute said work diligently and complete the work within the stated calendar days for each portion of the work as set forth in Section 011000.

B. The time stated for completion of Contract work includes final cleanup of area. Upon completion of total Contract work, ALL AREAS SHALL BE CLEAN.

C. The Contractor is to carry on responsibility for services and maintenance of such items as temporary roads, walks, ramps, field offices, parking areas, environmental controls and the like until work under this Contract is complete, unless otherwise directed by the Owner. Coordinate work herein with Section 011000, Description of Work.

1.5 COORDINATED SUBMITTAL SCHEDULES

A. Within two (2) weeks after receipt of Letter of Intent to Award, Notice to Proceed, and/or Execution of the Contract, The Contractor and its Subcontractors must submit, a detailed listing of all items to be incorporated within the work, including all items of mechanical and electrical.

This agreed upon information will then be incorporated in the "CPPS" as prepared by the Contractor in accordance with Paragraph 1.05 of this Section.

Listing should generally include the following:

1. Overall project milestones;
2. Proposed products list and status report on material orders.
3. Dates of shop drawing/sample submittals;
4. Guaranteed delivery dates after shop drawing and/or sample approvals;
5. Date of installation start;
6. Date of installation completion.

1.6 COORDINATED PROJECT PROGRESS SCHEDULE

A. Within two (2) weeks after receipt of Letter of Intent to Award, Notice to Proceed, and/or Execution of the Contract, but prior to the actual start of the field work, the Contractor shall submit to the Architect for his approval the proposed Coordinated Project Progress Schedule giving the information listed below.

In order to complete the "CPPS" the Contractor and their Subcontractors shall

submit to each other for review, comment and time coordination prior to submittal to the Contractor for General Construction, their requirements so as to allow for said schedule to be drawn.

THE CONTRACTOR SHALL SIGNIFY ACCEPTANCE OF SAID COORDINATED PROJECT PROGRESS SCHEDULE BY SIGNING PRIOR TO SUBMITTAL.

FAILURE OF THE CONTRQ TO SUBMIT SAID COORDINATED PROJECT PROGRESS SCHEDULE AND TO OBTAIN APPROVAL THEREOF WILL RESULT IN FORFEITURE OF RIGHT OF PAYMENT UNTIL SAID SCHEDULE IS APPROVED.

SHOULD SUCH FAILURE BE CAUSED BY THE LACK OF COOPERATION ON THE PART OF ANY CONTRACTOR, SAID CONTRACTOR WILL BE PENALIZED BY FORFEITURE OF RIGHT OF PAYMENT AS WELL AS BEING HELD RESPONSIBLE FOR ANY DELAYS AND RESULTANT COSTS AS OUTLINED IN THE GENERAL CONDITIONS THAT MAY ACCRUE UNTIL SUCH PARTICIPATION IS FORTHCOMING AND SAID SCHEDULE IS APPROVED.

The minimum information contained within the required project progress schedule shall consist of -

1. The estimated dates the various classes of work included in the Schedule of Values will be started and completed.
2. The estimated percentages of completion to be obtained and the total dollar value of the various classes of said work projected to the end of each calendar month until substantial completion.

   Calculations shall be based upon - work in place; materials on site and not installed; materials fabricated and stored under suitable conditions and insured to full value in a manner satisfactory to Architect and Owner; and such other items as may be agreed to among the Contractor, Architect and Owner.
3. The estimated delivery and installation dates of the major pieces of equipment to be furnished and installed by the Contractor.
4. The estimated projected progress of work that will be performed away from the job site.
5. A delineation of the work that will be performed by the Contractor's own forces and by his Subcontractors.
6. The estimated calendar dates on which all the work under the Contract will be completed and ready for substantial completion and final inspections.

B. The Coordinated Project Progress Schedule shall be based on an orderly progression of the Work, allowing adequate time for each operation, and leading to a reasonable certainty of Substantial Completion by the date established in Section 01 10 00.

The "CPPS" will be reviewed by the Architect and Owner’s Representative for compliance with the requirements of this article and will be accepted by them or returned to the Contractor for revision and resubmittal.

In the event that said schedule is returned, each Contractor shall participate in the

revision, as required, to prepare same for resubmittal.

Unless specifically required by law, no payment under this Contract shall be due until the Progress Schedule has been submitted to the Architect and Owner's Representative and approved by both parties.

C. As the work progresses, an up-to-date copy of the "CPPS" with the actual percent completion of the various classes of the work indicated in red shall be submitted by the Contractor, with input from each Subcontractor to the Architect and/or Owner's Representative during the first week of each calendar month. (Distribution to be established as part of "preconstruction meeting".

The "CPPS" may be adjusted and revised to meet unforeseen job conditions, but such changes shall, at all times, be approved by the Architect and the Owner's Representative.

D. A copy of the "CPPS" shall be available at all times at the job site for the inspection and guidance of other Contractors, Subcontractors and Vendors engaged on any construction phase of the project.

It shall be the responsibility of the Contractor to ascertain that all his Subcontractors, Vendors and Material men periodically consult the Schedule so that their work schedule shall be maintained in conformance with his own.

It shall also be the responsibility of the Contractor to periodically consult the Job Progress Schedules of any other Contractors that may be engaged on any separate construction of the project, so that undue delay in progress on their part shall not delay the work of the other Contractors.

E. AN UP-TO-DATE COPY OF COORDINATED PROJECT PROGRESS SCHEDULE MUST BE ATTACHED TO MONTHLY REQUISITION IN ORDER FOR PROCESSING TO BEGIN.

INCOMPLETE REQUISITIONS WILL BE REJECTED.

1.7 BREACH OF CONTRACT

A. The Contractor's failure to comply with any requirement called for in subsections 1.04, 1.05 and 1.06 above shall constitute a material breach of the Contract, and the Owner shall have the right to and may terminate the Contract, provided, however, that the failure of the Owner to so terminate shall not relieve the Contractor from future compliance.

1.8 TIME OF COMPLETION – Coordinate with Article 8, Sections 007000 and 011000

A. Notwithstanding the implementation of the Construction Schedule, it is the sole responsibility of the Contractor to complete the Work within a Contract Time which will assure the substantial completion of the Project by the required date.

END OF SECTION 013200

SECTION 013300 - SUBMITTALS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.

B. Related Sections include, but are not limited to, the following:

1. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
2. Division 01 Section "Closeout Procedures “for submitting warranties ,Project Record Documents and operation and maintenance manuals.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's approval. Submittals may be rejected for not complying with requirements.

1.3 SUBMITTAL PROCEDURES

A. General: Electronic copies of CAD Background Drawings of the Contract Drawings will be available from the Architect for use in preparing submittals. Refer to “Contractor Request for Electronic Drawing Files” attached to the end of this Section for procedures for ordering and transfer of files and for Architect’s limitations of liability for transfer.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
3. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
4. Submit product data, shop drawings and samples relating to a complete assembly at one time. Partial submittals will be returned without action.
5. Interrelated color selections will not be made until all pertinent samples are received by the Architect.

C. Submittals Schedule:

1. Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

D. Processing Time: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.

1. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.
2. The average review time required by the Architect for a submittal will be fifteen (15) business days for processing solely by the Architect's office and twenty (20) business days for processing when review by Architect's consultant is required.

E. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.

F. Paper and Physical Sample Submittals: Place Architect's Submittal Cover Sheet, which is included at the end of this section, on each submittal for identification. Complete all required information before submitting to Architect. Submittals received without Submittal Cover Sheet or with incomplete information on cover sheet will be returned for resubmission.

1. Include Contractor's stamp indicating information complies with Contract Document requirements.
2. Submittals indicating less than complete review by Contractor will be returned for Contractor's compliance without Architect's review.
3. Transmit all submittals to Architect with a copy to the Construction Manager unless otherwise indicated. Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
    a. When submittal requires review of data by Structural Engineer or Mechanical or Electrical Engineers, submit a copy directly to such engineer with a copy to the Architect and the Construction Manager.

G. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.

2. Name file with submittal number or other unique identifier, including revision identifier.
3. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software or electronic form acceptable to Owner.

H. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

I. Architect's Re-review of Submittals: When resubmittals are required due to Contractor's failure to properly coordinate submittals, including coordination with other Prime Contractors, Contractor shall reimburse the Owner for fees paid to the Architect for re-review of submittals through a credit change order, in accordance with the Architect's current fee schedule.

J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

K. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

1. The Contractor shall perform no portion of its work requiring submittal and review of shop drawings, product data, samples or similar submittals until the respective submittal has been approved by the Architect. Such work shall be in accordance with approved submittals.
2. The Contractor shall supply shop drawings to other Contractors engaged by the Owner to perform work in connection with the project to ensure proper coordination of its work with theirs.
3. Do not proceed with installation until an applicable copy of the submittal is in the installer's possession.
4. Do not permit use of unmarked copies of submittals in connection with construction.

L. Project Information Management System: The submittal process will be implemented through the use of a digital processing and tracking software similar to "Submittal Exchange". Use this Project Information Management (PIM) software to transmit all submittals. Contractors must participate in and become capable in using this system

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

1. Post electronic submittals as PDF electronic files directly to Architect's project information transmission web based software specifically established for Project.

a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Do not submit Product Data until compliance with the requirements of the Contract Documents has been confirmed.
3. Mark each copy of each submittal to show which products and options are applicable. Strike extraneous information prior to submittal
4. Include the following information, as applicable:
   a. Manufacturer's written recommendations.
   b. Manufacturer's product specifications.
   c. Manufacturer's installation instructions.
   d. Standard color charts.
   e. Manufacturer's catalog cuts.
   f. Wiring diagrams showing factory-installed wiring.
   g. Printed performance curves.
   h. Operational range diagrams.
   i. Standard product operating and maintenance manuals.
   j. Compliance with recognized trade association standards.
   k. Compliance with recognized testing agency standards.
   l. Application of testing agency labels and seals.
   m. Notation of coordination requirements.

5. Submittals: Submit pdf electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data. Standard information prepared without specific reference to the Project is not considered a Shop Drawing. Verify field measurements prior to preparation of shop drawings.

1. Preparation: Include the following information, as applicable:
   a. Dimensions.
   b. Identification of products.
   c. Fabrication and installation drawings.
   d. Roughing-in and setting diagrams.
   e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
   f. Shopwork manufacturing instructions.
   g. Schedules.
   h. Compliance with specified standards.
   i. Notation of coordination requirements.
   j. Notation of dimensions established by field measurement.

2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
3. Number of Copies: Submit pdf electronic file, unless paper copies are specifically required by Architect.

D. Samples: Prepare physical units of materials or products, including the following:

1. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
2. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
3. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
    a. If variation in color, pattern, texture, or other characteristic is inherent in the product represented by a Sample, submit at least three sets of paired units that show approximate limits of the variations.
    b. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

4. Number of Samples for Initial Selection: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
5. Number of Samples for Verification: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.
    a. Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

6. Schedule: Include significant sample submittals in the Contractor's Construction Schedule.
7. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    a. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

E. Mockups: Mock-ups and field samples specified in individual Sections are full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.

1. Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide record of activity.

F. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation."

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit pdf electronic file.
2. Certificates and Certifications: Provide a notarized statement that includes the signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
3. Test and Inspection Reports: Comply with requirements in Division 1 Section "Quality Requirements."

B. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

C. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.

D. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

E. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.

F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.

G. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.

H. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.

I. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on the testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.

J. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

K. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.

L. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

M. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

N. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 1 Section "Closeout Procedures."

O. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

P. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

Q. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

R. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

S. Material Safety Data Sheets: Submit information directly to Construction Manager. If submitted to Architect, Architect will not review this information but will return it with no action taken.

1. Submit MSDS’s for all products used during construction whether incorporated in the Work or used in the performance of the Work.
2. Construction Manager will compile a central file of MSDS’s on the site, which will be available to workers and others in accordance with “Right to Know” legislation.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field verify all dimensions. Mark with approval stamp before submitting to Architect.

B. Approval Stamp: Stamp each submittal and submittal cover sheet with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Except for submittals for information or similar purposes, where action and return is required or requested, Architect will review each submittal, mark to indicate action taken, and return.

1. Compliance with specified characteristics is Contractor's responsibility.

C. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

1. The contractor may proceed with fabrication on "REVIEWED" or "FURNISH AS NOTED" shop drawings provided that the Contractor adheres to the corrections noted.
2. Contractor may not proceed with fabrication on shop drawings noted "REVISE AND RESUBMIT" or "REJECTED" until "REVIEWED" or "FURNISH AS NOTED" stamp is received on resubmitted drawing.
   a. Do not permit submittals marked "Revise and Resubmit," or "Rejected," to be used at Project site, or elsewhere where Work is in progress.

3. Other Action: Where submittal is primarily for information or record purposes, special processing or other activity, submittal will be returned, marked "Action Not Required."

D. Informational Submittals: Architect will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

E. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 013301 - CONTRACTOR REQUEST FOR ELECTRONIC DRAWING FILES

The Architect, for the convenience of the Client/Owner, has electronic copies or representations of Drawings, Specifications and Project Manuals. Requests for electronic copies of such Drawings, Specifications and Project Manuals by the Contractor, for the Contractors use or the use of Subcontractors, shall be made in writing to the Client/Owner as outlined herein below and shall outline the benefit derived from such a request. The Contractor shall be prepared to reimburse the Client/Owner for any costs involved in preparing such electronic documents for the Contractors use.

Architect's Project Number:	
Project Name:	
Architect:	
Client/Owner:	
Contractor/Recipient's Name:	
Attention to:	
Contractor/Recipient's Address:	
Date of Request:	
Date of Release:	

As requested, attached is a list of electronic drawing files in DWG/DWF format (Drawings may be compressed). For the release of these electronic drawing files to the recipient, the following items shall be understood, acknowledged and signed by the authorized personnel of the recipient with the fee included as may be required.

A. The electronic drawing files are the property of the Architect and the Contractor is granted a license to use the electronic files only in connection with the subject project.

B. The electronic drawing files do not necessarily represent the Contract Documents associated with the referenced project. These files are solely for the use of the recipient and are not a representation of the scope of work for the project. Any use by contractors, subcontractors or fabricators shall be on all of the same terms and conditions being applicable to such users who shall acknowledge the same in writing. The Recipient may use the electronic drawing files only. Electronic drawing files or portions thereof, shall not be provided to anyone else without the written approval of the Client/Owner. The use of the electronic drawing files, documents and any reprographics shall not identify any member of the Architect or Architect's consultants or sub-consultants or the Client/Owner without the written approval from the parties.

C. The entire risks as to the results and performance of the package including the electronic drawing files, are assumed by the Contractor/recipient. The Client/Owner, the Architect and the Architect's consultants and sub-consultants, including directors, employees, representatives, and licensors of the company, shall not have any liability to the Contractor/recipient or any other person or entity for any direct, indirect, incidental special or consequential damages whatsoever, including, but not limited to, the loss of

revenue or profit, lost data, or any other personnel, commercial or economic loss, and claims by third parties. Even if the Client/Owner and Architect and the Architect's consultants and sub-consultants has been advised of the possibility of such damages; said Client/Owner and Architect and the Architect's consultants and sub-consultants shall not be held liable as stated above.

D. The Contractor/recipient hereby agrees to indemnify and hold the Client/Owner, the Architect and the Architect's consultants and sub-consultants harmless from and against any cost, damage, liability, loss or claim arising from violation of this license. The Contractor/recipient and all subcontractors of all tiers also agrees that, in addition to all other remedies hereunder, the Contractor/recipient and such parties grant the Client/Owner the right to seek injunctive or other equitable relief to prevent the violation or require the performance of any of the Contractor's/recipient's obligations under this license, and the Contractor/recipient hereby consents to the issuance of such relief by any court of competent jurisdiction without the need to post any bond or security.

E. The electronic files requested are as follows:

Electronic file name	Corresponding Drawing (close approximation)
1.	
2.	
3.	
Etc.	
Total number of files:	

CONTRACTOR'S/RECIPIENT'S AGENT SIGNATURE: _____

NAME IN BLOCK LETTERS: _____

AUTHORIZED POSITION HELD: _____

DATE OF SIGNATURE: _____

SUBMITTAL COVER SHEET

Contractor:_____

Address:_____ **Telephone:** (__)_____

Owner:

Name of Project:

TYPE OF SUBMITTAL:

☐Shop Drawings	☐Schedule	☐Physical Sample
☐Technical Data	☐Certificate	☐Color Sample
☐Test Report	☐Warranty	☐_____

Submission #: **1st** **2nd** **3rd** **4th** (circle one)

Description:

Product Identification: _____

_____

Manufacturer: _____

Subcontractor/Supplier:_____

DOCUMENT REFERENCES: (Must be fully filled out)

Spec Section No.:_____ Drawing No(s):_____

Paragraph: _____ Rm. Or Det. No(s):_____

Contractor Remarks:

Contractor Submittal Review Stamp

THE ATTACHED MATERIAL HAS BEEN REVIEWED BY THE UNDERSIGNED AND IS BELIEVED TO COMPLY WITH ALL REQUIREMENTS OF THE CONTRACT DOCUMENTS. THE UNDERSIGNED UNDERSTANDS VERIFICATION OF FIELD DIMENSIONS, AND COORDINATION WITH OTHER TRADES, REMAINS THE RESPONSIBILITY OF THE CONTRACTOR.

DATE: _____ BY (SIGN): _____

Consultant use below this line:

Architect Submittal Review Stamp

☐NO EXCEPTIONS	☐MAKE CORRECTIONS NOTED
☐REJECTED	☐REVISE AND RESUBMIT
☐EXAMINED	☐SUBMIT SPECIFIED ITEM

CHECKING IS ONLY FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONTRACT DOCUMENTS. ANY ACTION SHOWN IS SUBJECT TO THE REQUIREMENTS OF THE PLANS & SPECIFICATIONS. CONTRACTOR IS RESPONSIBLE FOR DIMENSIONS WHICH SHALL BE CONFIRMED & CORRELATED AT THE JOB SITE; FABRICATION PROCESSES AND TECHNIQUES OF CONSTRUCTION; COORDINATION OF HIS WORK WITH THAT OF ALL OTHER TRADES & THE SATISFACTORY PERFORMANCE OF HIS WORK

KAEYER, GARMENT + DAVIDSON ARCHITECTS, P.C.

DATE_____ BY_____

SECTION 013306 - CERTIFICATION OF SPECIFICATION COMPLIANCE

I/WE, the MANUFACTURER/SUPPLIER and INSTALLER of _____

_____

as specified in Section Number _____ of the Contract Documents prepared by KG+D Architects, PC; 285 Main Street; Mt. Kisco, NY 10549

Harrison New Recreation & Community Center
270 Harrison Road
Harrison, NY 10528

do (does) herein certify that -

1. All materials furnished for said project do fully comply with all specification requirements as stated within the Contract Documents;

2. That no asbestos containing materials of any nature are used in the work;

3. That execution of the Work covered by this certification has been performed in accordance with the drawings prepared by the design professional team.

CONTRACTOR: _____

CERTIFICATION BY: _____ TITLE: _____

ADDRESS: _____

CERTIFICATION DATED: _____

Distribution:

Original and One Copy to: KG+D Architects, PC
285 Main Street
Mt. Kisco, NY 10549

Att: _____

One Copy to:

CERTIFICATION OF SPECIFICATION COMPLIANCE

CORPORATE ACKNOWLEDGEMENT

State of) SS.

County of)

On the _____ day of _____, before me came _____ to me known and who by me being duly sworn did depose and say that he resides at _____ that he is the officer of the said corporation executing the foregoing instrument, that he knows the seal of said corporation, that the seal affixed to said instrument is such corporate 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

INDIVIDUAL ACKNOWLEDGEMENT

State of) SS.

County of)

On the _____ day of _____, before me came _____ to me known and who by me being duly sworn did depose and say that he resides at _____ that he is the individual who executed the foregoing instrument.

_____
Notary Public

PARTNERSHIP ACKNOWLEDGEMENT

State of) SS.

County of)

On the _____ day of _____, before me came _____ to me known and who by me being duly sworn did depose and say that he resides at _____ that he is the partner in the firm of _____ doing business under the name of _____ and that he executed the foregoing instrument on behalf of said partnership.

_____
Notary Public

SECTION 013529 - HEALTH AND SAFETY PLAN

1.1 GENERAL

A. Requirements set forth herein are in addition to and shall be considered as complementary to the Conditions of the Contract and the balance of Division #1 and Technical Specifications.

B. All Contractors, Subcontractors, Sub-subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.

C. Definitions as apply to "Contractors" involved with the work of this Project shall be as set forth in Section 011000, Article 1.01.

1.2 REQUIREMENTS INCLUDED IN THIS SECTION

A. Provide all labor, equipment and materials and perform all operations in connection with monitoring air quality, decontaminating equipment and providing worker health and safety protection for all Contractor and Subcontractor personnel.

B. Develop a site specific Health and Safety Plan (HASP) specifically addressing the potential hazards that may be encountered. This plan shall meet all Occupational Safety and Health Administration (OSHA) requirements.

C. Review the requirements and data presented and supplement the program with any additional measures deemed necessary to fully comply with regulatory requirements and adequately protect personnel on the site.

1.3 REFERENCES

A. OSHA Regulation 29 CFR 1910.120

B. OSHA Regulation 29 CFR 1926.62

1.4 DEFINITIONS

A. Site Safety Official (SSO): The individual who is responsible to the Contractor and has the authority and knowledge necessary to implement the site safety and health plan and verify compliance with applicable safety and health requirements.

B. SSO shall possess full and complete authority to order stoppage of any work which he deems unsafe.

1.5 SUBMITTALS

A. Provide within seven (7) days after execution of the Agreement.

1. Site-specific HASP including the Emergency Response Plan to the Owner, Owner’s Representative and Architect for review, including provisions for decontamination and a contingency plan for unforeseen emergencies. The review is only to determine if the HASP meets basic regulatory requirements and the minimum requirements of this Section. The review will not determine the adequacy of the HASP to address all potential hazards, as that remains the sole responsibility of the Contractor.
2. Current certification of employee's health and safety training and certification of employee's baseline medical exam status.
3. Certification of additional required health and safety training for Supervisors.
4. Qualifications and experience of the SSO for approval.

B. Submit minutes of weekly safety meetings at periodic progress meetings.

C. Refer to related submittal requirements in Section (s) 02 82 00 - Asbestos Abatement for project.

1.6 CONTRACTOR'S RESPONSIBILITIES

A. Contractor is solely responsible for the health and safety of workers employed by the Contractor, any Subcontractor and anyone directly or indirectly employed by any of them.

B. Develop and follow a site specific Health & Safety Plan (HASP) in accordance with the requirements of paragraph 1.07.

C. Provide a full-time SSO regardless of whether or not the Work is at a defined Uncontrolled Hazardous Waste Site.

D. Pre-arrange emergency medical care services at a nearby hospital, including establishment of emergency routes of travel.

E. Meetings:

1. Conduct daily job briefings with all site personnel to discuss relevant health and safety issues including but not limited to hazards, monitoring, procedures and controls. Document attendance and topics covered.
2. At a minimum, conduct weekly safety meetings with all site personnel, documenting attendance and topics covered.

F. Train all workers assigned to areas where contaminated media are likely to be encountered in accordance with 29 CFR 1910.120.

G. Include those workers involved with the abatement of Asbestos containing materials in a medical surveillance program and respiratory protection program that meet the requirements of 29 CFR 1910.120 and 29 CFR 1910.134, respectively.

H. In areas where contaminated media are likely to be encountered, monitor air quality in and around work area using appropriate air monitoring equipment/analysis, as indicated in Part 2. Record all readings and maintain record on site. Stop work and/or upgrade respiratory protection or personal protective equipment levels if action levels established in the HASP are exceeded. Ensure that degree and type of respiratory protection provided is consistent with the monitored concentrations and individual chemical parameters. Lawfully dispose of all contaminated clothing and equipment that cannot be decontaminated.

1.7 HEALTH & SAFETY PLAN (HASP) REQUIREMENTS

A. The following items shall be addressed in the HASP:

1. safety and health hazard assessment;
2. procedures for emergency medical treatment and first aid;
3. map indicating route to hospital for emergency medical care;
4. Lead Exposure Control Plan (29 CFR 1926.62);
5. equipment decontamination procedures;
6. air monitoring procedures and action levels;
7. personal protective equipment and decontamination;
8. physical hazard evaluation and abatement including:
    a. equipment operation;
    b. confined space entry;
    c. slips and falls;
    d. building collapse;
    e. falling debris;
    f. encountering unmarked utilities;
    g. cold and heat stress;
    h. hot work (cutting and welding);
    i. excavation entry;

9. training requirements;
10. recordkeeping requirements;
11. emergency response plan that includes:
    a. names of three (3) Emergency Response Contractors, experienced in the removal and disposal of oils and hazardous chemicals, that the Contractor intends to use in the event of an emergency;
    b. evacuation routes and procedures;
    c. emergency alerting and response procedures.

1.8 CONTINGENCY MEASURES & NOTIFICATIONS

A. The potential for encountering hazardous buried objects or materials that could pose a threat to human health or the environment exists at the Project Site. In the event that potentially hazardous materials are encountered during the work under this contract, the responsibilities of the Contractor and the Owner's Representative are described herein.

B. The procedures and protocols to be used by the SSO in defining materials that are potentially hazardous include screening with a photoionization detector, odor, visual appearance of a material, and obvious oil or chemical contaminated materials.

C. Upon encountering suspected hazardous buried objects or materials as described above, cover the excavation immediately if no imminent danger, as defined by the SSO, is present. If there is an imminent danger, as defined by the SSO, evacuate the area immediately. The SSO shall then notify the Owner's Representative of the situation.

D. Establish, properly barricade, and mark the area as an exclusion zone under the direction of the SSO. The SSO shall establish the exclusion zone boundaries based upon air quality monitoring using a photoionization detector and other equipment as appropriate. The exclusion zone shall be established at a minimum 50-foot radius around the location where the potentially hazardous material is encountered. Work within the exclusion zone shall be discontinued until the hazardous condition has been remediated and testing indicates that a hazard does not exist. Other activities of the site, outside the limits of the exclusion zone shall continue. Ambient air quality monitoring shall be performed by the SSO to demonstrate that ambient air quality in other portions of the site is not adversely impacted by the exclusion zone condition.

E. Notify Owner's Representative regarding the presence of potentially hazardous materials. Owner's Representative may direct the Contractor to notify regulators and to obtain necessary regulatory approvals for remediation.

F. Mobilize the appropriate equipment and personnel to sample and test the hazardous material within the exclusion zone to determine the remedial action required, subject to the Owner's Representative's direction. Contractor may be directed to remove and legally dispose of the material. Compensation for the removal and disposal of hazardous material will be as a Change in Work and Change in Contract Price in accordance with the Subcontract Agreement, if not covered under a specific bid item.

PART 2 - PRODUCTS

2.1 AIR MONITORING EQUIPMENT

A. Provide and maintain portable photoionization detector or organic vapor analyzer capable of detecting organic vapors or total hydrocarbons. Equipment shall be sensitive to the 0.5 PPM level.

B. Provide and maintain an oxygen analyzer to measure oxygen concentration in any trench or confined space prior to entry, as determined by the SSO.
C. Provide and maintain an explosimeter whenever the potential for accumulation of explosive gases exists, as determined by the SSO.
D. Provide and maintain air monitoring equipment as required for the collection/monitoring of airborne asbestos fibers. All air samples related to abatement work shall be analyzed by a laboratory accredited by the American Industrial Hygiene Association.
E. All air monitoring equipment shall remain the property of the Contractor.

PART 3 - EXECUTION - NOT USED

END OF SECTION 013529

SECTION 014100 - PERMITS AND COMPLIANCE

PART 1 - GENERAL

1.1 GENERAL
- A. Requirements set forth herein are in addition to and shall be considered as complementary to the Conditions of the Contract and the balance of Division #1 and Technical Specifications.
- B. All Contractors, Subcontractors, Sub-subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.
- C. Definitions as apply to "Contractors" involved with the work of this Project shall be as set forth in Section 011000, Article 1.01.

1.2 REQUIREMENTS INCLUDED IN THIS SECTION
- A. Preconstruction Meeting
- B. Permits and Licenses
- C. Compliance
- D. Additional Compliance

1.3 PRECONSTRUCTION MEETING
- A. After award of Contract and prior to the commencement of the Work, schedule and conduct meeting with Owner and Architect to discuss the applicable environmental regulations and requirements; coordinate with Sections 015713, 015719 and 017419.

1.4 PERMITS AND LICENSES
- A. The Contractor shall obtain, maintain and pay for all permits and licenses necessary for the execution of the work and for the use of such work when completed.
- B. For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with environmental regulations bearing on performance of the Work.

1.5 COMPLIANCE
- A. The Contractor shall give all notices, pay all fees and comply with all laws, rules and regulations applicable to the work.

1.6 ADDITIONAL COMPLIANCE
- A. The Contractor, Subcontractors, and the employees of the Contractor and Subcontractors, shall comply with all regulations governing conduct, access to the premises, operation of equipment and systems, and conduct while in or near the premises and shall perform the work in such a manner as not to unreasonably interrupt or interfere with the conduct of business of the Facility.
- B. **Further, attention is directed to requirements of Section 011501.**

PART 2 – PRODUCTS - NOT USED
PART 3 – EXECUTION - NOT USED

END OF SECTION 014100

SECTION 014219 CODES AND STANDARDS

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

C. Conflicting Requirements: Where compliance with two or more standards is specified, and the standards may establish different or conflicting requirements for minimum quantities or quality levels comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

1.2 REFERENCE STANDARDS - The abbreviations which may be used in the construction specifications, refer to the organizations and specifications of the organizations listed below.

AABC	Associated Air Balance Council
ABMA	American Boiler Manufacturers Association
AISC	American Institute of Steel Construction
ADC	Air Diffusion Council
AMCA	Air Movement and Control Association
ASC	Adhesive and Sealant Council
ASLA	American Society of Landscape Architects
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.
ASTM	American Society for Testing and Materials International
CLFMI	Chain Link Fence Manufacturers Institute
CRI	Carpet and Rug Institute
CS	Commercial Standard of NBS
GANA	Glass Association of North America
GS	Green Seal
IEEE	Institute of Electrical and Electronics Engineers
IESNA	Illuminating Engineering Society of North America
IGMA	Insulating Glass Manufacturers Alliance
LSGA	Laminators Safety Glass Association
NAIMA	North American Insulation Manufacturers Association
NFPA	National Fire Protection Association
NFRC	National Fenestration Rating Council
NPCA	National Paint and Coatings Association
NPA	National Particleboard Association
NSF	National Sanitation Foundation International
RFCI	Resilient Floor Covering Institute
SFPA	Southern Forest Products Association

SIGMA	Sealed Insulating Glass Manufacturers Association
SPC	Southern Pine Inspection Bureau (Grading Rules)
SSPC	Steel Structures Painting Council
WDMA	Window & Door Manufacturers Association
WRI	Wire Reinforcement Institute, Inc.
WSFI	Wood and Synthetic Flooring Institute
WWPA	Woven Wire Products Association

B. Federal Agencies:

CE	Army Corps of Engineers)
CPC	Consumer Product Safety Commission
EPA	Environmental Protection Agency
DOE	Department of Energy
NIST	National Institute of Standards and Technology
OSHA	Occupational Safety & Health Administration

Part 2 - PRODUCTS

NOT USED

Part 3 – EXECUTION

NOT USED

END OF SECTION 014219

SECTION 014326 -TESTING LABORATORY SERVICES

1.1 GENERAL

A. Requirements set forth herein are in addition to and shall be considered as complementary to the Conditions of the Contract and the balance of Division #1 and Technical Specifications.

B. All Contractors, Subcontractors, Sub-subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.

C. Definitions as apply to "Contractors" involved with the work of this Project shall be as set forth in Section 011000, Article 1.01.

D. Pursuant to the provisions of Section 01 33 00, Submittal Requirements, it is further required that unless otherwise specified, tests called for in the Specifications applicable to the work and/or required to implement the work shall be paid for by the Owner.

E. Where tests are required by the Architect to substantiate conformance to the specifications the Owner will pay all costs of such tests and engineering services unless said tests indicate that the workmanship or materials used by the Contractor are not in conformance with the Drawings, Specifications, Approved Shop Drawings or the approved materials.

In such event, the Contractor shall pay for the tests, remove all work and material so failing to conform, REPLACE with work and materials which are in full conformity.

F. Requirements related to testing services and specified elsewhere in these documents include:
1. Inspections and testing as required by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction over the work.
2. Certification of compliance as required by individual specification sections.
3. Testing, adjusting and balancing of mechanical equipment and systems.
4. Project record documents, including operation and maintenance manuals, record drawings and the like.
5. Subsurface exploration records.
6. Tests and standards governing work and/or materials as may be specified throughout these specifications and/or as shown on the drawings.

G. The Owner will employ, and pay for, the services of an Independent Testing Laboratory to perform all specified services.

H. **Inspection, sampling and testing is required for the following as applicable to the particular project**:
- ❑ Soils materials and compaction.
- ❑ Paving systems.
- ❑ Concrete, formwork, reinforcing and the like.
- ❑ Structural steel systems, joists, decking, light metal framing and the like.
- ❑ Welding
- ❑ Masonry and mortar.
- ❑ Roofing and flashing systems

however, this listing is to be considered as <u>partial</u> only with the burden placed on the Contractor to advise, and the Laboratory to provide, all such inspections, sampling and testing as may be specified and/or required by these Contract Documents and the applicable laws and ordinances of the jurisdiction.

I. Employment of the Testing Laboratory shall not relieve the Contractor of his

obligation to perform Work in accordance with the Contract.

1.2 REQUIREMENTS INCLUDED IN THIS SECTION
- A. Laboratory Qualifications
- B. Laboratory Duties
- C. Contractor's Responsibilities
- D. Tests Required

1.3 LABORATORY QUALIFICATIONS
- A. Laboratory shall meet -
  1. The "Recommended Requirements for Independent Laboratory Qualifications", latest edition as published by the American Council of Independent Laboratories.
  2. Basic requirements of ASTM E 329, latest edition, governing "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction".
- B. Laboratory shall submit copy of inspection of facilities as made by Materials Reference Laboratory of the National Bureau of Standards during most recent tour of inspection; with memorandum of remedies of any deficiencies reported by inspection.
- C. Testing equipment shall be calibrated at maximum 12-month intervals by devices of accuracy traceable to either - National Bureau of Standards or accepted values of natural physical constants; submit copy of certificate of calibration as executed by an accredited calibration agency.

1.4 LABORATORY DUTIES
- A. Cooperate with Architect and Contractor; provide qualified personnel promptly on notice.
- B. Perform specified inspections, sampling and testing of materials and methods of construction in conformance with specified standards, recognized authorities and the like so as to ascertain compliance with the requirements of the Contract Documents.
- C. Promptly notify Architect and Contractor of irregularities or deficiencies of Work which are observed during performance of services.
- D. Promptly submit sufficient copies (minimum 5) of reports and tests to Architect for distribution. Reports shall contain -
  1. Issue date
  2. Project title and number
  3. Testing laboratory name and address
  4. Name and signature of inspector
  5. Date of inspection or sampling
  6. Temperature and weather observations
  7. Test date
  8. Identification of product and specification section
  9. Location in project
  10. Type of inspection or test
  11. Observations regarding Contract Document compliance.
- E. Perform additional services as required by the Owner and/or Architect.
- F. The laboratory is not authorized to - release, revoke, alter or enlarge on, requirements of the Contract Documents; approve or accept any portion of Work;

perform any duties of the Contractor.

1.5 CONTRACTOR'S RESPONSIBILITIES

A. The Contractor shall to the best of his ability -

1. Cooperate with laboratory personnel, provide access to the Work and to Manufacturer's operations as may be necessary.
2. Provide to the laboratory preliminary representative samples of materials to be tested in required quantities.
3. Furnish copies of mill test reports.
4. Provide casual labor and facilities as required to provide access to Work to be tested; to obtain and handle samples at the Site; to facilitate inspections and tests; for laboratory's exclusive use for storage and curing of test samples.
5. Notify laboratory sufficiently in advance of operations to allow for his assignment of personnel and scheduling of tests.
6. Arrange with laboratory and PAY FOR, additional sampling and testing required for the Contractor's convenience.
7. Employ, AND PAY FOR, services of a separate, equally qualified Independent Testing Laboratory to perform additional inspections, sampling and testing required when initial tests indicate Work does not comply with Contract Documents. Coordinate with Paragraph 1.05.A.4 above.

1.6 TESTS REQUIRED – **As applicable to each respective project and the requirements therein.**

A. General Construction Tests: More detailed testing requirements are given in individual Specification Sections. The Owner shall retain the right to make any additional tests the Architect deem necessary or appropriate. The Contractor is responsible for providing his own tests to determine that materials meet specified requirements. The scope of tests required and paid for by the Owner (unless otherwise noted below) shall include as a minimum the following:

1. Earthwork: Lab tests to determine suitability of all fill materials shall be paid for by Contractor. Owner reserves the right to retain and pay for his own testing for checking purposes.
2. Earthwork: Proctor tests for compaction.
3. Concrete Paving and General Concrete Work: Concrete mix design testing shall be paid for by Contractor. Owner reserves the right to retain and pay for his own testing for checking purposes.
4. Concrete Paving and General Concrete Work: Concrete test cylinders as specified in Section 03 30 00, Cast-in-Place Concrete. All concrete cylinder testing will be performed by the Owner’s testing laboratory at the cost of the Owner.
5. Masonry Mortar: Three cubes tested for compressive strength at 10 days; ASTM C 91 tests.
6. Metals: Strength dimension; coating thickness; bolt torque; welding X-ray or ultrasonic tests.

B. Plumbing: At least the following tests will be performed. Conform to requirements specified in individual Division 22 Specification Sections. The test shall be performed and paid for by the subcontractor and witnessed by the Contractor and Owner's on-site representative:

1. Water supply piping hydrostatic pressure test.

2. Sanitary piping test before fixture installation: Cap pipes and fill to highest point in system.
3. Plumbing fixture operation.

C. Fire Protection System: At least the following tests will be performed. Conform to requirements specified in individual Division 21 Specification Sections. The test shall be performed and paid for by the subcontractor and witnessed by the Contractor and Owner's on-site representative:
1. Fire protection system flushed and pressure tested.

D. HVAC Testing: All HVAC work shall be tested by an independent testing and balancing agency. Conform to requirements specified in individual Division 23 Specification Sections. All costs of these tests will be paid by the subcontractor. Adjustments shall be made by the subcontractor as directed by the Owner. At least the following tests will be performed:
1. Piping hydrostatic tests.
2. Air and water balancing.
3. Thermostat control monitoring and testing.
4. Boiler efficiency testing.

E. Electrical Power System Testing: At least the following tests will be performed. Conform to requirements specified in individual Division 26 Specification Sections. The test shall be performed and paid for by the subcontractor and witnessed by the Contractor and Owner's on-site representative:
1. Polarity tests.
2. Operation of all circuits.
3. Testing of emergency system.
4. Security systems.
5. Generation system.
6. Grounding systems.

F. Electrical Lighting System Testing: Conform to requirements specified in individual Division 26 Specification Sections. At least the following tests shall be performed and paid for by the subcontractor.
1. Operation of every component of entire system.

G. Fire Alarm System Testing: At least the following tests will be performed. Conform to requirements specified in individual Division 28 Specification Sections. The test shall be performed and paid for by the subcontractor and witnessed by the Contractor and Owner's on-site representative:
1. All smoke and heat detectors.
2. Proper operation as required by authorities having jurisdiction.

H. Contractor's Responsibilities: The Contractor shall notify the Owner, Architect, and Testing Laboratory personnel at least 48 hours prior to performance of work requiring testing. The Contractor shall fully cooperate with testing agencies and permit free access to all areas at all times. The Contractor shall permit taking samples at any time during construction, either before or after installation. Prior to notice to proceed with construction, the Contractor shall submit a Testing Log of planned tests and scheduled test dates. Tests shall be numbered based on type of work, type of test, and sequence. The Testing Log shall be maintained by the Contractor and updated weekly.
1. Coordination: The Contractor shall coordinate all testing, including all testing and inspections to be paid for by the Owner. The Contractor will arrange testing and sampling performed by the Owner's testing agency and will have prepared test record forms. Upon receipt of test results, the Owner will

distribute 2 copies to the Contractor and 2 copies to the Architect with test results.

I. Follow-up and Corrective Action: The Contractor and the Owner will note the test record on the Testing Log to acknowledge test procedures and results. If the follow-up or corrective action is needed, the Contractor shall submit to the Owner 2 written copies of proposed follow-up or corrective plans and obtain the Owner's written approval before proceeding.

1. Cost of Testing: If tests indicate that materials or work do not comply with requirements, the contractor shall pay for all retesting, and shall remove and replace non-complying work at no additional cost to the Owner.

J. Local Owner Inspections: The Contractor is also responsible for coordinating and cooperating with local requirements for inspections.

END OF SECTION 014326

Statement of Special Inspections

Project: *Harrison Recreation & Community Center New Construction Phase 1*

Location: *270 Harrison Avenue, Harrison, NY*

Owner: *Town/Village of Harrison, NY*

Owner's Address: *1 Heineman Place*
Harrison, NY 10528

Design Professional in Responsible Charge: *The Di Salvo Engineering Group, Structural Engineers.*
83 Wooster Heights Rd. Suite 200, Danbury, CT 06810

Architect of Record: *KG+D Architects, PC*
285 Main Street, Mount Kisco, NY 10549

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the Building Code. It includes a schedule of Special Inspection services applicable to this project as well as the name of the Special Inspection Coordinator and the identity of other approved agencies to be retained for conducting these inspections and tests. This *Statement of Special Inspections* encompass the following disciplines:

☒ Structural ☐ Mechanical/Electrical/Plumbing
☐ Architectural ☐ Other: _____

The Special Inspection Coordinator shall keep records of all inspections and shall furnish inspection reports to the Building Official and the Registered Design Professional in Responsible Charge. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge.

A *Final Report of Special Inspections* documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy.

Job site safety and means and methods of construction are solely the responsibility of the Contractor.

Interim Report Frequency: *Monthly* or ☐ per attached schedule.

Prepared by:

Stephen G. Lehigh, PE.
(type or print name)

6/9/2023
Signature Date

Design Professional Seal

Owner's Authorization:
Owner to return signed copy to The Di Salvo Engineering Group

Signature Date

Building Official's Acceptance:

Signature Date

Schedule of Inspection and Testing Agencies

Statement of Special Inspections includes the following building systems:

- ☒ Soils and Foundations
- ☒ Cast-in-Place Concrete
- ☐ Precast Concrete
- ☐ Shotcrete
- ☐ Masonry Level 2
- ☐ Masonry Level 3
- ☐ Structural Steel
- ☐ Cold-Formed Steel Framing
- ☐ Prefabricated Cold-Formed Trusses
- ☐ Prefabricated Wall Panels
- ☐ Spray Fire Resistant Material
- ☐ Mastic and Intumescent Fire-Resistant Material
- ☐ Wood Construction
- ☐ Prefabricated Wood Trusses
- ☐ Prefabricated Timber Trusses
- ☐ Glue Laminated Wood Construction
- ☐ Exterior Insulation and Finish System
- ☐ Mechanical & Electrical Systems
- ☐ Architectural Systems
- ☐ Special Cases

Special Inspection Agencies	Firm	Address, Telephone
1. Special Inspector	*Special Inspector to be determined by Owner.*	
2. Testing Laboratory	*Testing Lab to be determined by Owner.*	
3. Geotechnical Engineer	*Skylands Engineering, LLC*	*124 Milton Road* *Sparta, NJ 07871*

Note: The inspection and testing agent shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official, prior to commencing work. The Di Salvo Engineering Group takes no responsibility for the qualifications of the Special Inspector, the Testing Laboratory nor the Geotechnical Engineer.

Seismic Design Category: *B*

Basic Wind Speed (Ultimate/Nominal Wind Speed/) (mph): *126 / 98*

Wind Exposure Category: *B*

Qualifications of Inspectors and Testing Technicians

The qualifications of all personnel performing Special Inspection and testing activities are subject to the approval of the Building Official. The credentials of all Inspectors and testing technicians shall be provided if requested.

Key for Minimum Qualifications of Inspection Agents:

When the Registered Design Professional in Responsible Charge deems it appropriate that the individual performing a stipulated test or inspection have a specific certification or license as indicated below, such designation shall appear below the *Agency Number* on the Schedule.

PE/SE	Structural Engineer – a licensed SE or PE specializing in the design of building structures
PE/GE	Geotechnical Engineer – a licensed PE specializing in soil mechanics and foundations.
EIT	Engineer-In-Training – a graduate engineer who has passed the Fundamentals of Engineering examination

American Concrete Institute (ACI) Certification

ACI-CFTT	Concrete Field Testing Technician – Grade 1.
ACI-CCI	Concrete Construction Inspector
ACI-LTT	Laboratory Testing Technician – Grade 1&2.
ACI-STT	Strength Testing Technician.

American Welding Society (AWS) Certification

AWS-CWI	Certified Welding Inspector.
AWS/AISC-SSI	Certified Structural Steel Inspector

American Society of Non-Destructive Testing (ASNT) Certification

ASNT	Non-Destructive Testing Technician – Level II or III

International Code Council (ICC) Certification

ICC-ECSI	Soils Special Inspector
ICC-SMSI	Structural Masonry Special Inspector
ICC-SWSI	Structural Steel and Welding Special Inspector
ICC-SBSI	Structural Steel and Bolting Special Inspector
ICC-SFSI	Spray-Applied Fireproofing Special Inspector
ICC-PCSI	Prestressed Concrete Special Inspector
ICC-RCSI	Reinforced Concrete Special Inspector
ICC-CBSI	Commercial Building Special Inspector

National Institute for Certification in Engineering Technologies (NICET)

NICET-CT	Concrete Technician – Levels I, II, III & IV
NICET-ST	Soils Technician - Levels I, II, III & IV
NICET-GET	Geotechnical Engineering Technician - Levels I, II, III & IV

Exterior Design Institute (EDI) Certification

EDI-EIFS	EIFS Third Party Inspector

Other

SCSI	Smoke Control Special Inspector
PE/ME	Mechanical/Electrical/Plumbing Engineer – a licensed PE specializing in the design of mechanical, electrical and plumbing building systems
RA	Registered Architect specializing in the design of architectural building systems

Soils and Foundations

Item	Agent No. (Qualif.)	Scope
1. Site Preparation	*2 (PE or EIT or ICC-ECSI) or 3 (PE or EIT or ICC-ECSI)*	***Table 1705.6 Site Preparation.*** *Prior to placement of the prepared fill, determine that the site has been prepared properly.*
	2 (PE or EIT or ICC-ECSI) or 3 (PE or EIT or ICC-ECSI)	***Table 1705.6 Footing Bottom.*** *Verify materials below foundations are adequate to achieve the design bearing capacity.*
	2 (PE or EIT or ICC-ECSI) or 3 (PE or EIT or ICC-ECSI)	***Table 1705.6. Excavation Depth.*** *Verify excavations have been extended to the proper depth and have reached proper material.*
2. Controlled Structural Fill	*2 (PE or EIT or ICC-ECSI) or 3 (PE or EIT or ICC-ECSI)*	***Table 1705.6 Placement of Fill****. Continuously verify the use of proper materials, densities and lift thicknesses during placement and compaction of controlled fill. Verify extent and slope of fill placement.*
	2 (PE or EIT or ICC-ECSI) or 3 (PE or EIT or ICC-ECSI)	***Table 1705.6 Compacted Fill Material.*** *Perform classification and testing of compacted fill material. Perform sieve tests and modified Proctor tests of each source of fill material to verify that the compacted fill material to be used under footings and under slabs complies with the project requirements. Review that the in-place dry density of the compacted fill complies with the project requirements.*
3. Deep Foundations		*Not applicable.*

Cast-in-Place Concrete

Item	Agent No. (Qualif.)	Scope
1. Mix Design	*1 (PE or EIT)* *2 (ACI)*	***Table 1705.3.*** *Review concrete mix design submittals for all classes of concrete specified on the structural drawings.* *Periodically review concrete batch tickets and verify compliance with approved mix design. Periodically verify that water added at the site does not exceed that allowed by the mix design.*
2. Material Certification	*1 (PE or EIT)*	***Section 1705.3.2. Materials.*** *Review material certificates of compliance or other acceptable documentation for all materials used in the concrete mix designs for conformance with ACI 318. In the absence of sufficient data or documentation providing evidence of conformance to quality standards of materials in ACI 318, materials shall be tested in accordance with the appropriate standards and criteria.*
3. Formwork Geometry	*1 (PE or EIT) or 2 (ACI)*	***Table 1705.3*** *Review formwork for shape, location and dimensions of the concrete member being formed.*
4. Reinforcement Installation	*1 (PE or EIT) or 2 (ACI)*	***Table 1705.3*** *Review the following percentages of installed reinforcement and verify placement: Footings 50%, Foundation Walls 50%, Retaining Walls 50%, Piers 50%.*
5. Post-Tensioning Operations		*Not applicable*
6. Anchors - Cast-In-Place	*2 (ACI)*	***Table 1705.3*** *Review 50% of cast-in-place anchors for anchor materials, size, positioning, spacing, edge distance and embedment for compliance with approved shop drawings. Review concrete placement and consolidation around anchors as per "Concrete Placement" section of this Statement.*
7. Anchor Rods - Post Installed	*2 (ACI)*	***Table 1705.3*** *Review 75% of post-installed mechanical anchors. Continuous review of 100% of post-installed adhesive anchors or reinforcing bars installed in horizontal or upwardly inclined orientations to resist sustained tension loads, in accordance with ACI 318; for other orientations review 75% of post-installed adhesive anchors/reinforcing bars.* *Review shall include 1) anchor and dowel materials, 2) adhesive materials and expiration date, 3) anchor/rebar type, size, positioning, spacing, edge distance, embedment and tightening torque, and 4) concrete type, compressive strength and thickness for compliance with approved contract documents. Review drilled holes (for proper preparation, size, depth and cleaning), and anchor and dowel installation for compliance with manufacturer's requirements.*

Cast-in-Place Concrete, cont'd.

8. Concrete Placement	*2 (ACI)*	***Table 1705.3*** *Continuous inspection of concrete placement for proper application techniques. Verify that concrete conveyance and depositing avoids segregation or contamination. Verify that concrete is properly consolidated.*
9. Sampling and Testing of Concrete	*2 (ACI)*	***Table 1705.3*** *Make one strength test for each day's pour exceeding 5 cubic yards, but less than 25 cubic yards, plus one set for each additional 50 cubic yards or fractions thereof from each mix design of concrete placed in any one day. Test each specimen for slump, air content, and temperature.*
10. Curing and Protection	*2 (ACI)*	***Table 1705.3.*** *Review periodically for maintenance of specified curing temperature and protection techniques.*
11. Other		

SECTION 014339 -MOCKUP REQUIREMENTS

1.1 GENERAL

A. Requirements set forth herein are in addition to and shall be considered as complementary to the Conditions of the Contract and the balance of Division #1 and Technical Specifications.

B. All Contractors, Subcontractors, Sub-subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.

C. Definitions as apply to "Contractors" involved with the work of this Project shall be as set forth in Section 011000, Article 1.01.

1.2 REQUIREMENTS INCLUDED IN THIS SECTION

A. General Purpose of Mockups

B. Miscellaneous Mockups

1.3 GENERAL PURPOSE OF MOCKUPS

A. Contractors are advised that various sections of the Specifications require construction of mockups. Where mockups are required the Contractor erecting the mockup shall notify the Architect one week prior to its completion.

B. The purpose of each mockup will be to establish minimum standards of materials and workmanship and to assure that completed installations based on the mockups will be fully functional and will serve the purpose for which they have been designed.

C. Approved mockups may be left in place and incorporated into the permanent installation.

D. The Contractor shall not proceed with the purchase or fabrication of any "mockup" items until the procedure of mockup erection, inspection and approval is completed and documented.

E. Contractor shall coordinate work at each mockup with other trades construction that mockup.

1.4 MISCELLANEOUS MOCKUPS

A. Additional field mockups for work are required as noted within the technical specifications and generally include work identified within said sections.

B. Failure to list any required mockup will not relieve the Contractor from executing said mockup.

END OF SECTION 014339

SECTION 015000 - TEMPORARY FACILITIES

1.1 GENERAL

A. The work of this Section includes all requirements for construction facilities and temporary controls, including temporary utilities, support facilities, and security and protection. Coordinate with Sections 011000 and 011500/01 for additional requirements.

B. Requirements set forth herein are in addition to and shall be considered as complementary to the Conditions of the Contract and the balance of Division #1 and Technical Specifications; further, attention of all contractors is directed to requirements set forth in Section 011501 as they affect school building safety during the execution of the work of this project.

C. All Contractors, Subcontractors, Sub-subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.

D. Definitions as apply to "Contractors" involved with the work of this Project shall be as set forth in Section 011000.

E. Temporary facilities indicated to be provided by any Prime Contractor for the use of his Subcontractors and/or other Contractors shall mean for their use without payment for such use unless otherwise specified and shall generally consist of the following;

1.2 QUALITY ASSURANCE

A. Environmental Protection: Provide environmental protection as required by authorities having jurisdiction and as indicated in the Contract Documents. Coordinate with requirements of the following:
   1. 014100 - Permits and Codes
   2. 015000 – Temporary Facilities
   3. 015719 - Environmental Protection During Construction
   4. 017400 - Cleaning.
   5. 017419 - Construction Waste Management.

B. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:
   1. Building Code requirements
   2. Health and safety regulations
   3. Utility company regulations
   4. Police, Fire Department and Rescue Squad rules

C. Standards: Comply with NFPA Code 241, “Building Construction and Demolition Operations”, ANSI-A10 Series standards for “Safety Requirements for Construction and Demolition”, and NECA Electrical Design Library “Temporary Electrical Facilities.” Refer to “Guidelines for Bid Conditions for Temporary Job Utilities and Services”, prepared jointly by AGC and ASC, for industry recommendations.

D. Accessible Temporary Egress: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ANSI A117.1.

1.3 REQUIREMENTS INCLUDED IN THIS SECTION

A. Project Sign
B. Field Office
C. Temporary and Permanent Services, General
D. Temporary Light and Power

E. Temporary Toilet Facilities
F. Temporary Water
G. Storage Facilities
H. Scaffolding and Staging
I. Rubbish Container
J. Construction Fencing
K. Burning
L. Dust Control
M. Maintenance of Permanent Roadways
N. Traffic Control
O. Fire Prevention Control
P. Temporary Fire Protection
Q. Discontinuance, Changes and Removal

1.4 PROJECT SIGN

A. The Contractor shall provide and maintain at the site of the work, the exact location thereof to be designated by the Architect, a construction sign containing the title of the Project; the name of the Owner; the names of the Architectural/Engineering team; and such other information as may be indicated and/or required by the Architect.
B. Said project sign shall be constructed of APA A/C "MDO" plywood, edged and banded in a minimum size of 4 foot by 8 foot and shall be set on supporting system designed to withstand a minimum 50 mph wind velocity or greater as determined by codes. Graphics shall be applied by a sign painter using a maximum of 4 colors plus black and white.
C. Upon completion of the project (Phase 1), or as may be directed by the Architect, said sign, framing, supports and foundations shall remain in place at the project site.

1.5 FIELD OFFICE

A. The Contractor, until all the work covered by the Contract is accepted by the Owner, shall provide a temporary office structure, with sanitary facilities, in accordance with provisions elsewhere described in the Contract Documents, for his use, and use of the Architect, Owner and their representatives and shall bear the cost of constructing, maintaining, and removing such structure.
B. The minimum size of such structure shall be 300 sq.ft. and shall be divided into:
    1. Office for Architect;
    2. Office for General Contractor;
    3. Central conference/meeting area with tables and chairs for 12 people.
C. Further, provide:
    1. adequate heating, lighting and air conditioning in said office;
    2. all required telephone service separates from the Owner's telephone service and system;
D. The Contractor, until all work covered by the Contract is accepted by the Owner, shall equip the temporary office with furniture, files, and accessories as necessary to service the project; coordinate requirements for Architect and Owner with said parties.
E. The Contractor shall provide daily housekeeping for all office spaces.
F. Maintain, in the Contractor's field office, all articles necessary for First Aid treatment; further, the Contractor shall establish standing arrangements for the immediate

removal and hospital treatment of any employees and other persons on the job site who may be injured or who may become ill during the course of the work.

G. All other Prime Contractors shall, and subcontractors may with permission from the Architect and/or Owner's Representative, establish a field office for their own use.

H. Said offices for the individual Prime Contractors, Sub-Contractors, Specialty Contractors, and the like shall be of such size and design as approved by the Owner and Architect and shall be located as directed by the Architect.

I. Each respective Contractor will arrange for telephone service, if required, directly with the utility company.

J. Electric service will be provided in accordance with Paragraph 1.06 of this Section.

1.6 TEMPORARY AND PERMANENT SERVICES, GENERAL

A. The Contractor shall provide and maintain, either directly or through its' subcontractors, all temporary services and utilities, including all labor, materials, equipment and the like necessary to adequately furnish, deliver and maintain said services at all times when required during the term of the Contract.

B. The Contractor's use of any permanent system or service of the building or portions thereof shall be subject to the Owner's approval.

C. The Contractor shall be responsible for any and all damage to permanent services used and shall make good any and all damage to the satisfaction of the Owner, prior to final completion and acceptance.

NOTE: In accordance with OSHA and other applicable regulations, the respective Contractors performing erection of structural steel, precast concrete and such other "skeleton" type work are solely responsible for the netting, guard rail protection and such other safety devices as deemed necessary to protect the workers and public from harm.

1.7 TEMPORARY LIGHT AND POWER

A. The General Contractor shall -

1. Provide all required temporary electric facilities as specified in Division 26 and further outlined below.
2. MAINTAIN AND SERVICE THE TEMPORARY ELECTRIC SYSTEM.

The energy will be supplied, **and paid for**, by the Owner for all work within the present building as same relates to the interior alterations; all site work will be fed from new temporary panels and service installation and all costs for service **other than usage charges** will be borne by the Contractor. Usage charges shall be borne by the General Contractor.

<u>Abuse of service will be cause for termination of service. No reimbursement will be made by Owner in the event of disconnect</u>.

The source of energy will be supplied by the Owner at specific locations to which sub-metered hook-up will be permitted.

B. Where feasible, locations for temporary power shall be from the nearest adequate duplex or simplex outlet to the work of this Contract.

In the event that this is inadequate, the Contractor shall provide, from the nearest adequately sized electric panel, the required temporary facilities in accordance with these specifications.

NOTE: Temporary light and power connections to field offices other than the Contractor's field offices, etc., shall be paid for by the individual contractor if they so desire this service; further, all use charges for remote offices will be paid for by those respective contractors requiring said service.

1.8 TEMPORARY TOILET FACILITIES

A. The Contractor shall provide suitable toilet facilities at approved locations complying with all state and local requirements in every respect as follows:
   1. Toilets shall be portable chemical type with screened enclosures each having a urinal and closet and mounted on skids. One (1) unit shall be provided for every 25 employees.
   2. Each unit shall be serviced by the renter at least twice a week, including removal of water matter, sterilizing, recharging tank, refilling tissue holders and thorough cleaning and scrubbing of entire interior.
   3. Each unit shall be delivered to site, located as directed, relocated if desired, and removed from site by rental company when required.

1.9 TEMPORARY WATER

A. The Owner will provide water service to the Contractor without charge, but reserves the right to terminate, without incurring additional cost, said service in the event of abuse of such service.
B. The Contractor shall make all necessary connections and extend piping to areas required at no additional cost to the Owner.
C. The Contractor shall have all equipment for the temporary water removed at the completion of the Project or when directed by the Architect or Owner.

1.10 STORAGE FACILITIES

A. The Contractor and each subcontractor shall provide temporary storage shanties, tool houses and other facilities as required for his own use. Temporary structures shall be located where directed or approved by the Owner, and shall be removed upon completion of the work or when directed. Temporary structures shall be maintained in a neat appearance.
B. Materials delivered to the site shall be safely stored and adequately protected against loss or damage. Particular care shall be taken to protect and cover materials that are liable to be damaged by the elements.

1.11 SCAFFOLDING AND STAGING

A. All scaffold, staging and appurtenances thereto shall comply in total to the requirements of Safety and Health Regulations for Construction Chapter XVII of OSHA, Part 1926 and all related amendments.

1.12 RUBBISH CONTAINER

A. The General Contractor shall provide suitable rubbish container device (s), properly maintained and serviced, replaced as required and protected from access by the public by fencing as may be specified herein or approved by the Architect.

B. Each Contractor and Subcontractor shall sweep up and gather together **daily** all his own rubbish and waste materials and place same in the rubbish containers to be provided by the Contractor. Large materials shall be broken up. Items larger than container capacity shall be removed from the site by the respective contractor.

C. THE CONTRACTOR'S ATTENTION IS DIRECTED TO THE REQUIREMENT OF RELOCATION OF THE COMPLETE REMOVAL SYSTEM AT VARIOUS TIMES THROUGHOUT THE PROJECT AS MAY BE REQUIRED TO MAINTAIN PROGRESS OF THE WORK.

1.13 CONSTRUCTION FENCING AND BARRIERS – Coordinate with Staging/Exiting Drawings as applicable to the project.

A. Construction fencing shall be provided by the GC enclosing all work and storage areas or where indicated on the drawings. Unless otherwise shown or directed, all fencing shall be 8 feet high, accurately aligned and plumb, adequately braced, and complete with gates, locks, and hardware as required. UNDER NO CONDITIONS SHALL FENCING BE ATTACHED OR ANCHORED TO EXISTING CONSTRUCTION OR TREES.

B. Fencing shall be as follows:

1. Fencing traversing paved areas shall be free standing sandbagged barrier type in a continuous manner, firmly aligned and securely mounted. Fencing shall essentially consist of heavy timber wood sill with chain link fencing consisting of 2 inch posts with top and bottom rails of 1 inch pipe and No. 9 wire fabric. All fencing shall be galvanized.
2. Fencing traversing unpaved areas shall be chain link fencing with posts set below grade a minimum of 2 feet and firmly anchored

C. Site access gates shall be provided as required of same material as site fence complete with all operating hardware and security devices.

D. Contractor shall submit drawings showing type, materials and construction of fencing to Architect for approval before proceeding with installation.

E. All wood or metal products, unless galvanized, shall receive 2 coats of latex exterior paint of color and manufacturer as approved by the Architect.

F. Should fencing be required to be relocated during the course of the project, same shall be done at the total expense of the Contractor.

G. The construction fence shall be MAINTAINED IN GOOD ORDER by the Contractor throughout the life of the project until the completed Phase 1 work is turned over to the Owner.

H. At the completion of the project (Phase 1), the construction fencing shall remain in place at the site and fully functional to secure the site.

1.14 BURNING: Burning will not be permitted.

1.15 DUST CONTROL: The Contractor shall, at all times, provide adequate dust control measures. He shall accomplish this without interference with the operations of the Owner, the neighbors or the safe progress of the work.

1.16 MAINTENANCE OF PERMANENT ROADWAYS

A. The General Contractor, for the life of the project, shall immediately remove dirt and debris which may collect on permanent roadways due to the work ON A DAILY BASIS. This includes permanent roads and sidewalks adjacent to the project site.

1.17 TRAFFIC CONTROL

A. Routes to and from the location of the work shall be as indicated in the Contract or as directed by the Owner through the Architect. Temporary roadways shall be closed only with prior approval of the Owner.

B. Parking areas for the use of those engaged in the work shall be as indicated on the Contract Drawings or as directed by the Owner.

C. The Contractor shall maintain parking areas for the use of those engaged in the work, including but not limited to snow removal.

1.18 FIRE PREVENTION CONTROL

A. All Contractors shall comply with the safety provisions of the National Fire Protection Association's "National Fire Codes" pertaining to the work and, particularly, in connection with any cutting or welding performed as part of the work.

1.19 TEMPORARY FIRE PROTECTION

A. Each Contractor shall take all possible precautions for the prevention of fires. Where flame cutting torches, blow torches, or welding tools are required to be used within the building, their use shall be as approved by the Architect at the site. When welding tools or torches of any type are in use, have available in the immediate vicinity of the work a fire extinguisher of the dry chemical 20 lbs. type. The fire extinguisher (s) shall be provided and maintained by the Contractor doing such work.

B. Fuel for cutting and heating torches shall be gas only and shall be contained in Underwriter's laboratory approved containers. Storage of gas shall be in locations as approved by the Owner and subject to Fire Department regulations and requirements.

C. No volatile liquids shall be used for cleaning agents or as fuels for motorized equipment or tools within a building except with the express approval of the Owner and/or Architect and in accordance with local codes. On-site bulk storage of volatile liquids shall be outside the buildings at locations directed by the Owner, who shall determine the extent of volatile liquid allowed within the building at any given time.

D. The Contractor shall comply with the following requirements relating to compressed gas:

1. Where compressed gas of any type is used for any purpose at the site, it shall be contained in cylinders complying with ICC regulations. Gases of different types shall not be stored together except when in use and when such proximity is required.

2. All gas cylinders shall be stored in sheds constructed of noncombustible materials. Sheds shall be well ventilated and without electric lights or fixtures and shall be located as far from other buildings as is practicable. All gas cylinders not in actual use, or in proposed immediate use, shall be removed from the building under construction or reconstruction. Empty gas cylinders shall be removed prior to bringing in a replacement cylinder. Cylinders shall at all times be supported and braced in an upright position. When not is use, the protective cap shall be screwed over the valve.

3. All persons required to handle gas cylinders or to act as temporary firemen (Fire Watchers) shall be able to read, write and understand the English language; they shall also be required by the Contractor to read Part 3 of Pamphlet P-1 "Safe Handling of Compressed Gases" published by the Compressed Gas Association, 500 Fifth Avenue, New York, NY 10036.

4. Where LP-Gas is required for Temporary Heat (including Construction Heat), the number of the cylinders within the structure or building shall be limited to the least amount required; in general, one (1) cylinder per heater. Cylinders and heaters shall be connected with two (2) braid neoprene hoses fitted at each end with threaded unions and capable of withstanding a pressure of 250 P.S.I. The length of those shall not exceed 30 feet and shall be protected from mechanical injury, kinking and abrasion. Heaters shall not be less than 6 feet from any cylinder and not less 10 feet from any tarpaulins or type closure. All debris and rubbish shall be removed to prevent fire hazards.
5. Where local ordinances are in effect regarding gas cylinders, (their use, appurtenances, and handling), such ordinances shall supplement the requirements of this paragraph. All personnel engaged in Firewatch shall be certified by the Local Fire Department having jurisdiction.
6. LP-Gas Heating will not be permitted in enclosed areas below grade.
7. Any cylinder not having the proper ICC markings or reinspection marking, or any cylinder with a leak shall be isolated immediately away from any building and the supplier shall be immediately notified; such other precautions as may be required to prevent damage or injury shall also be taken by the Contractor.

E. The Contractor shall comply with the following requirements relating to welding and cutting:
1. All cutting and/or welding (electric or gas) must be done only by skilled, certified and licensed personnel.
2. During welding or cutting operations, a contractor's man shall act as a fire watcher. The fire watcher shall have proper eye protection and suitable fire fighting equipment including fire extinguisher (bearing current inspection Certificate), protective gloves and any other equipment deemed necessary.
3. Welding or cutting shall not be done near flammable liquid, vapors or tanks containing such material.
4. Where cutting or welding is done above or adjacent to (within two feet) combustible material or persons, a shield of incombustible material shall be installed to protect against fire or injury to sparks or hot metal.
5. Tanks supplying gases for welding or cutting are to be placed in an upright position securely fastened, and as close as practical to the operation. Tanks, actives or spares, shall be protected from excess heat and shall not be placed in stairways, hallways or exits. When not in use, protective valve cap shall be screwed on the cylinder.
6. Adequate fire extinguishing equipment shall be maintained at all welding or cutting operations.
7. The Contractor shall secure all required inspections.
8. All equipment, hoses, gauges, pressure reducing valves, torches, etc., shall be maintained in good working order and all defective equipment shall immediately be removed from the job.
9. No person shall be permitted to do any welding or cutting until his name, address and current license number have been submitted in writing to the Owner.

F. Contractors for work outside the building shall commence operations promptly on award of Contract and shall be responsible for same being kept clear of materials and debris in connection with their own work and that of other Contractors. If a

Contractor for outside work allows other contractors to deposit material and debris over its lines, the Contractor shall be responsible for all delay and extra cost occasioned thereby.

1.20 DISCONTINUANCE, CHANGES AND REMOVAL

A. All Contractors shall:

1. Discontinue all temporary services required by the Contract when so directed by the Owner or the Architect.
2. The discontinuance of any such temporary service prior to the completion of the work shall not render the Owner liable for any additional cost entailed thereby and each Contractor shall thereafter furnish, at no additional cost to the Owner, any and all temporary service required by such Contractor's work.
3. Remove and relocate such temporary facilities as directed by the Owner or the Architect without additional cost to the Owner and shall restore the site and the work to a condition satisfactory to the Owner.

END OF SECTION 015000

SECTION 015719 - ENVIRONMENTAL PROTECTION DURING CONSTRUCTION

1.1 GENERAL

A. Requirements set forth herein are in addition to and shall be considered as complementary to the Conditions to the Contract and the balance of Division #1 and Technical Specifications.

B. All Contractors, Subcontractors, Sub-subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.

C. Definitions as apply to "Contractors" involved with the work of this Project shall be as set forth in Section 011000, Article 1.01.

1.2 REQUIREMENTS INCLUDED IN THIS SECTION

A. Scope
B. Applicable Regulations
C. Protection of Land Resources
D. Protection of Water Resources
E. Burning
F. Dust and Mud Control
G. Maintenance of Pollution Control Facilities During Construction

1.3 SCOPE

A. The work covered by this section consists of furnishing all labor, material and equipment and performing all work required for the prevention of environmental pollution during and as the result of construction operations under this contract except for those measures set forth in other Technical Provisions of these specifications.

For the purpose of this specification environmental pollution is defined by regulatory authorities as the presence of chemical, physical or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and recreational purposes.

The control of environmental pollution requires consideration of air, water and land, and involves noise, solid waste-management and management of radiant energy and radioactive materials, as well as other pollutants.

B. Compliance with the provisions of this section by all Subcontractors shall be the responsibility of the Contractor.

1.4 APPLICABLE REGULATIONS

A. In order to provide for abatement and control of any environmental pollution arising from the construction activities of the Contractor and his subcontractors in the performance of this contract, they shall comply with all applicable Federal, State and local laws, and regulations concerning environmental pollution control and abatement as well as the specific requirements stated elsewhere in the contract specifications.

1.5 PROTECTION OF LAND RESOURCES

A. It is intended that the land resources within the project boundaries and outside the limits of permanent work performed under this contract be preserved in their present condition or be restored to a condition after completion of construction that will appear to be natural and not detract from the appearance of the project. Insofar as possible, the Contractor shall confine his construction activities to areas defined by the plans or specifications.

B. The following additional requirements are intended to supplement and clarify the requirements contained in the General Conditions.

The location on the project site of the Contractor's storage and other construction buildings, required temporarily in the performance of the work, shall be upon assigned portions of the job site and shall require written approval of the Architect. The preservation of the landscape shall be an imperative consideration in the selection of all sites and in the overall construction of buildings. Plans showing storage and office facilities shall be submitted for approval of the Architect.

1.6 PROTECTION OF WATER RESOURCES

A. The Contractor shall not pollute streams, lakes, reservoirs or public waters with fuels, oils, bitumens, calcium chloride, acids or harmful materials. It is the responsibility of the Contractor to investigate and comply with all applicable Federal, State, County and Municipal laws concerning pollution of surrounding public waters. All work under this contract shall be performed in such a manner that objectionable conditions will not be created in public waters through or adjacent to the project areas.

B. Prior to any major construction the Contractor shall submit a plan for approval by the Architect showing his scheme for controlling erosion and disposing of waste.

C. Surface drainage from cuts and fills within the construction limits, whether or not completed, and from borrow and waste disposal areas, shall, if turbidity producing materials are present, be held in suitable sedimentation ponds or shall be graded to control erosion within acceptable limits. Temporary erosion and sediment control measures such as berms, dikes, drains, or sedimentation basins, if required to meet the above standards, shall be provided until permanent drainage and erosion control facilities are completed and operative. Fills and waste areas shall be constructed by selecting placement to eliminate silts or clays on the surface that will erode and contaminate adjacent public waters.

D. At all times of the year, special measures shall be taken to prevent chemicals, fuels, oils, grease, bituminous materials, waste washings, herbicides and insecticides, and cement and surface drainage from entering public waters.

E. Disposal of any materials, wastes, effluents, trash, garbage, oil, grease, chemicals, etc., in areas adjacent to public waters shall be subject to the approval of the Architect. If any waste material is dumped in unauthorized areas the Contractor shall remove the material and restore the area to the condition of the adjacent undisturbed area. If necessary, contaminated ground shall be excavated, disposed of as directed by the Architect, refilled with clean material and compacted all at the expense of the Contractor.

1.7 BURNING

A. Burning will not be permitted.

1.8 DUST AND MUD CONTROL

A. The Contractor shall at all times provide adequate dust control measures. He shall accomplish this, without interference to the public and vehicular transportation by wetting down the site daily with water trucks.
B. To control dust, it is required that all vehicles transporting dust producing materials to and from the job shall be covered with tarpaulins securely tied down, be sprinkled when necessary or be satisfactorily treated by other approved methods.
C. Trucks leaving excavations shall be water washed prior to entry on public streets to remove mud and other deleterious substances from wheels and undercarriages.
D. All public and private ways adjacent to the site shall be broomed and flushed whenever necessary in the opinion of the Architect. Drainage systems shall be cleaned and flushed whenever mud or debris hinders the flow of storm water to or in the stormwater systems.
E. The Contractor shall immediately remove refuse, rubbish, debris, and soil accumulations on roads, streets and on sidewalks, caused by wind, rain and snow erosions or by his own operations to prevent traffic hazards or interference with road drainage.

1.9 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION

A. During the life of this contract the Contractor shall maintain all facilities constructed for pollution control under this contract as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created. During the construction period the Contractor shall conduct frequent training courses for his maintenance personnel. The curriculum shall include methods of detection of pollution, familiarity with pollution standards, and installation and care of vegetation covers, plants and other facilities to prevent and correct environmental pollution.

END OF SECTION 015719

SECTION 016100 - MATERIAL AND EQUIPMENT

1.1 GENERAL

A. Requirements set forth herein are in addition to and shall be considered as complementary to the Conditions of the Contract and the balance of Division #1 and Technical Specifications.

B. All Contractors, Subcontractors, Sub-subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.

C. Definitions as apply to "Contractors" involved with the work of this Project shall be as set forth in Section 011000, Article 1.01.

1.2 REQUIREMENTS INCLUDED IN THIS SECTION

A. General Standards
B. Products
C. Sustainability
D. Transportation and Handling
E. Storage and Protection

1.3 GENERAL STANDARDS APPLICABLE TO ALL SPECIFICATION SECTIONS

A. These provisions, standards, and tolerances shall apply to all work under this Contract. Where stricter standards and tolerances are specified elsewhere in these Specifications or in references specified in these Specifications, they shall take precedence over these standards and tolerances.

B. Build and install parts of the Work level, plumb, square, and in correct position unless specifically shown or specified otherwise.

1. No part shall be out of plumb, level, square, or correct position so much as to impair the proper functioning of the part or the Work as judged by the Architect.
2. No part shall be out of plumb, level, square, or correct position so much as to impair the aesthetic effect of the part or the Work as judged by the Architect.

C. Make joints tight and neat. Provide uniform joints in exposed work. Arrange joints to achieve the best visual effect. Refer choices of questionable visual effect to the Architect.

D. Under potentially damp conditions, provide galvanic insulation between different metals which are not adjacent on the galvanic scale.

E. Manufacturers, subcontractors, and workmen shall be experienced and skillful in performing the work assigned to them; coordinate with Article 5 of Section 00 70 00.

F. All paint used on all products shall conform to ANSI Z66.1, Specifications for Paints and Coatings Accessible to Children to Minimize Dry Film Toxicity.

G. The Drawings do not attempt to show every item of existing work to be demolished and every item of repair required to existing surfaces. Perform work required to remove existing materials which are not to be saved and to restore existing surfaces to condition equivalent to new as judged by Architect. If possible, repairs shall be indistinguishable from adjacent sound surfaces. Where it is impossible to achieve repairs which are indistinguishable from adjacent sound surfaces to remain, notify Architect, and proceed according to his instructions.

1.4 PRODUCTS

A. Products include material, equipment and systems.
B. Comply with Specifications and referenced standards as minimum requirements.
C. Components required to be supplied in quantity within a Specification Section shall be the same, and shall be interchangeable.
D. In the case of an inconsistency between Drawings and the Specifications, or within either document which is not clarified by addendum, the product of greater quality or greater quantity of work shall be provided in accordance with the Designer's interpretation.
E. Provide environmentally preferable products to the greatest extent possible. To the greatest extent possible, provide products and materials that have a lesser or reduced effect on the environment considering raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, and/or disposal of the product.

1.5 SUSTAINABILITY

A. In the selection of the products and materials of this section as well as for the entire project, preference will be given to those with the following characteristics:
   1. Water based.
   2. Water-soluble.
   3. Can be cleaned up with water.
   4. Non-flammable.
   5. Biodegradable.
   6. Low or preferably no Volatile Organic Compound (VOC) content.
   7. Manufactured without compounds that contribute to ozone depletion in the upper atmosphere.
   8. Manufactured without compounds that contribute to smog in the lower atmosphere.
   9. Do not contain methylene-chloride.
   10. Do not contain chlorinated hydrocarbons.
   11. Contains the least possible of post-consumer or post-industrial waste.

1.6 TRANSPORTATION AND HANDLING

A. Arrange deliveries of materials in accordance with construction schedules in order to avoid delay in, conflict with, or the impeding of the progress of the Work and conditions at the site. Deliveries shall be made during regular work hours, unless approved otherwise by the Owner.
B. Deliver materials in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.

1.7 STORAGE AND PROTECTION

A. Store materials in accordance with manufacturer's instructions, with seals and labels accessible for inspection. Contractor shall be responsible for work and equipment until fully inspected, tested and accepted. Carefully store materials and equipment which are not immediately installed after delivery to site. Close open ends of work with temporary covers or plug during construction to prevent entry of obstructing material or damaging water.
B. Materials stored on the Site shall be neatly arranged and protected, and shall be stored in an orderly fashion in locations that shall not interfere with the progress of the Work or with the operations of the Owner.
C. Interior Storage: Maintain temperature and humidity within the ranges required by

manufacturer's instructions.

D. Exterior Storage:
   1. Store products subject to damage by the elements in weathertight enclosures.
   2. Store fabricated products above the ground, on blocking or skids; prevent soiling or staining. Cover products subject to damage or deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.

E. If it becomes necessary to remove and restack materials to avoid impeding the progress of any part of the Work or interfering with the work to be done by any other contractor employed on the Work, or interfering with the Owner's activities, the Contractor shall remove and restack such materials at no additional cost to the Owner.

F. Protection After Installation
   1. Provide adequate coverings to protect installed materials from damage resulting from natural elements, traffic, and subsequent construction.
   2. Remove when no longer needed.

END OF SECTION 016100

SECTION 017123 - FIELD ENGINEERING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specified field engineering services required for the Project, including but not limited to:
   1. Survey work.
   2. Civil, structural, or other professional engineering services specified, or required to execute Contractor's construction methods.

B. Owner's representative will identify existing control points and property line corner stakes indicated on the Drawings, as required.

1.2 REQUIREMENTS INCLUDED IN THIS SECTION

A. Related Requirements
B. Qualifications of Surveyor or Engineer
C. Survey Reference Points
D. Project Survey Requirements
E. Records
F. Submittals

1.3 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect work on this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
   1. General Conditions and Modifications to General Conditions.
   2. 011000 - Description of Work
   3. 017700 - Project Closeout

1.4 QUALIFICATIONS OF SURVEYOR OR ENGINEER

A. Qualified engineer or registered land surveyor, acceptable to Architect and Owner.

B. Registered professional engineer of the discipline required for the specific service on the Project, licensed in the state in which the Project is located.

1.5 SURVEY REFERENCE POINTS

A. Existing basic horizontal and vertical control points for the Project are those designated on Drawings.

B. Locate and protect control points prior to starting sitework and preserve all permanent reference points during construction.
   1. Make no changes or relocations without prior written notice to the Architect.
   2. Report to Architect when any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations.
   3. Require surveyor to replace Project control points which may be destroyed.
      a. Establish replacements based on original survey control.

1.6 PROJECT SURVEY REQUIREMENTS

A. Establish a minimum of two permanent bench marks on-site, referenced to data established by survey control points.

1. Record locations, with horizontal and vertical data, on Project Record Documents.

B. Establish lines and levels, locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements.
      a. Stakes for grading, fill, and topsoil placement.
      b. Utility slopes and invert elevations.
   2. Batter boards for structures.
   3. Building foundation, column locations, and floor levels.
   4. Controlling lines and levels required for mechanical and electrical trades.

C. From tine to time, verify layouts by same methods.

1.7 RECORDS

A. Maintain a complete, accurate log of all control and survey work as it progresses.

B. On completion of foundation walls and major site improvements, prepare a certified survey showing all dimensions, locations, angles, and elevations of construction in accordance with the requirements of modifications to General Conditions.

1.8 SUBMITTALS

A. Submit name and address of surveyor and professional engineer to Architect.

B. On request of Architect, submit documentation to verify accuracy of field engineering work.

C. Submit certificate signed by registered engineer or surveyor certifying that elevation and locations of improvements are in conformance, or non-conformance, with Contract Documents.

END OF SECTION 017123

SECTION 017329 - CUTTING AND PATCHING

1.1 GENERAL

A. Requirements set forth herein are in addition to and shall be considered as complementary to the Conditions of the Contract and the balance of Division #1 and Technical Specifications.

B. All Contractors, Subcontractors, Sub-subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.

C. Definitions as apply to "Contractors" involved with the work of this Project shall be as set forth in Section 011000, Article 1.01.

D. Provide materials, labor, equipment and services necessary and/or required to execute the work of this Section as shown on the drawings, specified herein and/or required by job conditions.

E. All cutting, removing, relocation, fitting, altering and rough patching for the installation and completion of all work shall be performed by the general Contractor.

F. All coring and finish patching of finished surfaces including exposed concrete, concrete masonry, brick masonry, glazed masonry and the like shall be performed by the General Contractor.

G. All references herein to trade contractors shall be the responsibility of the General Contractor.

1.2 REQUIREMENTS INCLUDED IN THIS SECTION

A. Coordination Efforts Between Trades

B. Definitions

C. Specific Requirements by Prime Contractor

1.3 COORDINATION EFFORTS BETWEEN TRADES

A. General Contractor will provide all <u>exterior</u> utility trenching and backfill as shown on Electrical site drawings and details. All installations related to pipe, boxes, connectors, poles or bases, shall be by the GC.

B. The GC shall provide temporary facilities not called for by other trades below, including an office trailer for use by Owner/Architect, temporary toilets, temporary roadways and maintaining roadways throughout the duration of the project, fencing, signs, etc. See Section 015000.

C. Interior trenching, backfill and restoration, will be done by the contractor (including MEP contractors) requiring same.

D. All cutting and patching and providing access through surfaces to do their work is by the contractor requiring same, including openings through masonry and providing lintels for openings over 12” wide. Where GC is shown to install new or remove and replace a ceiling or a wall, MEP contractors will coordinate their work and schedule to install their work in coordination with the GC’s schedule.

E. General contractor will provide power to equipment by others and low voltage for (only) those connections of systems shown in the documents. Interconnection between the same trades equipment will be by that trade unless specifically shown in the Electric or Data scope.

F. General contractor shall provide temporary water (within the building) as required, see Section 015000, an office trailer if contractor requires, and phone service for their own forces.

G. General contractor shall provide temporary light and power as required and noted in Section 01 50 00, for the office trailer as specified in Section 01 50 00, and phone service for their own forces. They will include wiring, including phone wire of office space to be provided for A/E by the GC. Payment for phone line services by GC.

H. Field office for use by Architect, or Engineer, or Owner representative as noted in Section 01 50 00, to be in GC's base bid.

I. General contractor shall provide an office trailer and phone service for their own forces.

1.4 DEFINITIONS - The following definitions shall apply to all work of this Contract involving cutting, patching, filling and the like.

A. Cutting - those operations required to expose existing construction or required to permit the installation of work under this contract, or passage of new or relocated work through existing construction.

B. Patching - Those operations required to bring surfaces to a level to permit the application of a finish treatment. The Contractor responsible for performing the patching shall be responsible for the restoration of the substrate to match adjacent areas, whether new or existing, except for the following conditions:

1. Exposed masonry, concrete or similar surfaces which do not require or call for painting.
2. Those patched surfaces which are wholly contained within an area which is to receive a new finish treatment as called for elsewhere in the Contract Documents.

C. Replace - Shall mean to furnish and install an entirely new element which matches the original element's material, color, dimension and design.

D. Repair - Shall mean to make the existing element as nearly "new", as possible, by the means and methods indicated for each element.

E. Fill - Shall mean to carefully and thoroughly remove, by approved methods, loose and deteriorated surface material and to install "new" material in the element so that the original contour is completely restored and color matched if exposed as a finished element. Follow manufacturers' instructions as applicable.

F. Match Original - Where indicated, this type of replacement will match the best available representative element, in design, dimension, and installation, with improvements which represent the best standards of fabrication, so that even if an existing best example of an element is gouged or pitted, or otherwise worn, the new element shall be unworn and without defects and fabricated of new material. The Architect will provide identifications of all original elements.

1.5 CUTTING AND PATCHING REQUIREMENTS

A. Where cutting, drilling or removals are required in existing and/or newly constructed wall, floor or roof construction, the work shall be done in a manner that will safeguard and not endanger the structure, and shall, in all cases, be as approved by the Architect. Prior to any cutting, drilling or removals, the Contractor shall investigate both sides of the surface involved, shall determine the exact location of adjacent structural members by visual examination, and shall avoid

interference with such members. No structural members such as joists, beams, columns supporting work that is to remain shall be cut, drilled or removed unless such conditions are shown in detail on the Contract Documents and reinforcing of members affected or new members to compensate for such drilling, cutting and removals are shown. Positive instructions shall be obtained from the Architect before cutting beams or other structural members, arches, lintels and the like and the Contractor shall be guided by such instructions.

B. Each Trade Contractor shall provide all sleeves, inserts, hangers and the like required for the execution of their respective work; failing to provide such, said responsible Contractor shall reimburse the General Contractor who shall do all necessary cutting and patching required for the execution of his work. Coordinate with Section 01 31 13/14 for sleeve types, packing of sleeves, pipe penetrations and duct openings for fire safing material and/or caulking; coordinate with Section 07 84 00 for firestopping systems.

C. No Contractor shall:
   1. endanger any work by cutting or drilling or otherwise;
   2. cut or alter the work of any other contractor except with the written consent of the Architect.
   3. cut or drill above the minimum needed to install work.

D. All holes cut through masonry exposed to view in the finished work and concrete slabs shall be core drilled except for specific holes that have been structurally detailed per Contract Documents. The Contractor shall locate adjacent structural members before core drilling to insure that structural members are not damaged. No jack hammering will be permitted in the work within any occupied portions of a structure.

E. Exposed patches and repairs shall be as inconspicuous as possible. Where new work does not match exactly the color, finish, dimension, size and the like of the existing, the new work shall be carried across the surface to which it is applied and be continued to a natural stopping point or corner.

F. All cutting and patching shall be performed using skilled mechanics of the trade or craft involved.

1.06 SPECIFIC REQUIREMENTS BY CONTRACTS

A. The General Contractor, or Subcontractors directly related to the "general construction operations", shall perform -
   1. All cutting and patching required to install all work under the Contract and as indicated on the Architectural, Structural and Site drawings.
   2. Cutting and patching of existing concrete slabs on grade in connection with underground utility work for all plumbing, heating, electric and other services; work shall be ascertained from the companion plumbing, heating and fire protection drawings; all such excavations needed shall further be accomplished by the General Contractor as specified in Division 31. Attention is directed to Section 024119 wherein modifications to this requirement will be set forth as applicable to the project scope.
   3. This work shall be deemed to include any required trenching, bedding and backfill operations made necessary in accordance with Section 312333.Cutting and patching of existing slabs within the General Contractors immediate work areas for the installation of new ductwork and

piping shall be accomplished by the General Contractor in accordance with statement set forth in Section 02 41 19.

END OF SECTION 017329

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 GENERAL

A. Requirements set forth herein are in addition to and shall be considered as complementary to the Conditions of the Contract and the balance of Division #1 and Technical Specifications.

B. All Contractors, Subcontractors, Sub-subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.

C. Any and all “Waste Handlers and Haulers” shall be licensed by the Authority having jurisdiction over “Solid Waste Management” and a copy of said license shall be submitted in accordance with Article 1.05 herein.

1.2 DESCRIPTION OF WORK

A. This Section specifies requirements for a complete program for implementation of waste management controls and systems for the duration of the Work and to –

1. Protect the environment, both on-site and off-site, during construction operations.
2. Prevent environmental pollution and damage.
3. Maximize source reduction, reuse and recycling of solid waste.

1.3 INTENT

A. The Owner has established that this Project shall generate the least amount of waste practical and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed.

B. Of the waste that is generated, as many of the waste materials as economically feasible shall be reused, salvaged, or recycled. Waste disposal in landfills shall be minimized to the greatest extent practical. With regard to these goals the Contractor shall develop, for Owner's Representative’s and Architect’s review, a Waste Management Plan for this Project. The Contractor shall be responsible for ensuring that debris will be disposed of at appropriately designated licensed solid waste disposal facilities, as defined by governing laws of the jurisdiction of the Work.

1.4 WASTE MANAGEMENT PLAN

A. After award of Contract and prior to the commencement of the Work, schedule and conduct meeting with Owner and Architect to discuss the proposed Waste Management Plan and to develop mutual understanding relative to details of environmental protection.

B. Waste Management Plan: The Contractor shall provide a plan containing the following:

1. Analysis of the proposed jobsite waste to be generated, including types and rough quantities.
2. Landfill Options: The name of the landfills where trash and building debris will be disposed of, the applicable landfill tipping fees, and the projected cost of disposing of all Project waste in the landfills.

3. Landfill Certification: Contractor's statement of verification that landfills proposed for use are licensed for types of waste to be deposited and have sufficient capacity to receive waste from this project.
4. Alternatives to Landfilling: A list of each material proposed to be salvaged or recycled during the course of the Project. Include the following and any additional items proposed:
   a. Cardboard.
   b. Clean dimensional wood.
   c. Beverage containers.
   d. Land clearing debris.
   e. Concrete.
   f. Bricks and masonry.
   g. Asphalt.
   h. Gypsum boards.
   i. Acoustical ceiling material (grid separate).
   j. Metals from framing, banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
   k. Glass, colored glass allowed.
   l. Plastic.
      1. Type 1: Polyethylene Terephthalate (PET, PETE).
      2. Type 2: High Density Polyethylene (HDPE).
      3. Type 3: Vinyl (Polyvinyl Chloride or PVC).
      4. Type 4: Low Density Polyethylene (LDPE).
      5. Type 5: Polypropylene (PP).
      6. Type 6: Polystyrene (PS).
      7. Type 7: Other. Use of this code indicates that the package in question is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination.
   m. Paint and paint cans.
   n. Carpet.
   o. Insulation.
   p. Light Fixtures and other electrical apparatus.
   q. Others as appropriate.
5. Meetings: A description of the regular meetings to be held to address waste management.
6. Materials Handling Procedures: A description of the means by which any waste materials identified above will be protected from contamination, and a description of the means to be employed in recycling the above materials consistent with requirements for acceptance by designated facilities.
7. Transportation: A description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site) and destination of materials.

1.5 SUBMITTALS

A. Construction Waste Management Plan: Submit 3 copies of plan within 21 days of date established for the Notice to Proceed.

B. Calculations and supporting documentation to demonstrate end-of-project recycling rates meeting the requirements for Construction Waste Management Plan of Item above.
C. For materials separated for recycling off-site, establish a method for tracking the weight of the recycled material. The method shall be included in the CWM Plan for the Architect's review and approval.
D. Waste Reduction Progress Reports: Concurrent with the Applications for Payment, submit three copies of report. Include monthly tabulations for demolition and construction waste sent off-site for disposal or recycling.
E. Waste haulers solid waste management license.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 RECYCLING
A. Metal, including but not limited to aluminum stairs, structural beams and sections, and reinforcing steel shall be recycled.
B. Wood that is not painted and does not contain preservatives (i.e. creosote, arsenic, and chromium-containing preservatives) shall be segregated and recycled.

3.2 WASTE MANAGEMENT PLAN IMPLEMENTATION – All sorting will be done “off site” by a recognized construction and demolition processing facility who will be responsible for provision of all documentation as to where loads were processed and the recycling rate achieved.

**END OF SECTION 017419 **

SECTION 017700 - PROJECT CLOSE OUT

1.1 GENERAL

A. Requirements set forth herein are in addition to and shall be considered as complementary to the Conditions of the Contract and the balance of Division #1 and Technical Specifications.

B. All Contractors, Subcontractors, Sub-subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.

1.2 REQUIREMENTS INCLUDED

A. Final Cleanup

B. Required Close Out Documentation

C. Orientation Instruction

D. Project Close Out Inspections

1.3 FINAL CLEANUP

A. The Contractor shall leave the work ready for use and occupancy without the need of further cleaning of any kind.

B. The Contractor shall remove all tools, appliances, project signs, material and equipment from the phased areas as soon as possible upon completion of the work.

C. The work is to be turned over to the Owner in new condition, in proper repair and in perfect adjustment.

1.4 REQUIRED CLOSE OUT DOCUMENTATION

A. Prior to final payment, and **as part of the final requisition**, the Owner shall receive, in addition to those documents required by the General Conditions, the following:

1. Project record documents as per Section 017719.
2. The Contractor's general guarantees.
3. Specific guarantees of material, equipment and systems installed in the work.
4. A copy of all test data taken in connection with the work.
5. Three (3) copies of all operation and maintenance manuals which shall include:
   a. Parts List, including illustrations, assembly drawings and diagrams required for maintenance, predicted life of parts subject to wear, and recommendations for stocking spare parts.
   b. Copies of accepted shop drawings, charts and diagrams.
   c. Names, addresses and telephone numbers of manufacturer’s representative and service company.
   d. Letters from each manufacturer certifying that his equipment was properly installed and is operating in accordance with manufacturer’s intent.
   e. MSDS sheets tabulated and indexed as per specification sections.
   f. Copies of all test reports, including balancing, and with corrections confirmed, must be provided with the contractor’s request for a substantial completion inspection.
   g. An “Underwriter’s Certificate” shall be provided in the O&M manuals to be provided to the Owner.
6. All keys, tools, screens, attic stock, spare construction material and

equipment required to be furnished to the Owner as part of the work.

7. Copies of all Certification of Specifications Compliance as per Section 0133 00.
8. Certified Payroll Records.

B. Further, the following items are required:
1. List of incomplete work
2. Warranty information
3. Documentation that user group instruction, on operable systems, have been done. (operable doors, heating plants, etc.)
4. All Fire Safing has been certified.
5. All doors, hardware, or other features in stairwells and means of egress are fully installed.
6. Fire Protection and Alarm system reports (approved)
7. All necessary inspections and approvals complete (DOH, etc) for use of systems.

C. As Built topographic survey certified by a NY licensed Land Surveyor is required, including horizontal and vertical locations of all foundation walls and piers, top of wall and top of pier elevations, and individual anchor bolt locations.

1.5 ORIENTATION INSTRUCTION

A. Prior to final payment appropriate maintenance personnel of the Owner shall be oriented and instructed by the Contractor in the operation of all systems and equipment as required by the Contract.

1.6 PROJECT CLOSE OUT INSPECTIONS

A. When the Work has reached such a point of completion that the building or buildings, equipment, apparatus or phase of construction or any part thereof required by the Owner for occupancy or use can be so occupied and used for the purpose intended, the Contractor, prior to notification to the Architect, shall make a preliminary inspection of the Work to insure that all the requirements of the Contract have been met and the Work is substantially complete and is acceptable. Upon such notification, the Architect shall make a detailed inspection of the Work to insure that all the requirements of the Contract have been met and that the Work is complete and is acceptable.

B. A copy of the report of the inspection shall be furnished to the Contractor as the inspection progresses so that the Contractor may proceed without delay with any part of the Work found to be incomplete or defective.

C. When the items appearing on the report of inspection have been completed or corrected, the Contractor shall so advise the Architect. After receipt of this notification, the Architect shall inform the Contractor of the date and time of final inspection. A copy of the report of the final inspection containing all remaining contract exceptions, omissions and incompletions shall be furnished to the Contractor.

D. After the receipt of notification of completion and all remaining contract exceptions, omissions and incompletions from the Contractor, the Architect will reinspect the Work to verify completion of the exception items appearing on the report of final inspection.

E. Upon completion of reinspection, the Architect will prepare a certificate of final acceptance or will furnish to the Contractor a copy of the report of the Architect's reinspection detailing Work that is incomplete or obligations that have not been

fulfilled but are required for final acceptance.

The Contractor shall pay the Architect for services performed in inspection beyond the original inspection and two reinspections of the same area, through a "credit" change order to the Owner in accordance with Schedule outlined in Section 01 25 00.

END OF SECTION 017700

SECTION 017719 - PROJECT RECORD DOCUMENTS

1.1 GENERAL

A. Requirements set forth herein are in addition to and shall be considered as complementary to the Conditions of the Contract and the balance of Division #1 and Technical Specifications.

B. All Contractors, Subcontractors, Sub-subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.

1.2 REQUIREMENTS INCLUDED IN THIS SECTION

A. Project Record Drawings

B. Record Drawing Certification

1.3 PROJECT RECORD DRAWINGS

A. The purpose of the project drawings is to record the actual location of the work in place including but not limited to underground lines, concealed piping within buildings, concealed valves and control equipment, and to record changes in the work.

In addition to the above, these drawings shall be "color-coded", by each trade, on a daily basis to indicate progress of the work. Color legend will be assigned by the Architect.

B. In addition to the sets of contract drawings that are required by the Contractor on the site to perform the work, the Contractor shall maintain, at the site, one (1) copy of all drawings, specifications and addenda that are part of the Contract as awarded.

Each of these documents should be clearly marked "Project Record Copy", maintained in a clean and neat condition available at all times for inspection by the Owner or the Architect, and shall not be used for any other purpose during the progress of the work.

The Owner's Representative, <u>or other designee</u>, will be the custodian of the project record documents until the end of the Project.

C. Project Record Requirements

1. The Contractor shall mark-up the "Project Record Copy" to show:
    a. Approved changes in the work.
    b. Location of underground work and concealed work.
    c. Details not shown in the original Contract Documents.
    d. Any relocation of work including piping, conduits, ducts and the like.
    e. All changes in dimensions.
    f. All access doors <u>and</u> "tack" locations access points in accessible ceilings.
    g. Location of all plumbing, heating, ventilating, air conditioning or electrical assemblies, whether existing to remain or newly installed.
    h. Revisions to any electrical circuitry.
2. Such information shall include, but shall not be limited to:
    a. Footing depth in relation to finished grade elevations.

b. Any change in floor elevations.
c. Any structural changes.
d. Any substitutions.
e. Elevations and locations of all underground utilities, services, or structures referenced to permanent above ground structures or monuments.
f. Designation of all utilities as to the size and use of such utilities.
g. All invert elevations of manholes.
h. The location of all utilities, services and appurtenances concealed in building structures that have been installed differently from that required by the Contract.
i. Any approved change order.

and other such data as required by the Architect and/or Owner so as to establish a complete record of "As-Constructed" conditions.

D. The Contractor, ***as part of the contract requirements and at no additional cost to the Owner***, shall keep the project record documents up-to-date from day to day as the work progresses. Appropriate documents are to be updated promptly and accurately; no work is to be permanently concealed until all required information has been recorded.

E. The project record drawings are to be submitted by the Contractor to the Owner or the Architect when all the work is completed and is approved by the Owner and the Architect before the Contractor may request final payment.

If the project record drawings as submitted are found to be unacceptable due to incompleteness or inaccurate information, the drawings shall be returned to the offending Contractor for corrective action and resubmitted for approval prior to the release of final payment.

FINAL PAYMENT IS CONTINGENT UPON PREPARATION OF FINAL PROJECT RECORD DRAWINGS ON A SET OF "PRINTS" and CAD DISKETTES IN "DXF" or “DWG” FORMAT AS APPROVED BY THE OWNER (A SET OF BASE DISKETTES WILL BE FURNISHED BY THE ARCHITECT) AND SUBMITTAL OF SAME TO THE OWNER, THROUGH THE ARCHITECT.

F. In addition to the drawings required as mentioned above, the Contractor shall submit a list of all approved Shop Drawings of the Work as installed.

From this list the Architect will select the drawings desired for permanent records. The Contractor shall furnish these in a bound set to the Owner as part of the closeout requirements.

1.4 RECORD DRAWING CERTIFICATION

A. The record drawings required under the terms and conditions of this Section shall be reviewed and processed by the CM/Contractor as part of their overall contractual responsibility.
B. This certification may be issued for individual trades or as a collective document to cover the entire record drawing requirements of the project.

The format of this certification shall be as follows:

These record drawings prepared by:

_____

for _____
have been reviewed by the undersigned and:

> ***Appear to be an accurate representation of the work incorporated within the project and are accepted as submitted in accordance with the technical documents***.

This record document review made by this office is for determination of compliance to the requirements of the contract documents.

Firm Name: _____

Review Date: _____ By:_____

END OF SECTION 017719

SECTION 017823 - OPERATION AND MAINTENANCE REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL

A. Requirements set forth herein are in addition to and shall be considered as complementary to the Conditions of the Contract and the balance of Division #1 and Technical Specifications.

B. All Contractors, Subcontractors, Sub-subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.

C. Definitions as apply to "Contractors" involved with the work of this Project shall be as set forth in Section 011000, Article 1.01.

1.2 REQUIREMENTS INCLUDED IN THIS SECTION

NOTE: Each project and separate facility will require a separate set of record drawings, maintenance brochures and work plans, each complying with the requirements of this Section.

A. Start Up and Demonstration
B. Parts List
C. Operation and Maintenance Data

1.3 START UP AND DEMONSTRATION

A. The work required herein consists of starting up and demonstrating all systems and equipment to operating personnel and includes training of said operating personnel.

B. The respective Trade or Subcontractor shall make arrangements, via the Owner's Representative (with notification to the Architect), as to whom the instructions are to be given in the operation of the basic and auxiliary systems and the period of time in which they are to be given.

C. As specified in individual sections, furnish the services of instructors to train designated personnel in adjustment, operation, maintenance, and safety requirements of equipment and systems. If procedures are not specified for specific items of equipment, follow that recommended by the item Manufacturer.

D. Instructors shall be thoroughly familiar with the equipment and systems and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given after the equipment or system has been accepted and turned over to the Owner. The duration of instruction shall be as specified in individual sections but shall be not less than two (2) days on each portion of operating mechanical/electrical systems.

When more than four (4) days of instruction are specified, approximately one-half of the time shall be used for classroom instructions. All other time shall be used for instruction with the equipment or system.

Use Operating and Maintenance Data as a training guide.

If requested by the Owner, videotape all demonstrations and training sessions on VHS two hour format and provide cassettes to the Owner.

E. The Architect, and Owner's Representative, shall be completely satisfied that the representative of the Owner has been thoroughly and completely instructed in the proper operation of all systems and equipment before final payment is made. If the Architect, or the Owner's Representative, determines that complete and thorough instructions have not been given by the contractor to the Owners' Representative, then the offending Contractor shall be directed by the Architect to provide whatever instructions are necessary until the intent of this paragraph of the Specification has been complied with as determined by the Architect and Owner's Representative.

1.4 PARTS LIST

A. As required the respective Trade or Subcontractor shall furnish three (3) typed sets of instructions for the ordering and stocking of spare parts for all equipment installed. The lists shall include parts numbered and suggested supplier. Each set shall also include an itemized list of component parts that should be kept on hand and where such parts can be purchased.

1.5 OPERATION AND MAINTENANCE DATA

A. The Contractor shall submit to the Architect for approval three (3) typed sets, bound neatly in hard backed loose leaf binders, of all instructions for the installation, operation, care and maintenance of all equipment, fixtures and systems.

1. Provide typed or printed label identifying binder as operating and maintenance data. List title of project, contract number, and location of equipment.
2. Furnish manufacturer's printed data or sheets neatly typewritten on 8-1/2 inch by 11 inch, 20 pound minimum white paper. Provide indexed tabs.
3. Drawings: Bind in with text. Provide reinforcement rings. Fold larger drawings to the size of the text pages.

Information shall indicate possible problems with equipment and suggested corrective action.

B. CONTENT OF MANUAL FOR EQUIPMENT AND SYSTEMS

The instructions shall contain information deemed necessary by the Architect and include but not be limited to the following:

1. Introduction:
    a. Explanation of Manual and its use.
    b. Summary description of all mechanical and electrical and equipment operating systems.
    c. Purpose of systems.
    d. Maintenance scheduling summary analysis, sheets and software operating instructions and diskette(s).
2. System:
    a. Detailed description of all systems.
    b. Illustrations, schematics, block diagrams, photographs and other exhibits.
    c. Complete wiring diagrams, tabulations and installation drawings.
    d. Valve tag charts and control diagrams.
    e. 1/2 size reduced copy of "Record Drawings".

3. Operations:
   a. Complete detailed, step-by-step, sequential description of all phases of operation for portion of the systems, including startup, shutdown, adjusting and balancing, and emergency procedures. Include all posted instruction charts.
4. Maintenance:
   a. Parts list and parts number.
   b. Maintenance, lubrication and replacement charts and Contractor's recommendations for preventative maintenance.
   c. Trouble shooting charts for systems and components.
   d. Instructions of testing each type of part.
   e. Recommended list of on-hand spare parts.
   f. Complete calibration instructions for all parts and entire systems.
   g. Instruction for charging, filling, draining and purging.
   h. General or miscellaneous maintenance notes.
5. Manufacturer's Literature:
   a. Complete listing for all parts with names, addresses and telephone numbers.
   b. Care and operation.
   c. All and only pertinent brochures, illustrations, drawings, cuts, bulletins, technical data, certified performance charts and other literature with the model actually furnished to be clearly and conspicuously identified.
   d. Internal wiring diagrams and engineering data sheets for all items and/or equipment to be furnished.
   e. Guarantee and warranty data.
6. Instructions for lubricating each piece of equipment installed. Instructions shall state type of lubricant, where and how frequently lubrication is required.

   Frame all instructions under glass and hang in the Mechanical Room or other location as directed by Architect.

C. MANUALS FOR PRODUCTS, MATERIALS, AND FINISHES:
   1. Submit three (3) copies of complete manual.
   2. Content: Provide complete information for architectural products, applied materials, and finishes.
      a. Manufacturer's data, including catalog number, size, composition, color and texture designations, and information for reordering.
      b. Instructions for care and maintenance, including manufacturer's recommendations for cleaning agents and methods; cautions against detrimental cleaning agents and methods; and recommended schedule for cleaning and maintenance.

PART 2 – PRODUCTS - NOT USED

PART 3 – EXECUTION - NOT USED

END OF SECTION 017823

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Demonstration of operation of systems, subsystems, and equipment.
   2. Training in operation and maintenance of systems, subsystems, and equipment.

1.2 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
   1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Attendance Record: For each training module, submit list of participants and length of instruction time.

1.3 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

1.4 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
   a. System, subsystem, and equipment descriptions.
   b. Performance and design criteria if Contractor is delegated design responsibility.
   c. Operating standards.
   d. Regulatory requirements.
   e. Equipment function.
   f. Operating characteristics.
   g. Limiting conditions.
   h. Performance curves.
2. Documentation: Review the following items in detail:
   a. Emergency manuals.
   b. Operations manuals.
   c. Maintenance manuals.
   d. Project record documents.
   e. Identification systems.
   f. Warranties and bonds.
   g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
   a. Instructions on meaning of warnings, trouble indications, and error messages.
   b. Instructions on stopping.
   c. Shutdown instructions for each type of emergency.
   d. Operating instructions for conditions outside of normal operating limits.
   e. Sequences for electric or electronic systems.
   f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
   a. Startup procedures.
   b. Equipment or system break-in procedures.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Control sequences.
   f. Safety procedures.
   g. Instructions on stopping.
   h. Normal shutdown instructions.
   i. Operating procedures for emergencies.
   j. Operating procedures for system, subsystem, or equipment failure.
   k. Seasonal and weekend operating instructions.

l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:
   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
   a. Diagnostic instructions.
   b. Test and inspection procedures.
7. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.
8. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
   2. Owner will furnish an instructor to describe Owner's operational philosophy.

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Provide floor slabs on grade including mesh reinforcement, vapor barriers, jointing systems and the like.

C. Supply, fabricate, and place all required reinforcing bar.

D. This section includes cast-in-place concrete for the following:

1. Light pole footings – Coordinate the work with electrical requirements including grounding design.

1.2 SUBMITTALS

A. Product Data: Submit product data for proprietary materials & items including reinforcing and forming accessories, admixtures, water stops, joint systems, and curing compounds

B. Submit shop drawings for fabrication, bending, & placement of concrete reinforcement

C. Provide jointing plan for horizontal placement of concrete grade slabs

D. Submit laboratory test reports for concrete materials and mix design test

E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

F. Welding certificates.

G. Material certificates.

H. Material test reports.

I. Floor surface flatness and levelness measurements.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

E. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

F. Preinstallation Conference: Conduct conference at Construction trailer.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete (Exposed): medium density plastic overlaid plywood 5/8" min. thickness. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: (Concealed) 'Plyform' plywood 5/8" min thickness.

2.2 STEEL REINFORCEMENT

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. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed billet steel. Bars bent cold.

C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets. Rolls not permitted.

D. Reinforcement accessories shall include spacers, chair ties, chair bars and other devices for properly assembling, placing, spacing, supporting, & fastening reinforcement.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I or Type II Free from water soluble salts or alkalis.

a. Fly Ash: ASTM C 618, Class F or C.

B. Normal-Weight Aggregates: ASTM C 33, graded.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement. Provide aggregates from a single source for exposed concrete

C. Water: ASTM C 94/C 94M.

D. Concrete fill for steel stair & landing pans: composed of 1:2:2 mix with a 3/8" maximum size normal weight aggregate. Place with a 0" to 1" slump.

2.4 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

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 and Retarding Admixture: ASTM C 494/C 494M, Type D.
2. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
3. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
4. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 WATERSTOPS

A. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricate corners, intersections, and directional changes.

B. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

2.6 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Material: polyethylene or approved equivalent, minimum thickness 6-mil. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.7 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

2.8 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

2.9 CONCRETE MIXTURES

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 301.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of Portland cement, which would otherwise be used, by not less than 40 percent.

C. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing high-range water-reducing 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.

D. Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, 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.

PART 3 - EXECUTION

3.1 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. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 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.

3.3 VAPOR RETARDERS

A. Sheet Vapor Retarders: Material: polyethylene or approved equivalent, minimum thickness 6-mil. Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 12 inches and seal with manufacturer's recommended tape.

3.4 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.

3.5 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.

C. Contraction 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. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/4 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-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.

E. Waterstops: Install in construction joints and at other joints indicated according to manufacturer's written instructions.

3.6 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. 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. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

C. Cold-Weather Placement: Comply with ACI 306.1.

D. Hot-Weather Placement: Comply with ACI 301.

3.7 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

3.8 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, 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 1/8 inch in one direction.

1. Apply scratch finish to surfaces to receive concrete floor toppings to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill

low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten 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.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

3.9 CONCRETE PROTECTING 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 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. Cure concrete according to 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.
2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.10 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

END OF SECTION 033000

3. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
   1. Schedule training with Owner, through Architect, with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 017900

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Provide floor slabs on grade including mesh reinforcement, vapor barriers, jointing systems and the like.

C. Supply, fabricate, and place all required reinforcing bar.

1.2 SUBMITTALS

A. Product Data: Submit product data for proprietary materials & items including reinforcing and forming accessories, ad mixtures, waterstops, joint systems, and curing compounds

B. Submit shop drawings for fabrication, bending, & placement of concrete reinforcement

C. Provide jointing plan for horizontal placement of concrete grade slabs

D. Submit laboratory test reports for concrete materials and mix design test

E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

F. Welding certificates.

G. Material certificates.

H. Material test reports.

I. Floor surface flatness and levelness measurements.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

E. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

F. Preinstallation Conference: Conduct conference at Construction trailer on site <Insert location>.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete (Exposed): medium density plastic overlaid plywood 5/8" min. thickness. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete:(Concealed) 'Plyform' plywood 5/8" min thickness.

2.2 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed billet steel. Bars bent cold

C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets. Rolls not permitted.

D. Reinforcement accessories shall include spacers, chair ties, chair bars and other devices for properly assembling, placing, spacing, supporting, & fastening reinforcement.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, [Type I] or Type II Free from water soluable salts or alkalies.

a. Fly Ash: ASTM C 618, Class F or C.

B. Normal-Weight Aggregates: ASTM C 33, graded.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement. Provide aggregates from a single source for exposed concrete

C. Water: ASTM C 94/C 94M[and potable].

D. Concrete fill for steel stair & landing pans: composed of 1:2:2 mix with a 3/8" maximum size normal weight aggregate. Place with a 0" to 1" slump.

2.4 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

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 and Retarding Admixture: ASTM C 494/C 494M, Type D.
2. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
3. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
4. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 WATERSTOPS

A. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops[with factory-installed metal eyelets], for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricate corners, intersections, and directional changes.

B. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

2.6 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.7 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

2.8 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: [ASTM D 1751, asphalt-saturated cellulosic fiber] [or] [ASTM D 1752, cork or self-expanding cork].

2.9 CONCRETE MIXTURES

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 301.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

C. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing high-range water-reducing 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.

D. Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 5 inches, plus or minus 1 inch.
4. Air Content: [5.5] <Insert number> percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M **and ASTM C 1116/C 1116M**, 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.

PART 3 - EXECUTION

3.1 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. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 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.

3.3 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.4 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.

3.5 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.

C. Contraction 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] <Insert depth> of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-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.

E. Waterstops: Install in construction joints and at other joints indicated according to manufacturer's written instructions.

3.6 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. 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. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

C. Cold-Weather Placement: Comply with ACI 306.1.

D. Hot-Weather Placement: Comply with ACI 301.

3.7 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces [not exposed to public view] <Insert locations>.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

3.8 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, 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 in one direction.

1. Apply scratch finish to surfaces to receive concrete floor toppings to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten 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.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

3.9 CONCRETE PROTECTING 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 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. Cure concrete according to 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.
2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.10 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

END OF SECTION 03 30 00

SECTION 033543 - CONCRETE TOPPING COMPOUND

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the concrete topping compound as shown on the drawings and specified herein, including, but not necessarily limited to, the following:

1. Self-leveling cement topping.

1.3 RELATED SECTIONS

A. Cast-in-Place Concrete - Section 03 30 00.

1.4 REFERENCE STANDARDS

A. Reference Standards if fly-ash is specified:

1. ASTM C618, Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Uses as a Mineral Admixture in Portland Cement Concrete

2. ASTM C311, Standard Methods of Sampling and Testing Fly Ash and Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete.

B. Reference Standards if ground granulated blast furnace (GGBF) slag is specified):

1. ASTM C989, Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars

2. Standard Practice ACI 226.R1, Ground Granulated Blast-Furnace Slag as a Cementitous Constituent in Concrete

1.5 QUALITY ASSURANCE

A. Applicator: Company specializing in performing the work of this Section with a minimum of 3 years' experience and approved by the manufacturer of the product used.

B. Tolerance: Top surface shall be level to 1/8" in 10 ft.

1.6 SUBMITTALS

A. Submit catalog information and product data for material to be used.

1.7 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.8 JOB REQUIREMENTS

A. Do not install topping until floor penetrations and peripheral work are complete.

B. Maintain minimum ambient temperatures of 50 degrees F. 24 hours before, during, and 72 hours after installation of topping.

C. During the curing process, ventilate spaces to remove excess moisture and until topping is dry, allow a minimum of seven (7) days.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide "Ardex SD-T Self-Drying, Self-Leveling Concrete Topping" as manufactured by Ardex Inc., 400 Ardex Park Drive, Aliquippa, PA 15001, or approved equal.

1. Topping shall be able to be installed from 1/4" to 2" in one pour and tapered to match the existing elevations.

2. Topping to be applied to a minimum average thickness of 1/4" over highest point in the subfloor.

3. Topping material shall achieve compressive strength of 6100 psi after 28 days per ASTM C 1090/mod.

4. Topping shall be walkable after 2 to 3 hours at 70 deg. F.

5. Topping shall be able to be surface treated as soon as it can be walked upon without damage.

2.2 MATERIALS

A. Portland-cement-based, self-drying, self-leveling topping.

B. Primer for concrete substrate shall be "Ardex P-51 Primer."

C. Water shall be clean, potable and sufficiently cool (not warmer than 70 deg. F.)

D. Aggregate as applicable for deep fill areas shall be 1/8" to 1/4" washed, dried and graded pea gravel.

E. Wear Surface: The finished SD-T surface shall be normal smooth trowel and coated with 2 coats of RJSC TekSeal followed by one coat of RJSC StoneLok "E for SC-T" applied in accordance with RJSC written specifications. Matte, low gloss or gloss, and number of coats, shall be as approved by the Architect.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where concrete topping compound is to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PREPARATION

A. Floor Preparation

1. All standard absorbent concrete surfaces must be sound, solid, cleaned and primed.

2. All subfloors must be of adequate strength, clean, and free of all oil, grease, dirt curing compounds and any substance which might act as a bond breaker before priming. Mechanically clean, if necessary, using shot-blasting or other. Acid etching and the use of sweeping compounds and solvents are not acceptable.

3. All dormant cracks in the subfloor shall be repaired using Ardex SD-P Self Drying, Fast Setting Concrete Underlayment Patch to minimize telegraphing through the topping.

4. All moving joints, to include expansion and isolation joints, shall be honored up through the topping.

5. All active cracks shall be handled in accordance with the recommendations of a structural engineer.

6. Substrates shall be inspected and corrected for moisture or any other conditions which could affect the performance of the topping or the finish coating.

7. Ardex materials are cementitious material. Observe the basic rules of concrete work. Do not install below 50 deg. F. surface temperature. Install quickly if floor is warm and floor how weather precautions available from Ardex Technical Service Department. Never mix with cement or additives other than specified herein or other than specifically Ardex approved.

8. Joints: Honor all expansion and isolation joints up through the underlayment.

9. Saw Cuts and Control Joints: Fill all non-moving joints with Ardex SD-F Feather finish or Ardex SD-P InstantPatch as required.

B. Priming: Initial application of Ardex P-51 diluted with three parts water. Apply evenly with a soft push broom. Do not leave bare spots. Remove all puddles and excess primer. Allow to dry thoroughly to a clear, thin film, 1 to 3 hours. Install a second application of Ardex P-51 mixed 1:1 with water. The topping shall not be applied until primer is thoroughly dry.

3.3 INSTALLATION OF SELF-LEVELING PRODUCT

A. Installation

1. Ardex SD-T is mixed in 2 bag batches at one time. Measure out 2 x 4 3/4 quarts of clean, potable water into Ardex T-10 Mixing Drum. For integral color, thoroughly shake container of RJSC Colloidal Dye custom blend and add entire contents to pre-measured water and stir. Add two bags of Ardex SD-T (50 lbs. each) and mix using Ardex T-1 Mixing Paddle and a 1/2" heavy-duty drill (min. 650 rpm). Mix thoroughly for approximately 2 to 3 minutes to obtain a lump-free mixture. Follow written instructions per the Ardex SD-T bag label.

2. Pour the liquid Ardex SD-T and spread in place with the Ardex T-4 Spreader. Use the Ardex T-5 Smoother for featheredge and touch-up. Wear baseball shoes with non-metallic cleats to avoid leaving marks in the liquid Ardex SD-T.

3. The topping can typically be walked on in 2 to 4 hours at 70 deg. F.

B. Sealing Sequence

1. This process shall begin at soon as smooth surfaces can be walked on without causing damage; and when sanded floors are totally dry and free of all residues. If this is not possible, there must be NO foot traffic on the finished floor or it must be physically protected with non-scratch Kraft paper for walking and with Kraft paper plus Masonite for on-going construction.

2. If sealer to be applied to natural cured surface, wear clean socks and no shoes on floor during sealing process.

3. First coat of TekSeal to be applied to floor area.

4. StoneLok clear coat(s) to be applied as final step(s).

C. Sealer Application

1. Shake TekSeal Matte thoroughly to be sure all matting agents are in emulsion. Apply TekSeal using HVLP (only) sprayer with application technique to achieve visual results of approved sample(s).

2. For dry times, and subsequent coat timing, follow RJSC Usage and Cure Chart for TekSeal and StoneLok.

3. For final coat, thoroughly shake one or more gallons of StoneLok to be sure all matting agents are in emulsion. If gloss, gently swirl. Thirty (30) minutes prior to use, add one bottle each activator and Binder per gallon StoneLok. Stir with clean utensil.

4. Apply using HVLP (only) sprayer with fluid nozzle for thin materials moving at even pace with gun a consistent 10" to 12" from surface and getting maximum coverage without pooling.

5. Follow "Usage and Cure Chart" and "Precautions and Immediate Post Application Care." Installation must be physically protected after completion thorough construction and move-in.

3.4 APPLICATION OF CEMENTITIOUS TOPPING AT NO GREATER THAN ¼"

A. Apply a scratch coat of the mix to the substrate with the flat side of a steel trowel to obtain a solid mechanical bond. Apply sufficient pressure to fill all defects and to feather the product into the subfloor surface. The scratch coat or base coat should be applied to pre-smooth and achieve a uniformly absorbent surface.

B. It is necessary to have a minimum of two coats of ARDEX SD-M with the total finished thickness of 20 mils (about the thickness of a standard business card). Use the least amount possible to attain the desired smoothness. The finish coat may be applied as soon as the trowel will not damage the base coat. A third application of ARDEX SD-M is optional depending on the desired finish and texture. This application is used primarily to achieve a very smooth troweled finish. Total thickness should not exceed 1/16".

C. The surface of ARDEX SD-M must always be protected from oil, salt, water, and surface wear by applying a suitable protection system such as concrete sealer or paint. Ardex recommends the use of ARDEX CG CONCRETE GUARD to seal ARDEX SD-M that will be exposed to normal foot traffic. The topping must be coated with a wear protection coating suitable for the intended use of the floor. The coating process can begin within 2- 3 hours after installation if a water-borne coating is selected.

3.5 FIELD QUALITY CONTROL

A. field sampling of the Ardex topping is to be done by taking an entire unopened bag of the product being installed to an independent testing facility to perform compressive strength testing in accordance with ASTM C 109/modified: air-cure only.

END OF SECTION 033543

SECTION 071326 - SHEET MEMBRANE WATERPROOFING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the sheet membrane waterproofing as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

1. Sheet membrane waterproofing for under slab conditions.

2. Sheet membrane waterproofing for foundation wall surfaces.

1.3 RELATED SECTIONS

A. Cast-in-Place Concrete - Section 03 30 00.

B. Crystalline Waterproofing - Section 07 16 16.

C. Earthwork - Section 31 20 00.

1.4 SUBMITTALS

A. Shop D r a w i n g s : Typical installation details, showing details at flashings, at terminations, at joints, at intersection of horizontal and vertical surfaces, and at penetrations in membrane system.

B. Samples - Submit

1. Membrane, 6" x 6" samples of each membrane.

2. 6" x 6" sample of flashing.

3. 6" x 6" sample of drainage board.

C. Manufacturer's Literature: Submit manufacturer's technical, safety data sheets, and installation literature for all materials of this Section. Submit Independent Test data indicating that membrane meets properties specified herein.

D. General Contractor's Certification: Submit per Article 1.5.

1.5 QUALITY ASSURANCE

A. Preinstallation Conference: Approximately 2 weeks prior to scheduled commencement of waterproofing installation, meet at Project site with Waterproofing Installer; preparer of substrate to receive waterproofing; installers of other work in and

around waterproofing that must precede, follow, or penetrate waterproofing (including Mechanical and Electrical Installers as applicable); Architect; Owner; and waterproofing manufacturer's representative to review materials, procedures, schedules, and other requirements and conditions related to installing waterproofing.

B. Qualifications of Subcontractors

1. Subcontractors: All work of this Section shall be performed by a subcontractor who is approved by the manufacturer of the waterproofing material.

2. Qualifications of Subcontractors: Subcontractors shall submit evidence of being bona fide waterproofing subcontractors, for a period of not less than five (5) years, and that they are approved by the manufacturer of the waterproofing material for the installation of the manufacturer’s material in accordance with the requirements of this Section.

   a. Subcontractor shall submit a letter from manufacturer of waterproofing material stating that subcontractor is approved by the manufacturer for the application of the waterproofing systems specified and accepted for use on the Project.
   b. Letter shall certify that the subcontractor has previously and satisfactorily applied the waterproofing systems specified herein on jobs of similar size and scope, under manufacturer’s supervision.
   c. Letter shall be on manufacturer’s letterhead and shall be signed by an officer of the company, not by a local sales representative.

C. Manufacturer’s Representative/Contractor’s Certification

1. Representative of the waterproofing material manufacturer shall be required to provide field instructions and supervision for the installation of the waterproofing systems at the start of the work of this Section.

2. The manufacturer’s representative shall be required to make sure that the workmen for waterproofing systems on the site of the Project are fully instructed and trained in the handling and application of all the materials and shall see that all the materials are correctly installed.

3. Upon completion of the Installation, submit to the Architect written certification that the representative of the manufacturer of the waterproofing material has supervised the work of this Section and that all materials were correctly installed.

D. The project Geotechnical Report shall be provided to the Manufacturer for review and approval at time of waterproofing applicator's bid.

E. A preinstallation meeting shall be coordinated by the General Contractor and attended by an Owner’s Representative, the Waterproofing Consultant, the waterproofing applicator and membrane manufacturer’s representative. Any trade having relevant or adjacent work to blindside system before, during and after installation should also be present and properly represented by a Project Manager and Job Foreman. These trades include the Foundation Contractor, the Concrete Contractor, the Steel Reinforcement Contractor, the Mechanical Contractor, the Electrical Contractor and the Plumbing Contractor. The purpose of this meeting is to discuss the necessity of

ensuring proper waterproofing membrane protection during all phases of installation and to review other applicable requirements or unusual field conditions.

F. Upon request by the Approved Applicator, an inspection will be conducted by the Manufacturer's representative to ensure that the waterproofing membrane has been installed according to the Manufacture's specifications and details. This inspection shall be coordinated prior to installing the blindside components so that access to the membrane is not impaired.

G. An in-progress inspection may be scheduled after the initial inspection (after the membrane installation is completed) to ensure proper protection procedures are being followed to prevent possible damage to the membrane during the installation of above membrane components

H. Manufacturer shall have access to the job site at the start of installation, periodically as work progresses and after installation completion for the waterproofing and any other relevant or adjacent work

1.6 STORAGE OF MATERIALS

A. All materials shall be stored in their original tightly sealed containers or unopened packages; shall be clearly labeled with the manufacturer's name, brand name and number, and batch number of the material with expiration date where appropriate.

B. Materials shall be stored in a neat and safe manner so as not to exceed the allowable live load of the storage area.

C. Material shall be stored out of the weather in a clean, dry area.

D. Liquid materials, such as adhesives, thinners and primers, shall be stored in areas away from sparks, open flames and excessive heat.

1.7 JOB CONDITIONS

A. No application of waterproofing shall commence or proceed during inclement weather, or the threat of imminent precipitation.

B. All surfaces to receive the system shall be thoroughly dry and free of dew or frost.

C. Materials shall be stored until time of mixing at temperatures above 60 deg. F. to maintain a consistency suitable for mixing. Do no work below 40 deg. F.

D. Prior to and during application, all dirt and dust shall be removed from surfaces either by vacuuming, sweeping, blowing with compressed air, or similar methods.

E. Surfaces not designated to receive the system shall be properly masked or otherwise protected against accidental spillage or application of the material to those areas.

1.8 PROTECTION

A. Against Loads: Protect work of this Section against concentrated loads and any other loads or equipment that would damage the materials or work.

B. Against Traffic: Do not permit traffic on horizontally installed work of this Section, except for workmen doing the work, during the installation, and after the installation until membrane systems are covered with protective boards or with the specified finishing materials.

C. Against Damage: Protect vertically installed work of this section from damage by reinforcing and placement.

1. Take and maintain necessary preventive measures to protect work of this Section from damage until Project is accepted.

2. Rejection of Damaged Work

a. Damaged materials or work will be rejected.
b. Rejected materials or work must be immediately removed and replaced with new materials.

1.9 FIELD QUALITY CONTROL

A. Construction Traffic:

1. Limit construction traffic over completed membrane.

2. General Contractor shall provide 1/2 in. plywood protection layer, where construction traffic is unavoidable.

B. Inform Architect in writing on a daily basis of any of the following events. State specific location of each occurrence.

1. Buckling to the Waterproofing and other deformations as a result of ground water events.

2. Leakage through the finished waterproofing installation.

3. Damage by other trades.

C. Provide Manufacturer's Representative's report (prior to backfill) stating that the waterproofing has been inspected and is acceptable and eligible for manufacturer's warranty.

1.10 WARRANTY

A. The manufacturer of the waterproofing system executed under this Section warrants the waterproofing system to be watertight and free from defects in materials and workmanship for a period of ten (10) years from date of acceptance of this Contract, and that he, agrees to promptly make repairs or replace defective waterproofing materials during the warranty period.

B. Contractor's Two-Year Workmanship Warranty: Provide a written guarantee for all work of this Section, stating that if, within two years after the Date of Substantial Completion of the Work, any of the work is found to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of a

written notice from the Owner to do so. The guarantee shall state that the Contractor shall bear all costs incurred by the Owner, including reasonable attorney's fees, to enforce compliance with the obligations of this Guarantee, and will replace any material or system that requires repeated maintenance or repair to function effectively. The obligation of this Guarantee shall run directly to the Owner and may be enforced by the Owner against the Contractor, shall survive the termination of the Contract and shall not be limited by Conditions other than this Contract.

PART 2 PRODUCTS

2.1 WATERPROOFING MEMBRANE

A. Trade names used herein for membrane waterproofing are those of GCP Applied Technologies. Other acceptable manufacturers will be Carlisle Coatings and Waterproofing (CCW) or approved equal.

B. For foundation walls, provide "Bituthene 4000" sheet waterproofing membrane, 60 mils thick and "Liquid Membrane," 60 mils thick, for flashing, as manufactured by GCP Applied Technologies or approved equal.

C. At under-slab conditions, provide adhesive coated HDPE Composite Sheet "Preprufe 300R Plus" system by GCP Applied Technologies or approved butyl alloy adhesive coated reinforced TPO Composite Sheet "MiraPly H" system by CCW.

1. Blindside HDPE membrane or reinforced TPO membrane shall have a protective layer to protect the membrane from the weather and U.V. for up to 56 days before casting concrete against it.

D. Primer/Conditioner: "Bituthene 4000" latex/water-based primer specifically formulated to provide adhesion of Bituthene Waterproofing Membranes.

1. If water-based primer does not provide sufficient adhesion to substrate, substitute Bituthane Primer B-2 solvent-based primer.

E. Mastic: "Bituthene Elastomeric Mastic" rubberized asphalt-based mastic.

F. Tape: Double sided synthetic adhesive tape equal to "Preprufe LT" and "HC."

G. Protection Board: 1/4" thick semi-rigid protection board, "Bituthene Asphaltic Hardboard."

H. Bituthene Liquid Membrane: Two-component 100% solids trowel grade asphalt modified urethane.

I. Drainage Board/Composite

1. For vertical application, use "Hydroduct 220" prefabricated dimpled polystyrene drainage core with a non-woven filter fabric on one side and a polymer film on the reverse side, by GCP Applied Technologies.

2. At horizontal applications, use "Hydroduct 660" by GCP Applied Technologies.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where membrane waterproofing is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work. Starting of work implies acceptance of substrate.

3.2 PREPARATION OF SURFACES TO RECEIVE WATERPROOFING

A. Conform to the requirements of specified manufacturer.

B. Earth or crushed stone substrates shall be compacted to produce an even, sound substrate. Loose aggregate, sharp protrusions and standing water shall be removed.

3.3 INSTALLATION OF FOUNDATION WALL WATERPROOFING

A. General: Conform to recommendations and published specifications of the manufacturer' including environmental requirements and preparation requirements to receive waterproofing.

B. Accessible Foundation Walls

1. General: The membrane, when in place must withstand a minimum static ground water pressure of 150 feet.

2. Priming: Application of primer shall be limited to what can be covered with Bituthene Waterproofing Membrane in a given work day. Primed areas not covered by membrane during the work day will be reprimed. Apply primer by spray, roller or brush at a rate of 250 - 350 sq. ft. per gallon. Roller shall be natural material such as lamb's wool, having a nap of approximately one inch. Primer shall be applied to a clean, dry, frost-free and dust-free surface. Sufficient primer must be used on the day surface to condition it to a dust-free state suitable for the application of Bituthene Waterproofing Membranes.

   a. Bituthene 4000 Surface Conditioner should not be applied below 25 deg. F. on vertical surfaces. Allow primer to dry 30 minutes. Conditioner is considered dry when the substrate returns to its original color.
   b. Re-prime areas that become dusty or dirty prior to membrane installation.

3. Membrane Installation: Apply Bituthene Waterproofing Membrane vertically in sections of 8' in length or less. On higher walls apply two or more sections with the upper overlapping the lower by a least 2-1/2". Press all membrane in place with heavy hand pressure or rollers during application.

4. Sealing Edges: Bituthene Waterproofing Membrane shall be applied over the edge of the slab or over the top of the foundation or parapet wall. If the membranes are terminated on the vertical surface, a reglet or counter flashing may be used or the membrane may be terminated directly on the vertical surface by pressing very firmly to the wall. Press edges with a metal or hardwood tool

such as a hammer or knife handle. Apply a troweled bead of Bituthene Mastic to all vertical and horizontal terminations. Bituthene Liquid Membrane can be used as an alternative method at the General Contractor's option.

5. Sealing Seams: All edges and end seams must be overlapped at least 2-1/2". Apply succeeding sheets with a minimum 2-1/2" overlap and stagger end laps. Roll or press the entire membrane firmly and completely as soon as possible. Patch misaligned or inadequately lapped seams with Bituthene Membrane. Slit any fish mouths, overlap the flaps, and repair with a patch of Bituthene and press or roll in place. The edges of the patch shall be sealed with a troweling of mastic. Laps within 12" of all corners shall be sealed with a troweling of mastic.

6. Corner Forming: Outside corners must be free of sharp edges. Inside corners shall receive a fillet formed with Liquid Membrane, latex modified cement mortar equal to Daraweld C made by Grace mixed with cement mortar or epoxy mortar. Do not use fiber or wood cants. One of two methods may be used for treating corners at the General Contractor's option:

   a. Apply Bituthene Liquid Membrane 6" in each direction from the corner and form a fillet with a minimum 3/4" face.
   b. Install an 11" minimum strip of Bituthene Membrane centered on the corner. Install Bituthene Membrane over the treated inside and outside corners.

7. Over waterproofing, apply drainage composite board by adhering board to cured membrane using tape or adhesive per manufacturer’s recommendations; lap all edges 4” and conform to the following:

   a. Install drainage layer directly over the membrane. Start at the low points on the wall and shingle all laps to the flow of water.
   b. Splice drainage panels together by butting longitudinal edges of adjacent sheets and peeling back fabric to expose the cores of the panels. Install precut “lock strips” consisting of 4 dimple x 5 dimple sections of the drainage panel centered on the joint between the panels and spaced every 10 dimples along the length of the joint. Snap dimples of "lock strip" to dimples of each panel and reattach fabric over the panel joint.
   c. Cut the core of the drainage panels around penetrations and cut an 'X' in the filter fabric and tape the fabric to the sides of the penetration.
   d. Cover all terminal edges of the drainage composite with an integral fabric flap by tucking the fabric around the edge of the core and adhering the fabric to the bottom of the core.

3.4 INSTALLATION OF BLIND-SIDE WATERPROOFING

A. General: Install adhesive coated HDPE composite sheet according to waterproofing manufacturer's written instructions.

1. Install drainage layer directly over the membrane.

2. Splice drainage panels together by butting longitudinal edges of adjacent sheets and peeling back fabric to expose the cores of the panels. Install precut “lock strips” consisting of 4 dimple x 5 dimple sections of the drainage panel centered on the joint between the panels and spaced every 10 dimples along the length of

the joint. Snap dimples of “lock strip” to dimples of each panel and reattach fabric over the panel joint.

3. Cut the core of the drainage panels around penetrations and cut an 'X' in the filter fabric and tape the fabric to the sides of the penetration.

4. Cover all terminal edges of the drainage composite with an integral fabric flap by tucking the fabric around the edge of the core and adhering the fabric to the bottom of the core.

B. Preparation

1. Surfaces to receive blind side membranes must be smooth and sound, with no gaps or voids in excess of 1/2". Earth and stone substrates must be compacted to produce an even, solid substrate. If required by membrane manufacturer, provide an additional layer of underlayment protection board over sharp or angular stone substrates. Surfaces to receive waterproofing shall be thoroughly dry and free of moisture.

2. General: Comply with manufacturer's instructions for preparing surface including joint or crack treatment.

3. Apply primer to substrate surfaces at rate recommended by manufacturer of primary waterproofing materials. Prime only area that will be covered by waterproofing membrane in same working day. Reprime areas not covered by waterproofing membrane within 24 hours.

C. Underslab Applications

1. Apply Hydroduct 660 drainage composite board as recommended by manufacturer over the compacted sub-grade.

2. Apply the membrane over the drainage composite board with the HDPE side facing the drainage composite board and the treated white coating surface facing the concrete to be poured. The membrane may be installed at any convenient length. Apply succeeding sheets by overlapping previous sheets 3" along the self-adhesive edge of the membrane. Remove the silicone coated release liner covering the membrane and roll the side lap to assure a tight seal.

3.5 SEAM REINFORCEMENT FOR HDPE COMPOSITE SHEETS ONLY

A. Provide a 6" strip of modified bituminous sheet membrane (Bituthene 4000) centered behind all laps.

B. At locations where a salvage edge is not present and at end laps, lap sheets 6", apply a 1/8" thick by 6" wide application of liquid membrane between sheets, to provide a 6" wide seal.

C. Integration of old onto new pre-applied sheet membrane.

1. Integration of Sheet Membrane onto Sheet Membrane that has been installed in excess of 30 days prior

a. Lap sheets 12", apply a 1/8" thick by 12" wide application of fluid membrane between sheets, to provide a 12" wide seal at this location.
b. Install Waterproofing Tape centered at edge of lap and roll firmly into place with an approved roller.
c. Install additional Waterproofing Tape to cover white film that has been installed over 30 days prior.

2. Repair of pre-applied sheet membrane

a. Scratch on white coating exposing underlying black surface of Sheet Membrane. Install Waterproofing Tape at areas where the white coating of the membrane is damaged, including boot scuff marks and abrasions by rebar.
b. Damage or Puncture of Sheet Membrane: Install Patch of short Membrane set in Liquid Membrane. Patch must extend 3" in every direction around extent of damaged area. Install Waterproofing Tape centered over the edge of the patch. If the damaged area does not have 5" of sound material around it, inject Liquid Membrane into puncture until Liquid Membrane backs out, and proceed with patch as space allows.

3.6 CLEAN-UP

A. Upon completion of the waterproofing system, the General Contractor shall remove all equipment, material and debris from the work and storage area, and leave those areas in an undamaged and acceptable condition.

END OF SECTION 071326

SECTION 071616 - CRYSTALLINE WATERPROOFING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the crystalline waterproofing as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

1. Crystalline waterproofing system for interior surfaces of pits, including elevator pits.

1.3 RELATED SECTIONS

A. Cast-in-Place Concrete - Section 03 30 00.

1.4 SUBMITTALS

A. Shop Drawings: Submit shop drawings showing details at terminations, at joints, at intersection of horizontal and vertical surfaces, and at penetrations in waterproofing system.

B. Product Data: Submit manufacturer's technical information and installation instructions for all materials of this Section.

C. Contractor's Certification: Submit per Article 1.6.

D. Subcontractor's Qualifications: Submit per Article 1.7.

1.5 STORAGE OF MATERIALS

A. All materials shall be stored in their original tightly sealed containers or unopened packages; shall be clearly labeled with the manufacturer's name, brand name and number, and batch number of the material where appropriate.

B. Materials shall be stored in a neat and safe manner so as not to exceed the allowable live load of the storage area.

C. Material shall be stored out of the weather in a clean, dry area.

1.6 MANUFACTURER'S REPRESENTATIVE

A. Contractor shall require representative of manufacturer of the waterproofing material to provide field instructions and supervision of the installation of the complete waterproofing system.

B. Contractor shall require the manufacturer's representative to make sure that the subcontractor's workmen are fully instructed and trained in the handling and application of all the materials, and shall see that all the materials are correctly installed.

C. Upon completion of the installation, the Contractor shall submit to the Architect a written certification that the representative of the manufacturer of the waterproofing material has supervised the work of this Section and that all materials are correctly installed.

1.7 QUALIFICATIONS OF SUBCONTRACTORS

A. Subcontractors: All work of this Section shall be performed by a subcontractor who is approved by the manufacturer of the waterproofing material.

B. Qualifications of Subcontractors: Subcontractors, in order to obtain Architect's acceptance for doing work of this Section, shall submit evidence of being bona fide waterproofing subcontractors, and that they are approved by the manufacturers of the waterproofing material for the installation of their material in accordance with the requirements of this Section. Subcontractor shall submit letter from manufacturer of waterproofing material stating that the subcontractor is approved by the manufacturer for the application of the waterproofing system specified for the Project. Letter shall certify that the subcontractor has satisfactorily applied the waterproofing system specified herein under manufacturer's supervision. Letter shall be on manufacturer's letterhead and shall be signed by an officer of the company.

1.8 WARRANTY

A. The Contractor and manufacturer shall jointly warrant the waterproofing system executed under this Section to be watertight and free from defects in materials and workmanship for a period of ten (10) year from date of acceptance of this Contract, and that he, at his own expense, repair and/or replace all other work which may be damaged as a result of such defective work, and which becomes defective during the warranty period.

PART 2 PRODUCTS

2.1 MATERIALS

A. Waterproofing materials shall be a cement bond compound, free from chloride and iron oxide, which waterproofs by crystalline growth through the capillary tracts and shrinkage cracks in the concrete substrate equal to "Aqua-Fin IC," as manufactured by Aqua-Fin Inc., or equal made by Tamms Industries, Xypex Chemical Corp. or Anti-Hydro Co.

B. Mixing Water: Potable.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where crystalline waterproofing is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Temperature Requirements: Surrounding temperatures shall be a minimum thirty-five (35) degrees F. for forty-eight (48) hours before, during and after installation.

B. Preparation of Surfaces

1. Surfaces to be waterproofed shall be clean and free of form scale, mould, laitance, oil, form release agents, curing compounds, hardeners, and any other materials likely to affect the bond penetration or performance of the waterproofing materials.

2. Materials shall not be applied to frozen or frosted surfaces, nor during rain or snow.

3. The presence of moisture in the concrete substrates is essential at the time of the waterproofing application. Should this not be the case, soak thoroughly all surfaces with water a day prior to the waterproofing, and remove all free laying water.

4. All cracks in the concrete structure exceeding 0.01" in width and construction joints which have not been treated before with crystalline waterproofing, shall be routed out to a minimum depth of 3/4".

5. Areas that have become dirty and concrete pours which have resulted in an extremely smooth surface shall be acid etched or, at the Contractor's option, may be sand blasted. Surfaces to be acid etched shall be dampened with clean water. Etching shall be done with a fifteen (15) percent hydrochloric (muriatic) acid. One gallon of acid should cover about fifty (50) to seventy-nine (79) square feet. Allow the acid to stand at least three (3) minutes and when bubbling ceases, flush off with water immediately. Do not let the acid stay on the surface for a prolonged period. When completed, the surface shall have a finish similar to fine or medium sandpaper. Surfaces which retain a smoothness or dirty condition shall be re-etched until the desired effect is obtained.

6. Fill Form: Tie holes with "Aqua-Fin Mortar" of mortar consistency.

7. Vertical Concrete Surfaces

a. Grind off all fins and other projections.
b. Extremely smooth surfaces must be etched or sand blasted.
c. Form ties with insets shall be removed. Chip back concrete approximately one (1) inch where form ties are without insets.
d. Honeycombed Pockets and Faulty Construction Joints: Rout out all faulty

materials back to sound concrete; clean and rinse thoroughly with water all surfaces to be treated; check by rubbing hand over the surfaces. Hand should not become wet.

C. Mixing of Crystalline Waterproofing Materials

1. Slurry Consistency: The crystalline waterproofing materials shall be delivered in powder consistency in original undamaged containers with manufacturer's labels and seals intact.

   a. Separate container shall be used for measuring by volume the powdery crystalline waterproofing and the water.
   b. Measure two (2) parts of crystalline waterproofing and 0.7 - 0.9 parts of water (depending on water or absorption of concrete).

2. Mortar Consistency for Seal Strips and Coves

   a. Add water to crystalline waterproofing and/or crystalline waterproofing reinforcing proportion 1:2 and/or 1:3 and mix thoroughly until stiff consistency is reached.
   b. Prepare only as much mortar as can be applied within ten (10) minutes.

D. Installation of Crystalline Waterproofing Materials

1. Slurry Application

   a. Concrete surfaces to be treated with crystalline waterproofing shall be moist, not wet.
   b. Crystalline waterproofing slurry coatings shall be applied with a stiff masonry brush or stiff broom and worked into every irregularity of the concrete surfaces.
   c. Prior to the specified final application of crystalline waterproofing slurry coatings on the concrete surface, the following initial applications and repairs to the concrete structure have to be completed.

2. Construction Joints

   a. Construction joints shall receive a slurry coating of crystalline waterproofing 2.5 lbs. per square yard immediately prior to each concrete pour. In areas where inaccessibility is difficult, apply 2.5 lbs. per square yard of crystalline waterproofing by dry sprinkle method immediately prior to the following pour or rout out to a minimum depth of 3/4".
   b. Apply slurry coating of crystalline waterproofing 1.5 lbs. per square yard to routed out areas of cracks and construction joints and fill remaining depth with crystalline waterproofing and crystalline waterproofing reinforcing 1:6 in mortar consistency in two (2) laminating layers after each layer has reached its initial set (approximately 20-30 minutes).

3. Installation of Crystalline Waterproofing Coves (Junction Horizontal Surfaces and Walls): Apply slurry coating of crystalline waterproofing 1.5 - 2.0 lbs. per square

yard, six (6) inches in width, and install a cove with crystalline waterproofing and crystalline waterproofing reinforcing 1:3 in mortar consistency.

4. Honeycombed Pockets in Wall Areas: Rout out all faulty materials back to sound concrete. Apply slurry coating of crystalline waterproofing 1.5 lbs. per square yard over routed out area and fill with sand and cement mortar 1:3. If necessary (owing to depth) apply layers of mortar not exceeding 5/8" in thickness after each layer has hardened and repeat crystalline waterproofing slurry coating.

5. Foundation and Pit Walls - Interior Face

   a. Moisture treat vertical concrete surfaces thoroughly one day prior to application. Construction joints and form tie holes shall be filled with crystalline waterproofing and crystalline waterproofing reinforcing 1:6 in mortar consistency.
   b. Apply two (2) slurry coatings on entire surface, consisting of "Aqua-Fin IC" crystalline waterproofing 1.25 lbs. per square yard per coating, to levels and on surfaces indicated. The second coating shall be applied while the first coating is green, normally within an hour or the application of first coating.

6. Concrete Slabs – Pits: Apply Aqua-Fin IC at the rate of 2.5 lbs./sq. yd. in slurry consistency to concrete slab surfaces in one coat.

E. Curing of Crystalline Waterproofing Application

1. Crystalline waterproofing applications while setting shall be protected from rain, frost and from drying out. During extreme hot weather, light water fog spraying may be necessary during time of application.

2. Moisture treat crystalline waterproofing treated areas for minimum period of three (3) days starting the day following the completion of the crystalline waterproofing application with fog water spray. Surfaces shall have moist and later wet appearance for the duration of the curing period.

3. Treated surfaces shall not be exposed to aggressive water, chemicals or acids until the applications have reached full strength (normally after 14 days).

END OF SECTION 071616

SECTION 072100 - THERMAL INSULATION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the thermal insulation as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Insulation under slabs-on-grade.
2. Foundation wall insulation.
3. Concrete-faced insulated wall panels.
4. Insulated wood sheathing panels.
5. Foil-faced blanket insulation.
6. Closed-cell spray foam insulation.
7. Attachment devices.

1.3 RELATED SECTIONS

A. Roof insulation - Division 7.

B. Firestops and Smokeseals - Section 07 84 13.

C. Gypsum Drywall - Section 092900, for acoustical insulation.

D. Earthwork - Division 31.

1.4 SUBMITTALS

A. Submit product data for each type of product indicated, including re-cycled content.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.

1.5 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.

B. Vertical and Lateral Fire Propagation Test Characteristics: The exterior wall assembly is required to comply with NFPA 285 "Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Nonload-bearing Wall Assemblies Containing Combustible Components." The base wall, stud cavity insulation, wall sheathing, air barrier, continuous wall rigid insulation and exterior cladding are components that are required to be to be evaluated as part of this specific assembly test. The basis of design product listed herein is a component of the design test assembly selected by the Architect.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site ready for use in the manufacturer's original and unopened containers and packaging, bearing labels as to type and brand. Delivered materials shall be identical to approved samples.

B. Store materials under cover in a dry and clean location, off the ground. Remove materials which are damaged or otherwise not suitable for installation and replace with acceptable materials.

C. Take every precaution to prevent the insulation from becoming wet, cover with tarps or other weather/watertight sheet goods.

PART 2 PRODUCTS

2.1 FOUNDATION WALL AND UNDERSLAB INSULATION

A. Provide extruded polystyrene board insulation equal to "Styrofoam" manufactured by Dow Chemical Co. or approved equal made by Owens Corning or PACTIV Building Products, conforming to ASTM C 578, Type IV, with a maximum flame spread and smoke developed indices of 75 and 450 respectively.

B. Insulation shall have an aged R value of not less than 5/inch; shall be 2" thick unless otherwise noted on the drawings.

2.2 CONCRETE-FACED INSULATED WALL PANELS

A. Perimeter Insulation: Provide "WallGUARD" as manufactured by T. Clear Corporation; extruded polystyrene board conforming to ASTM C 578, Type IV, rigid, closed-cell, with integral 5/16" (8mm) thick, latex-modified concrete facing.

1. Thermal Resistance: Long term aged R-value of 5 per inch, to ASTM C 518.

2. Board Size: 24" x 48", with insulation thickness of 3" (R-15).

3. Compressive Strength: Conforming to ASTM D 1621, minimum 40 psi.

4. Water Absorption: Conforming to ASTM D 2842, <0.1 (0.7% by volume max).

5. Edges: Tongue-and-groove sides, square edge ends.

6. Water Vapor Permeance: Conforming to ASTM E 96, 0.8.

B. Clips and Fasteners: Corrosion-resistant type, stainless steel, sized to suit application; as supplied by insulation manufacturer.

2.3 INSULATED SHEATHING PANELS

A. Board Insulation Bonded to Wood Panel: Provide continuous insulation wall panels equal to "Hunter Xci Ply" manufactured by Hunter Panels, or approved equal, composed of a closed cell polyisocyanurate foam core bonded on both sides to a coated glass facer and bonded to wood panel on one side, conforming to ASTM C 1289, Type V, Grade 3. Insulation joints shall be taped with manufacturer's compatible waterproof tape.

1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2. Boards shall be 48" wide x 96" long, thickness as noted on the drawings.

3. Insulation shall have an aged R-value/inch @ 75 deg. F. of not less than 4.5 hr.ft.^{2}F/Btu, per ASTM C 518.

B. Fasteners: Corrosion-resistant type with oversized heads. Length of fasteners shall be as recommended by the panel manufacturer.

1. Provide Hunter SIP HD (16 gauge steel stud up to ¼ inch steel), Hunter SIP SD (Concrete, CMU, 18 gauge and lighter Steel Stud), and Hunter SIP WD (FRT Wood).

2.4 BLANKET INSULATION

A. Reinforced-Foil-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim Kraft, or foil-scrim polyethylene.

1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2. Insulation shall have an R value of not less than 3.7/inch and shall be 3.5" thick unless otherwise noted on the drawings.

2.5 SPRAY FOAM INSULATION

A. Closed-Cell Polyurethane Foam Insulation: "Icynene MD-C-200" spray-applied, rigid closed-cell polyurethane insulation manufactured by Icynene, or approved equal; 2.2 lb./cu. ft. density material per ASTM D 1622; meets Class 1 requirements of ASTM E 84.

1. R-Value shall be 6.5 per inch per ASTM C 518.
2. Bond strength shall be greater than 100 psf per ASTM E 736.
3. Product shall be Class 1 Class A per ASTM E 84/ UL 723.
4. Product shall be tested in accordance with UBC 26-2 Test Method for the evaluation of Thermal Barriers (ASTM E 119).
5. Product shall pass Full-Scale Corner Test.
6. Product shall have passed the Air Barrier Association of America (ABAA) testing and be an approved air barrier product.
7. Provide manufacturer's written certification that product contains no asbestos.

B. Thermal Barrier: DC315 thermal ignition barrier over spray-applied insulation, or approved equal.

C. NOTE: Ensure that closed-cell spray foam insulation is compatible with spray-applied fireproofing.

2.6 ACCESSORIES

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. Provide "Series T TACTOO Insul-Hangers" by AGM Industries, Inc., "Sprindle Type" by Gemco, or approved equal.

1. Plate: Perforated, galvanized carbon-steel sheet, 0.030" thick by 2" square.
2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105" in diameter; length to suit depth of insulation indicated.
3. Affix plate with stainless steel staple or screw.

B. Adhesive for Bonding Insulation: The type recommended by the insulation manufacturer and complying with fire-resistance requirements.

1. For bonding rigid polystyrene insulation to masonry or concrete, provide adhesive equal to "Foamgrab PS" made by Dacor Products Co. or equal made by ChemRex Inc. or Miracle Adhesives.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where thermal insulation is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION, GENERAL

A. Clean substrates of substances that are harmful to insulation including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

B. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

C. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

D. 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.

E. 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.

3.3 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" 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 36" in from exterior walls.

3.4 INSTALLATION OF BLANKET 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. 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", 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 as indicated on Drawings.

3.5 INSTALLATION OF INSULATED SHEATHING PANELS

A. Install in accordance with manufacturer's instructions.

B. Fasten insulation to substrate. Provide base support for the insulation panels as required for the exterior cladding to be installed over the panels. Exterior cladding must be attached through to the framing as required by the cladding manufacturer. Coordinate with the cladding or wall finish manufacturer for the attachment requirements over insulation panels.

3.6 INSTALLATION OF SPRAY FOAM INSULATION

A. Apply self-supported, spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make it flush with face of studs by using method recommended by insulation manufacturer.

3.7 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

**END OF SECTION 072100*

SECTION 072700 – VAPOR PERMEABLE AIR BARRIER LIQUID MEMBRANE

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. The Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the vapor permeable air barrier liquid membrane as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

1. Vapor permeable/air barrier applied over sheathing board and cold-formed metal framing.

2. Materials and installation to bridge and seal the following air leakage pathways and gaps:

    a. Connections of the walls to the roof.
    b. Connections of the walls to the foundations.
    c. Seismic and expansion joints.
    d. Openings and penetrations of window frames, storefront, curtain wall.
    e. Door frames.
    f. Piping, conduit, duct and similar penetrations.
    g. Masonry ties, screws, bolts and similar penetrations.
    h. All other air leakage pathways in the building envelope.

1.3 RELATED SECTIONS

A. Cold-Formed Metal Framing, including sheathing - Section 05 40 00.

1.4 SUBMITTALS

A. Provide evidence to the Architect of licensing and certification under the Air Barrier Association of America's (ABAA's) Quality Assurance Program.

B. Submit shop drawings showing locations and extent of air/vapor barrier and details of all typical conditions, intersections with other envelope systems and materials, membrane counter-flashings, and details showing how gaps in the construction will be bridged, how inside and outside corners are negotiated and how miscellaneous penetrations such as conduits, pipes electric boxes and the like are sealed.

C. Submit manufacturer's product data sheets for each type of membrane, including manufacturer's printed instructions for evaluating, preparing, and treating substrate,

temperature and other limitations of installation conditions, technical data, and tested physical and performance properties.

D. Submit manufacturer's data showing solids content of fluid applied membranes and coverage rates and wet film thickness upon application in order to achieve minimum dry film thickness required by this specification.

E. Submit manufacturer's installation instructions.

F. Submit certification by air/vapor barrier manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

G. Submit certification of compatibility by air/vapor barrier manufacturer, listing all materials on the project that it connects to or that come in contact with it, including sealant as specified in Section 054000 for caulking joints between sheathing panels.

H. Submit samples, 3 by 4 inch minimum size, of each air/vapor barrier material required for Project.

I. Test results of air permeability testing of primary air barrier material (ASTM E 2178-01).

J. Test results of assembly in accordance with ASTM E 2357.

1.5 PERFORMANCE REQUIREMENTS

A. Provide air/vapor barrier constructed to perform as a continuous air/vapor barrier, and as a liquid water drainage plane flashed to discharge to the exterior any incidental condensation or water penetration. Membrane shall accommodate movements of building materials by providing expansion and control joints as required, with accessory air seal materials at such locations, changes in substrate and perimeter conditions.

B. Provide an air barrier assembly that has been tested in accordance with the Air Barrier Association of America's (ABAA's) approved testing protocol to provide air leakage results not to exceed 0.01 cfm/sf @ 1.57 psf.

C. NFPA 285 Compliance.

D. Connections to Adjacent Materials: Provide connections to adjacent materials at the following locations and show same on shop drawings:

1. Foundation and walls, including penetrations, ties and anchors.

2. Walls, windows, curtain walls, storefronts, louvers or doors.

3. Different wall assemblies, and fixed openings within those assemblies.

4. Wall and roof connections.

5. Floors over unconditioned space.

6. Walls, floor and roof across construction, control and expansion joints.

7. Walls, floors and roof to utility, pipe and duct penetrations.

8. Seismic and expansion joints.

9. All other leakage pathways in the building envelope.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:

1. The air barrier contractor shall be, during the bidding period as well as for the duration of the installation, officially recognized as a Licensed Contractor by the Air Barrier Association of America (ABAA). The contractor shall carry liability insurance and bonding.

2. Each worker who is installing air barriers must be either a Certified Applicator or an installer who is registered with ABAA.

3. Each Lead Certified Applicator can supervise a maximum of five registered installers. The Certified Applicator shall be thoroughly trained and experienced in the installation of air barriers of the types being applied. Lead Certified Applicators shall perform or directly supervise all air/vapor barrier work on the project.

B. Single-Source Responsibility: Obtain air/vapor barrier materials from a single manufacturer regularly engaged in manufacturing the product.

C. Provide products which comply with all state and local regulations controlling use of volatile organic compounds (VOCs).

D. Field-Constructed Mock-Ups: Prior to installation of air/vapor barrier, apply air/vapor barrier as follows to verify details under shop drawing submittals and to demonstrate tie-ins with adjoining construction, and other termination conditions, as well as qualities of materials and execution:

1. Construct typical exterior wall panel, 8 feet long by 8 feet wide (one of CMU and one of sheathed areas, incorporating back-up wall, cladding, window and doorframe and sill, insulation, flashing, building corner condition, and typical penetrations and gaps; illustrating materials interface and seals.

E. Test mock-up in accordance with ASTM E 783 and ASTM E 1105 for air and water infiltration.

F. Manufacturer shall be on-site at least once a week to observe installation and provide written report within 3 days.

G. Manufacturer shall confirm all termination details and compatibility with materials being terminated to.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.

B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air/vapor barrier manufacturer. Protect stored materials from direct sunlight.

C. Avoid spillage. Immediately notify Owner, Architect if spillage occurs and start clean up procedures.

D. Clean spills and leave area as it was prior to spill.

1.8 WARRANTY

A. System Warranty: Provide the manufacturer’s five (5) year system warranty, including the primary air/vapor barrier and installed accessory sealant and membrane materials which fail to achieve air tight and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.1 MATERIALS

A. Liquid Membrane: "Air-Bloc 31MR" or "Air-Bloc 17MR Vapor Permeable Liquid Membrane" by Henry Company, "Perm-A-Barrier VP" by GCP Applied Technologies or approved equal. Trade names used herein are those of Henry Company.

B. Sheet Transition Membrane: Blueskin SA or VP 160.

C. Window and Door Opening Flashing: Blueskin SA or Metal Clad.

D. Alternative Liquid Applied Flashing: Henry Air-Bloc LF.

E. Through-Wall Flashing: Blueskin TWF.

F. Primer for Blueskin: Blueskin LVC Adhesive.

G. Air Barrier Sealant: HE 925 BES Sealant.

H. Substrate Cleaner: Mineral spirits or Xylol.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where the above grade waterproof membrane is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected to permit proper installation of the work.

3.2 SURFACE PREPARATION

A. All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants.
B. Cracks in masonry and concrete up to 1/4" wide shall be filled with a trowel application of Air-Bloc 31MR, Air-Bloc LF or HE 925 Sealant and allowed to cure overnight prior to application of the liquid membrane to the surface, or alternatively, the cracks may be sealed with a strip of Blueskin membrane applied to the substrate. Cracks wider than 1/4" should be sealed with Blueskin membrane adhered to the substrate lapped a minimum of 3" on both sides of the crack.
C. Joints in sheathing up to 1/2" can be treated with HE 925 BES Sealant or Air-Bloc LF.
D. Surfaces should be tied in with beams, columns, etc. using strips of Blueskin SA or VP 160 lapped a minimum of 3" on both substrates. Mechanical attachment should be made to all window and door frames, or a properly designed sealant joint provided.

3.3 TRANSITION MEMBRANE

A. Align and position self-adhering transition membrane, remove protective film and press firmly into place. Ensure minimum 3" overlap at all ends and side laps.

B. Tie-in to window frames, metal door frames, etc., and at the interface of dissimilar materials as indicated on the Drawings.

C. Promptly roll all laps and membrane with a counter top roller to effect seal.

D. Ensure all preparatory work is complete prior to applying Air-Bloc 31MR.

3.4 THROUGH-WALL FLASHING MEMBRANE

A. Align and position the leading edge of Blueskin TWF self-adhering through-wall flashing membrane with the front horizontal edge of the foundation walls or shelf angles, partially remove protective film and roll membrane over surface and up vertically.

B. Press firmly into place. Ensure minimum 50mm overlap at all end and side laps.

C. Promptly roll all laps and membrane to effect the seal.

D. Ensure all preparatory work is complete prior to applying Blueskin TWF.

E. Ensure through-wall flashing membrane extends fully to the exterior face of the exterior masonry veneer. Trim off excess as directed by the consultant.

F. Apply through-wall flashing membrane along the base of masonry veneer walls, over windows, doors and all other wall openings. Membrane shall form continuous flashing and shall extend up a minimum of 4-1/2" up the back-up wall.

G. When flashing at window openings, wrap the entire window opening with air barrier flashing membrane.

3.5 LIQUID MEMBRANE APPLICATION

A. Apply Air-Bloc 31MR to wall substrates in a continuous coat at manufacturer’s

recommended rate by spray or trowel to provide a minimum wet film thickness of 0.093".

1. Minimum dry film thickness shall be 0.078".

B. Overlap liquid membrane on to transition membrane at connections a minimum of 1".

C. Trowel Air-Bloc 31MR around ties and other projections to ensure a complete seal.

D. Do not leave membrane exposed for any longer than 6 weeks.

E. Penetrations: Seal all penetrations with termination mastic liquid membrane, sealant, flashing or other procedures in accordance with manufacturer's instructions.

3.6 PROTECTING AND CLEANING

A. Protect air/vapor barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Protect air/vapor barrier from exposure to the elements as required by the manufacturer.

D. Remove any masking materials after installation. Clean any stains on materials that would be exposed in the completed work using procedures as recommended by manufacturer.

1. Schedule work to ensure that the air and vapor barrier system is covered as soon as possible after installation. Protect air and vapor barrier system from damage during subsequent operations. If the air and vapor barrier system cannot be permanently covered within 90 days after installation, apply temporary UV protection.

3.7 FIELD QUALITY CONTROL

A. Air Barrier Association of America Installer Audits: Cooperate with ABAA's testing agency. Allow access to work areas and staging. Notify ABAA in writing of schedule for Work of this Section to allow sufficient time for testing and inspection. Do not cover Work of this Section until testing and inspection is accepted. Arrange and pay for site inspections by ABAA to verify conformance with the material Manufacturer's instructions, the site Quality Assurance Program used by ABAA, and this section of the project specification.

1. Audits and subsequent testing shall be carried out at the following rate:

a. Up to 10,000 ft^2 of air barrier contract requires one (1) audit.
b. 10,001 – 35,000 ft^2 of air barrier contract requires two (2) audits.
c. 35,001 – 75,000 ft^2 of air barrier contract requires three (3) audits.
d. 75,001 - 125,000 ft^2 of air barrier contract requires four (4) audits.
e. 125,001 – 200,000 ft^2 of air barrier contract requires five (5) audits.

f. 200,001 ft^2 and over of air barrier contract requires six (6) audits.

2. Forward written audit reports to the Architect within 10 working days of the inspection and test being performed.

3. If the inspections reveal any defects, promptly remove and replace defective work at no additional cost to the Owner.

B. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to 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.

END OF SECTION 072700

SECTION 210517 - SLEEVES AND SLEEVE SEALS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 STACK-SLEEVE FITTINGS

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. Jay R. Smith Mfg. Co.
2. Zurn Industries, LLC.

B. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

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. Advance Products & Systems, Inc.
2. Metraflex Company (The).
3. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Stainless steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

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. Advance Products & Systems, Inc.
2. Metraflex Company (The).
3. Proco Products, Inc.

B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Non-shrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Install sleeves in seismic applications to provide adequate clearance according to NFPA 13 recommendations unless otherwise indicated.
4. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
2. Install fittings in seismic applications to provide adequate clearance according to NFPA 13 recommendations unless otherwise indicated.
3. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing.
4. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
5. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
6. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials.

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

a. Piping Smaller Than NPS 6: Cast-iron wall sleeves or Galvanized-steel wall sleeves or Galvanized-steel-pipe sleeves or Sleeve-seal fittings.
b. Piping NPS 6 and Larger: Cast-iron wall sleeves or Galvanized-steel wall sleeves or Galvanized-steel-pipe sleeves.

2. Exterior Concrete Walls below Grade:

   a. Piping [All Sizes]: Cast-iron wall sleeves with sleeve-seal system or Galvanized-steel wall sleeves with sleeve-seal system or Galvanized-steel-pipe sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

   a. Piping [All Sizes]: Cast-iron wall sleeves with sleeve-seal system or Galvanized-steel wall sleeves with sleeve-seal system or Galvanized-steel-pipe sleeves with sleeve-seal system or Galvanized-steel-pipe sleeves.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

   a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves or Stack-sleeve fittings or Sleeve-seal fittings.
   b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves or Stack-sleeve fittings.

5. Interior Partitions:

   a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
   b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 210517

SECTION 210518 - ESCUTCHEONS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.

E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
j. Bare Piping in Equipment Rooms: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.

2. Escutcheons for Existing Piping:

a. Chrome-Plated Piping: Split-casting brass type with polished, chrome-plated finish.
b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge.
c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge.
g. Bare Piping in Unfinished Service Spaces: Split-casting brass type with polished, chrome-plated finish.

h. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed hinge.
i. Bare Piping in Equipment Rooms: Split-casting brass type with polished, chrome-plated finish.
j. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with concealed hinge.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.
2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 210518

SECTION 210553 - IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Equipment labels.
   2. Warning signs and labels.
   3. Pipe labels.
   4. Stencils.
   5. Valve tags.
   6. Warning tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment-Label Schedule: Include a listing of all equipment to be labeled and the proposed content for each label.

D. Valve Schedules: Valve numbering scheme.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:
   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. Brady Corporation.
      b. Craftmark Pipe Markers.
      c. Marking Services, Inc.
      d. Seton Identification Products.

2. Material and Thickness: Brass, 0.032-inch or aluminum, 0.032-inch thick, with predrilled holes for attachment hardware.
3. Letter Color: White.
4. Background Color: Red.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:
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. Brady Corporation.
   b. Craftmark Pipe Markers.
   c. Marking Services, Inc.
   d. Seton Identification Products.
2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16-inch or 1/8-inch thick, with predrilled holes for attachment hardware.
3. Letter Color: White.
4. Background Color: Red.
5. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
7. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
8. Fasteners: Stainless-steel rivets or self-tapping screws.
9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment-Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

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. Brady Corporation.
   2. Craftmark Pipe Markers.
   3. Marking Sevices Inc.
   4. Seton Identification Products.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16-inch or 1/8-inch thick, with predrilled holes for attachment hardware.

C. Letter Color: Yellow.

D. Background Color: Black.

E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

H. Fasteners: Stainless-steel rivets or self-tapping screws.

I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

J. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

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. Brady Corporation.
   2. Craftmark Pipe Markers.
   3. Marking Sevices Inc.
   4. Seton Identification Products.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service and showing flow direction according to ASME A13.1.

C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Self-adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

E. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
   1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
   2. Lettering Size: Size letters according to ASME A13.1 for piping with at least 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.

F. Pipe-Label Colors:
   1. Background Color: Safety Red.
   2. Letter Color: White.

2.4 STENCILS

A. Stencils for Piping:
   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. Craftmark Pipe Markers.
      b. Marking Sevices Inc.
   2. Lettering Size: Size letters according to ASME A13.1 for piping with at least 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.
   3. Stencil Material: Fiberboard or metal.
   4. Stencil Paint: Safety Red, exterior, gloss, acrylic enamel. Paint may be in pressurized spray-can form.
   5. Identification Paint: White, exterior, acrylic enamel. Paint may be in pressurized spray-can form.

2.5 VALVE TAGS

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. Brady Corporation.
   2. Craftmark Pipe Markers.
   3. Marking Sevices Inc.
   4. Seton Identification Products.

B. Description: Stamped or engraved with 1/4-inch letters for piping-system abbreviation and 1/2-inch numbers.
   1. Tag Material: Brass, 0.032-inch or aluminum, 0.032-inch thick, with predrilled holes for attachment hardware.
   2. Fasteners: Brass wire-link chain, beaded chain or S-hook.

3. Valve-Tag Color: Safety Red.
4. Letter Color: White.

C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Brady Corporation.
2. Craftmark Pipe Markers.
3. Marking Sevices Inc.
4. Seton Identification Products.

B. Description: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
1. Size: Approximately 4 by 7 inches.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Safety Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be installed.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Stenciled Pipe-Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, with painted, color-coded bands or rectangles on each piping system.
   1. Identification Paint: Use for contrasting background.
   2. Stencil Paint: Use for pipe marking.

B. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
   1. Near each valve and control device.
   2. Near each branch connection excluding short takeoffs. Where flow pattern is not obvious, mark each pipe at branch.
   3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
   4. At access doors, manholes, and similar access points that permit a view of concealed piping.
   5. Near major equipment items and other points of origination and termination.
   6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
   7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes including pipes where flow is allowed in both directions.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in fire-suppression piping systems. List tagged valves in a valve-tag schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and with captions similar to those indicated in "Valve-Tag Size and Shape" Subparagraph below:
   1. Valve-Tag Size and Shape:
      a. Fire-Suppression Standpipe: 1-1/2 inches, round.
      b. Wet-Pipe Sprinkler System: 1-1/2 inches, round.
      c. Dry-Pipe Sprinkler System: 1-1/2 inches, round.
      d. Foam-Water System: 1-1/2 inches, round.
      e. Clean-Agent Fire-Extinguishing System: 1-1/2 inches, round.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 210553

SECTION 211313 - WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Specialty valves.
3. Sprinklers.
4. Alarm devices.
5. Pressure gages.

B. Related Requirements:

1. Section 211119 "Fire Department Connections" for exposed-, flush-, and yard-type fire department connections.
2. Section 230523 "General-Duty Valves for Water-Based Fire-Suppression Piping" for ball, butterfly, check, gate, post-indicator, and trim and drain valves.

1.3 DEFINITIONS

A. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175-psig maximum.

B. High Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure higher than standard 175-psig but not higher than of 300-psig maximum.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For wet-pipe sprinkler systems.

1. Include plans, elevations, sections, and attachment details.

2. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For wet-pipe sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Domestic water, sanitary and storm piping.
2. Compressed air and medical gas piping.
3. HVAC ductwork and piping.
4. Items penetrating finished ceiling include the following:

a. Lighting fixtures and ceiling mounted controllers.
b. Air outlets and inlets.
c. Fire Alarm initiating and signaling devices.

B. Qualification Data: For qualified Installer and professional engineer.

C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations and seismic calculations.

D. Welding certificates.

E. Fire-hydrant flow test report, recent within one (1) year.

F. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping" and fire pump test reports.

G. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wet-pipe sprinkler systems and specialties to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include

number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Welding Qualifications: Qualify procedures and operators according to 2010 ASME Boiler and Pressure Vessel Code.

1.9 FIELD CONDITIONS

A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:

1. Notify Architect, Construction Manager, Owner and Engineer no fewer than two days in advance of proposed interruption of sprinkler service.
2. Do not proceed with interruption of sprinkler service without Architect's, Construction Manager's, Owner's and Engineer’s written permission.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13.

B. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

C. High-Pressure Piping System Component: Listed for 300-psig working pressure.

D. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design wet-pipe sprinkler systems.

1. Available fire-hydrant flow test records: Refer to Fire Protection contract drawings.

2. Sprinkler system design shall be approved by authorities having jurisdiction.

   a. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
   b. Sprinkler Occupancy Hazard Classifications: According to NFPA 13 recommendations unless otherwise indicated.

3. Minimum Density for Automatic-Sprinkler Piping Design: According to NFPA 13 recommendations unless otherwise indicated.

4. Maximum Protection Area per Sprinkler: According to UL listing.
5. Maximum Protection Area per Sprinkler: According to NFPA 13 recommendations unless otherwise noted.

E. Total combined Hose-Stream Demand Requirement: According to NFPA 13 unless otherwise indicated.

F. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

2.2 STEEL PIPE AND FITTINGS

A. Standard-Weight, Black-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

B. Schedule 10, Black-Steel Pipe: ASTM A 135/A 135M or ASTM A 795/A 795M, Schedule 10 in NPS 5 and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10, plain end.

C. Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

D. Uncoated-Steel Couplings: ASTM A 865/A 865M, threaded.

E. Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

F. Malleable- or Ductile-Iron Unions: UL 860.

G. Cast-Iron Flanges: ASME 16.1, Class 125.

H. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

1. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8-inch thick or ASME B16.21, nonmetallic and asbestos free or EPDM rubber gasket.

   a. Class 125 and Class 250, Cast-Iron, Flat-Face Flanges: Full-face gaskets.

b. Class 150 and Class 300, Ductile-Iron or -Steel, Raised-Face Flanges: Ring-type gaskets.

2. Metal, Pipe-Flange Bolts and Nuts: Carbon steel unless otherwise indicated.

I. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.

1. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

J. Grooved-Joint, Steel-Pipe Appurtenances:

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. Anvil International.
b. Tyco Fire Products LP.
c. Victaulic Company.

2. Pressure Rating: 175-psig minimum or 300-psig where exposed to higher system pressures.

3. Uncoated Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.3 SPECIALTY VALVES

A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

B. Pressure Rating:

1. Standard-Pressure Piping Specialty Valves: 175-psig minimum.
2. High-Pressure Piping Specialty Valves: 300-psig.

C. Body Material: Cast or ductile iron.

D. Size: Same as connected piping.

E. End Connections: Flanged or grooved.

F. Automatic (Ball Drip) Drain Valves:

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. Reliable Automatic Sprinkler Co., Inc. (The).
b. Tyco Fire Products LP.

2. Standard: UL 1726.

3. Pressure Rating: 175-psig minimum.
4. Type: Automatic draining, ball check.
5. Size: NPS 3/4.
6. End Connections: Threaded.

2.4 SPRINKLER PIPING SPECIALTIES

A. Branch Outlet Fittings:

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. Anvil International.
b. Tyco Fire Products LP.
c. Victaulic Company.

2. Standard: UL 213.
3. Pressure Rating: 175-psig minimum or 300 psig.
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-tee and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

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. Reliable Automatic Sprinkler Co., Inc. (The).
b. Tyco Fire Products LP.
c. Victaulic Company.

2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum or 300 psig.
4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded or grooved.

C. Branch Line Testers:

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. Elkhart Brass Mfg. Co., Inc.
    b. Fire-End & Croker Corporation.
    c. Potter Roemer LLC.

2. Standard: UL 199.
3. Pressure Rating: 175 psig.
4. Body Material: Brass.
5. Size: Same as connected piping.
6. Inlet: Threaded.
7. Drain Outlet: Threaded and capped.
8. Branch Outlet: Threaded, for sprinkler.

D. Sprinkler Inspector's Test Fittings:

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. Tyco Fire Products LP.
    b. Victaulic Company.
    c. Viking Corporation.

2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum or 300 psig.
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

E. Adjustable Drop Nipples:

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. CECA, LLC.
    b. Corcoran Piping System Co.
    c. Merit Manufacturing.

2. Standard: UL 1474.
3. Pressure Rating: 250-psig minimum or 300 psig.
4. Body Material: Steel pipe with EPDM-rubber O-ring seals.
5. Size: Same as connected piping.
6. Length: Adjustable.
7. Inlet and Outlet: Threaded.

F. Flexible Sprinkler Hose Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Victaulic Co.
    b. Reliable Sprinkler
    c. FlexHead Industries, Inc.

2. Standard: UL 1474.
3. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
4. Pressure Rating: 175-psig minimum or 300 psig.
5. Size: Same as connected piping, for sprinkler.

2.5 SPRINKLERS

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. Reliable Automatic Sprinkler Co., Inc. (The).
2. Tyco Fire Products LP.
3. Victaulic Company.
4. Viking Corporation.

B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

C. Pressure Rating for Residential Sprinklers: 175-psig maximum.

D. Pressure Rating for Automatic Sprinklers: 175-psig minimum.

E. Pressure Rating for High-Pressure Automatic Sprinklers: 300 psig.

F. Automatic Sprinklers with Heat-Responsive Element:

1. Early-Suppression, Fast-Response Applications: UL 1767.
2. Nonresidential Applications: UL 199.
3. Residential Applications: UL 1626.
4. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

G. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, one piece, flat or Chrome-plated steel, two piece, with 1-inch vertical adjustment.
2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

H. Sprinkler Guards:

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. Reliable Automatic Sprinkler Co., Inc. (The).
    b. Tyco Fire Products LP.
    c. Victaulic Company.
    d. Viking Corporation.

2. Standard: UL 199.
3. Type: Wire cage with fastening device for attaching to sprinkler.

2.6 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Electrically Operated Alarm Bell:

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. Fire-Lite Alarms, Inc.; a Honeywell International company.
    b. Notifier.
    c. Potter Electric Signal Company, LLC.

2. Standard: UL 464.
3. Type: Vibrating, metal alarm bell.
4. Size: 8-inch minimum diameter.
5. Finish: Red-enamel factory finish, suitable for outdoor use.
6. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Water-Flow Indicators:

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. Potter Electric Signal Company, LLC.
    b. System Sensor.
    c. Viking Corporation.
    d. Watts; a Watts Water Technologies company.

2. Standard: UL 346.
3. Water-Flow Detector: Electrically supervised.
4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-

set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.

5. Type: Paddle operated.
6. Pressure Rating: 250 psig.
7. Design Installation: Horizontal or vertical.

D. Pressure Switches:

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. Potter Electric Signal Company, LLC.
    b. System Sensor.
    c. Tyco Fire Products LP.
    d. Viking Corporation.

2. Standard: UL 346.
3. Type: Electrically supervised water-flow switch with retard feature.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design Operation: Rising pressure signals water flow.

E. Valve Supervisory Switches:

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. Fire-Lite Alarms, Inc.; a Honeywell International company.
    b. Potter Electric Signal Company, LLC.
    c. System Sensor.

2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.
6. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.7 PRESSURE GAGES

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. AGF Manufacturing Inc.
2. AMETEK, Inc.
3. Brecco Corporation.

B. Standard: UL 393.
C. Dial Size: 3-1/2- to 4-1/2-inch diameter.
D. Pressure Gage Range: 0 to 300 psig.
E. Label: Include "WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article. Flow test utilized for calculations shall be recent within one (1) year.

B. Report test results promptly and in writing.

3.2 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Engineer before deviating from approved working plans.
2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.

C. Install seismic restraints on piping. Comply with NFPA 13 requirements for seismic-restraint device materials and installation.

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

J. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.

K. Install alarm devices in piping systems.

L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13. In seismic-rated areas, refer to Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."

M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.

N. Fill sprinkler system piping with water.

O. Install electric heating cables and pipe insulation on sprinkler piping in areas subject to freezing. Comply with requirements for heating cables in Section 210533 "Heat Tracing for Fire-Suppression Piping" and for piping insulation in Section 210700 "Fire-Suppression Systems Insulation."

P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

I. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

J. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

K. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Specialty Valves:

1. Install valves in vertical position for proper direction of flow, in main supply to system.
2. Install alarm valves with bypass check valve and retarding chamber drain-line connection.

3. Install deluge valves in vertical position, in proper direction of flow, and in main supply to deluge system. Install trim sets for drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.

3.5 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.

B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

C. Install sprinklers into flexible, sprinkler hose fittings, and install hose into bracket on ceiling grid.

3.6 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13. Comply with requirements for identification specified in Section 210553 "Identification for Fire-Suppression Piping and Equipment".

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.
6. Coordinate with fire-pump tests. Operate as required.
7. Verify that equipment hose threads are same as local fire department equipment.

B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.8 CLEANING

A. Clean dirt and debris from sprinklers.

B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.9 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain sprinkler system and components.

3.10 PIPING SCHEDULE

A. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends, cast-iron threaded fittings, and threaded joints or grooved ends, grooved-end fittings, grooved-end-pipe couplings, and grooved joints. Where piping between fire department connection and check valve is routed below grade, piping and fittings shall also be externally coated and wrapped per AWWA C203 or C105.

B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.

C. Standard-pressure, wet-pipe sprinkler system, NPS 1-1/2 and smaller, shall be one of the following:

1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight, black-steel pipe with plain ends; steel welding fittings; and welded joints.

D. Standard-pressure, wet-pipe sprinkler system, NPS 2 and Larger, shall be one of the following:

1. Standard Weight black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. Standard-weight, black-steel pipe with plain ends; steel welding fittings; and welded joints.
4. Schedule 10 black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
5. Schedule 10 black-steel pipe with plain ends; welding fittings; and welded joints.

E. High-pressure, wet-pipe sprinkler system, [All Sizes], shall be one of the following:

1. Standard-weight, black-steel pipe with plain ends; steel welding fittings; and welded joints.

3.11 SPRINKLER SCHEDULE

A. Use sprinkler types as indicated on Fire Protection contract drawings.

END OF SECTION 211313

SECTION 220517 SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 80, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 80, zinc coated, with plain ends.

D. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 STACK-SLEEVE FITTINGS

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. Smith, Jay R. Mfg. Co.
2. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

B. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Description:

1. Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
2. Designed to form a hydrostatic seal of 20 psig minimum.
3. Sealing Elements: EPDM-rubber or Nitrile (Buna N) interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
4. Pressure Plates: Carbon steel, Stainless steel, Stainless steel, Type 316.
5. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, ASTM B 63,3 Stainless steel, Stainless steel, Type 316 of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall.

B. Rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

A. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.6 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Non-shrink; recommended for interior and exterior applications. Premixed and factory packaged.

C. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls. Sleeves for building service piping shall be one nominal line size larger than the service pipe.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, and concrete walls as new slabs and walls are constructed.
1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.

3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Division 07 Section "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Division 07 Section "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Division 07 Section "Sheet Metal Flashing and Trim."
3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Division 07 Section "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Use grout to seal the space around outside of sleeve-seal fittings.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.

B. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

a. Piping Smaller Than NPS 6: Steel pipe sleeves Sleeve-seal fittings.
b. Piping NPS 6 and Larger: Cast-iron pipe sleeves, or Steel pipe sleeves with Sleeve-seal fittings.

2. Exterior Concrete Walls below Grade:

a. Piping Smaller Than NPS 6: Steel pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch minimum annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Cast-iron pipe sleeves with sleeve-seal system or Steel pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch minimum annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

a. Piping Smaller Than NPS 6: Steel pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch minim annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Cast-iron pipe sleeves with sleeve-seal system or Steel pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch minimum annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

a. Piping Smaller Than NPS 6: Steel pipe sleeves or Stack-sleeve fittings.
b. Piping NPS 6 and Larger: Steel pipe sleeves or Stack-sleeve fittings.

5. Interior Partitions:

a. Piping Smaller Than NPS 6: Steel pipe sleeves.
b. Piping NPS 6 and Larger: Galvanized-steel sheet sleeves.

END OF SECTION 220517

SECTION 220518 - ESCUTCHEOUNS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.

E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
f. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
g. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with concealed hinge.

2. Escutcheons for Existing Piping: (not used)

a. Chrome-Plated Piping: Split-casting brass type with polished, chrome-plated finish.
b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge.
c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
e. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed hinge.
f. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with concealed hinge.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.
2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 220518

SECTION 220523 - GENERAL-DUTY VALVES OR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Brass ball valves.
   2. Bronze lift check valves.
   3. Bronze swing check valves.
   4. Bronze gate valves.
   5. Iron gate valves.
   6. Bronze globe valves.
   7. Iron globe valves.

B. Related Sections:

   1. Division 22 plumbing piping Sections for specialty valves applicable to those Sections only.
   2. Division 22 Section "Identification for Plumbing Piping and Equipment" for valve tags and schedules.
   3. Division 33 water distribution piping Sections for general-duty and specialty valves for site construction piping.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Non-rising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

1.4 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

D. Every pipe, fixture, and fitting used to convey water for potable use shall contain less than 0.25% of lead by weight according to lead free law "reduction of lead in drinking water act", nsf/ansi standard 372.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set gate valves closed to prevent rattling.
4. Set ball valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:
1. Handwheel: For valves other than quarter-turn types.
2. Hand lever: For quarter-turn valves NPS 6 and smaller.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRASS BALL VALVES

A. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:

1. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Forged brass.
f. Seats: PTFE or TFE.
g. Stem: Brass.
h. Ball: Chrome-plated brass.
i. Port: Full.

B. Two-Piece, Regular-Port, Brass Ball Valves with Brass Trim:

1. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Forged brass.
f. Seats: PTFE or TFE.
g. Stem: Brass.
h. Ball: Chrome-plated brass.
i. Port: Regular.

2.3 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. Iron, Single-Flange Butterfly Valves with EPDM or NBR Seat and Aluminum-Bronze Disc:

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. Crane Co.; Crane Valve Group; Jenkins Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. NIBCO INC.
d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 250 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM or NBR.
f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum bronze.

2.4 IRON, GROOVED-END BUTTERFLY VALVES

A. Iron, Grooved-End Butterfly Valves:

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. Kennedy Valve; a division of McWane, Inc.
b. Shurjoint Piping Products.

c. Tyco Fire Products LP; Grinnell Mechanical Products.
d. Victaulic Company.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating, NPS 8 and Smaller: 300 psig.
c. CWP Rating, NPS 10 and Larger: 200 psig.
d. Body Material: Coated, ductile iron.
e. Stem: Two-piece stainless steel.
f. Disc: Coated, ductile iron.
g. Seal: EPDM.

2.5 BRONZE LIFT CHECK VALVES

A. Class 125, Lift Check Valves with Bronze Disc:

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. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 200 psig.
c. Body Design: Vertical flow.
d. Body Material: ASTM B 61 or ASTM B 62, bronze.
e. Disc: Bronze.

2.6 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

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. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Disc: Bronze.

2.7 BRONZE GATE VALVES

A. Class 125, NRS Bronze Gate Valves:

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. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Jenkins Valves.
   c. Crane Co.; Crane Valve Group; Stockham Division.
   d. Milwaukee Valve Company.
   e. NIBCO INC.
   f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

   a. Standard: MSS SP-80, Type 1.
   b. CWP Rating: 200 psig.
   c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
   d. Ends: Threaded or solder joint.
   e. Stem: Bronze.
   f. Disc: Solid wedge; bronze.
   g. Packing: Asbestos free.
   h. Handwheel: Malleable iron**,** bronze, or aluminum.

B. Class 125, NRS Bronze Gate Valves:

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. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Jenkins Valves.
   c. Crane Co.; Crane Valve Group; Stockham Division.
   d. Hammond Valve.
   e. Milwaukee Valve Company.
   f. NIBCO INC.
   g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

   a. Standard: MSS SP-80, Type 2.
   b. CWP Rating: 300 psig.
   c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.

d. Ends: Threaded or solder joint
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron**,** bronze, or aluminum.

2.8 IRON GATE VALVES

A. Class 150, OS&Y, Iron Gate Valves:

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. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.
b. CWP Rating: 200 psig.
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Disc: Solid wedge.
g. Packing and Gasket: Asbestos free.

B. Class 250, OS&Y, Iron Gate Valves:

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. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.
b. CWP Rating: 500 psig.
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.

e. Trim: Bronze.
f. Disc: Solid wedge.
g. Packing and Gasket: Asbestos free.

2.9 BRONZE GLOBE VALVES

A. Class 125, Bronze Globe Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 200psig.
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Bronze, PTFE, or TFE
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

2.10 IRON GLOBE VALVES

A. Class 125, Iron Globe Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-85, Type I.
b. CWP Rating: 200 psig.
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.

e. Trim: Bronze.
f. Packing and Gasket: Asbestos free.

2.11 LUBRICATED PLUG VALVES

A. Plug valves are specified in Specification section 221114 Natural gas piping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.
2. Lift Check Valves: With stem upright and plumb.

F. All valves used in any system shall have a pressure class that exceeds the pressure of the system it is installed in.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated on plan, use the following:

1. Shutoff Service: Ball, butterfly**,** or gate valves.
2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
3. Throttling Service: Globe or ball valves.
4. Pump-Discharge Check Valves:

a. NPS 2 and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
b. NPS 2-1/2 and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Steel Piping, NPS 2 and Smaller: Threaded ends.
4. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
5. For Grooved-End Copper Tubing and Steel Piping: Valve ends may be grooved.

3.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Brass Valves: May be provided with lead free solder-joint ends instead of threaded ends.
2. Ball Valves: Two-piece, full port, brass with brass trim. Class 150
3. Bronze Swing Check Valves: Class 150, bronze disc.
4. Bronze Gate Valves: Class 150.

B. Pipe NPS 2-1/2 and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.

2. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM, NBR seat, aluminum-bronze disc.
3. Iron, Grooved-End Butterfly Valves: 175 CWP.
4. Iron Gate Valves: Class 150.

3.6 SANITARY WASTE AND STORM-DRAINAGE VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
2. Bronze Swing Check Valves: Class 150, nonmetallic disc.
3. Bronze Gate Valves: Class 150.

B. Pipe NPS 2-1/2 and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
2. Iron Gate Valves: Class 150.
3. Iron Swing Check Valves: Class 150.
4. Iron Globe Valves: Class 150.

END OF SECTION 220523

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Equipment labels
   2. Warning signs and labels.
   3. Pipe labels.
   4. Stencils.
   5. Valve tags.
   6. Warning tags.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass 0.032-inch, stainless steel 0.025-inch, aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Letter Color: Black, Blue, Red, White, Yellow. As per ANSI depending on service
3. Background Color: Black, Blue, Red ,White, Yellow as per ANSI depending on service
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
6. Fasteners: Stainless-steel rivets or self-tapping screws.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:
1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black, Blue, Red, White, Yellow as per ANSI depending on service.
3. Background Color: Black, Blue, Red, White, Yellow ANSI depending on service.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Black.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Pre-coiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.4 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.
   1. Stencil Paint: Exterior, gloss, black unless otherwise indicated. Paint may be in pressurized spray-can form.
   2. Identification Paint: Exterior, enamel in colors according to ASME A13.1 unless otherwise indicated.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

   1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
   2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

   1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

   1. Size: 3 by 5-1/4 inches minimum.
   2. Fasteners: Brass grommet and wire.
   3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
   4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Division 09 Section "Interior Painting."

B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels with painted, color-coded bands or rectangles on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

C. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feetalong each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

D. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

E. Pipe Label Color Schedule:

1. Low-Pressure Compressed Air Piping:

a. Background: Safety blue.
b. Letter Colors: White.

2. High-Pressure Compressed Air Piping:

a. Background: Safety blue.
b. Letter Colors: White.

3. Domestic Water Piping

a. Background: Safety green.
b. Letter Colors: White.

4. Sanitary Waste and Storm Drainage Piping:

a. Background Color: Safety black
b. Letter Color: White

3.3 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

a. Cold Water: 1-1/2 inchesround.
b. Hot Water: 1-1/2 inchesround.
c. Sanitary waste and storm drainage: 1-1/2 inches round.

2. Valve-Tag Color:

a. Cold Water: Green.
b. Hot Water: Green.
c. Sanitary waste and storm drainage: Natural.

3. Letter Color:

a. Cold Water: White.
b. Hot Water: White.
c. Sanitary waste and storm drainage: white.

3.4 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 220553

SECTION 221114 - FACILITY NATURAL-GAS AND PROPANE GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.
6. Concrete bases.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.
2. Service Regulators: 100 psig minimum unless otherwise indicated.

B. Natural-Gas System Pressure within Buildings: 0.5 psig or less.

1.5 SUBMITTALS

A. Product Data: For each type of the following:

1. Piping valves and specialties.
2. Corrugated, stainless-steel tubing with associated components.
3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
4. Pressure regulators. Indicate pressure ratings and capacities.
5. Dielectric fittings.

B. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

1. Shop Drawing Scale: 3/8 inch per foot.
2. Detail mounting, supports, and valve arrangements for pressure regulator assembly.

C. Site Survey: Plans, drawn to scale, on which natural-gas piping is shown and coordinated with other services and utilities.

D. Qualification Data: For qualified professional engineer.

E. Welding certificates.

F. Field quality-control reports.

G. Operation and Maintenance Data: For pressure regulators to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

1.8 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

B. Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural-gas supply according to requirements indicated:

1. Notify Construction Manager and Owner no fewer than one week in advance of proposed interruption of natural-gas service.
2. Do not proceed with interruption of natural-gas service without Construction Manager's and Owner's written permission.

1.9 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces. Comply with requirements in Division 08 Section "Access Doors and Frames."

C. Part 2 specifies general descriptions and minimum standards for pipe valves and fitting. All pipes valves fittings and specialties shall meet the requirements of the local utility and shall be listed and approved for use by the local utility.

D. The contractor shall be responsible for all utility coordination. This will include but is not limited to field supervision by the utility, applications to the utility for service. Submit application, arrange field meetings and inspections as required. HDPE piping fusion welding shall only be performed by contractors having current certification, (by the utility), for both personal and equipment. Before service work begins, determine service gas pressure and obtain service layout from the utility. Required gas service pressure shall be coordinated with equipment requirements.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

    a. Material Group: 1.1.
    b. End Connections: Threaded or butt welding to match pipe.
    c. Lapped Face: Not permitted underground.
    d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
    e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.
5. Mechanical Couplings:

    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) Dresser Piping Specialties; Division of Dresser, Inc.
        2) Smith-Blair, Inc.
        3) Other manufacturers offering similar products.

    b. Steel flanges and tube with epoxy finish.
    c. Buna-nitrile seals.
    d. Steel bolts, washers, and nuts.
    e. Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
    f. Steel body couplings installed underground on plastic pipe shall be factory equipped with anode.

B. HDPE Pipe: ASTM D 2513, SDR 11. (Underground piping only)

1. HDPE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
2. HDPE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
3. Anodeless Service-Line Risers: Factory fabricated and leak tested.

a. Underground Portion: HDPE pipe complying with ASTM D 2513, SDR 11 inlet.
b. Casing: Steel pipe complying with ASTM A 53/A 53M, Schedule 40, black steel, Type E or S, Grade B, with corrosion-protective coating covering.
c. Aboveground Portion: PE transition fitting.
d. Outlet shall be threaded or flanged or suitable for welded connection.
e. Tracer wire connection.
f. Ultraviolet shield.
g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

4. Transition Service-Line Risers: Factory fabricated and leak tested.

a. Underground Portion: HDPE pipe complying with ASTM D 2513, SDR 11 inlet connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E or S, Grade B, with corrosion-protective coating for aboveground outlet.
b. Outlet shall be threaded or flanged or suitable for welded connection.
c. Bridging sleeve over mechanical coupling.
d. Factory-connected anode.
e. Tracer wire connection.
f. Ultraviolet shield.
g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

5. Plastic Mechanical Couplings, NPS 1-1/2 and Smaller: Capable of joining PE pipe to PE pipe.

a. Manufacturers: Subject to approval of the utility and in compliance with requirements, provide products by one of the following:

1) Lyall, R. W. & Company, Inc.
2) Mueller Co.
3) Perfection Corporation.

b. PE body with molded-in, stainless-steel support ring.
c. Buna-nitrile seals.
d. Acetal collets.
e. Electro-zinc-plated steel stiffener.

6. Plastic Mechanical Couplings, NPS 2 and Larger: Capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.

a. Manufacturers: Subject to approval by the utility and in compliance with utility requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Lyall, R. W. & Company, Inc.
2) Mueller Co.
3) Perfection Corporation.

b. Fiber-reinforced plastic body.
c. PE body tube.
d. Buna-nitrile seals.

e. Acetal collets.
f. Stainless-steel bolts, nuts, and washers.

7. Steel Mechanical Couplings: Capable of joining plain-end PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.

a. Manufacturers: Subject to approval by the utility and in compliance with utility requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following
1) Dresser Piping Specialties.
2) Smith-Blair, Inc.
b. Stainless-steel flanges and tube with epoxy finish.
c. Buna-nitrile seals.
d. Stainless-steel bolts, washers, and nuts.
e. Factory-installed anode for steel-body couplings installed underground.

2.2 PROTECTIVE COATING FOR UNDERGROUND STEEL PIPING:

A. All buried steel piping shall be catholically protected as per the following:
a. All buried steel pipe requires factory applied coating in accordance with gas specification g- 8062 titled “extruded polyolefin coating on steel gas pipe”.

b. Field installed joints and fittings will be coated in accordance with gas specification g-8209 titled “field coating of steel gas pipe and fittings installed underground and in subsurface structures”.

c. The new steel service pipe must have an insulating joint (ij) installed when a connection to existing steel or copper tubing is required.

d. An insulating joint (ij) will be installed under the following conditions:
1) Low pressure service - after the service head valve (shv) but before the gas meter.
2) Elevated pressure - after the gas regulator but before the gas meter.

e. Electrical continuity of all steel underground service pipes must be provided. Bonding must be installed across all compression couplings and fittings installed on buried service pipes as per gas drawing specification eo-4718 titled “bonding of compression couplings and valves on steel mains and services”.

f. Magnesium anodes are required on all new direct buried steel service pipes. Con Edison will furnish and install the required anodes on its portion of gas steel gas service pipe with the customer and/or his contractor responsible for the anode installation on the customer's portion of service pipe. All anode wires shall be a-fixed to the steel service pipe using the thermit welding process or by using an approved connector as per gas drawing specification eo-14134 titled “thermit weld process for attaching wire to pipe or fitting”.

PIPE SIZES	PIPE LENGTH	ANODE SIZE	QUANTITY
2"-4"	EVERY 100' OR LESS	32LB	1
6"-12"	EVERY 100' OR LESS	32LB	2

*REFER TO CON ED YELLOW BOOK FOR THE COMPLETE TABLE.

g. When a steel gas service is installed that supplies more than one building, the anodes shall be installed after con Edison personnel has tested the pipe to determine the acceptability of the pipe coating.

h. Con Edison will test the catholic protection on all new gas service installations. Proper catholic protection must exist prior to the final tie-in by con Edison.

i. Test stations shall be installed along with anodes on all buried steel service pipes greater than 100 lf or more in length. Anode test stations are to consist of #10 copper wire leads (white) thermit-welded to the steel service pipe along with anode leads (black) routed into a 4” x 4” box, flush to grade. Con Edison’s gas corrosion personnel will make final splice.

2. Mechanical Couplings:

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) Dresser Piping Specialties; Division of Dresser, Inc.
2) Smith-Blair, Inc.
3) Other manufacturers offering similar products.

b. Steel flanges and tube with epoxy finish.
c. Buna-nitrile seals.
d. Steel bolts, washers, and nuts.
e. Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
f. Steel body couplings installed underground on plastic pipe shall be factory equipped with anode.

2.3 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Corrugated stainless-steel tubing with polymer coating.
3. Operating-Pressure Rating: 0.5 psig.
4. End Fittings: Zinc-coated steel.

5. Threaded Ends: Comply with ASME B1.20.1.
6. Maximum Length: 72 inches.
7. Corrugated Stainless Steel Piping (CSST) installation is not permitted on distribution piping in New York City.

B. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

C. Basket Strainers:

1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

D. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.4 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.5 MANUAL GAS SHUTOFF VALVES

A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig.
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.

4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

C. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig.
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

D. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

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. BrassCraft Manufacturing Company; a Masco company.
    b. Conbraco Industries, Inc.; Apollo Div.
    c. Lyall, R. W. & Company, Inc.
    d. McDonald, A. Y. Mfg. Co.
    e. Perfection Corporation; a subsidiary of American Meter Company.

2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Bronze Plug Valves: MSS SP-78.

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. Lee Brass Company.

b. McDonald, A. Y. Mfg. Co.
c. .

2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig.
7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. Cast-Iron, Nonlubricated Plug Valves: MSS SP-78.

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. McDonald, A. Y. Mfg. Co.
b. Mueller Co.; Gas Products Div.
c. Xomox Corporation; a Crane company.

2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.6 AUTOMATIC GAS SHUTOFF VALVES

A. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33. and UL listed guide #YRPV2.

1. CWP Rating: 125 psig.
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves where indicated. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
5. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

6. Body; Aluminum
7. Seals and disc; NBR
8. Core tube; 305 stainless steel
9. Core and plugnut; 430F stainless
10. Springs; 302 stainless
11. Valves shall be normally closed, cable operated and held open. Coordinate operating mechanism with fire protection contractor and equipment. Mechanism shall be designed to close valve when cable is pulled or released as required.

B. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38. and UL listed guide #YRPV2.

1. CWP Rating: 125 psig.
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves where indicated.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.
5. Body; Aluminum
6. Seals and disc; NBR
7. Core tube; 305 stainless steel
8. Core and plugnut; 430F stainless
9. Springs; 302 stainless
10. Valves shall be normally closed, cable operated and held open. Coordinate operating mechanism with fire protection contractor and equipment. Mechanism shall be designed to close valve when cable is pulled or released as required.

2.7 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.

B. Service Pressure Regulators: Comply with ANSI Z21.80.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. American Meter Company.
   b. Fisher Control Valves and Regulators; Division of Emerson Process Management.

2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.

8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 100 psig.

2.8 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

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. Capitol Manufacturing Company.
    b. Central Plastics Company.
    c. Hart Industries International, Inc.
    d. McDonald, A. Y. Mfg. Co.
    e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    f. Wilkins; a Zurn company.

2. Description:

    a. Standard: ASSE 1079.
    b. Pressure Rating: 125 psig minimum at 180 deg F.
    c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

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. Capitol Manufacturing Company.
    b. Central Plastics Company.
    c. Matco-Norca, Inc.
    d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    e. Wilkins; a Zurn company.

2. Description:

    a. Standard: ASSE 1079.

b. Factory-fabricated, bolted, companion-flange assembly.
c. Pressure Rating: 125 psig minimum at 180 deg F.
d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

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. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.

2. Description:

a. Nonconducting materials for field assembly of companion flanges.
b. Pressure Rating: 150 psig.
c. Gasket: Neoprene or phenolic.
d. Bolt Sleeves: Phenolic or polyethylene.
e. Washers: Phenolic with steel backing washers.

2.9 LABELING AND IDENTIFYING

A. In accordance with ASME and Local utility requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping according to NFPA 54 and the New York State Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with NFPA 54 and the New York State Fuel Gas Code requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

A. Comply with NFPA 54 and Con Edison requirements for installation and purging of natural-gas piping.

B. Install underground, natural-gas piping buried at least 36 inches below finished grade. Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

1. If natural-gas piping is installed less than 36 inches below finished grade, install it in containment conduit.

C. Install fittings for changes in direction and branch connections.

D. Install pressure gage upstream and downstream from each service regulator. Pressure gages are specified in Division 23 Section "Meters and Gages for HVAC Piping."

3.4 INDOOR PIPING INSTALLATION

A. Comply with NFPA 54 and the New York State Fuel Gas Code for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Verify final equipment locations for roughing-in.

K. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

L. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-regulator outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

M. Extend relief vent connections for service regulators to outdoors and terminate with weatherproof vent cap.

N. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

O. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.
1. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.

a. Exception: Tubing passing through partitions or walls does not require striker barriers.

2. Prohibited Locations:

a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys, or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
b. Do not install natural-gas piping in solid walls or partitions.

P. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

Q. Connect branch piping from top or side of horizontal piping.

R. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

S. Do not use natural-gas piping as grounding electrode.

T. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."

V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."

W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 23 Section "Escutcheons for HVAC Piping."

3.5 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install underground valves with valve boxes.

C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

3.6 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.

G. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.

3.7 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hangers and supports specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

3.8 CONNECTIONS

A. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

B. Install piping adjacent to appliances to allow service and maintenance of appliances.

C. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.9 LABELING AND IDENTIFYING

A. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for piping and valve identification.

B. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.10 PAINTING

A. Comply with requirements in Division 09 painting Sections for painting interior and exterior natural-gas piping.

B. Paint exposed, interior and exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.

1. Alkyd System: MPI EXT 5.1D.

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
c. Topcoat: Exterior alkyd enamel (flat).
d. Color: yellow.

C. Paint exposed, interior metal piping, valves, service regulators, and piping specialties, except components, with factory-applied paint or protective coating.

D. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.11 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Use 3000-psig, 28-day, compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.12 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Test, inspect, and purge natural gas according to NFPA 54 and the New York Fuel Gas Code and authorities having jurisdiction.

C. Natural-gas piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Aboveground natural-gas piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

F. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.13 PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

A. PIPE SIZE AND PRESSURE LIMITATION FOR GAS PIPING

PSIG	Gas Pipe Installation
In Excess of ½ psig - 5	Gas distribution pipe operating size 4-inch or larger must be
In Excess of 5 psig	All gas distribution pipes sizes operating above 5 psig must be
All welding of gas distribution pipe shall be subject to DOB special inspection (NYCFGC Sec-	
All piping 4-Inch or larger operating in excess of 5 psig must be butt-welded, Subject to DOB special inspection and radio-	
Threaded piping may be used up to 4-inch at pressure no greater than ½ psig.	

B. Aboveground, branch piping smaller than 4" NPS and less than ½ psi shall be the following:
   1. Steel pipe with malleable-iron fittings and threaded joints.

C. All welded distribution piping shall be one of the following:
   1. Steel pipe with wrought-steel fittings and welded joints.

D. Underground, piping shall be one of the following:
   1. Steel pipe with wrought-steel fittings and welded joints.
   2. HDPE pipe and Fittings with fusion welded joints

E. All piping buried under buildings shall be in containment piping:
   1. Containment Conduit for gas pipe: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
   2. Containment Conduit for gas vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.14 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes NPS 2 and smaller at regulator shall be one of the following:

   1. One-piece, bronze ball valve with bronze trim.
   2. Two-piece, full-port, bronze ball valves with bronze trim.
   3. Bronze plug valve.

B. Valves for pipe sizes NPS 2-1/2 and larger at service regulator shall be one of the following:

   1. Two-piece, full-port, bronze ball valves with bronze trim.
   2. Bronze plug valve.
   3. Cast-iron, nonlubricated plug valve.

C. Distribution piping valves for pipe sizes NPS 2 and smaller shall be one of the following:

   1. One-piece, bronze ball valve with bronze trim.
   2. Two-piece, full-port, bronze ball valves with bronze trim.
   3. Bronze plug valve.

D. Distribution piping valves for pipe sizes NPS 2-1/2 and larger shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.
3. Cast-iron, nonlubricated plug valve.

E. Valves in branch piping for single appliance shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

3.15 UNDERGROUND GAS PIPING

A. The contractor shall field verify the exact size, location, depth and invert of all existing utilities within the limits of work prior to commencing his operations, and report any discrepancies to the engineer for resolution.

B. The contractor shall notify all utility companies 72 hours prior to the start of his operations and shall comply with the latest industrial code rule 53 regulations.

C. Install all high pressure and low piping in accordance with Con Edison requirements. Provide minimum cover over the top of the service pipe of 24” in accordance with con Edison requirements. Use only Con Ed approved back fill material, yellow sand, clean of all stones and debris.

D. Plastic and steel pipe shall be installed to allow thermal expansion and contraction. Joints shall be made under con Edison guidelines. Install tracer wire along the lengths of the pipe in accordance with con Edison guidelines. Plastic and steel pipe installation is subject to inspection by the utility.

E. All buried piping shall have plastic warning tape installed 1’-0” above the pipe as per utility requirements.

F. All buried plastic pipe shall be installed with a #14 gage, red, insulated tracer wire from 1’ above grade, taped to the meter riser, and along the entire continuous length of the service pipe to a point 1’ beyond the installation. The tracer must not be electrically connected to any metallic pipe.

G. Provide all pressure tests in accordance with con Edison requirements and nfpa 54. The contractor is responsible for all required paperwork and filing.

H. Provide appropriate plugs and caps on open-ended pipes.

I. When steel service pipe is required, the service pipe will be installed as follows:
1. Buried steel service pipe is to be joined with non-insulating compression-type couplings or by welding. Buried threaded joints or flanged joints are not permitted.

2. Compression couplings may be used to join exposed meter piping as depicted on gas meter piping drawings. Refer to applicable drawings in reference section. All meter piping must be properly supported and a-fixed to building wall, floor or ceiling.
3. Care should be taken in the use and application of pipe joint compound or teflon™ tape. The compound shall only be applied to the male threaded end of the fitting. Teflon™ tape may not be used on pipe joints on the inlet side of a gas rotary meter.
4. Lamp wick or cloth thread intended for the use as a seal in the root of threaded joints is not permitted.
5. Changes in the direction of gas service pipe may be made through the use of factory bends only.

J. This project shall use HDPE pipe for underground service to the building. All above ground piping shall be steel as per the above specifications.

3.16 BELOW GROUND PIPING: LEAKAGE TESTING:

A. All of the customer's service piping and meter piping shall be tested in accordance with the following requirements:

B. All buried piping, before the building wall, shall be pressure tested per the requirement of Gas Specification G-8204, "Pressure testing Requirements for Gas Mains and Services".

C. All buried piping shall be blocked, supported and held in place with sand bags for the leakage test and coating inspection.

D. The test medium shall be either air, inert gas for testing pressures up to 150 psig. Water may be used for test pressures exceeding 150 psig.

E. The pressure source shall be isolated from the piping prior to the start of the test.

F. All joints, fittings, valves or other potential leak sources shall be checked for leakage during the pressure test using leak detection solution (soap water).

G. Test duration times are to be measured after the test medium has stabilized.

H. Pressure readings shall be performed using a calibrated pressure gauge.

I. Prior to tie-in, Con Edison will pressure test buried pipe to the head of service/riser valve.

3.17 REQUIREMENTS FOR BUILDINGS IN FLOOD ZONES:

A. For buildings in flood zones with industrial meter sets or elevated pressure gas regulators, vent lines should be elevated so the terminus is 3' above the FEMA base flood elevation (BFE). If this is not feasible, a Vent Line Protector (VLP) shall be installed on the vent line to prevent water intrusion.

B. Refer to Gas Specification G-8217, “Flood-Prone Areas for the Installation of Gas Service Regulator Vent Line Protectors (VLP’s)” for location listings (by M&S Plate) where water intrusion protection devices shall be installed on vent lines of elevated pressure gas services in Category 3 hurricane flood prone areas.

C. For those areas not listed in Gas Specification G-8217 where there is a potential for exposure to severe water or flooding, a water intrusion protection device should be considered for installation to prevent blocking of the service regulator vent line at Con Edison’s discretion.

D. All outside regulators and the outside terminus for inside service regulators shall have an approved vent line cap (peck vent) or water intrusion protection device aka vent line protector (VLP).

E. Each Water Intrusion Protection Device shall:

1. Terminate outdoors with VLP facing downward.
2. Be weather and insect resistant.
3. Not be covered or obstructed in any way that would prevent or interfere with the operation of the gas regulator.
4. Have a minimum clearance of eighteen inches (18”) from the final outdoor grade to the lower end of the protection device.

F. Refer to Gas Specification G-699, “Installation and Inspection of Gas Service Regulator Vent Line Protectors (VLPs)” for proper sizing of device and properly matched 90 deg. elbow and pipe strap.

3.18 PROHIBITED LOCATIONS FOR SERVICE AND METERING EQUIPMENT OUTDOORS AND INDOORS:

1. Service head valves, meters, pressure regulators, and associated equipment shall not be located:

2. In a designated Boiler or Fire Pump room of a multi-family or commercial building.
3. Gas meters may not be installed within three feet (3 ft.) of sources of ignition including burners, electric panel boxes or machinery.
4. Where they could become a hindrance, obstruction or exposed to mechanical damage.
5. In sleeping quarters, toilets, bathrooms, washrooms, unventilated closets, stairways and stair landings.
6. Indoors on walls of elevator or dumbwaiter shafts, over doorways.
7. Underwater pipes or other pipes which may be subject to sweating.
8. In any recess or enclosure unless its design and location have been approved by Con Edison.
9. Gas piping shall not be installed within six inches of electric meter equipment.

3.19 SPECIAL CONSIDERATIONS FOR SCHOOLS:

A. All gas piping and appliances shall be provided in accordance with New York State Education Department Manual of Planning Standards. Pipe materials, testing requirements and pressure limitation as stated in the SED Manual of Planning Standards shall supersede any other requirements of local utility or state or local codes. Including but not limited to the following.

B. GAS FACILITIES

1. See S409; Part IV, Site and Utilities.

2. Outside shut-off valves to shut off the supply of gas shall be installed and located for ready accessibility in case of emergency.

3. All gas equipment shall comply with AGA Listing or Approved Requirements and shall bear the listing or approval seal of a recognized testing agency such as the American Gas Association Laboratories, Inc. or Underwriter's Laboratories, Inc. Installation of gas equipment and piping shall be in accord with the applicable American National Standards Institute (ANSI) Code and the rules and regulations of the local gas utility.

   All gas appliances shall be provided with suitable pressure regulation by approved individual regulator. It is not required that individual Bunsen burner outlets be provided with pressure regulators.

4. Gas piping shall not be buried in slabs or under buildings unless there is no other reasonable location available. In such cases the gas pipe shall be encased in a gas tight casing which shall be vented to the atmosphere. Gas pipes shall not be run in or through heating ducts and shall not be installed in plenums where air is being returned to air handling systems for recirculation. Gas piping shall be in accordance with ANSI Z21.30 or Z83.1 (where applicable) and in accordance with the Public Service Commission Regulations NYCRR, Part 255 and the Federal Department of Transportation, Part 192.

5. Gas Piping Tests

   a. Gas piping with a working pressure up to 12" W.C. must be welded for pipe sizes 3" and over. The completed line is to be pressure tested with air or inert gas for a minimum of one hour at 15 psig.

   b. Gas piping with a working pressure above 12" W.C. must be welded for pipe sizes 3" and over. The completed line is to be pressure tested with air or inert gas for a minimum of one hour at 1/2 times the working pressure or a minimum of 50 psig.

   c. Coated or wrapped pipe must be tested at 100 psig for a time period of 1 hour to insure the gas tightness of the pipe.

d. The source of test pressure shall be isolated before the pressure tests are made. Tests shall be made in the presence of the architect, engineer, or their representative in conjunction with the local gas utility requirements.

6. Utility gas admitted into school buildings shall also be adequately odorized to render it detectable as prescribed by the Public Service Commission. Liquefied petroleum gases shall be odorized as prescribed by NFPA Standard No. 58.

7. Whenever liquefied petroleum is used, special pipe joint compound resistant to liquefied petroleum gas shall be used.

8. Gas piping entering a building shall be sleeved and sealed as stated in S403d.

C. BUILDING GAS PRESSURES

1. The allowable gas pressures within areas of the school building, other than the Boiler Room, (after the meter and/or regulators) will be the normal 1/2 psig or less service.

2. The allowable gas pressures within the Boiler Room, after the meter and/or regulators, may be up to 2 psig. Normally above 1/2 psig is only required for use in the Boiler Room. It will not be ordinary that gas pressure above 2 psig will be required and requests for utilization of gas pressures above 2 psig pressures will only be considered for approval upon formal presentation for such a request by the consulting engineer of technical reasons to the Office of Facilities Planning.

3. Pressure switches, pressure regulators, and other equipment requiring atmospheric pressure to balance a diaphragm shall be suitably vented to function properly. Over pressure relief valves, normally open vent solenoids, and other similar equipment shall be suitably vented to function properly and operate safely.

4. Gas pressure regulators designed and equipped with vent limiting devices need not be vented to the outdoors. Other gas pressure regulators shall be vented directly to the outdoors.

5. Relief valves and normally open vent valves shall be vented directly to the outdoors.

6. Vent line size

7. Vent lines for gas pressure regulators and other devices requiring venting which do not normally discharge gas through the vent shall be vented to the outdoors through a rigid pipe at least 3/4" in size. Consideration shall be given to increasing the size of the vent lines longer than 20 feet. Manifolding of these vents is allowed providing the cross-sectional area of a common vent line is equal to the sum of the cross sectional areas of the manifolded vent lines.

8. Vent lines for relief valves and normally open vent valves shall be piped directly to the outdoors. (They shall not be vented commonly with devices requiring

atmospheric air pressure to balance a diaphragm.) The size of these lines shall be calculated to provide full relief capacity under the conditions of design. The size of such lines shall never be less than the size of the connection at the device. Manifolding of these vent lines is allowed providing the cross-sectional area of a common vent line is not less than the cross-sectional area of the largest individual line plus 50% of the total cross-sectional area of all other connecting lines.

9. Vent termination - All vent lines shall terminate outdoors in a safe place and not less than 18" from any opening or overhang. Adequate means shall be employed to prevent water from entering the vent pipe, and also to prevent stoppage of it by insects or foreign matter.

D. AREAS OF USE OF GAS DISTRIBUTION

1. Science classrooms - gas outlets at fixed spacing (usually 5 feet) at work counters.

2. Homemaking classrooms - outlets to gas burner type kitchen equipment.

3. Art classrooms - gas outlets at work counters (usually every 30 inches).

4. Gas fired kilns - whenever used, a control valve shall be provided.

5. Kitchens - as required by equipment.

6. Soldering and Annealing - with compressed air if a compressed air torch is to be used.

7. A master control valve shall be provided for the instructor's control in any space having 3 or more gas outlets. This valve may be either a manual or an electrically operated solenoid valve.

8. If gas outlets are in close proximity to water or air outlets, the gas supply pipe shall be equipped with a gas check valve.

END OF SECTION 221114

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Copper tube and fittings
2. Ductile iron pipe and fittings
3. Pipe joining materials
4. Specialty valves
5. Transition fittings
6. Dielectric fittings.

B. Related Section:

1. Division 22 Section "Facility Water Distribution Piping" for water-service piping and water meters outside the building from source to the point where water-service piping enters the building.

1.3 SUBMITTALS

A. Product Data: For the following products:

1. Specialty valves.
2. Transition fittings.
3. Dielectric fittings.
4. Flexible connectors.

B. Water Samples: Specified in "Cleaning" Article.

C. Coordination Drawings: For piping in equipment rooms and other congested areas, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Fire-suppression-water piping.
2. Domestic water piping, storm water piping and sanitary piping.
3. HVAC hydronic piping and Ductwork.
4. Electrical conduits.

D. Field quality-control reports.

E. Sustainable Design Submittals:
   1. Product Data: For adhesives, indicating VOC content.
   2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 61 for potable domestic water piping and components.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

   1. Notify Construction Manager, Owner no fewer than two days in advance of proposed interruption of water service.
   2. Do not proceed with interruption of water service without Construction Manager's, Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

C. Comply with NSF Standard 372 for low lead.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

   1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
   2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
   3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

B. Copper Unions:

1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

C. Copper-Tube, Extruded-Tee Connections:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Apollo Valves; Conbraco Industries, Inc.
   b. Elkhart Products Corporation.
   c. Mueller Industries, Inc.
   d. NIBCO INC.

2. Description: Tee formed in copper tube according to ASTM F 2014.

2.3 DUCTILE-IRON SERVICE PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe:
1. AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Standard-Pattern, Mechanical-Joint Fittings:
1. AWWA C110/A21.10, ductile or gray iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

C. Compact-Pattern, Mechanical-Joint Fittings:
1. AWWA C153/A21.53, ductile iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

D. Plain-End, Ductile-Iron Pipe: AWWA C151/A21.51.

2.4 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free, unless otherwise indicated; full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.5 SPECIALTY VALVES

A. Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for general-duty metal valves.

B. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves, drain valves, backflow preventers, and vacuum breakers.

2.6 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

2.7 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

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. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   d. Zurn Plumbing Products Group; Wilkins Water Control Products.

2. Description:

   a. Pressure Rating: 150 psig at 180 deg F.
   b. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

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. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. EPCO Sales, Inc.
   d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

   a. Factory-fabricated, bolted, companion-flange assembly.
   b. Pressure Rating: 150 psig.
   c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Kits:

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. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Central Plastics Company.
   d. Pipeline Seal and Insulator, Inc.

2. Description:

   a. Nonconducting materials for field assembly of companion flanges.
   b. Pressure Rating: 150 psig.
   c. Gasket: Neoprene or phenolic.
   d. Bolt Sleeves: Phenolic or polyethylene.
   e. Washers: Phenolic with steel backing washers.

E. Dielectric Couplings:

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. Calpico, Inc.
   b. Lochinvar Corporation.

2. Description:

   a. Galvanized-steel coupling.
   b. Pressure Rating: 300 psig at 225 deg F.
   c. End Connections: Female threaded.

d. Lining: Inert and noncorrosive, thermoplastic.

F. Dielectric Nipples:
1. Standard: IAPMO PS 66.
2. Electroplated steel nipple complying with ASTM F1545.
3. Pressure Rating and Temperature: 300 psig at 225 deg F.
4. End Connections: Male threaded or grooved.
5. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for drain valves and strainers.

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install domestic water piping level without pitch and plumb.

G. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that spac

H. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

I. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

J. Install piping adjacent to equipment and specialties to allow service and maintenance.

K. Install piping to permit valve servicing.

L. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

M. Install piping free of sags and bends.

N. Install fittings for changes in direction and branch connections.

O. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

P. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping."

Q. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 221123 "Domestic Water Pumps."

R. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."

S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.2 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

E. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Copper-Tubing Grooved Joints: Roll groove end of tube. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings according to AWWA C606 for roll-grooved joints.

G. Joint Construction for Grooved-End, Ductile-Iron Piping: Make joints according to AWWA C606. Cut round-bottom grooves in ends of pipe at gasket-seat dimension required for specified (flexible or rigid) joint. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket with keys seated in piping grooves. Install and tighten housing bolts.

H. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

I. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.3 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for valve installations.

B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2and larger.

C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping. Drain valves are specified in Division 22 Section "Domestic Water Piping Specialties."

1. Hose-End Drain Valves: At low points in water mains, risers, and branches.
2. Stop-and-Waste Drain Valves: Instead of hose-end drain valves where indicated.

3.4 DIELECTRIC FITTING INSTALLATION

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2and Smaller: Use dielectric couplings or nipples or unions.

3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.
4. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices.

B. Comply with requirements in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support products and installation.

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet If Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
   1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
   2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
   3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
   4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.7 IDENTIFICATION

A. Identify system components. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.

B. Label pressure piping with system operating pressure.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Piping Inspections:

   1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
   2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

      a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
      b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

   3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
   4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

C. Piping Tests:

   1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
   2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.

3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports. Submit for engineer's review and approval.

3.9 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
7. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.10 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.

2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.11 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller, shall be one of the following:
1. Soft copper tube, ASTM B 88, Type K, ASTM B 88 Type L; wrought-copper, solder-joint fittings; and brazed, copper pressure-seal fittings; and pressure-sealed joints.

E. Under-building-slab, domestic water, building-service piping, NPS 4 to NPS 8 and larger, shall be one of the following:
1. Soft copper tube, ASTM B 88, Type K, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.
2. Mechanical-joint, ductile-iron pipe; standard-pattern, mechanical-joint fittings; and mechanical joints.

F. Under-building-slab, combined domestic water, building-service, and fire-service-main piping, NPS 6 to NPS 12, shall be the following:
1. Mechanical-joint, ductile-iron pipe; standard-pattern, mechanical-joint fittings; and mechanical joints.
2. Push-on-joint, ductile-iron pipe; standard-pattern, push-on-joint fittings; and gasketed joints.

G. Under-building-slab, domestic water distribution piping, NPS 3 and smaller, shall be the following:
1. Hard copper pipe type L, ASTM B42 or soft copper tube type L, ASTM B 88. wrought-copper, solder-joint fittings; and brazed joints.

H. Aboveground domestic water distribution piping, NPS 2 and smaller, shall be one of the following:
   1. Hard copper tube, ASTM B 88, Type L; copper, solder-joint fittings; and joints.

I. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be one of the following:
   1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and brazed soldered joints.

J. Aboveground domestic water piping, NPS 5 to NPS 8, shall be one of the following:
   1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and brazed soldered joints.
   2. Hard copper tube, ASTM B 88, Type L or; grooved-joint, copper-tube appurtenances; and grooved joints.

K. Aboveground, combined domestic water-service and fire-service-main piping, NPS 6 to NPS 12, shall be one of the following:
   1. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.

3.12 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

   1. Shutoff Duty: Use ball or gate valves for piping NPS 2and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2and larger.
   2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
   3. Hot-Water Circulation Piping, Balancing Duty: Memory-stop balancing valves.
   4. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION 221116

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.
3. Encasement for underground metal piping.

B. Related Requirements:

1. Section 221313 "Facility Sanitary Sewers" for sanitary sewerage piping and structures outside the building.
2. Section 221329 "Sanitary Sewerage Pumps" for effluent and sewage pumps.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control reports.

C. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.

2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Construction Manager, Owner no fewer than two days in advance of proposed interruption of sanitary waste service.
2. Do not proceed with interruption of sanitary waste service without Construction Manager's, Owner's written permission.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 300-foot head of water
2. Waste, Force-Main Piping: 100 psig.

2.2 PIPING MATERIALS

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Sovent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.

C. CISPI, Hubless-Piping Couplings:
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. ANACO-Husky.
b. Dallas Specialty & Mfg. Co.
c. MIFAB, Inc.
d. Tyler Pipe.

2. Standards: ASTM C 1277 and CISPI 310.

3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

D. Heavy-Duty, Hubless-Piping Couplings:
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. ANACO-Husky.
b. Dallas Specialty & Mfg. Co.
c. MIFAB, Inc.
d. Tyler Pipe.

2. Standards: ASTM C 1277 and ASTM C 1540.
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

E. Cast-Iron, Hubless-Piping Couplings:
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. ANACO-Husky.
b. Dallas Specialty & Mfg. Co.
c. MIFAB, Inc.
d. Tyler Pipe.

2. Standard: ASTM C 1277.
3. Description: Two-piece ASTM A 48/A 48M, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

F. No Hub Fitting Restraints:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Holdrite: 117 Series No Hub Fitting Restraints or comparable.

2. Description: CISPI Designation 301-12, large diameter no-hub cast iron fittings, 4” and over in size, shall be provided with supplemental support to minimize the risk of joints separation under high thrust conditions. Auxiliary restraint products used shall be manufactured assemblies with thrust pressure rating adequate for the specific installation. Field devised methods and materials shall not be used to accomplish this application solution.

2.4 DUCTILE-IRON, GRAVITY SEWER PIPE AND FITTINGS

A. Pipe: ASTM A 746, for push-on joints.

B. Standard Fittings: AWWA C110/A21.10, ductile or gray iron, for push-on joints.

C. Compact Fittings: AWWA C153/A21.53, ductile iron, for push-on joints.

D. Gaskets: AWWA C111/A21.11, rubber.

2.5 DUCTILE-IRON, PRESSURE PIPE AND FITTINGS

A. Mechanical-Joint Piping:

1. Pipe: AWWA C151/A21.51, with bolt holes in bell.
2. Standard Fittings: AWWA C110/A21.10, ductile or gray iron, with bolt holes in bell.
3. Compact Fittings: AWWA C153/A21.53, with bolt holes in bells.
4. Glands: Cast or ductile iron; with bolt holes and high-strength, cast-iron or high-strength, low-alloy steel bolts and nuts.
5. Gaskets: AWWA C111/A21.11, rubber, of shape matching pipe, fittings, and glands

2.6 PRESSURE-TYPE PIPE COUPLINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cascade Waterworks Mfg. Co.
2. Dresser, Inc.
3. Jay R. Smith Mfg. Co.
4. JCM Industries, Inc.
5. Victaulic Company.

B. Tubular-Sleeve Couplings: AWWA C219, with center sleeve, gaskets, end rings, and bolt fasteners.

C. Metal, bolted, sleeve-type, reducing or transition coupling; for joining underground pressure piping. Include 200-psig minimum pressure rating and ends of same sizes as piping to be joined.

D. Center-Sleeve Material: Stainless steel or Ductile iron.

E. Gasket Material: Natural or synthetic rubber.

F. Metal Component Finish: Corrosion-resistant coating or material

2.7 COPPER TUBE AND FITTINGS

A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.

B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

C. Hard Copper Tube: ASTM B 88, Type L and Type M, water tube, drawn temper.

D. Soft Copper Tube: ASTM B 88, Type L, water tube, annealed temper.

E. Copper Pressure Fittings:

1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

F. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.

1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

G. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.8 SPECIALTY PIPE FITTINGS

A. Non-pressure Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
3. Unshielded, Nonpressure Transition Couplings:

a. Standard: ASTM C 1173.
b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
c. Sleeve Materials:
1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
2) For Concrete Pipes: ASTM C 443, rubber.
3) For Fiberglass Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
4) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
5) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

4. Shielded, Non-pressure Transition Couplings:

a. Standard: ASTM C 1460.

b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Ring-Type, Flexible Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Fernco Inc.
b. Logan Clay Pipe.
c. Mission Rubber Company; a division of MCP Industries, Inc.

2. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

C. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Unions:

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) Capitol Manufacturing Company.
2) Hart Industries International, Inc.
3) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
4) Wilkins; a Zurn company.

b. Description:

1) Standard: ASSE 1079.
2) Pressure Rating: 125 psig minimum at 180 deg F.
3) End Connections: Solder-joint copper alloy and threaded ferrous.

3. Dielectric Nipples:

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) Grinnell Mechanical Products.
2) Precision Plumbing Products, Inc.
3) Victaulic Company.

b. Description:

1) Electroplated steel nipple complying with ASTM F 1545.
2) Pressure Rating: 300 psig at 225 deg F.
3) End Connections: Male threaded or grooved.
4) Lining: Inert and noncorrosive, propylene.

2.9 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Standard: ASTM A 674 or AWWA C105/A 21.5.

B. Material: high-density, cross-laminated polyethylene film of 0.004-inch minimum thickness.

C. Form: Sheet or tube.

D. Color: Black or natural.

2.10 EXPANSION JOINTS AND DEFLECTION FITTINGS

A. Ductile-Iron, Flexible Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. EBAA Iron, Inc.
b. Romac Industries, Inc.
c. Star Pipe Products.

2. Description: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig minimum working pressure and for offset and expansion indicated.

B. Ductile-Iron Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Dresser, Inc.
b. EBAA Iron, Inc.
c. JCM Industries, Inc.
d. Smith-Blair, Inc.; a Sensus company.

2. Description: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for expansion indicated.

C. Ductile-Iron Deflection Fittings:

1. Description: Compound coupling fitting with ball joint, flexing section, gaskets, and restrained-joint ends complying with AWWA C110/A21.10 or AWWA C153/A21.53. Include rating for 250-psigminimum working pressure and for up to 15 degrees of deflection.

2.11 BACKWATER VALVES

A. Cast-Iron Backwater Valves:

1. Description: ASME A112.14.1, gray-iron body and bolted cover, with bronze seat.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg. Co.
b. Josam Company.
c. Watts; a Watts Water Technologies company.
d. Zurn Industries, LLC.

3. Horizontal type: with swing check valve and hub-and-spigot ends.
4. Combination horizontal and manual gate-valve type; with swing check valve, integral gate valve, and hub-and-spigot ends.
5. Terminal type; with bronze seat, swing check valve, and hub inlet.

2.12 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Josam Company.
b. Smith, Jay R. Mfg. Co.
c. Watts Water Technologies, Inc.
d. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

2. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back-to-back or side by side with common drainpipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

K. Lay buried building waste piping beginning at low point of each system.

1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
3. Maintain swab in piping and pull past each joint as completed.

L. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:

1. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

M. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

N. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

O. Install engineered soil and waste and vent piping systems as follows:

1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
2. Hubless, Single-Stack Drainage System: Comply with ASME B16.45 and hubless, single-stack aerator fitting manufacturer's written installation instructions.

3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

P. Install underground, ductile-iron, force-main piping according to AWWA C600.

1. Install buried piping inside building between wall and floor penetrations and connection to sanitary sewer piping outside building with restrained joints.
2. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.
3. Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.

Q. Install underground, copper, force-main tubing according to CDA's "Copper Tube Handbook."

1. Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.

R. Install force mains at elevations indicated.

S. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Division 22 Section "Sanitary Waste Piping Specialties."
2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Division 22 Section "Sanitary Waste Piping Specialties."

3. Install backwater valves in sanitary waster gravity-flow piping.

a. Comply with requirements for backwater valves specified in Section 221319 "Sanitary Waste Piping Specialties."

T. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

3.2 PIPE JOINT CONSTRUCTION

A. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

B. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

C. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

D. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

E. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

F. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use non-pressure flexible couplings where required to join gravity-flow, non-pressure sewer piping unless otherwise indicated.

a. Shielded flexible couplings for pipes of same or slightly different OD.
b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.

c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

2. Use pressure pipe couplings for force-main joints.

G. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105/A21.5:
1. Hubless cast-iron soil pipe and fittings.
2. Ductile-iron pipe and fittings.
3. Expansion joints and deflection fittings.

H. Install No Hub Fitting Restraints on all piping 4 inch and over in size, shall be provided with supplemental support to minimize the risk of joints separation under high thrust conditions. Auxiliary restraint products used shall be manufactured assemblies with thrust pressure rating adequate for the specific installation. Field devised methods and materials shall not be used to accomplish this application solution.

3.3 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts, and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads. H-50

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches Insert dimensions deep. Set with tops 1 inch above surrounding grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in OD's.
2. In Drainage Piping: Shielded, non-pressure transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples or unions.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric nipples.
4. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.5 VALVE INSTALLATION

A. Comply with requirements in Section 220523. General-duty valve installation requirements.

B. Shutoff Valves:

1. Install shutoff valve on each sewage pump discharge.
2. Install gate or full-port ball valve for piping NPS 2 and smaller.
3. Install gate valve for piping NPS 2-1/2 and larger.

C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

D. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves. Use normally closed type unless otherwise indicated.
2. Floor Drains: Drain outlet backwater valves unless drain has integral backwater valve.
3. Install backwater valves in accessible locations.
4. Comply with requirements for backwater valve specified in Section 221319 "Sanitary Waste Piping Specialties."

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
3. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
4. Vertical Piping: MSS Type 8 or Type 42, clamps.
5. Install individual, straight, horizontal piping runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

6. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
7. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support horizontal piping and tubing within 12 inches of each fitting**,** valve, and coupling.

C. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

D. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
5. NPS 10 and NPS 12 60 inches with 7/8-inch rod.
6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

E. Install supports for vertical cast-iron soil piping every 15 feet and or at every floor

F. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 84 inches with 3/8-inch rod.
2. NPS 1-1/2: 108 inches with 3/8-inch rod.
3. NPS 2: 10 feet with 3/8-inch rod.
4. NPS 2-1/2: 11 feet with 1/2-inch rod.
5. NPS 3: 12 feet with 1/2-inch rod.
6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
7. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
8. NPS 6 and NPS 8: 12 feet with 3/4-inch rod.
9. NPS 10 and NPS 12: 12 feet with 7/8-inchrod

G. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 72 inches with 3/8-inch rod.
2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
3. NPS 2-1/2: 108 inches with 1/2-inch rod.
4. NPS 3 and NPS 5: 10 feet with 1/2-inch rod.
5. NPS 6: 10 feet with 5/8-inch rod.
6. NPS 8: 10 feet with 3/4-inch rod

H. Install supports for vertical copper tubing every 10 feet and at every floor.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect waste and vent piping to the following:

1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Comply with requirements for backwater valves cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
6. Equipment: Connect waste piping as indicated.

    a. Provide shutoff valve if indicated and union for each connection.
    b. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Connect force-main piping to the following:

1. Sanitary Sewer: To exterior force main.
2. Sewage Pump: To sewage pump discharge.

E. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

F. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved.

    a. Expose work that was covered or concealed before it was tested.

2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials.

    a. Isolate test source and allow to stand for four hours.
    b. Leaks and loss in test pressure constitute defects that must be repaired.

3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
4. Prepare reports for tests and required corrective action.

3.10 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.11 PIPING SCHEDULE

A. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; heavy duty hubless-piping couplings; and coupled joints.
3. Copper DWV tube, copper drainage fittings, and soldered joints.
4. Dissimilar Pipe-Material Couplings: Shielded, pressure transition couplings.

B. Aboveground, soil and waste piping NPS 5 and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
3. Galvanized-steel pipe, drainage fittings, and threaded joints.
4. Dissimilar Pipe-Material Couplings: Shielded, pressure transition couplings.

C. Aboveground, vent piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Copper DWV tube, copper drainage fittings, and soldered joints.

    a. Option for Vent Piping, NPS 2-1/2 and NPS 3-1/2: Hard copper tube, Type M; copper pressure fittings; and soldered joints.

3. Dissimilar Pipe-Material Couplings: Shielded, pressure transition couplings.

D. Aboveground, vent piping NPS 5 and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
3. Galvanized-steel pipe, drainage fittings, and threaded joints.
4. Dissimilar Pipe-Material Couplings: Shielded, pressure transition couplings.

E. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:

1. Extra heavy class, cast-iron soil piping; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Shielded, pressure transition couplings.

F. Underground, soil and waste piping NPS 5 and larger shall be any of the following:

1. Extra heavy class, cast-iron soil piping; gaskets; and gasketed joints.
2. Dissimilar Pipe-Material Couplings: Shielded, pressure transition couplings.

3. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.

G. Aboveground sanitary-sewage force mains NPS 1-1/2 and NPS 2 shall be any of the following:

1. Hard copper tube, Type L; copper pressure fittings; and soldered joints.
2. Galvanized-steel pipe, pressure fittings, and threaded joints.

H. Aboveground sanitary-sewage force mains NPS 2-1/2 to NPS 6 shall be any of the following:

1. Hard copper tube, Type L; copper pressure fittings; and soldered joints.
2. Galvanized-steel pipe, pressure fittings, and threaded joints.

I. Underground sanitary-sewage force mains NPS 4 and smaller shall be any of the following:
1. Ductile-iron, mechanical-joint piping and mechanical joints.
2. Fitting-type transition coupling for piping smaller than NPS 1-1/2 and pressure transition coupling for NPS 1-1/2 and larger if dissimilar pipe materials.

J. Underground sanitary-sewage force mains NPS 5 and larger shall be any of the following:
1. Ductile-iron, mechanical-joint piping and mechanical joints.
2. Pressure transition couplings if dissimilar pipe materials.

END OF SECTION 221316

SECTION 221413 - STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Hubless, cast-iron soil pipe and fittings.
   2. Galvanized-steel pipe and fittings.
   3. Ductile-iron pipe and fittings.
   4. Specialty pipe and fittings.
   5. Encasement for underground metal piping.

B. Related Sections:

   1. Division 33 Section "Storm Utility Drainage Piping" for storm drainage piping outside the building.

1.3 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

   1. Storm Drainage Piping: 10-foot head of water.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For controlled-flow roof drainage system. Include calculations, plans, and details.

C. Field quality-control reports.

D. Sustainable Design Submittals:

   1. Product Data: For adhesives, indicating VOC content.
   2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping System Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer" for plastic sewer piping.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Storm-Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Construction Manager, Owner no fewer than two days in advance of proposed interruption of storm-drainage service.
2. Do not proceed with interruption of storm-drainage service without Construction Manager's, Owner's written permission.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Storm Drainage Piping: 300-foot head of water
2. Storm Drainage, Force-Main Piping: 100 psig.

2.2 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings:

1. Marked with CISPI collective trademark and NSF certification mark.
2. Standard: ASTM A 888 or CISPI 301.

B. CISPI, Hubless-Piping Couplings:

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. Fernco Inc.
    b. MIFAB, Inc.
    c. Tyler Pipe.

2. Standards: ASTM C 1277 and CISPI 310.
3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Fernco
    b. ANACO-Husky.
    c. MIFAB, Inc.
    d. Tyler Pipe; a subsidiary of McWane Inc.

2. Standard: ASTM C 1540.
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

D. Cast-Iron, Hubless-Piping Couplings:

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. MG Piping Products Company.

2. Standard: ASTM C 1277.
3. Description: Two-piece ASTM A 48/A 48M, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

E. No Hub Fitting Restraints:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Holdrite: 117 Series No Hub Fitting Restraints or comparable.
2. Description: CISPI Designation 301-12 , large diameter no-hub cast iron fittings, 4” and over in size, shall be provided with supplemental support to minimize the risk of joints separation under high thrust conditions. Auxiliary restraint products used shall be manufactured assemblies with thrust pressure rating adequate for the specific installation. Field devised methods and materials shall not be used to accomplish this application solution.

2.4 GALVANIZED-STEEL PIPE AND FITTINGS

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. Tubular USA.
2. U.S. Steel.
3. Wheatland Tube Company.

B. Pipe: ASTM A 53/A 53M, Type E, Standard Weight class. Include square-cut-grooved or threaded ends matching joining method.

C. Galvanized-Cast-Iron Drainage Fittings: ASME B16.12, threaded.

D. Steel-Pipe Pressure Fittings:

1. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106/A 106M, Schedule 40, seamless steel pipe. Include ends matching joining method.
2. Malleable-Iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
3. Galvanized-Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, standard pattern.

E. Cast-Iron Flanges: ASME B16.1, Class 125.

1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

2.5 DUCTILE-IRON PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Ductile Iron Pipe.
2. McWane Ductile.
3. U.S. Pipe and Foundry Company.

B. Ductile-Iron, Mechanical-Joint Piping:

1. Ductile-Iron Pipe: AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. Ductile-Iron Fittings: AWWA C110/A21.10, mechanical-joint ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.

3. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.6 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in ODs or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified-piping-system fitting.
3. Unshielded, Non-pressure Transition Couplings:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Dallas Specialty & Mfg. Co.
        2) Fernco Inc.
        3) Mission Rubber Company, LLC; a division of MCP Industries.
        4) Plastic Oddities.

    b. Standard: ASTM C 1173.

    c. Description: Elastomeric sleeve, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

    d. Sleeve Materials:

        1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
        2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
        3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

4. Shielded, Non-pressure Transition Couplings:

    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) Cascade Waterworks Mfg. Co.
        2) Mission Rubber Company, LLC; a division of MCP Industries.

    b. Standard: ASTM C 1460.

    c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

d. End Connections: Same size as and compatible with pipes to be joined.

5. Pressure Transition Couplings:

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) Cascade Waterworks Mfg. Co.
2) EBAA Iron, Inc.
3) Ford Meter Box Company, Inc. (The).
4) JCM Industries, Inc.
5) Romac Industries, Inc.

b. Standard: AWWA C219.

c. Description: Metal, sleeve-type couplings same size as pipes to be joined, and with pressure rating at least equal to and ends compatible with pipes to be joined.
d. Center-Sleeve Material: Carbon steel, Stainless steel, Ductile iron.
e. Gasket Material: Natural or synthetic rubber.
f. Metal Component Finish: Corrosion-resistant coating or material.

B. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Unions:

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) Capitol Manufacturing Company.
2) Central Plastics Company.
3) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
4) Wilkins; a Zurn company.

b. Description:

1) Standard: ASSE 1079.
2) Pressure Rating: 150 psig at 180 deg F.
3) End Connections: Solder-joint copper alloy and threaded ferrous.

3. Dielectric Flanges:

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) Capitol Manufacturing Company.
2) Central Plastics Company.
3) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
4) Wilkins; a Zurn company.

b. Description:

1) Standard: ASSE 1079.
2) Factory-fabricated, bolted, companion-flange assembly.
3) Pressure Rating: 150 psig.
4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

4. Dielectric-Flange Insulating Kits:

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) Advance Products & Systems, Inc.
2) Calpico, Inc.
3) Central Plastics Company.
4) Pipeline Seal and Insulator, Inc.

b. Description:

1) Nonconducting materials for field assembly of companion flanges.
2) Pressure Rating: 150 psig.
3) Gasket: Neoprene or phenolic.
4) Bolt Sleeves: Phenolic or polyethylene.
5) Washers: Phenolic with steel-backing washers.

5. Dielectric Nipples:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Grinnell Mechanical Products.
2) Matco-Norca.
3) Precision Plumbing Products.

b. Description: Electroplated steel nipple.

c. Standard: IAPMO PS 66.
d. Pressure Rating: 300at 225 deg F.
e. End Connections: Male threaded or grooved.
f. Lining: Inert and noncorrosive, propylene.

2.7 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Standard: ASTM A 674 or AWWA C105/A 21.5.

B. Material: High-density, cross-laminated polyethylene film of 0.004-inchor linear low-density polyethylene film of 0.008-inchminimum thickness.

C. Form: Sheet or tube.

D. Color: Black or natural.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations from layout are approved on coordination drawings.

B. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

C. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

D. Install piping to permit valve servicing.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install piping to allow application of insulation.

I. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

J. Lay buried building piping beginning at low point of each system.

1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
3. Maintain swab in piping and pull past each joint as completed.

K. Install storm drainage piping at the following minimum slopes unless otherwise indicated:

1. Building Storm Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4and larger.
2. Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.

L. Install cast-iron storm piping according to CISPI's "Cast Iron Storm Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron storm Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

M. Install engineered controlled-flow drain specialties and storm drainage piping in locations indicated.

N. Install steel piping according to applicable plumbing code.

O. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

P. Install underground, ductile-iron, force-main piping according to AWWA C600.

1. Install buried piping inside building between wall and floor penetrations and connection to storm sewer piping outside building with restrained joints.
2. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.
3. Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.

Q. Install underground, copper, force-main tubing according to CDA's "Copper Tube Handbook."

1. Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.

R. Install force mains at elevations indicated.

S. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers in storm drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping. Comply with requirements for cleanouts specified in Division 22 Section "Storm Drainage Piping Specialties."
2. Install drains in storm drainage gravity-flow piping. Comply with requirements for drains specified in Division 22 Section "Storm Drainage Piping Specialties."

T. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

3.2 JOINT CONSTRUCTION

A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Hub-and-Spigot, Cast-Iron Soil Piping Calked Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.

C. Hubless, Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fittings. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

F. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

G. Joint Restraints and Sway Bracing:

1. Provide joint restraints and sway bracing for storm drainage piping joints to comply with the following conditions:

a. Provide axial restraint for pipe and fittings 5 inches and larger, upstream and downstream of all changes in direction, branches, and changes in diameter greater than two pipe sizes.

b. Provide rigid sway bracing for pipe and fittings 4 inches and larger, upstream and downstream of all changes in direction 45 degrees and greater.
c. Provide rigid sway bracing for pipe and fittings 5 inches and larger, upstream and downstream of all changes in direction and branch openings.

H. All no-hub cast iron fittings, 4” and over in size, shall be provided with supplemental support to minimize the risk of joints separation under high thrust conditions. Auxiliary restraint products used shall be manufactured assemblies with thrust pressure rating adequate for the specific installation. Field devised methods and materials shall not be used to accomplish this application solution.

3.3 SPECIALTY PIPE FITTING INSTALLATION

A. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples or unions.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples unions.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges, flange kits, nipples.
4. Dielectric Fittings for NPS 5and Larger: Use dielectric flange kits.

3.4 VALVE INSTALLATION

A. General valve installation requirements for general-duty valve installations are specified in the following Sections:

1. Section 220523 general duty valves for plumbing."

B. Shutoff Valves:

1. Install shutoff valve on each sump pump discharge.
2. Install full port ball valve for piping NS 2 and smaller.
3. Install gate valve for piping NPS 2-1/2and larger.

C. Check Valves: Install swing-check valve, between pump and shutoff valve, on each sump pump discharge.

D. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves. Use normally closed type unless otherwise indicated.
2. Install backwater valves in accessible locations.
3. Comply with requirements for backwater valves specified in Section 221423 "Storm Drainage Piping Specialties."

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
3. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
4. Vertical Piping: MSS Type 8 or Type 42, clamps.
5. Individual, Straight, Horizontal Piping Runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet:MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

6. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
7. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inchminimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.

F. Install supports for vertical cast-iron soil piping every 15 feet and at every floor.

G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 84 inches with 3/8-inch rod.
2. NPS 1-1/2: 108 inches with 3/8-inch rod.
3. NPS 2: 10 feet with 3/8-inch rod.
4. NPS 2-1/2: 11 feet with 1/2-inch rod.
5. NPS 3: 12 feet with 1/2-inch rod.
6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
7. NPS 6 and NPS 8: 12 feet with 3/4-inch rod.
8. NPS 10 and NPS 12: 12 feet with 7/8-inch rod.

H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

I. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 72 inches with 3/8-inch rod.
2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
3. NPS 2-1/2: 108 inches with 1/2-inch rod.
4. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
5. NPS 6: 10 feet with 5/8-inch rod.
6. NPS 8: 10 feet with 3/4-inch rod.

J. Install supports for vertical copper tubing every 10 feet.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.
2. Comply with requirements for cleanouts specified in Division 22 Section "Storm Drainage Piping Specialties."

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

F. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.7 IDENTIFICATION

A. Identify exposed storm drainage piping. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Test Procedure: Test storm drainage piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.
4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved.

    a. Expose work that was covered or concealed before it was tested.

2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials.

    a. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
4. Prepare reports for tests and required corrective action.

F. Piping will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

3.9 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.10 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground storm drainage piping NPS 6 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; Heavy Duty, hubless-piping couplings; and coupled joints.
3. Galvanized-steel pipe, drainage fittings, and threaded joints.
4. Copper Type DWV tube, copper drainage fittings, and soldered joints.
5. Dissimilar Pipe-Material Couplings: Shielded, pressure transition couplings.

C. Aboveground, storm drainage piping NPS 8 and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; heavy duty, hubless-piping couplings; and coupled joints.
3. Galvanized-steel pipe, drainage fittings, and threaded joints.

4. Copper Type DWV tube, copper drainage fittings, and soldered joints.
5. Dissimilar Pipe-Material Couplings: Shielded, pressure transition couplings.

D. Underground storm drainage piping NPS 6 and smaller shall be any of the following:
1. Extra heavy class, cast-iron soil pipe and fittings; gaskets; heavy-duty, hubless-piping couplings; and coupled joints.

2. Dissimilar Pipe-Material Couplings: Shielded, pressure transition couplings.

E. Underground, storm drainage piping NPS 8 and larger shall be any of the following:

1. Extra heavy class, cast-iron soil pipe and fittings; heavy-duty, hubless-piping couplings; and coupled joints.

2. Dissimilar Pipe-Material Couplings: Shielded, pressure transition couplings.

FORCE MAINS

F. Aboveground storm drainage force mains NPS 1-1/2 and NPS 2 shall be any of the following:

1. Hard copper tube, Type L copper pressure fittings, and soldered joints.
2. Galvanized-steel pipe, pressure fittings, and threaded joints.

G. Aboveground storm drainage force mains NPS 2-1/2 to NPS 6 shall be any of the following:

1. Hard copper tube, Type L copper pressure fittings, and soldered joints.
2. Galvanized-steel pipe, pressure fittings, and threaded joints.
3. Fitting-type transition couplings if dissimilar pipe materials.

H. Underground storm drainage force mains NPS 4 and smaller shall be any of the following:

1. Hard copper tube; Type L copper pressure fittings; and soldered joints.
2. Ductile-iron, mechanical-joint piping and mechanical joints.
3. Ductile-iron, push-on-joint piping and push-on joints.
4. Ductile-iron, grooved-joint piping and grooved joints.
5. Fitting-type transition coupling for piping smaller than NPS 1-1/2 and pressure transition coupling for NPS 1-1/2 and larger if dissimilar pipe materials.

I. Underground storm drainage force mains NPS 5 and larger shall be any of the following:

1. Hard copper tube: Type L wrought-copper pressure fittings; and soldered joints.
2. Ductile-iron, mechanical-joint piping and mechanical joints.
3. Pressure transition couplings if dissimilar pipe materials.

END OF SECTION 221413

SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves
2.
3. Grout

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral water stop unless otherwise indicated.

B. Galvanized Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

2.2 GROUT

A. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000 psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 INSTALLATION OF SLEEVES - GENERAL

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use sealants appropriate for size, depth, and location of joint.

E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke-Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

3.2 INSTALLATION OF SLEEVES WITH WATERSTOP

A. Install sleeve with waterstop as new walls and slabs are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal space around outside of sleeves.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.
2. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.

B. Prepare test and inspection reports.

3.4 SLEEVE SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above and below Grade:

    a. Sleeves with waterstops.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

2. Concrete Slabs-on-Grade:

    a. Sleeves with waterstops.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs above Grade:

    a. Sleeves with waterstops.

4. Interior Walls and Partitions:

    a. Sleeves without waterstops.

END OF SECTION 230517

SECTION 232113.33 – GROUND-LOOP HEAT-PUMP PIPING

This draft specification is for ground-loop heat-pump piping systems. REHAU supplies these systems under the name RAUGEO Ground Loop Heat Exchange Systems.

This draft specification is provided only as an aid in architect's/engineer's development of the final specification and is not intended as a substitute for sound architectural/engineering judgment. The architect/engineer shall be responsible to convert this draft specification into a final specification that meets the functional and aesthetic needs of his/her client, as well as to comply with all applicable codes.

Part 1 - GENERAL

1.01 SUMMARY

Ground loop heat exchange systems, where shown on the Drawings and Schedules, shall include the following:

1. Crosslinked polyethylene (PEXa) piping.
2. Distribution manifold(s) with balancing and flow control valves where required.
3. Pipe-to-manifold national pipe thread fittings.
4. Cold-expansion fittings using metal compression sleeves.
5. Electrofusion fittings.
6. Supervision and field engineering required for the complete and proper function of the system.

1.02 RELATED SECTIONS

Section 23 21 23 – Hydronic Pumps

Section 31 20 00 – Earth Moving: Excavation and Backfill

1.03 REFERENCES

Publications listed here are part of this specification to the extent they are referenced. Where no specific edition of the standard or publication is identified, the current edition shall apply.

ASHRAE – American Society of Heating, Refrigerating, and Air-Conditioning Engineers

1. Ground-Source Heat Pumps: Design of Geothermal Systems for Commercial and Institutional Buildings (Textbook by Kavanaugh and Rafferty)

ASTM – American Society for Testing and Materials

1. ASTM D2513 – Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings
2. ASTM F876 – Standard Specification for Crosslinked Polyethylene (PEX) Tubing
3. ASTM F877 – Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems
4. ASTM F1055 – Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing
5. ASTM F2080 – Standard Specification for Cold-Expansion Fittings With Metal Compression-Sleeves for Cross-Linked Polyethylene (PEX) Pipe

CEN – European Committee for Standardization (Comité Européen de Normalisation)

1. EN 1555-3 – Plastic piping systems for the supply of gaseous fuels. Polyethylene (PE). Fittings

CSA – Canadian Standards Association

1. CSA B137.5 – Cross-Linked Polyethylene (PEX) Tubing Systems for Pressure Applications
2. CSA C448 – Design and Installation of Earth Energy Systems

DIN – German Institute for Standardization (Deutsches Institut für Normung)

1. DIN 16892 – Crosslinked high-density polyethylene (PE-X) pipes - General quality requirements and testing
2. DIN 16893 – Crosslinked high-density polyethylene (PE-X) pipes – Dimensions

IGSHPA – International Ground Source Heat Pump Association

1. Closed-Loop / Ground Source Heat Pump Systems, Design and Installation Standards

ISO – International Organization for Standardization

1. ISO 15875-1 – Plastic piping systems for hot and cold-water installation - Crosslinked polyethylene (PE-X) - Part 1: General
2. ISO 15875-2 – Plastic piping systems for hot and cold-water installation - Crosslinked polyethylene (PE-X) - Part 2: Pipes
3. ISO 15875-3 – Plastic piping systems for hot and cold-water installation - Crosslinked polyethylene (PE-X) - Part 3: Fittings
4. ISO 9001 – Quality Management Systems - Requirements
5. ISO 14531-2 – Plastic pipes and fittings - Crosslinked polyethylene (PE-X) pipe systems for the conveyance of gaseous fuels. Fittings for heat-fusion joining

1.04 DEFINITIONS

"The closed-loop portion [ground loop heat exchange] of a ground source heat pump system consists of a long plastic pipe buried below the earth's surface. This plastic pipe is buried in the ground, or ground coupled, to allow heat transfer between the fluids and the earth. The heat pump transfers thermal energy to and from the closed, buried pipe and the building's thermal load. The system consists of a closed loop buried pipe, a water source heat pump, and an air [or water] distribution system for directing heated or cooled air [or water] to specific locations in the building." (IGSHPA Installation Guide, p1).

Crosslinked polyethylene, or PEX is a modified polyethylene material, typically high-density polyethylene (HDPE), which has undergone a change in the molecular structure using a chemical or a physical process whereby the polymer chains are permanently linked to each other. This crosslinking of the polymer chains results in improved performance properties such as elevated temperature strength, chemical resistance, environmental stress crack resistance (ESCR), slow crack growth (SCG) resistance, toughness and abrasion resistance. Crosslinking also makes PEX a "semi-thermoset" polymer, providing excellent long-term stability.

This specification requires PEX to be designated as PEXa and be manufactured by the high-pressure peroxide method. HDPE and PEXa are both acceptable materials for the vertical closed loop wells.

1.05 SUBMITTALS

Comply with Section 01 33 00, Submittal Procedures. Approval and/or acceptance of all submittals is required prior to fabrication.

Product Data: Submit manufacturer's Technical Manual, submittal forms, catalog cuts, brochures, specifications, and installation instructions. Submit data in sufficient detail to indicate compliance with the contract documents.

1. Submit manufacturer's instructions for installation.
2. Submit data for equipment, fittings, fasteners and associated items necessary for the installation of the piping and manifolds.

Submit computer-generated ground loop heat exchange system design indicating total pipe required, ground loop configuration (i.e., borehole, single pipe horizontal, slinky, horizontal, etc), pipe diameter, borehole or trench separation, ground thermal conductivity and diffusivity, and entering and leaving water temperatures. Ground loop heat exchange design calculations shall be performed on industry recognized software.

Drawings: Provide plans drawn to scale for all installation areas.

1. Indicate dimensions, descriptions of materials, general construction, component connections, and installation procedures.
2. Indicate design, schematic layout of system, including equipment, critical dimensions and piping/slab penetration details as well as details for protecting exposed PEXa piping.

Maintenance Instructions: Submit instructions for maintenance.

1.06 QUALITY ASSURANCE

Comply with Section 01 43 00, Quality Assurance.

Manufacturer: Must be a company specializing in the Work of this Section with a minimum of 5 years documented experience.

Pipe shall be manufactured in a facility whose quality management system is ISO 9001 certified.

Pipe and fittings shall be IGSHPA approved.

Pipe and U-bends shall be certified to CSA C448 by a third-party certification body.

1.07 DELIVERY, STORAGE, AND HANDLING

Comply with Section 01 60 00, Product Requirements.

Deliver and store piping and equipment in shipping containers with labeling in place.

1. Pipe shall be kept in original shipping packaging until required for installation.

Store piping and equipment in a safe place, dry, enclosed, under cover, in a well-ventilated area.

1. Do not expose pipe to ultraviolet light beyond exposure limits recommended by manufacturer.
2. Protect piping and manifolds from entry of contaminating materials. Install suitable plugs in open pipe ends until installation.
3. Where possible, connect pipes to assembled manifolds to eliminate possibility of contaminants and cross-connections.
4. Piping shall not be dragged across the ground or other surfaces, and shall be stored on a flat surface with no sharp edges.

Protect materials from damage by other trades.

Pipe shall be protected from oil, grease, paint, direct sunlight and other elements as recommended by manufacturer.

1.08 WARRANTY

Provide manufacturer's standard written warranty.

1. The pipe manufacturer shall warrant the crosslinked polyethylene pipe to be free from defects in material and workmanship for a period of twenty-five (25) years.

Part 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

RAUGEO™ Ground Loop Heat Exchange System for geothermal applications as manufactured by REHAU Construction LLC, 1501 Edwards Ferry Road, NE; Leesburg, VA 20176; email: rehau.mailbox@rehau.com; website: na.rehau.com; upon whose products and equipment these specifications are based.

No Substitutions allowed.

2.02 PIPING

Ground loop heat exchange pipe shall be high-density crosslinked polyethylene manufactured using the high-pressure peroxide method of crosslinking (PEXa). Pipe shall conform to (a) ASTM F876 and (b) CSA B137.5 and (c) CSA C448 or (d) ISO 15875-1:2003, 15875-2:2003 or (e) DIN 16892 and 16893

Pipe shall be rated for continuous operation of 100 psi gauge pressure at 180°F (690 kPa @ 82°C) temperature, and 160 psi gauge pressure at 73.4°F temperature (1,103 kPa @ 23°C).

Horizontal Heat Exchanger:

1. The minimum bend radius for cold bending of the pipe shall be no less than five (5) times the outside diameter. Bends tighter than this minimum shall require the use of a bending template, as supplied by the pipe manufacturer, and hot air.

Vertical Borehole Heat Exchanger:

1. The vertical borehole heat exchanger tip shall be manufactured of one continuous pipe, with no joints in the borehole or shall be manufactured from coated stainless steel components manufactured to the ASTM F2080 standard.
2. The vertical borehole heat exchanger shall be a premanufactured single U-bend and be one continuous 1-1/4” pipe for the depth of the well. [Bid Addendum 2]
3. The vertical borehole heat exchanger tip shall be covered in a GRP resin or a rubber coating.

2.03 FITTINGS

All buried fittings shall be of a permanent design.

Cold-expansion compression-sleeve fittings shall conform and be third-party certified to ASTM F2080, and CSA B137.5.

Cold-expansion compression-sleeve fittings shall be manufactured of brass or stainless steel and shall be supplied by the piping manufacturer as part of a proven cataloged system.

All electrofusion fittings intended for ground loop heat exchange applications shall conform to ASTM F1055 or EN 1555-3.

2.04 MANIFOLDS

Material: Distribution manifolds shall be manufactured of brass or polypropylene and be supplied by the piping manufacturer as a part of a proven cataloged system.

Brass manifolds shall be produced from extruded brass round pipe with tapped holes for connections, and be pre-assembled by the manufacturer. 100% of manifolds used shall have been air tested by the manufacturer with no indication of leaks.

Polypropylene manifolds shall be produced from extruded polypropylene SDR 11 pipe containing a fiber layer to restrict thermal expansion. Holes shall be tapped for connections. Outlet ports shall be fusion welded onto the body of the manifold, with integrated fittings for connection to the borehole field. Fusion welding shall be done in a factory setting to ensure quality of the manifold. Manifold shall be supplied by the manufacturer with all components pressure tested and with no indication of leaks.

Balancing Manifolds

1. Where required by design, manifolds shall be equipped with supply and return manifold isolation valves, integral thermometer and manometer housings, and air vent/fill ports.
2. Where required by design, each circuit shall be supplied with circuit isolation valves, integral visual flow gauges and brass cold expansion compression-sleeve fittings to connect to IGSHPA-approved PEXa pipe.

Part 3 - EXECUTION

3.01 ACCEPTABLE INSTALLERS

Installation shall be performed by qualified laborers trained in the procedures of ground loop heat exchange systems and have IGSHPA certification.

3.02 EXAMINATION

Examine areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of Work. Do not proceed until unsatisfactory conditions are corrected.

Beginning of installation means acceptance of existing conditions.

3.03 THERMAL CONDUCTIVITY TEST

Soil thermal conductivity test shall be performed according to IGSHPA Closed-Loop / Geothermal Heat Pump Systems, Design & Installation Standards, 2008.

3.04 PREPARATION

Coordinate with related trades and manufacturer's recommendations with regard to installation in conjunction with:

1. Drilling
2. Excavation
3. Pipe fusion
4. Heat pump location

3.05 INSTALLATION

Install in accordance with manufacturer's published installation manual and/or published guidelines and final shop drawings.

Mount manifolds in the locations previously prepared or in previously installed cabinets, if used. Manifolds shall be mounted as level as possible, with the venting device on the uppermost section.

Route piping in an orderly manner, according to layout and spacing shown in final shop drawings.

At connections and fittings, use a plastic pipe cutter to ensure square and clean cuts, and join pipes immediately or cap ends of pipe to seal from contaminants. Where compression-sleeve fittings are installed within the ground, they shall be wrapped in a heat-shrink material approved by the manufacturer.

Piping that shall pass through expansion joints shall be covered in protective polyethylene convoluted sleeving (flexible conduit) extending 15 inches (40 cm) on each side of the joint. Sleeving shall be secured on pipe to prevent movement during installation of thermal mass.

Where piping exits the thermal mass, a protective conduit shall be placed around the pipe, with the conduit extending a minimum of 6 inches (15 cm) into the floor and exiting by a minimum of 6 inches (15 cm). For penetrations at manifolds, use rigid PVC bend guides secured in place to prevent movement.

At the time of installation of each circuit of pipe, connect the pipe to the correct manifold outlet and record pipe length for balancing. If manifold is not installed, cap the end of the pipe and label the pipe's circuit numbers along with S for supply and R for return. Connect pipes to manifold as soon as possible and record circuit lengths. Circuits shall be labeled to indicate circuit length and serviced area.

3.06 FIELD QUALITY CONTROL

Filling, Testing & Balancing: Tests of ground loop heat exchange systems shall comply with authorities having jurisdiction, and, where required, shall be witnessed by the building official.

Pressure gauges used shall show pressure increments of 1 psig and shall be located at or near the lowest points in the distribution system.

Air Test

1. Charge the completed, yet unconcealed pipes with air at a minimum of 40 psig.
2. Do not exceed 150 psig.
3. Use liquid gas detector or soap solution to check for leakage at manifold connections.

Water Test

1. Purge air from pipes.
2. Charge the completed, yet unconcealed pipes with water.
3. Take necessary precautions to prevent water from freezing.
4. Check the system for leakage, especially at pipe joints.

Perform a preliminary pressure test pressurizing the system to the greater of 1.5 times the maximum operating pressure or 100 psig for 30 minutes.

1. As the piping expands, restore pressure, first at 10 minutes into the test and again at 20 minutes.
2. At the end of the 30-minute preliminary test, pressure shall not fall by more than 8 psig from the maximum, and there shall be no leakage.

After successfully performing the preliminary test, perform the main pressure test immediately.

1. The main pressure test shall last 2 hours.
2. The test pressure shall be restored and shall not fall more than 3 psig after 2 hours.
3. No leakage shall be detected.

3.07 PROTECTION

Protect installation throughout construction process until date of final completion.

Replace components that cannot be repaired.

END OF SECTION 232113.33

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.3 DEFINITIONS

A. VFC: Variable frequency controller.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

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. Alpha Wire Company.
2. Belden Inc.
3. Cerro Wire LLC.
4. Encore Wire Corporation.
5. General Cable Technologies Corporation.
6. General Cable; General Cable Corporation.

7. Senator Wire & Cable Company.
8. Southwire Company.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN/THWN-2, Type XHHW-2 and Type SO.

D. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC mineral-insulated, metal-sheathed cable, Type MI and Type SO with ground wire.

E. VFC Cable:

1. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable.
2. Type TC-ER with oversized crosslinked polyethylene insulation, spiral-wrapped foil plus 85 percent coverage braided shields and insulated full-size ground wire, and sunlight- and oil-resistant outer PVC jacket.

2.2 CONNECTORS AND SPLICES

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. 3M.
2. AFC Cable Systems, Inc.
3. Gardner Bender.
4. Hubbell Power Systems, Inc.
5. Ideal Industries, Inc.
6. ILSCO.
7. NSi Industries LLC.
8. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
9. Tyco Electronics Corp.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type XHHW-2, single conductors in raceway.

B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway or Mineral-insulated, metal-sheathed cable, Type MI.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway, Metal-clad cable, Type MC or Mineral-insulated, metal-sheathed cable, Type MI.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway or Metal-clad cable, Type MC.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway or Type XHHW-2, single conductors in raceway.

H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

I. VFC Output Circuits: Type TC-ER cable with braided shield.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.

    a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    b. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

B. Test and Inspection Reports: Prepare a written report to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment, plus the following special applications:

1. Underground distribution grounding.
2. Foundation steel electrodes.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency and testing agency's field supervisor.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 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. Burndy; Part of Hubbell Electrical Systems.
2. ERICO International Corporation.
3. Galvan Industries, Inc.; Electrical Products Division, LLC.
4. Harger Lightning & Grounding.
5. ILSCO.
6. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
7. Siemens Power Transmission & Distribution, Inc.

2.2 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for

mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 5/8 by 96 inches.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches below grade.

C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

3.4 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

E. Metallic Fences: Comply with requirements of IEEE C2.

1. Grounding Conductor: Bare, tinned copper, not less than No. 8 AWG.
2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.5 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For grounding electrode system, install at least two rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

D. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

E. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

F. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

G. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.

1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.

3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Manhole Grounds: 10 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Surface raceways
5. Boxes, enclosures, and cabinets.
6. Handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.

B. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

A. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

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. AFC Cable Systems, Inc.
2. Allied Tube & Conduit.
3. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
4. Republic Conduit.
5. Southwire Company.
6. Thomas & Betts Corporation, A Member of the ABB Group.
7. Western Tube and Conduit Corporation.
8. Wheatland Tube Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. EMT: Comply with ANSI C80.3 and UL 797.

F. FMC: Comply with UL 1; zinc-coated steel.

G. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:

a. Material: Steel or die cast.
b. Type: Compression.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

I. Joint Compound for IMC or GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

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. AFC Cable Systems, Inc.
2. Arnco Corporation.
3. CANTEX INC.
4. CertainTeed Corporation.
5. Kraloy.
6. RACO; Hubbell.
7. Thomas & Betts Corporation, A Member of the ABB Group.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

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. Cooper B-Line, Inc.; a division of Cooper Industries.
2. Hoffman; a brand of Pentair Equipment Protection.
3. MonoSystems, Inc.
4. Square D.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.

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. Hubbell Incorporated; Wiring Device-Kellems.
b. MonoSystems, Inc.
c. Legrand/Wiremold
d. Panduit

2.5 BOXES, ENCLOSURES, AND CABINETS

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. Cooper Technologies Company.
2. EGS/Appleton Electric.
3. Erickson Electrical Equipment Company.
4. Hoffman; a brand of Pentair Equipment Protection.
5. Hubbell Incorporated.
6. MonoSystems, Inc.
7. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
8. RACO; Hubbell.
9. Thomas & Betts Corporation, A Member of the ABB Group.
10. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Metal Floor Boxes:

1. Material: Cast metal or sheet metal.
2. Type: Fully adjustable.
3. Shape: Rectangular.

4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

J. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

K. Gangable boxes are allowed.

L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

M. Cabinets:

1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

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. Armorcast Products Company.
    b. Carson Industries LLC.
    c. NewBasis.
    d. Oldcastle Precast, Inc.
    e. Quazite: Hubbell Power Systems, Inc.
    f. Synertech Moulded Products.

2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC.".
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.7 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC or IMC.
2. Concealed Conduit, Aboveground: GRC or IMC.
3. Underground Conduit: RNC, Type EPC-40-PVC or Type EPC-80-PVC.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC or IMC. Raceway locations include the following:

   a. Loading dock.
   b. Mechanical rooms.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC or IMC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. EMT: Use compression, steel or cast-metal fittings. Comply with NEMA FB 2.10.
3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install aluminum conduits, boxes, or fittings.

F. Install surface raceways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inchesof enclosures to which attached.

I. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-footintervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from RNC, Type EPC-40-PVC to GRC or IMC before rising above floor.

J. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

M. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

N. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

O. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

P. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

Q. Surface Raceways:

1. Install surface raceway with a minimum 2-inch radius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

R. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

S. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

T. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

U. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
    d. Attics: 135 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific

location at time of installation. Install conduit supports to allow for expansion movement.

V. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC in damp or wet locations not subject to severe physical damage.

W. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to bottom of box unless otherwise indicated.

X. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Y. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

Z. Locate boxes so that cover or plate will not span different building finishes.

AA. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

BB. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

CC. Set metal floor boxes level and flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

5. Warning Planks: Bury warning planks approximately 12 inches above direct-buried conduits but a minimum of 6 inches below grade. Align planks along centerline of conduit.
6. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install handholes with bottom below frost line, below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

    a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
    b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

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. Advance Products & Systems, Inc.
    b. CALPICO, Inc.
    c. Metraflex Company (The).
    d. Pipeline Seal and Insulator, Inc.
    e. Proco Products, Inc.

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Plastic.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

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. HOLDRITE.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel or cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.3 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 electrical identification products.

B. Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1 and IEEE C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

B. Raceways and Cables Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.
2. Legend: "DANGER - CONCEALED HIGH VOLTAGE WIRING."

C. Warning labels and signs 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."

2.3 LABELS

A. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

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. Brady Corporation.
b. Champion America.
c. emedco.
d. Grafoplast Wire Markers.
e. LEM Products Inc.
f. Marking Services, Inc.
g. Panduit Corp.
h. Seton Identification Products.

B. Snap-Around Labels for Raceways and Cables Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters of raceways they identify, and that stay in place by gripping action.

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. Brady Corporation.
    b. Marking Services, Inc.
    c. Panduit Corp.
    d. Seton Identification Products.

C. Self-Adhesive Labels:

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. A'n D Cable Products.
    b. Brady Corporation.
    c. Brother International Corporation.
    d. emedco.
    e. Grafoplast Wire Markers.
    f. Ideal Industries, Inc.
    g. LEM Products Inc.
    h. Marking Services, Inc.
    i. Panduit Corp.
    j. Seton Identification Products.

2. Preprinted, 3-mil-thick, polyester or vinyl flexible label with acrylic pressure-sensitive adhesive.

    a. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized to fit the cable or raceway diameter, such that the clear shield overlaps the entire printed legend.

3. Polyester or Vinyl, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

    a. Nominal Size: 3.5-by-5-inch.

4. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
5. Marker for Tags: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

2.4 BANDS AND TUBES:

A. Snap-Around, Color-Coding Bands for Raceways and Cables: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameters of raceways or cables they identify, and that stay in place by gripping action.

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. Brady Corporation.
b. Marking Services, Inc.
c. Panduit Corp.

B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameters of and shrunk to fit firmly around cables they identify. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.

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. Brady Corporation.
b. Panduit Corp.

2.5 TAPES AND STENCILS:

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

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. Carlton Industries, LP.
b. Champion America.
c. Ideal Industries, Inc.
d. Marking Services, Inc.
e. Panduit Corp.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.

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. Brady Corporation.
b. Carlton Industries, LP.

c. emedco.
d. Marking Services, Inc.

C. Tape and Stencil for Raceways Carrying Circuits 600 V or Less: 4-inch-wide black stripes on 10-inch centers placed diagonally over orange background that extends full length of raceway or duct and is 12 inches wide. Stop stripes at legends.

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. LEM Products Inc.
b. Marking Services, Inc.
c. Seton Identification Products.

D. Floor Marking Tape: 2-inch-wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

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. Carlton Industries, LP.
b. Seton Identification Products.

E. Underground-Line Warning Tape

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. Brady Corporation.
b. Ideal Industries, Inc.
c. LEM Products Inc.
d. Marking Services, Inc.
e. Reef Industries, Inc.
f. Seton Identification Products.

2. Tape:

a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
b. Printing on tape shall be permanent and shall not be damaged by burial operations.
c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

3. Color and Printing:

a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

4. Tag:

a. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
b. Width: 3 inches.
c. Overall Thickness: 5 mils.
d. Foil Core Thickness: 0.35 mil.
e. Weight: 28 lb/1000 sq. ft..
f. Tensile according to ASTM D 882: 70 lbf and 4600 psi.

F. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.6 Tags

A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

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. Brady Corporation.
b. Carlton Industries, LP.
c. emedco.
d. Marking Services, Inc.
e. Seton Identification Products.

B. Nonmetallic Preprinted Tags: Polyethylene tags, 0.015 inch thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.

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. Brady Corporation.
b. Carlton Industries, LP.
c. emedco.
d. Grafoplast Wire Markers.
e. LEM Products Inc.

f. Marking Services, Inc.
g. Panduit Corp.
h. Seton Identification Products.

C. Write-On Tags:

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. Carlton Industries, LP.
b. LEM Products Inc.
c. Seton Identification Products.

2. Polyester Tags: 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to raceway, conductor, or cable.
3. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.7 Signs

A. Baked-Enamel Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal Size: 7 by 10 inches.

4. 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. Carlton Industries, LP.
b. Champion America.
c. emedco.
d. Marking Services, Inc.

B. Metal-Backed Butyrate Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch galvanized-steel backing and with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal Size: 10 by 14 inches.

4. 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. Brady Corporation.
b. Champion America.

c. emedco.
d. Marking Services, Inc.

C. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:

a. For signs up to 20 sq. inches, minimum 1/16-inch-
b. For signs larger than 20 sq. inches, 1/8 inch thick.
c. Engraved legend with black letters on white face.
d. Punched or drilled for mechanical fasteners.
e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

3. 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. Brady Corporation.
b. Carlton Industries, LP.
c. emedco.
d. Marking Services, Inc.

2.8 CABLE TIES

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. Ideal Industries, Inc.
2. Marking Services, Inc.
3. Panduit Corp.

B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F according to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

C. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F according to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

D. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, self-locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F according to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

G. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

I. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

J. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

K. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

L. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

3.3 IDENTIFICATION SCHEDULE

A. Accessible Raceways, Armored and Metal-Clad Cables, More Than 600 V: Snap-around labels. Install labels at 10-foot maximum intervals.

B. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive vinyl label. Install labels at 30-foot maximum intervals.

C. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels containing the wiring system legend and system voltage. System legends shall be as follows:

1. "STANDBY POWER."
2. "POWER."
3. "UPS."

D. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

E. Power-Circuit Conductor Identification, More Than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic preprinted tags colored and marked to indicate phase, and a separate tag with the circuit designation.

F. Install instructional sign, including the color code for grounded and ungrounded conductors using adhesive-film-type labels.

G. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive, self-laminating polyester labels with the conductor or cable designation, origin, and destination.

H. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive, self-laminating polyester labels with the conductor designation.

I. Conductors To Be Extended in the Future: Attach marker tape to conductors and list source.

J. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker-tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

K. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for direct-buried cables and cables in raceways.

L. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

M. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Metal-backed, butyrate warning signs.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:

    a. Power-transfer switches.
    b. Controls with external control power connections.

N. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

O. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer.

P. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm unless equipment is provided with its own identification.

1. Labeling Instructions:

    a. Indoor Equipment: Engraved, laminated acrylic or melamine plastic label, punched or drilled for mechanical fasteners. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
    b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
    c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    d. Unless labels are provided with self-adhesive means of attachment, fasten them with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment To Be Labeled:

    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a engraved, laminated acrylic or melamine label.

b. Enclosures and electrical cabinets.
c. Access doors and panels for concealed electrical items.
d. Switchboards.
e. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
f. Emergency system boxes and enclosures.
g. Enclosed switches.
h. Enclosed circuit breakers.
i. Enclosed controllers.
j. Variable-speed controllers.
k. Push-button stations.
l. Power-transfer equipment.
m. Contactors.
n. Remote-controlled switches, dimmer modules, and control devices.
o. Battery-inverter units.
p. Power-generating units.
q. Monitoring and control equipment.
r. UPS equipment.

END OF SECTION 260553

SECTION 310000 - EARTHWORK (STORMWATER, SANITARY, WATER SITE UTLITIES)

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes

1. Excavating, filling, backfilling, stockpiling, bedding, compacting, grading, hauling, disposal of on-site soils, processing of on-site soils for reuse, testing of soils, protection and other Work necessary for the construction of stormwater, sanitary, and water site utilities, pipelines, pavements, earthen embankments, and appurtenant Work in accordance with this Section, the Drawings and applicable reference standards listed in Article 1.3.

B. Related Sections

1. Section 31 50 00 Excavation Support and Protection

1.2 PRICE AND PAYMENT PROCEDURES

A. Measurement and payment requirements: per Division 01 General Requirements.

1.3 REFERENCES

A. Reference Standards

1. NYSDOT Standard Specifications and Standard Construction Details, latest revision.

2. Geotechnical report, "*Preliminary Geotechnical Report Town/Village of Harrison Sollazzo Recreation Center",* prepared by Skylands Engineering, LLC, dated April 19, 2019.

B. ASTM International (ASTM)

1. ASTM C117: Standard Test Method for Materials Finer than 75-Micrometers (No. 200) Sieve in Mineral Aggregates by Washing

2. ASTM C136: Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

3. ASTM D422: Standard Test Method for Particle-Size Analysis of Soils

4. ASTM D698: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12400 ft-lbf/ft^3 (600 kN-m/m^3))

5. ASTM D1556: Density and Unit Weight of Soil in Place by the Sand-Cone Method

6. ASTM D1557: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort

7. ASTM D2488: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)

8. ASTM D6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

9. ASTM D2922: Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth)

10. ASTM D3017: Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

11. ASTM D3740: Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

12. ASTM D6938: Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

13. ASTM E329: Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

C. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO T11: Standard Specification for Materials Finer Than 75-Micrometer (No. 200) Sieve in Mineral Aggregates by Washing

2. AASHTO T27: Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates

3. AASHTO T96: Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination, Sequencing, and Scheduling: per Division 01 General Requirements.

1.5 PRE-CONSTRUCTION MEETINGS

A. Review methods and procedures related to earthmoving including, but not limited to, the following:

1. Work hours.

2. Personnel and equipment needed to maintain the proposed construction schedule and avoid delays.

3. Work procedures.

4. Establishing and maintaining Site access.

5. Coordination of Work with utility locator service.

6. Stockpiling area and temporary access points.

7. Site logistics for hauling and stockpiling.

8. Coordination of Work and equipment movement with support of excavation systems installation

9. Construction phasing, anticipated daily and weekly progress and conformance to proposed construction schedule.

10. Methodology for field quality control.

1.6 SUBMITTALS

A. Submit in accordance with Division 01 General Requirements.

1. Product and material data.

B. Qualifications:

1. For Testing Agency qualified according to ASTM E329 and ASTM D3740 for testing indicated.

C. Sample Test Reports and Evaluations:

1. Provide samples of each type of soil or aggregate proposed for use on the project.

a. Samples shall consist of a minimum of 50 pounds of material in an airtight container.

b. Submit samples to the testing laboratory.

c. Provide samples a minimum of 14 days prior to starting construction.

d. Use of these proposed materials by the Contractor prior to testing and approval shall be at the Contractor's risk.

e. The Engineer will be responsible for the approval or rejection of the suitability of all materials.

f. Materials' gradations

g. Soil moisture-density relationships

h. Field compaction testing

2. The Engineer will be responsible for the approval or rejection of the suitability of all materials.

D. Provide copies of material testing reports for each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D2487.

2. Laboratory compaction curve according to the Modified Proctor Test (ASTM D1557).

3. Submit additional material samples every 500 cubic yards or more frequently, throughout the course of the Work, if requested by the Engineer, to evaluate the consistency of the source or process, at no additional cost to the Owner.

4. Material gradations

E. Material Data Documentation: For each on-site and borrow soil material or aggregate as follows:

1. Submit the name of each material supplier and specific type and source of each material. Any change in source throughout the project requires approval of the Owner and Engineer.

2. Certification stating that the materials are virgin materials from a commercial or non-commercial source.

3. Bills of Lading to document the source(s) of the materials, including the name of the supplier and relationship to the source, the location where the materials were obtained, including the street, town, lot and block, country and state. Also include present and past usage of the source site.

4. A statement that to the best of the supplier's knowledge and belief, the material is not contaminated pursuant to any applicable remediation standards and is free of extraneous or solid waste, and a description of the

steps taken to confirm such. Imported soil or fill materials to the site shall be analyzed for the following chemical parameters using EPA methods: Volatiles, Semi-Volatiles, TAL Metals, Pesticides/Herbicides, PCBs. Concentrations shall be compared to the NYSDEC Part 375-6.8 unrestricted use and approved by Engineer. Samples shall be taken at a frequency of 1 per 5,000 cubic yards if originating from a natural borrow source and 1 per 1,000 cubic yards if manufactured or recycled.

5. Product Weight Shipping Tickets (Certified by Supplier).

F. Prepare and submit finished grade information and Drawings.

1.7 QUALITY ASSURANCE

A. Provide in accordance with Division 01 General Requirements.

B. The Contractor is responsible to retain and pay for the services of an independent testing and inspection agency to perform on-site observation and testing during the various phases of the construction operations. The scope of services is to include, at a minimum, compaction testing of all subgrade materials prior to backfilling, including but not limited to all utility trenches, subgrade of all structures including drainage, curbs, etc. Copies of reports will be provided to the Engineer by the Contractor.

C. The Contractor shall make provisions for allowing observations and testing of Contractor's work by the independent testing and inspection agency and/or Geotechnical Consultant.

1. The presence of the independent testing and inspection agency and/or Geotechnical Consultant does not include supervision or direction of the actual work of the Contractor, and his employees or agents. Neither the presence of the independent testing and inspection agency nor any observations and testing performed by them, nor failure to give notice of defects shall excuse the Contractor from defects discovered in his work.

D. Costs related to retesting due to unacceptable qualities of work and failures discovered by testing shall be paid for by the Contractor at no additional expense to Owner, and the costs thereof will be deducted by the Owner from the Contract Sum.

E. The geotechnical testing agency chosen to monitor the earthwork should be qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

F. Prior to start of earthwork the Contractor shall arrange an on-site meeting with the Engineer, the Owner's Representative, the independent testing firm, and/or the Geotechnical Consultant for the purpose of establishing the Contractor's schedule of operations and scheduling observation and testing activities.

G. As construction proceeds, the Contractor shall be responsible for notifying the Owner and Engineer prior to the start of earthwork operations requiring observation and/or testing.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Provide in accordance with Division 01 General Requirements.

B. Waste Management and Disposal:

1. Excess or unsuitable material shall be disposed off-site in accordance with federal, state and local regulations at no additional cost to Owner.

1.9 SITE CONDITIONS

A. Existing Conditions: per Division 01 General Requirements.

B. Before bidding the Work, the Contractor shall perform a site visit to assess the site, equipment access conditions, potential interferences with intended equipment, and location of existing structures and materials.

C. A limited Geotechnical Engineering Report has been prepared for the site. The Contractor shall review this document and become familiar with the site conditions.

D. Review available logs of borings and test pits, records of explorations and other pertinent data for the site. After obtaining Owner's permission, take whatever additional subsurface explorations deemed necessary at no expense to the Owner.

E. The above-mentioned data are for general information and are accurate only at the particular locations and times the subsurface explorations were made. It is the Contractor's responsibility to make interpretations and to draw conclusions based on the character of materials to be encountered and the impact on the Contractor’s work based on the Contractor’s expert knowledge of the area and of earthwork techniques.

F. If a potential conflict exists between the Geotechnical Report and these technical Specifications, the Contractor shall, immediately upon its discovery, request clarification from the Owner's Representative or the Engineer.

G. The Contractor shall notify the Engineer of unexpected subsurface conditions and discontinue Work in area until notified by Engineer.

H. The Contractor shall verify that subsurface utilities have been marked prior to performing excavation or earthwork and shall provide sufficient notification to the local Dig Safe agency.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General

1. Suitable materials: Material consisting of mineral soil (inorganic), blasted or broken rock and similar materials of natural origin, including mixtures thereof, and without the presence of organic or man-made fill materials; as specified below. Maximum particle size will not exceed 2/3 of the specified layer thickness prior to compaction.

2. Imported soil or fill materials to the Site shall be analyzed for environmental parameters identified in Part of this specification.

3. Unsuitable materials (physical): Topsoil fill, very soft or soft clay or silt, organic clays or silts, peats, debris, concrete, pavement, stones or boulders over 6 inches in greatest dimension, wet or frozen material, and material, which in the opinion of the Owner or Engineer, will not provide a suitable foundation or structural support for foundations, slabs, pipes and associated structures, and is unsuitable for use in backfill.

4. On-Site Material: Any suitable material from on-site preparation/ excavation. Supply additional material at no additional cost to the Owner as required to completely backfill trenches, establish subgrades, and other areas as shown on the Drawings. Utilize existing on-site material with the matching gradation for site work as shown on the Drawings. Only import supplemental suitable materials once all suitable on-site materials have been exhausted. Premature removal of suitable materials from the site will not be an acceptable basis for requests for additional payment if additional suitable materials need to be imported after on-site suitable materials are removed from the site.

5. Owner reserves the right to inspect off site sources of materials and order tests of these materials to verify compliance with these Specifications, in addition to those tests required to be completed by the Contractor. The Contractor shall provide the location of off-site sources and access to off-site sources whenever requested by Owner.

B. ¾” Crushed Stone (AASHTO No. 57 Crushed Stone / Pipe and Structure Bedding): Durable, clean angular rock fragments obtained by breaking and crushing rock material meeting the criteria of AASHTO No. 57 stone free of ice, snow, sand, silt, clay, loam, shale, or other deleterious matter, bedding beneath pipe and structures, to minimum of 6 inches above the crown of the pipe. Sieve analysis by weight.

Sieve Size	Percent Passing by Weight
1-1/2-inch	100
1-inch	95-100
½-inch	25-60
#4	0-10
#8	0-5

C. Sand: Shall consist of clean inert, hard, durable grains of quartz or other hard durable rock, free from loam or clay, surface coatings and deleterious materials. Sieve analysis by weight:

Sieve Size	Percent Passing by Weight
3/8-inch	100
#4	95-100
#16	50-85
#50	10-30
#100	2-10
#200	0-3

D. Suitable Backfill: well-graded granular material, of which at least 25 percent by weight shall be retained on the #40 sieve and contain less than 15 percent finer than a #200 sieve by weight, predominantly free from organic matter, man-made materials, ice, snow or other deleterious material and have characteristics so it can be readily placed and compacted. Place 6 inches above the crown of the pipe and around structures 6 inches above the crown of the highest pipe and up to the underside of the pavement section.

E. Unsuitable Material Refill Material: Use crushed stone for refilling excavation below grade or rock excavation unless otherwise directed by the Engineer.

2.2 CONTROLLED LOW STRENGTH MATERIAL

A. A rigid-setting mixture of portland cement, sand, and water shall not require vibration during placement, flow without noticeable segregation, self-consolidate, and be excavatable with hand tools.

B. Sand gradation (U.S. Standard Sieve/Percent Passing)

1. 3/8-inch/100

2. No. 4/95-100

3. No. 16/45-80

4. No. 50/10-30

5. No. 100/2-10

6. No. 200/0-3

C. Cement, water, and chemical admixtures shall meet the requirements of ASTM C260.

D. The 28-day and 90-day compressive strengths, measured in accordance with ASTM D4832, shall be between 30-80 psi and less than 100 psi, respectively.

2.3 SHORING AND BRACING MATERIALS

A. Provide suitable shoring and bracing materials to support loads imposed and to assure complete safety against collapse of the earth at the side of excavations. Materials may be used and in serviceable condition and are subject to inspection and approval of the Engineer once delivered to the Site.

2.4 SOURCE QUALITY CONTROL

A. Provide in accordance with Division 01 General Requirements.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verification of Conditions

1. Before starting Work, check and verify governing dimensions and elevations. Survey condition of adjoining properties with Engineer. Take digital video recording any prior settlement or cracking of structures, pavements and other improvements. Prepare a list of such damages, verified by and signed by Contractor, Engineer, and others conducting the investigation.

2. Coordinate survey. Establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations. Locate datum level used to establish benchmark elevations sufficiently distant so as not to be affected by excavation operations.

3.2 FIELD QUALITY CONTROL

A. Provide in accordance with Division 01 General Requirements.

3.3 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

3.4 SUBGRADE PREPARATION

A. Insulate subgrades from freezing temperatures and frost. Remove temporary protection before placing subsequent materials. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.

B. Prevent surface water and groundwater from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Prevent or control surface water flow into excavations, or water accumulation in excavations, to ensure that the bottoms and sides of excavations remain firm and stable throughout construction operations.

2. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3. Water from excavations shall be recharged on site in such manner as will not cause injury to public health, public and private property, existing work, work to be completed or in progress, roads, walks, and streets, or cause any interference with use of same by public. Concrete or fill shall not be placed in excavations containing free water.

4. Construction will require excavation below water level in soil. The Contractor shall complete this work in-the-dry to maintain the undisturbed condition of the bearing soil.

5. Care shall be taken to avoid disturbance to subgrades.

6. Provide a firm, smooth, stable, undisturbed subgrade as judged by the Engineer. Loose, disturbed soil shall be removed by hand shovel.

7. Subgrades consisting of cohesive soils shall not be back bladed or compacted to prepare a smooth surface.

8. Subgrades consisting of granular soils above groundwater levels shall be re-compacted with at least four passes of hand-guided vibratory plate or vibratory roller compaction equipment.

9. Subgrades shall be prepared as recommended in the geotechnical report.

10. Movement of construction equipment directly over exposed final subgrades, except for compaction equipment, is not permitted.

11. The exposed subgrade will be examined in the field by the Engineer to observe the strength and bearing capacity of the soils. Disturbed, soft, or unstable soils, as judged by the Engineer, shall be excavated and replaced with lean concrete, granular fill, or other acceptable materials at no additional cost to the Owner.

12. Prevent soil subgrades from freezing and frost. Soil subgrades that freeze prior to concrete or backfill placement shall be thawed and re-compacted, or removed and replaced with non-frozen backfill, lean concrete, or other acceptable material as directed by the Engineer.

13. Excavations shall not undermine existing foundations, streets, sidewalks, or structures.

3.5 EXCAVATION

A. Remove materials encountered to the limits shown on the Drawings, designated in the Specifications or as required by the Owner.

1. Do not perform excavation below normal grade to remove and replace unsuitable materials until approved by the Engineer.

2. Do not perform excavation of rock, boulder or unsuitable materials until material to be excavated has been cross-sectioned and classified by Engineer.

B. Earth Excavation: removal and disposal of pavements, curbing and other obstructions visible on ground surface, underground structures and utilities indicated to be demolished and removed, and other materials encountered that are not classified as rock excavation or unauthorized excavation. Legally dispose of surplus materials resulting from excavation and not needed for use on the Project, as determined by the Engineer. Obtain necessary permits for legal disposal of surplus material.

C. Excavation in Asphalt Pavement Areas

1. Saw cut or mill to full depth through existing pavement prior to any excavation for pipe or structure placement. Minimize disturbance of remaining pavement. Cut and remove the minimum amount of pavement

required to do the Work.

2. Use shoring and bracing where sides of excavation will not stand without undermining pavement, as required by OSHA, or is otherwise unsafe for entrance of personnel.

3. Keep material and soil stockpiles a minimum 10 feet back from the edge of excavation, or in accordance with the approved support of excavation design, to avoid overloading of the sides of excavation and prevent slides or cave-ins.

4. Remove and dispose of existing pavements in the course of the Work. Take care to avoid mixing existing pavement material with excavation material to be used for backfill.

D. Excavation for Trenches

1. Excavate to widths shown on the Drawings.

2. Produce an evenly graded flat trench bottom at the subgrade elevation required for installation of pipe and bedding material.

3. Load excavated material directly into trucks unless otherwise permitted by the Engineer.

4. Place backfill material directly into trench or excavation. Do not stockpile material to be used as backfill in roadways.

E. Unauthorized Excavation: removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Engineer. Unauthorized excavation, as well as remedial work directed by Engineer including refilling, is at no additional cost to Owner.

1. Refilling Unauthorized Excavation

a. Trenches: Use 3/4 to 1-1/2-inch crushed stone and stabilization fabric as a separator material, if necessary, as directed by Engineer.

b. Elsewhere: Backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Engineer.

F. Excavation Below Normal Grade: When excavation has reached required subgrade elevations, notify Engineer who will make an inspection of conditions. If unsuitable bearing materials, as defined in Paragraph 2.1 above, are encountered at required subgrade elevations, carry excavations deeper as directed by Engineer and replace excavated material with crushed stone or as directed by the Engineer.

G. Excavation Above Normal Grade: If unsuitable materials, as defined in Paragraph 2.1 above, are encountered above normal grade, remove the unsuitable material and dispose of and do not use as backfill on any portion of the Project, unless otherwise approved by the Engineer. Use suitable stockpiled material approved by the Engineer, to replace the unsuitable material to backfill the trench to the dimensions for pipe and structure bedding and backfill as shown on the Drawings. If suitable stockpile material is not sufficient to backfill the trench to required dimensions, use gravel borrow to complete the trench backfill to the elevation shown for pipe and structure backfill. Furnish and install stockpiled material and gravel borrow at no additional cost to Owner.

H. Material Storage

1. Stockpile and maintain suitable surplus excavated materials for re-use as backfill anywhere within the Project limits as directed by the Engineer. Place, grade, and shape stockpiles for proper drainage. Cover stockpiles when unused to limit infiltration by precipitation.

2. Provide erosion controls around stockpile areas as required by the Erosion and Sediment Control Plan and/or the Engineer at no additional cost to Owner.

3. Locate and retain soil materials at least 10 feet away from edge of excavations or as allowed approved support of excavation design.

I. Contractor is to obtain any required trench or excavation permits as applicable.

J. Field Quality Control

1. Provide in accordance with Division 01 General Requirements.

3.6 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings, Foundations, and Underground Tanks: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

2. Excavation to final subgrade level shall not take place until the geotextile and and/or crushed stone layer can be placed immediately following with no undue delay that might result in softening or deterioration of the formation. Where this is not the case, a minimum depth of 3 feet overlying the final subgrade level shall be left in place.

3. No trafficking on the final subgrade or upper surface of the crushed stone layer shall be permitted without prior placement of a sacrificial haulage layer (details to be agreed with the Engineer).

B. Approval of Subgrade:

1. Notify Engineer when excavations have reached required subgrade. Unless otherwise agreed with the Engineer, remove the last 6" just before inspection.

2. Clear subgrade of all soft, spongy or other material unsuitable for founding. If independent inspection and testing agency and/or Engineer determines that unsatisfactory soil is present, continue excavation and replace with suitable as directed.

3. The finished subgrade shall be within the following tolerance: +0 / -1" (25mm). Over-excavation beyond the proposed subgrade will not provide basis to request additional funds from Owner.

4. The subgrade shall be sealed and protected from degradation that might result from frost, rainfall and/or trafficking.

5. Following excavation to foundation bearing levels in the natural soils above groundwater, the exposed surfaces should be recompacted prior to backfilling or constructing foundations with a minimum of four passes with a double-drum vibratory roller compactor such as a Bomag BW-60S or other equipment approved by the Engineer. If, in the opinion of the Engineer, recompaction will be detrimental to the integrity of the subgrade soils, the requirement should be waived. Do not proof-roll wet or saturated subgrades.

6. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities where these affect the final subgrade.

7. Unless otherwise instructed seal formations within 4 hours of inspection with specified geotextile and crushed stone.

8. Measures shall be taken by the Contractor to protect formations from loosening either by trafficking or resulting from the high groundwater table.

3.7 ROCK REMOVAL

A. General

1. Notify Engineer immediately of change in classification. Should bedrock be encountered above the trench bottom grade or above the subgrade

elevation, expose the bedrock surface to allow the Engineer to perform the necessary elevation survey and take cross-sectional measurements.

2. Perform Rock Excavation by mechanical methods only. Do not blast.

3. Remove or partially remove boulders exposed on the sides of or in the bottom of excavations as directed by the Engineer. Depressions resulting from the removal of boulders and rock shall be refilled with approved crushed stone or compacted structural fill.

4. Remove and dispose of unused rock and boulders off-site.

5. Remove, transport and legally dispose of all residual solids encountered to the limits shown on the Drawings, or designated in the Specifications, or as needed to complete the project, in a method approved by Local, State and Federal regulatory agencies.

3.8 SHORING AND BRACING

A. General

1. Provide shoring and bracing in accordance with Specification 31 50 00 Excavation Support and Protection.

2. Provide temporary sheeting, shoring, and bracing in locations where required to protect excavated areas as required for safety or compliance with OSHA, at no additional cost to the Owner. If the Engineer is of the opinion that at any point sufficient or proper supports have not been provided, additional supports may be ordered to be placed at no additional cost to the Owner. Compliance with such order shall not relieve the Contractor from responsibility for the sufficiency of such supports.

3. Slope height, slope inclination, or excavation depth, including utility trench excavation depth, should follow the current OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926.

4. Provide system to resist earth and hydrostatic pressures, including surcharges from surface loads.

5. Maintain shoring and bracing while excavation is open.

6. If not leaving in place, remove systems in stages to prevent disturbance of soils and damage to structures and improvements. Fill voids as soon as sheeting is withdrawn.

B. Provide shoring and bracing designed by a New York Registered Professional Engineer to protect existing buildings, utilities, and other improvements and excavation against movement due to caving and to meet safety requirements of

OSHA for shoring and bracing.

1. Wood Sheeting and Bracing: used as needed to make excavation safe and secure. Leave wood sheeting in place.

2. Steel Sheet Piling: to be removed following completion of Work or remain in place when directed by the Engineer. Drive sheet piling prior to excavation where possible. Fill and compact voids outside sheeting to hold sides of excavation in place. Steel sheet piling may be left in place at the Contractor's option if approved by the Engineer and at no additional cost to the Owner. Cut off sheet piling to be left in place at least 5 feet below finish grade or less if directed by the Engineer.

3. Movable box: used where a shoring system is required but steel piling is not suitable as determined by Contractor.

C. Field Quality Control

1. Provide in accordance with Division 01 General Requirements.

3.9 DEWATERING

A. Water Control and Dewatering

1. Grade Site to drain away from excavations to approved drainage collection facilities. Ensure collected surface drainage water meets permitted criteria for sediment content prior to discharge.

2. Maintain excavations free of water. Furnish, operate and maintain pumping equipment.

3. Dewater excavations and legally dispose of water in a manner that will not cause injury to public and private property.

4. Protect Site from puddling, ponding or running water.

5. Design, furnish, install, maintain, operate and remove temporary dewatering systems as required to lower and control water levels and hydrostatic pressures in excavations during construction; legally dispose of pumped water; construct, maintain, observe and, except where indicated or required to remain in place, remove dewatering equipment and system at the completion of construction.

a. Dewatering may include: lowering the water table, intercepting and collecting seepage which may penetrate the support of excavation, slopes or bottom of the excavation; increasing the stability of excavated slopes; preventing loss of material from beneath the slopes or bottom of the excavation; reducing lateral loads on

sheeting and bracing; limiting horizontal displacements and stresses in support of excavation to tolerable and allowable levels; preventing displacements of existing structures, utilities, pavements, and sidewalks; improving the excavation and hauling characteristics of sandy soil; preventing rupture or heaving of the bottom of any excavation; and disposing of pumped water.

b. *Normal dewatering* is defined as using conventional pumps installed in open excavations, ditches, or sumps to control water and allow for installation of the pipe in a dry trench.

c. *Special dewatering* (NOT IN CONTRACT) is defined as installing wellpoints, deep wells, or eductor and ejector systems to control groundwater and hydrostatic pressures to allow for installation of the work. Special dewatering includes design of the dewatering system by a Professional Engineer currently registered in the state where the Project is located in good standing, and conducting additional borings or subsurface explorations deemed necessary by the Contractor, and approved by the Engineer, to support design.

    1) For Special Dewatering, retain the services of a Professional Engineer currently registered in the state where the Project is located in good standing, experienced in design of dewatering systems, to independently evaluate the boring logs and other soils information available to determine those areas that will require special dewatering techniques and to design the required system. If, in the opinion of the Contractor or Contractor's Dewatering Professional Engineer, additional borings are needed to design special dewatering systems or determine areas where special dewatering techniques will be required, the Contractor shall retain and pay for the services of a boring subcontractor. Contractor's Dewatering Professional Engineer shall provide sufficient on-Site inspection and supervision to assure that the dewatering is carried out in accordance with the approved design.

d. Design a dewatering system capable of:

    1) effectively reducing the hydrostatic pressure and lowering the groundwater levels to a minimum of 2 feet below excavation subgrade in the existing fills and any organic peat, and below the excavation subgrade in the existing organic silts/clays unless otherwise directed by the Engineer, so that all excavation bottoms are firm and dry;

    2) maintaining a dry and stable subgrade until the structures, pipes, appurtenances, and drainage pipe and structure bedding to be built therein have been completed to the

extent that structures, pipes, and appurtenances will not be floated or otherwise damaged;

3) lowering of the groundwater level within the work area without adversely affecting existing structures, utilities, pavements, sidewalks or wells outside of the Work area.

e. Submit the following.

1) Plans and description of the Normal and/or Special Dewatering systems, including the number, location and depth of wells, wellpoints or sumps; designs of filters to prevent pumping of fine soil; method and location for filtering, sedimentation tanks and legal disposal of pumped water; and flow capacity of proposed system, accounting for groundwater level relative to tide cycles if applicable

2) Design calculations, description and complete layout drawings, stamped and signed by Contractor's Dewatering Professional Engineer, at least two weeks prior to scheduled installation of Special Dewatering system

3) Locations of observation wells

4) Records of pump operation and groundwater elevations

6. Dewatering Operations and Procedures

a. Provide electrically operated dewatering equipment, powered with independent generators adequately sized to operate the dewatering system and capable of running on commercial power. Provide standby equipment independent of commercial power and provide for dewatering within 24 hours upon primary pump or power failure. No work shall be performed by the Contractor below the pre-construction groundwater level during dewatering system failure.

b. Provide suitable temporary pipes, flumes or channels for water that may flow along or across the Site of the Work.

c. Provide dewatering equipment with noise attenuation systems capable of meeting the governing noise regulation requirements.

d. Encapsulate the suction end of the pump with crushed stone, filter fabric, and other materials to minimize the amount of silt discharged to the amount allowed by the construction dewatering permit.

e. Do not operate equipment on paved surfaces to prevent damaging these surfaces.

f. Locate dewatering facilities to prevent interference with utilities and construction work to be done by others.

g. For dewatering operations with relatively minor flows, direct pump discharges using filtration bag or system per Erosion and Sediment Control specifications, or pump into hay bale sedimentation traps lined with filter fabric. Filter water through the hay bales and filter fabric prior to seepage into storm drainage or any natural water course.

h. For dewatering operations with larger flows, provide pump discharges into a steel dewatering/sedimentation basin. Use steel baffle plates to slow water velocities, to increase the contact time, and allow adequate settlement of sediment prior to discharge into waterways, storm drainage or discharge point allowed by the construction permit(s).

i. Utilize silt sacks in catch basins when excess silt is suspended in the discharge water per Erosion and Sediment Control specifications.

j. If siltation basin is used, size to effectively filter for the volume and discharge rate of water anticipated without overflow.

k. Provide treatment necessary to prevent discharge of silty and/or contaminated ground water caused by the Contractor's operations, or any contaminated ground water that may pass from excavated surfaces and/or through the excavation support system selected by the Contractor.

l. Dispose of water pumped or drained from the Work in accordance with permit requirements and in a manner to prevent undue interference with other work or damage to adjacent properties, pavements and other surfaces, buildings, structures and utilities.

m. Obtain necessary regulatory approvals for the disposal of dewatering flows, including, among others, approval by the Environmental Protection Agency under the National Pollutant Discharge Elimination System (NPDES) program for construction dewatering activities. Submit the completed and approved construction dewatering permit to the Engineer immediately upon receipt.

7. Special Dewatering (NOT IN CONTRACT)

a. Use Special Dewatering as necessary if Normal Dewatering methods are inadequate to ensure dry and stable excavation subgrade conditions.

b. Special Dewatering techniques may consist of one- or two-stage wellpoint systems, deep wells, or eductor and ejector type systems.

Design with suitable screens to prevent pumping of fines and to address specified Work Site conditions.

c. In areas requiring special dewatering, lower the groundwater level to a minimum of 2 feet below the existing fill and/or organic peat subgrades or to the excavation subgrade for organic silt/clay subgrades prior to any installation and maintain that groundwater level until the excavation has been backfilled and provide monitoring by Contractor's Dewatering Professional Engineer to ensure conformance with the requirements herein.

d. Furnish materials and install at least two observation wells at each excavation area. The location of the wells shall be proposed in the field by the Contractor's Dewatering Professional Engineer and reviewed and approved by the Engineer.

3.10 BACKFILL AND FILL

A. General

1. The contractor shall exercise care when operating equipment adjacent to existing structures so as not to cause damage or displacement. If the contractor's placement and compaction operations result in damage to the structures or track, the contractor shall be required to repair all damage at no additional cost to the Owner.

2. Contractor operations shall be suspended whenever weather conditions are unsatisfactory for placing backfill, or otherwise determined by the Engineer.

3. After occurrence of precipitation, do not operate equipment on previously placed material or an approved excavation until material has dried sufficiently.

4. When excavations or previously placed material have been softened or eroded, all soft and yielding material or other unsuitable or damaged areas shall be removed and replaced with compacted backfill as specified, at no additional cost to the owner.

5. Do not backfill excavations and trenches until new utilities and structures have been inspected and, if required, tested satisfactorily for conformance with the Drawings and Specifications unless directed otherwise by the Engineer. Place acceptable soil material in layers to required elevations as shown on the Drawings or as specified. Fill, backfill, and compact in accordance with this Section to produce minimum subsequent settlement of the material and provide adequate support for the surface treatment or structure to be placed on the material. Place material in approximately horizontal layers beginning at lowest area to be filled. Do not impair

drainage. Replace fill that becomes frozen or saturated in stockpiles with suitable off-site fill at no additional cost to Owner.

B. Crushed stone may be used for fill or backfill where unsuitable soils have been over-excavated or unauthorized excavation has occurred, at no additional cost to the Owner.

C. Any excess excavated on-site soils shall not be suitable for reuse as compacted structural fill below foundations.

D. Ground Surface Preparation

1. Remove asphalt and concrete pavements, granular base course, existing topsoil, sandy and gravelly fills, existing organic silty/clay soils, organic peat, vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface to excavation subgrade prior to placement of fills.

2. When existing ground surface has a density less than that specified under Article 3.11 Compaction, for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

E. Placement

1. Place backfill and fill materials in layers not more than 6 inches in loose depth for material compacted by heavy compaction equipment or hand-operated tampers. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice. Utilize suitable on-site generated fill materials prior to importing additional materials from off-site.

2. Place backfill and fill materials evenly adjacent to structures, to required elevations. Take care to prevent wedging action of backfill against structures by carrying material uniformly around structure to approximately same elevation in each lift.

3. Do not allow heavy machinery within 5 feet of structure during backfilling and compacting.

F. Backfilling Excavations

1. Backfill excavations promptly as Work permits, but not until completion of the following:

a. Inspection and recording locations of underground utilities and structures

b. Removal of concrete formwork

c. Removal of shoring and bracing, and backfilling of voids with satisfactory materials

d. Removal of trash and debris

e. Compaction testing

2. Use care in backfilling to avoid damage or displacement of underground structures and pipe.

3. Backfill under existing utility pipes crossed by new utility pipes with Controlled Low Strength Material (CLSM). The CLSM will extend continuously from the bedding of the new pipe to the utility pipe crossed, including a 6-inch thick envelope of CLSM around the existing utility pipes.

4. Backfill with CLSM when clearance between proposed structure and existing structure is 18 inches or less and sufficient clearance is not provided to obtain suitable compaction, in the opinion of the Engineer.

5. Backfill with CLSM for trenches within impervious surfaces with pipes containing less than 3 feet of cover.

6. Provide that 3/4 to 1-1/2 inch crushed stone backfill stands at its own angle of repose. "Haunching" or "forming" with common fill is not allowed.

G. Backfilling Trenches

1. See Trench Detail on the Drawings.

2. Place pipe and structure bedding and gravel bedding to the extent and dimensions shown on the Drawings so that the pipes and structures have complete and uniform bearing.

3. Grade, compact and shape pipe and structure bedding so that the full length of pipe barrel has complete and uniform bearing. Dig bell holes and depressions for joints after the bedding has been graded and compacted, at proper clearance for jointing the pipes.

4. Following inspection and approval of pipe installation by Engineer, carefully hand place and properly compact additional approved bedding to the limits shown on the Drawings. Hand or mechanical tamping on the sides of the pipe.

5. Place 6 inches of suitable backfill not frozen and without stones larger than 3 inches in the greatest dimension in trenches above the crown of pipe as approved. Spread in layers not exceeding 6 inches in loose thickness and compact each layer by at least 4 passes with an approved vibratory compactor. See Article 3.11 Compaction for compaction types and standards. Carefully place trench backfilling to avoid disturbance of new

Work and of existing structures. Adjust moisture content of backfill to allow for proper compaction.

6. Bed pipe in pipe and structure bedding, crushed stone except where otherwise indicated. Limits of bedding and requirements for remaining trench backfill are shown on the Drawings.

7. Trenches in cross-country runs: Restore surface to that existing prior to construction, as shown on the Drawings, or required by the Engineer. Mound trench 6 inches above existing grade or as required by the Engineer.

H. Placement of Fill

1. Strip all organic topsoil, trees, shrubs, and roots of other vegetation from along the length and breadth of all areas which are to have fill material placed on top. Fill depressions left by grubbing and stripping with material of the same type and compacted to a density at least equal to that of the surrounding foundation material.

2. If independent inspection and testing agency and/or Engineer determines that unsuitable soil is present, continue excavation and replace with compacted fill material as directed.

3. Proof roll all subgrades above groundwater levels as directed by the Engineer prior to placement of fill. Excavate soft areas and replace with appropriate compacted fill.

4. Do not place embankment over porous, wet, frozen, or spongy subgrade or previous embankment surfaces. In the event these conditions occur, excavate and remove the unsuitable material prior to placing more fill.

5. Dewater to maintain groundwater levels a minimum of 1 foot below bottom of excavations and/or subgrades. Place all fill "in-the-dry." Maintain groundwater levels a minimum of 1 foot below surface of adequately compacted fill while additional fill is being placed and compacted.

6. Bench all existing slopes prior to placing horizontal fill layers on existing slopes of greater than 6H to 1V.

7. Place materials in continuous horizontal layers not exceeding 12-inch loose lift thickness when compaction is supplied by a self-propelled vibratory compactor having a minimum ten-thousand-pound drum. In confined areas, place materials in 6-inch loose lift thickness and compact with manually-operated, powered vibratory plate or drum compactor.

8. Compact soil materials placed in various areas to the minimum compaction percentages presented in Article 3.11 Compaction. If wet fill cannot be

adequately compacted within 48 hours of placement, remove and replace with drier fill.

9. Disc, harrow or otherwise dry any fill that is too wet for proper compaction to a proper moisture content for compaction to the required density. Remove and replace fill material that cannot be dried within 48 hours of placement with drier fill.

10. Uniformly water fill that is too dry for proper compaction with sufficient water to allow compaction to the required density.

11. Compact to meet the stated density criteria in Article 3.11 Compaction, but at minimum make four passes with an approved compactor(s). In addition to achieving adequate compaction, the fill shall be judged to be in a firm and stable condition by the Engineer or testing agency prior to further filling of construction.

12. Compact impervious and semi-pervious materials (more than 15 percent passing the #200 sieve) with a tamping (sheep-foot) roller or a rubber-tired roller. In the event that compaction results in a smooth surface on top of the lift, that surface is to be scarified before the placement of the next lift.

13. Compact pervious materials (sands, gravels, and stone materials) by means of self-propelled vibratory rollers. In confined areas, use hand-guided equipment such as a large vibratory plate compactor. Do not exceed lift thickness of 6 inches in confined areas.

14. Remove and replace fill which becomes disturbed after compaction as a result of the Contractor's operations and re-compact to the specified degree of compaction at the Contractor's expense.

15. Place and compact soil material in the embankment in a direction parallel the top of the embankment.

I. Field Quality Control

1. Provide in accordance with Division 01 General Requirements.

3.11 COMPACTION

A. Use methods which produce the required degree of compaction throughout the entire depth of material placed without damage to new or existing facilities and which are approved by the Engineer. Adjust moisture content of soil as required. Remove and replace material which is too wet to compact to required density within 48 hours of placement. Compact each layer as Work progresses.

B. Compaction equipment in open areas for backfill placed shall consist of self-propelled vibratory rollers. In confined areas, hand-guided equipment such as a

large vibratory plate compactor shall be used and the loose lift thicknesses shall not exceed 6 inches.

C. A minimum of four (4) systematic passes of the specified compaction equipment shall be used to compact each lift.

D. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

E. The compaction alternatives presented below are stated to provide minimum compaction standards only and in no way relieve the Contractor of their obligation to achieve the specified degree of compaction by whatever additional effort is necessary.

Compaction Method	Maximum Stone Size	Maximum Loose Lift Thickness	Minimum Number of Passes
		Less Critical Areas	Less Critical Areas
Hand-operated vibratory plate or light roller in confined areas	4 inches	8	4
Hand-operated vibratory drum rollers weighing at least 1,000 lbs. in confined areas	6 inches	12 inches	4
Light vibratory drum roller min. weight at drum 5,000 lbs., min. dynapac force 10,000 lbs.	8 inches	18 inches	4
Medium vibratory drum roller min. weight at drum 10,000 lbs., min. dynapac force 20,000 lbs.	8 inches	24 inches	6

F. Degree of Compaction (minimum densities):

Fill and Backfill Location	Density
Below slabs and foundations	95% of max.
Below top 3 feet under pavement grade	92% of max.
Pipe Bedding	92% of max.
Maximum density:	ASTM D698, modified

Note: Fill that is too wet for proper compaction shall be disked, harrowed, or otherwise dried to proper moisture content for compaction to the required density. If the fill material cannot be dried within 48 hours of placement, remove and replace with drier fill.

G. Field Quality Control

1. Provide in accordance with Division 01 General Requirements.

2. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

   a. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet (46 m) less of trench length, but no fewer than two tests.

3. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

4. Testing

   a. Determine actual in place densities using field tests as directed by the Engineer and in accordance with Division 01 General Requirements.

   b. Perform additional Work to obtain proper compaction if in-place densities do not meet the specified densities. Retesting may be required, at no additional cost to the Owner.

3.12 GRADING

A. Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

B. Grade areas adjacent to structure lines to drain away from structures and to prevent ponding.

C. Finish surfaces: free from irregular surface changes and as follows.

1. Lawn or Other Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 feet above or below required subgrade elevations.

2. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than plus or minus 1 inch above or below required subgrade elevation while still meeting requirements to

maintain positive, consistent slope(s).

D. Compaction: After grading, compact subgrade surfaces to the percentage of maximum density for each area classification.

3.13 MAINTENANCE

A. Protect newly graded areas from traffic and erosion. Keep free of trash and debris. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction. Immediately repair any subsequent settling and provide such maintenance for the remainder of the Contract at no additional expense to the Owner.

C. Prior to completing remaining work upon any established subgrade, remove soft or unsuitable material and replace with suitable backfill material. Bring low sections, holes, or depressions to the required grade with approved material to meet specified tolerances. Shape entire subgrade to line, grade, and cross section and thoroughly compact.

D. Provide erosion control measures in accordance with Laws and Regulations and in accordance with Division 01 General Requirements. Keep roads free of debris. Use suitable watertight vehicles for hauling wet materials over roads and streets. Clean up materials dropped from or spread by vehicles promptly or when directed by the Engineer.

3.14 DISPOSAL OF EXCESS MATERIALS

A. Legally dispose of excess or unsuitable material at no additional cost to Owner in accordance with all local, State, and Federal regulations.

3.15 CLOSEOUT ACTIVITIES

A. Provide in accordance with Division 01 General Requirements.

END OF SECTION 310000

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SECTION 311000 – SITE CLEARING

PART 1-GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, Division 01 General Requirements and Section 015000 Temporary Facilities and Controls apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, and removing site utilities or abandoning site utilities in place.
7. Temporary erosion and sedimentation control measures.

1.3 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

E. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated.

F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain on the Site, cleared materials shall become Contractor's property and shall be removed from the Site.

1.5 SUBMITTALS

A. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations per applicable Highway Permits, Division 01 General Requirements, and Drawings.

B. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

C. The following practices are prohibited within protection zones:
1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

D. Do not direct vehicle or equipment exhaust towards protection zones.

E. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

F. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2-PRODUCTS

2.0 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 31 Section "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3-EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Flag each tree trunk at 54 inches (1372 mm) above the ground.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide in accordance with Drawings and Section 015000 Temporary Facilities and Controls.

3.3 TREE AND PLANT PROTECTION

A. General: Protect trees and plants remaining on-site according to Drawings.

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Landscape Architect.

3.4 EXISTING UTILITIES

A. Contractor (with consent of owner) shall arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

1. Arrange with utility companies to shut off indicated utilities.
2. Owner will arrange to shut off indicated utilities when requested by Contractor.

C. Locate, identify, and disconnect utilities indicated to be abandoned in place.

D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

E. Excavate for and remove underground utilities indicated to be removed.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and/or remove stumps, roots, obstructions, and debris to a depth of 24 inches below exposed subgrade.
3. Use only hand methods for grubbing within protection zones.
4. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Top soil material shall be screened to be 1” minus and stockpiled onsite. Topsoil shall be in accordance with Section 2.2 of Turfs and Grasses Section 32 92 00

D. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches, unless otherwise authorized by Engineer.
2. Do not stockpile topsoil within protection zones.
3. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off the Site.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

SECTION 312000 – EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, Division 01 General Requirements and Section 01 50 00 Temporary Facilities and Controls apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Preparing subgrades for curbs, walks, pavements, lawns, and plantings.
2. Excavating and backfilling for stormwater practices and utility structures.
3. Subbase course for concrete walks and pavements.
4. Excavating and backfilling trenches for buried utilities and pits for buried utility structures.
5. Excavation for mass grading of site.
6. Excavation for structural foundations

B. Refer to Section 310000 for earthwork involving Sanitary, Stormwater and Water utilities.

1.3 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

C. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

D. Excavation: Removal of material encountered above subgrade elevations.

1. Additional Excavation: Excavation below subgrade elevations as directed by Engineer.
2. Bulk Excavation: Excavations more than 10 feet (3 m) in width and pits more than 30 feet (9 m) in either length or width.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond

indicated dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

E. Fill: Soil materials used to raise existing grades.

F. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. (0.76 cu. m) in place that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted.

1. Excavation of Trenches and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- (1065-mm-) wide, short-tip-radius rock bucket; rated at not less than 120-hp (89-kW) flywheel power with bucket-curling force of not less than 25,000 lbf (111 kN) and stick-crowd force of not less than 18,700 lbf (83 kN); measured according to SAE J-1179.
2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp (157-kW) flywheel power and developing a minimum of 45,000-lbf (200-kN) breakout force; measured according to SAE J-732.

G. Structures: Slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

H. Subbase Course: Layer placed between the subgrade and asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.

I. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

J. Utilities: include on-site underground pipes, conduits, ducts, and cables, as well as underground services within 5 feet of the building.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Each type of detectable warning tape.
2. Drainage fabric.
3. Separation fabric.

B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site or borrow soil material pro- posed for fill and backfill.

2. Analytical results demonstrating imported soil meets constituent concentration requirements for “Unrestricted Use” as defined by NYSDEC Part 375 and DER-10 technical guidance documents unless another use category and alternate

constituent concentrations are approved by Engineer.

C. Blasting plan approved by authorities having jurisdiction, for record purposes.

1.5 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Engineer and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Engineer's written permission.
3. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be re- moved. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Backfill and Fill: Satisfactory soil materials.

E. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; meeting the requirements of NYSDOT Item # 304.12.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (38-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

G. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

H. Crushed Stone: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; meeting the requirements of NYSDOT Item # 623.12 and gradation requirements of NYSDOT Item # 605.0901.

I. Rip Rap: Medium stone fill of crushed or uncrushed rock meeting the requirements of NYSDOT Item # 620.04, unless otherwise specified on the Drawings.

2.2 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

B. Drainage Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:

1. Grab Tensile Strength: 110 lbf (490 N); ASTM D 4632.
2. Tear Strength: 40 lbf (178 N); ASTM D 4533.
3. Puncture Resistance: 50 lbf (222 N); ASTM D 4833.
4. Water Flow Rate: 150 gpm per sq. ft. (100 L/s per sq. m); ASTM D 4491.
5. Apparent Opening Size: No. 50 (0.3 mm); ASTM D 4751.

C. Separation Fabric: Woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum proper- ties determined according to ASTM D 4759 and referenced standard test methods:

1. Grab Tensile Strength: 200 lbf (890 N); ASTM D 4632.
2. Tear Strength: 75 lbf (333 N); ASTM D 4533.
3. Puncture Resistance: 90 lbf (400 N); ASTM D 4833.
4. Water Flow Rate: 4 gpm per sq. ft. (2.7 L/s per sq. m); ASTM D 4491.
5. Apparent Opening Size: No. 30 (0.6 mm); ASTM D 4751.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and waterways.

3.2 DEWATERING

A. Provide in accordance with Section 312319 Dewatering~~01 50 00 Temporary Facilities and Controls~~.

3.3 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavation materials may include rock, soil materials, and obstructions. **No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.**

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:

a. 24 inches outside of concrete forms other than at footings.

b. 6 inches outside of minimum required dimensions of concrete cast against grade.

c. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.

d. 6 inches beneath bottom of concrete slabs on grade.

e. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

3.4 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). Extend excavations a sufficient distance from structures for placing

for inspections.

1. Excavations for Equipment Pads: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or mi- nus 1 inch (25 mm). Do not disturb bottom of excavations intended for bearing surface.

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.6 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit, unless otherwise indicated.

1. Clearance: As indicated.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
3. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.7 APPROVAL OF SUBGRADE

A. Notify Engineer when excavations have reached required subgrade.

B. If Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer.

3.8 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Engineer.

1. Fill unauthorized excavations under other construction or utility pipe as directed by Engineer.

3.9 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
2. Soil material shall be screened to be 3” minus and stockpiled on site. Soil material shall be in accordance with section 2.1 of Earth Moving 31 20 00.
3. Top soil material shall be screened to be 1” minus and stockpiled onsite. Topsoil shall be in accordance with Section 2.2 of Turfs and Grasses Section 32 92 00.

3.10 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for record documents.
3. Inspecting and testing underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.11 UTILITY TRENCH BACKFILL

A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

B. Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings; fill with concrete to elevation of bottom of footings.

C. Place and compact initial backfill of subbase material, free of particles larger than 1 inch (25 mm), to a height of 12 inches (300 mm) over the utility pipe or conduit.

1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

D. Coordinate backfilling with utilities testing.

E. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is removed.

F. Place and compact final backfill of satisfactory soil material to final subgrade.

G. Install warning tape directly above utilities, 18 inches below finished grade, except 6 inches be- low subgrade under pavements and slabs.

3.12 FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal, so fill material will bond with existing material.

C. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.

3.13 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact

to specified dry unit weight.

3.14 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under utility structures and paved shoulders, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 92 percent.
3. Under lawn or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 90 percent.
4. Under NYSDOT travel lanes and within 1 on 1 slope of travel lanes backfill trench with select granular fill meeting NYSDOT Item #623.12 or #605.0901.

3.15 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).
2. Walks: Plus or minus 1 inch (25 mm).
3. Pavements: Plus or minus 1/2 inch (13 mm).

3.16 SUBBASE AND BASE COURSES

A. Under pavements and walks, place subbase course on prepared subgrade and as

follows:

1. Place base course material over subbase.
2. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight ac- cording to ASTM D 1557.
3. Shape subbase and base to required crown elevations and cross-slope grades.
4. When thickness of compacted subbase or base course is 6 inches (150 mm) or less, place materials in a single layer.
5. When thickness of compacted subbase or base course exceeds 6 inches (150 mm), place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick when compacted.

B. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.17 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m) or less of paved area, but in no case fewer than three tests.
2. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet (46 m) or less of trench length, but no fewer than two tests.

D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.18 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially

completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, back-fill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.19 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Transport surplus satisfactory soil offsite.

1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it offsite.

END OF SECTION 312000

SECTION 312316.26 - ROCK REMOVAL

PART 1-GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, Section 312000 Earth Moving, and Division 01 General Requirements apply to this Section.

1.2 SUMMARY

A. This Section includes rock removal for site utilities and to the grades shown on the Drawings including the loosening, removing, transporting, storing and disposal of all materials requiring blasting, barring, or wedging for removal from their original beds, and backfill of rock excavations with acceptable materials.

1.3 SUBMITTALS

A. The following items shall be submitted:

1. Blasting plan conforming to the Town ordinances.

2. Before any drilling or blasting operations begin the Contractor shall obtain all permits and licenses required.

3. Seismic Survey Report: Owner to provide for record purposes; from seismic survey agency.

4. Pre-excavation Photographs or Videotape: In addition to what is required in Division 01 General Requirements, show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

1.4 DEFINITIONS

A. Rock

1. See Section 312000 Earth Moving

1.5 QUALITY ASSURANCE

A. Provide in accordance with Division 01 General Requirements.

B. Blasting: Comply with applicable requirements in NFPA 495, "Explosive Materials Code," and prepare a blasting plan reporting the following:

Types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.

C. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:

1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
2. Seismographic monitoring during blasting operations.

D. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

E. Pre-excavation Conference: Conduct pre-excavation conference at the Site.

F. Any Blasting shall be performed in small and controlled blasts so as not to cause disruption or damage to the adjacent roadway, its user, or adjacent residences. Any damage to the adjacent road and / or users, the residences within the vicinity of blasting (distance to monitor structures for damage per the Laws and Regulations for blasting) or belongings of the inhabitants shall be replaced by the contractor at no additional expense to the Owner.

PART 2-PRODUCTS

NOT USED

PART 3-EXECUTION

3.1 BLASTING

A. General

1. Handling of explosives and blasting shall be done only by experienced persons.

2. Handling and blasting shall be in accordance with all Federal, State and local laws, rules and regulations relating to the possession, handling, storage and transportation and use of explosives.

3. All blasts in open cut shall be properly covered and protected with approved blasting mats.

4. Charges shall be of such size that the excavation will not be unduly large and shall be so arranged and timed that adjacent rock, upon or against which pipelines or structures are to be built, will not be shattered.

5. Blasting will not be permitted within 25 feet of pipelines or structures, unless approved by engineer.

6. All existing pipes or structures exposed during excavation shall be adequately protected from damage before proceeding with the blasting.

B. Repair of Damages Due to Blasting

1. Any injury or damage to the work or to existing pipes or structures shall be repaired or rebuilt by the Contractor at his expense.

2. Whenever blasting may damage adjacent rock, pipes or structures, blasting shall be discontinued and the rock removed by drilling, barring, wedging or other methods.

3. The contractor shall be responsible for repairing/replacing any damage caused by blasting to the adjacent roads, its users, or structures within the vicinity of blasting as required by the Laws and Regulations. This includes the personal property of the inhabitants.

C. Explosives

1. At no time shall an excessive amount of explosives be kept at the site of the work. Such explosives shall be stored, handled and used in conformity with all applicable laws and regulations.

2. Accurate daily records shall be kept showing the amounts of explosives on hand, both at the site and at any storage magazine, the quantities received and issued, and the purpose for which issued.

3. The Contractor shall be responsible for any damage or injury to any persons, property or structures as a result of his handling, storage or use of explosives.

D. Rock Clearance in Trenches

1. Ledge rock, boulders and large stones shall be removed from the sides and bottom of the trench to provide clearance for the specified embedment of each pipe section, joint or appurtenance; but in no instance shall the clearance be less than 6 inches. Additional clearance at the pipe bell or joint shall be provided to allow for the proper make-up of the joint.

2. At the transition from an earth bottom to a rock bottom the minimum bottom clearance shall be 12 inches for a distance of not less than 5 feet.

3.2 EXCAVATION AND BACKFILL

A. Rock removal and backfilling shall be performed in accordance with the applicable provisions of the Section 31 20 00 Earth Moving.

B. The rock excavated shall be disposed of as spoil and no rock processing is permitted on the subject property.

END OF SECTION 312316.26

SECTION 312319 - DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Dewatering system.
2. Surface water control system.
3. System operation and maintenance.
4. Water disposal.

B. Related Requirements:

1. Available Project Information: Subsurface investigation report, indicating boring logs, soil profiles, ground water levels.

2. Contractor to coordinate and gain approval from the Town/Village of Harrison Engineer for discharge locations from dewatering operations.

1.2 DEFINITIONS

A. Dewatering:

1. Lowering of ground water table and intercepting horizontal water seepage to prevent ground water from accumulating in excavations.
2. Disposing of removed water.

B. Surface Water Control: The removal of surface water within open excavations.

1.3 COORDINATION

A. Coordinate Work of this Section to permit following construction operations to be completed on dry and stable substrate:

1. Excavation for structures as specified in Section 312000 – Earth Moving.

1.4 SEQUENCING

A. Sequence Work of this Section to obtain required permits before start of dewatering operations. Contractor to procure approval of the municipal Engineer for pump discharge locations as part of the excavation permit.

1.5 SUBMITTALS

A. Product Data:

1. Submit sizes, capacities, priming method, and motor characteristics for dewatering pumps.
2. Submit pumping equipment for control of surface water within excavation.

B. Shop Drawings:

1. Indicate dewatering system layout, well depths, well screen lengths, dewatering pump locations, pipe sizes and capacities, grades, filter sand gradations, surface water control devices, valves, and water disposal method and location.
2. Indicate primary power system location and capacity.
3. Include detailed description of dewatering and monitoring system installation procedures and maintenance of equipment.
4. Include description of emergency procedures to follow when problems arise.

1.6 QUALITY ASSURANCE

A. Comply with the Town/Village of Harrison for following:

1. Water discharge and disposal from pumping operations.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Furnish dewatering and surface water control systems to permit Work to be completed on dry and stable subgrade.

B. Install sump pit to dewater and relieve hydrostatic pressure within the work area.

C. Standby Equipment:

1. Store at Site and ready for immediate use upon failure of dewatering equipment.

2.2 PERFORMANCE AND DESIGN CRITERIA

A. Design:

1. Lower water table within areas of excavation to permit Work to be completed on dry and stable subgrade.
2. Relieve hydrostatic pressures in confined water bearing strata below excavation to eliminate risk of uplift or other instability of excavation.

3. Prevent damage to adjacent properties, buildings, structures, utilities, and other facilities from construction operations.
4. Maintain stability of sides and bottoms of excavations.
5. Surface Water Control System: Collect and remove surface water and seepage entering excavation.

2.3 DEWATERING EQUIPMENT

A. Furnish dewatering equipment to appropriately dewater the work area during the construction operations if required due to site conditions in accordance with the project plans and requirements of the Town/Village of Harrison.

2.4 ACCESSORIES

A. Valves and Fittings: Furnish valves and fittings as required connect the pump to the discharge location.

B. Filtering materials to ensure that only water is pumped from the site to the discharge locations, in accordance with the Town/Village of Harrison requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Utility Service Locator:
1. Request that underground utilities be located and marked within and immediately surrounding the site.

3.2 PREPARATION

A. Protect existing adjacent buildings, structures, and improvements from damage that may be caused by dewatering operations.

3.3 DEWATERING SYSTEM

A. Install dewatering system in accordance with project plans and requirements of the Town/Village of Harrison permit.

B. Locate system components to allow continuous dewatering operations without interfering with installation of permanent Work and existing public rights-of-way, sidewalks, and adjacent buildings, structures, and improvements.

C. Pumps:

1. Install according to manufacturer instructions.
2. Connect pumps to discharge location.
3. Install valves to permit pump isolation.

3.4 SURFACE WATER CONTROL SYSTEM

A. Provide ditches, berms, and other devices to divert and drain surface water from excavation area, as specified in Section 31 25 00 - Erosion and Sedimentation Control.

B. Divert surface water and seepage water within excavation areas into sumps and pump water to approved discharge locations.

C. Control and remove unanticipated water seepage into excavations.

3.5 SYSTEM OPERATION AND MAINTENANCE

A. Operate dewatering system as needed to remove water from excavations during the construction project.

B. Dewatering operations to continue on an as needed basis until the time of the building construction commences, as necessary and in accordance with the requirements of the Town/Village of Harrison.

C. Monitoring:

1. Conduct daily observation of dewatering system and monitoring system.
2. Make required repairs and perform scheduled maintenance.

D. Start emergency generators at least twice each week to check operating condition.

E. System Failure:

1. If dewatering system cannot control water within excavation, notify Engineer and stop excavation Work.

F. Modify dewatering and surface water control systems if operation causes or threatens to cause damage to new construction, existing Site improvements, adjacent property, or adjacent water wells.

G. Correct unanticipated pressure conditions affecting dewatering system performance.

H. Do not discontinue dewatering operations without approval of Engineer.

3.6 WATER DISPOSAL

A. Town/Village of Harrison to determine ultimate discharge location of the dewatering line.

3.7 SYSTEM REMOVAL

A. Remove dewatering and surface water control systems after dewatering operations are discontinued.

B. Repair damage caused by dewatering and surface water control systems or resulting from failure of systems to protect property.

3.8 PROTECTION

A. Protect sump pits and dewatering equipment from damage by construction operations.

END OF SECTION 312319

SECTION 312500 - EROSION AND SEDIMENTATION CONTROLS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes

1. Provide and install permanent devices to control erosion, siltation, sedimentation in accordance with this Section and applicable reference standards listed in Article 1.3.

a. Undertake every reasonable precaution to avoid erosion of soil and to prevent silting of drainage ditches, storm sewers, wetlands, rivers, streams, and lakes.

b. Keep exposure of soils on embankments, excavations, and graded areas to as short a duration as possible.

c. Install erosion control measures in any ditch, swale or channel before runoff is allowed to flow to the waterway.

1.2 PRICE AND PAYMENT PROCEDURES

A. Measurement and payment requirements: per Division 01 General Requirements.

1.3 REFERENCES

A. Reference Standards

1. New York State Department of Environmental Conservation (NYSDEC) SPDES General Permit for Stormwater Discharges from Construction Activity Permit No. GP-0-20-001, issued pursuant to Article 17, Titles 7, 8 and Article 70 of the Environmental Conservation Law.

2. New York State Standards & Specifications for Erosion and Sediment Control (Blue Book), latest edition.

1.4 RESPONSIBILITY

A. Conduct operations in such a manner as to prevent or reduce to a minimum any damage to any water body from pollution by debris, sediment, chemical or other foreign material during construction. Legally dispose of any water which has been used for wash purposes or other similar operations which become polluted with sewage, silt, cement, concentrated chlorine, oil, fuels, lubricants, bitumens, or other impurities as it shall not be discharged into any water body.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination, Sequencing, and Scheduling: per Division 01 General Requirements.

1. Schedule of Implementation

a. Employ pollution prevention measures, erosion and sedimentation control, before, during and after soils are exposed. Implement and maintain erosion and sedimentation control measures as necessary until the Site is permanently stabilized and the Notice of Termination for Permit coverage has been accepted.

b. Stabilize areas as shown on the Drawings with permanent erosion control practices as soon as practicable, but no more than 7 days after construction activity on a particular portion of the Site has permanently ceased.

c. Inspections of disturbed soil areas, material storage areas exposed to precipitation and erosion control measures will be conducted as required by the project SPDES Permit. Immediately correct deficiencies in the erosion control measures identified by the inspections.

1.6 SUBMITTALS

A. Submit in accordance with Division 01 General Requirements.

B. Product data for all proposed products.

C. Manufacturer's instructions.

D. Closeout and Maintenance Material Submittals: per Division 01 General Requirements.

1.7 QUALITY ASSURANCE

A. Provide in accordance with Division 01 General Requirements.

B. Regulatory Approvals

1. Conform to all requirements of applicable federal, state and local permits.

C. Pre-Construction Meeting

1. Meet with Engineer to discuss erosion control requirements prior to the start of construction.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Provide in accordance with Division 01 General Requirements.

1.9 SITE CONDITIONS

A. Existing Conditions: per Division 01 General Requirements

PART 2 – PRODUCTS

2.1 MATERIALS

A. Provide sufficient quantity of materials on-site prior to start of Work.

B. Acceptable level of quality and equivalent to the following:

1. Temporary Erosion Control Blanket: Erosion control blanket shall be 100% straw matrix stitched with photodegradable thread between photodegradable polypropylene top and bottom nets. Erosion control blanket shall be North American Green BioNet® DS150, or approved equal. Stakes shall be 100% biodegradable and shall not consist of wood, or metal stakes or any type of staples. Stakes shall extend minimum 6” in depth and be North American Green EcoStake®, or approved equal.

2. Silt Fence: SiltFence® by Tencate Mirafi, or approved equal.

3. Silt Sack: High Flow SiltSack® by Terrafix Geosynthetics, Inc., or approved equal.

4. Mulch:

   a. Long fibered hay or straw in dry condition and which are relatively free of weeds and foreign matter detrimental to plant life.

   b. Mulch binder: An asphalt emulsion mulch binder of type acceptable to the Engineer.

5. Temporary seed: Seed variety and applied rate are selected based upon the date of application, and as determined by the following table. Equivalent seed mixture based on its suitability for use in controlling erosion of the various soil types and slopes may be used as approved by the ENGINEER.

Dates	Seed	Applied Rate
4-1 to 7-1 8-15 to 9-15	Oats	1.8 lb/1000 ft2
4-1 to 7-1	Annual Ryegrass	0.9 lb/1000 ft2
5-15 to 8-15	Sudangrass	0.9 lb/1000 ft2
9-15 to 10-15	Winter Rye	2.6 lb/1000 ft2

6. Hay Bales: Rectangular shaped bales of hay or straw weighing at least 40 pounds per bale; free from noxious weed seeds and rough or woody materials.

7. Concrete Washout: Construct concrete washout area as shown in the Drawings and in accordance with the New York State Standards and Specifications for Erosion and Sediment Control, latest revision.

   a. Minimum size 8’ by 8’ by 2’ deep. Size appropriately for volume of wash water anticipated. Side slopes maximum 2H:1V. Wash water is estimated to be 7 gallons per chute and 50 gallons per hopper of the concrete truck.

b. Line washout area with plastic sheeting, minimum 10 mils thickness. Anchor liner with sandbags, earth, stone, and/or other materials, except at entrance.

c. Pre-fabricated washout areas are acceptable if they are sized based on the expected frequency of concrete pours.

d. Locate at least 100’ away from drainage swales storm drain inlets, wetlands, streams, and other surface waters.

e. Prevent surface waters and runoff from entering the washout area.

f. Place signs to direct concrete truck drivers to washout area after their load is discharged.

PART 3 – EXECUTION

3.1 PREPARATION

A. Temporary Erosion Control Blanket

1. Conform to grades and cross sections for slopes and ditches shown on the Drawings.

2. Finish to a smooth and even condition. Rake out and remove debris, roots, stones, and lumps.

3. Loosen soil surface to permit bedding of the matting.

4. Apply seed prior to placement unless otherwise directed.

5. Dewater trenches and swales to install materials in the dry.

B. Silt Sack

1. Clean catch basins from sediment and debris prior to installation.

3.2 INSTALLATION

A. Temporary Erosion Control Blanket:

1. Install erosion control blanket in accordance with manufacturer’s instructions where shown on Drawings or as directed by Engineer. Submit manufacturer's instructions to Engineer prior to installation. Place immediately following seeding.

2. Install an erosion control blanket onto slopes that have been graded, seeded, completed to required line where shown on the Drawings and directed by Engineer.

3. The erosion control blanket shall be rolled down-slope starting at the very top of the slope and anchored with a check slot.

4. Place strips lengthwise in the direction of the flow of water.

5. Overlap ends at least 6 inches in a shingle fashion.

6. Verify staking pattern with manufacturer.

7. Turn down up-slope end of each strip of the blanket and bury to a depth of not less than 6 inches with the soil firmly tamped against it.

8. Engineer may require that any other edge exposed to more than normal flow of water be buried in a similar manner.

9. Build check slots at right angles to the direction of the flow of water. Space so that one check slot or one end occurs within each 50 feet of slope length. Construct by placing a tight fold of the matting at least 6 inches vertically into the ground, and tamp the same as up-slope ends.

10. The start of a new run mid-slope shall be installed in a shingle-style where the top roll overlaps the bottom roll by a minimum of 3".

11. When ordered, spread additional seed over blanket, particularly at those locations disturbed by building the slots. Press matting onto the ground with a light lawn roller or by other satisfactory means.

B. Silt Fence:

1. Install to intercept runoff in accordance with manufacturer's instructions where shown on the Drawings or as directed by Engineer.

2. Install parallel to contours where possible, prior to site clearing and grading activities.

3. Bury lower edge of fabric at least 8 inches below ground surface to prevent underflow.

4. Curve ends of fence uphill to prevent flow around ends.

5. Inspect frequently; repair or replace any damaged sections.

6. Remove fence only when adequate grass has been established.

C. Silt Sack:

1. Install to capture silt and debris in drainage structures in accordance with manufacturer's instructions where shown on the Drawings or as directed by Engineer.

D. Mulch:

1. Undertake immediately after each area has been properly prepared.

2. When seed for erosion control is sown prior to placing the mulch, place mulch on the seeded areas within 48 hours after seeding.

3. Apply mulch at 1.5 to 2.0 tons per acre. Mulch applied between the dates of December 1 through March 31 for winter stabilization shall be applied at 3.0 to 4.0 tons per acre.

4. Blowing chopped mulch will be permitted. Protect adjacent areas from receiving mulch where it is not intended.

5. Hay mulch should cover the ground enough to shade it, but the mulch should not be so thick that a person standing cannot see ground through the mulch.

6. Remove matted mulch or bunches.

E. Temporary Seeding:

1. Seed with appropriate seeds and application rates from the table in Section 2 of this specification. Seed shall be sown at the rate indicated, on the pure live seed basis.

2. Mulch areas where temporary seeding has been applied. Do not mulch seeded areas where blankets will be immediately installed.

3. If temporary seeding does not achieve adequate growth by November 1, an additional layer of mulch shall be applied at that time.

F. Topsoil Storage:

1. Topsoil which is stockpiled on the site for use in loam applications shall be placed out of natural drainages, in piles not more than 8 feet in height, which have side slopes of 50% to 70%.

2. Silt fence shall be installed around stockpile area.

3. A shallow trench shall be bulldozed around the base of the pile to prevent eroding soil from washing into drainages.

4. Any topsoil piles which are to remain for a period of 1 month or more shall be covered with temporary seed and mulch immediately following stockpiling.

G. Hay Bales:

1. Place as ordered and as required to provide for temporary control of erosion.

2. Install as shown on Drawings or as ordered by the Engineer, and stake with wooden stakes with a length of a minimum of two times the thickness of the bale.

H. Concrete Washout:

1. Construct, clean, and maintain concrete washout area as shown in the Drawings and in accordance with the New York State Standards and Specifications for Erosion and Sediment Control, latest revision.

2. Minimum size 8’ by 8’ by 2’ deep. Size appropriately for volume of wash water anticipated to be generated based on concrete delivery frequency. Side slopes maximum 2H:1V. Wash water is estimated to be 7 gallons per chute and 50 gallons per hopper of the concrete truck.

3. Line washout area with plastic sheeting, minimum 10 mils thickness. Anchor liner with sandbags, earth, stone, and/or other materials, except at entrance for access.

4. Pre-fabricated washout areas are acceptable if they are sized based on the expected frequency/volume of concrete pours.

5. Locate washout area at least 100’ away from drainage swales storm drain inlets, wetlands, streams, and other surface waters.

6. Prevent surface waters and runoff from entering the washout area. Prevent wash water from exiting washout area.

7. Place signs to direct concrete truck drivers to washout area after their load is discharged.

8. All concrete washout facilities shall be inspected daily. Damaged or leaking facilities shall be deactivated and repaired or replaced immediately. Excess stormwater that has accumulated over hardened concrete should be pumped to a stabilized area, such as a sediment filter bag on a grass filter strip.

9. Accumulated hardened material shall be removed when 75% of the storage capacity of the structure is filled. Any excess wash water shall be pumped into a containment vessel and properly disposed of off-site.

10. Dispose of the hardened material off-site in a construction/demolition landfill. On-site disposal/reuse may be allowed if this has been approved. In that case, the material should be recycled as specified, or buried and covered with a minimum of 2 feet of clean compacted earth fill that is permanently stabilized to prevent erosion. Burying on-site requires written approval of the Owner and burying may not occur in areas of proposed improvements.

11. The plastic liner shall be replaced with each cleaning of the washout facility.

12. Inspect the project site frequently to ensure that no concrete discharges are taking place in non-designated areas.

3.3 REPAIR/RESTORATION

A. Repair erosion control blanket if any anchors become loosened or raised, or if any blanket becomes loose, torn, or undermined, make satisfactory repairs immediately.

B. Maintain and replace all temporary erosion and sediment control measures at intervals required by the drawings and manufacturer's recommendations, and prior to becoming ineffective, whichever is stricter.

3.4 FIELD QUALITY CONTROL

A. Provide in accordance with Division 01 General Requirements.

B. Site Inspections

1. Inspect erosion controls immediately after each rainfall and at least daily during prolonged rainfall or snowmelt for damage. Make appropriate repairs or replacement at no additional cost to Owner, until acceptance by Engineer.

3.5 CLOSEOUT ACTIVITIES

A. Provide in accordance with Division 01 General Requirements.

B. Remove all temporary erosion and sediment controls utilized on-site once the site has been stabilized as determined by Engineer. Dispose of used materials off-site in accordance with federal, state and local regulations.

3.6 MAINTENANCE

A. Maintain erosion and sediment controls in working conditions during construction and until the Site has been stabilized as determined by Engineer, at no additional cost to Owner.

B. Maintain drainage infrastructure such as drain inlets, manholes, pipes, swales, etc. within the limits of work and adjacent to the project site as required by removing accumulated silt and debris, at no additional cost to Owner, until Final acceptance.

END OF SECTION 312500

SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION (STORMWATER, SANITARY, WATER SITE UTLITIES)

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes

1. Provide excavation support and protection in accordance with this Section and applicable reference standards listed in Article 1.3, including shoring and bracing necessary to protect existing buildings, sidewalks and streets, utilities, all existing improvements, and excavation against movement due to caving, to meet OSHA safety requirements of shoring and bracing, and to cofferdams related to stormwater, sanitary, and water site utilities.

    a. Installation of shoring and bracing

    b. Maintenance of shoring and bracing

    c. Removal of shoring and bracing, as required

2. Shoring and bracing systems include permanent and temporary measures.

B. Related Requirements

1. Section 31 00 00 - Earthwork

1.2 PRICE AND PAYMENT PROCEDURES

A. Measurement and payment requirements: per Division 01 General Requirements.

1.3 REFERENCES

A. Reference Standards

1. American Institute of Steel Construction (AISC)

    a. Steel Construction Manual

2. ASTM International (ASTM)

    a. ASTM A36 Standard Specification for Carbon Structural Steel

    b. ASTM A307 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength

    c. ASTM A328 Standard Specification for Steel Sheet Piling

    d. ASTM A572 Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel

e. ASTM A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

f. ASTM A690 Standard Specification for High-Strength Low-Alloy Nickel, Copper, Phosphorus Steel H-Piles and Sheet Piling with Atmospheric Corrosion Resistance for Use in Marine Environments

g. ASTM A992 Standard Specification for Structural Steel Shapes

3. American Welding Society (AWS)

a. D1.1 - Structural Welding Code, Steel

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination, Sequencing, and Scheduling: per Division 01 General Requirements.

B. Pre-installation Conference

1. Review geotechnical report, existing utilities and subsurface conditions.

2. Review coordination for interruption, shutoff, capping, and continuation of utility services.

3. Review instrumentation and monitoring program, and dewatering program. Confirm coordination with instrumentation and monitoring, and dewatering activities.

4. Review proposed excavations and equipment, monitoring of excavation support and protection system and abandonment or removal of excavation support and protection system.

1.5 SUBMITTALS

A. Submit in accordance with Division 01 General Requirements.

B. Do not begin excavation requiring support until submittals are approved.

C. Product Data

1. Construction details, material descriptions, performance properties, dimensions of individual components and profiles, and calculations for excavation support and protection system for each type of product

D. Shop Drawings

1. Plans, elevations, sections, and details for excavation support and protection system, by professional engineer licensed in the state where Project is located

2. Arrangement, locations, and details of soldier piles, sheet piling, lagging, tiebacks, bracing, and other components of excavation support and protection system by professional engineer licensed in the state where Project is located

3. Written plan for excavation support and protection, including sequence of construction of support and protection coordinated with progress of excavation

E. Qualification Data: For Installer and Professional Engineer.

1. Work under this Section shall be performed by a licensed, qualified Contractor and Professional Engineer having a minimum of five (5) years' experience with design and construction of excavation support systems. The Professional Engineer shall demonstrate that key personnel have successfully designed a minimum of three (3) excavation support systems in the last five (5) years. Each system designed shall be of equal or greater size and complexity than the excavation support systems required to install Work proposed under this Contract. The Contractor shall also demonstrate that key personnel have competently and successfully managed to the construction of a minimum of three (3) excavation support systems in the last five (5) years. Each system constructed shall be of equal or greater size and complexity to the excavation support systems required to install the Work proposed under this Contract.

2. Furnish a project list consisting of at least three (3) excavation support systems designed and constructed in the last five (5) years by the Contractor or Subcontractor responsible for design and construction of excavation support systems for this Contract. Each project listed must be complete by the date of the Bid opening. The project list shall include the name, address, phone number and email address of the Owner for whom the Work was performed, the scope, original contract value and final contract value of the excavation support systems installed, and the names and experience for each of the key personnel proposed to design and construct excavation support systems for this Contract.

F. Calculations and analysis data for excavation support and protection system by professional engineer licensed in the state where Project is located

G. Existing Conditions: Using photographs or video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by inadequate performance of excavation support and protection systems. Submit all photographs and video recordings to the Owner prior to beginning Work on the project.

H. Record Drawings: Identify locations and depths of capped utilities, abandoned-in-place support and protection systems, and other subsurface structural, or utility conditions.

I. Closeout and Maintenance Material Submittals: per Division 01 General Requirements.

1. Identify locations and depths of capped utilities, abandoned-in-place support and protection systems, and other subsurface structural, electrical, or mechanical conditions on record documents.

1.6 QUALITY ASSURANCE

A. Provide in accordance with Division 01 General Requirements.

B. Qualifications: per Division 01 General Requirements for Installer and professional engineer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Provide in accordance with Division 01 General Requirements.

1.8 SITE CONDITIONS

A. Existing Conditions: per Division 01 General Requirements.

B. Review geotechnical report and determine need to perform additional test borings and conduct other exploratory operations necessary for excavation support and protection.

C. Verify dimensions and elevations before starting Work. Survey condition of adjoining properties with Engineer. Take photographs, recording any prior settlement or cracking of structures, pavements, and other improvements. Prepare list of existing damages, verified by dated photographs, signed by Contractor, Engineer and others conducting the investigation.

D. During excavation, re-survey benchmarks twice weekly, employing a New York Registered Land Surveyor or Registered Professional Engineer. Maintain accurate log of surveyed elevations for comparison with original elevations. Notify Owner if changes in elevations occur or if cracks, sags or other damage is evident.

E. Survey adjacent structures and improvements, establishing exact elevations at fixed points to act as benchmarks. Identify benchmarks and record existing elevations. Locate datum level where it will not be affected by excavation operations.

F. Interruption of Existing Utilities

1. Do not interrupt any utility serving facilities without Owner's written permission. Provide temporary utility if required.

2. Provide minimum 5 days’ advance notice of proposed interruption of utility.

3. Where interruption of utility service is permitting, do not proceed with interruption of utility service without Owner's written permission.

G. Project-Site Information: Limited geotechnical information has been prepared for this Project and is available for information only. The opinions expressed in this documentation represent interpretations of subsoil conditions, tests, and results of analyses conducted. Owner or Engineer is not responsible for interpretations or conclusions drawn from the data.

1. The Contractor shall review the available geotechnical information and make a determination as to the need to perform additional test borings and conduct other exploratory operations necessary for excavation support and protection according to the performance requirements. The Contractor will be responsible for conducting these additional investigations including associated costs.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Provide shoring and bracing materials, in serviceable condition and adequate for intended purpose.

B. Steel sheet piling and shapes: continuous interlocking type; section modulus, type of section specified, in accordance with ASTM A328, ASTM A572, and ASTM A690, with continuous interlocks.

C. Provide movable box where shoring system is required, and where sheet piling is not specified.

D. Bracing members: wood timbers or steel members in accordance with ASTM A36.

E. Provide bolts in accordance with ASTM A307.

F. Provide structural steel in accordance with ASTM A36, ASTM A690, and ASTM A992.

G. Wood lagging: lumber, mixed hardwood, pressure-treated.

H. Provide reinforcing bars in accordance with ASTM A 615, Grade 60, deformed.

2.2 SOURCE QUALITY CONTROL

A. Provide in accordance with Division 01 General Requirements.

2.3 PERFORMANCE REQUIREMENTS

A. Provide, design, monitor, and maintain excavation support and protection system capable of supporting and avoiding damage to excavation sidewalls, existing

properties and structures adjacent to excavations and of resisting earth and hydrostatic pressures, seepage forces, allowance for thermal stresses on any bracing, and superimposed and construction loads.

B. Contractor Design: Design excavation support and protection system as required to complete the Work of this Contract, including comprehensive engineering analysis by a Professional Engineer registered in the State of New York. Provide professional engineering services needed to assume engineering responsibility, including preparation of Shop Drawings.

C. Earth support design must be coordinated with dewatering design. The design shall incorporate the lowest anticipated excavation depths and the full differential water head during dewatering.

D. Base stability shall be checked.

E. Prevent surface water from entering excavations by grading, dikes, or other means.

F. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.

G. Continuously monitor vibrations, settlements, and movements to ensure stability of excavations and constructed slopes and to ensure that damage to permanent structures is prevented.

2.4 DESIGN CRITERIA

A. Provide services by professional engineer licensed in the state where Project is located, including preparation of Shop Drawings.

B. Design excavation support system in accordance with earth pressures and other criteria indicated, for construction of permanent structures without excessive movement or settlement of adjacent buildings, roadways, structures, or utilities, as shown on Drawings and as specified. Include analysis by professional engineer licensed in the state where Project is located.

C. Earth support design: coordinated dewatering design incorporating lowest anticipated excavation depths and full differential water head during dewatering.

D. Consult official records of both surface and subsurface existing utilities and connections to verity existing conditions and limitations as they apply to this Work and its relation to other construction work. Proceed with caution in areas of utility facilities. Excavate by hand, or other methods acceptable to utility owner. Protect existing utilities to remain within and adjacent to Work area in accordance with requirements of authorities having jurisdiction.

2.5 SOURCE QUALITY CONTROL

A. Provide in accordance with Division 01 General Requirements.

PART 3 – EXECUTION

3.1 GENERAL

A. Anchor and brace system to resist earth and hydrostatic pressures, including surcharges from surface loads. Support excavation to prevent undermining or disturbance to foundations of existing structures and utilities, or of ongoing or previously completed Work. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or adjacent occupied or used facilities without approval. Provide alternate routes around closed or obstructed traffic ways if required.

C. Maintain shoring and bracing while excavation is open.

D. Check base stability.

E. Prevent surface water from entering excavations.

3.2 SOLDIER PILES AND LAGGING

A. Soldier piles and lagging may only be considered for excavations above groundwater or excavations below groundwater where existing soil conditions are conducive to minimizing groundwater flow.

B. Install steel soldier piles before starting excavation. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.

C. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.

D. Install wales horizontally and secure to soldier piles.

3.3 STEEL SHEET PILING

A. Install 1-piece sheet piling lengths and interlock vertical edges to form a continuous barrier before starting excavation.

B. Place piling using templates and guide frame unless otherwise specified by sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches. Align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line, and not more than 1:120 out of vertical alignment.

C. Cut off sheet piling to be left in place at least 5 feet below finish grade. Indicate location of sheet piling cut off and left in place on record documents.

D. Remove steel sheet piling following completion of Work where shown on Drawings or directed by Engineer. Obtain approval for steel sheet piling to be left in place.

3.4 BRACING

A. Locate bracing to clear columns, floor framing construction, and other permanent Work. Install new bracing before removing original brace if moved. Do not place bracing where it will be cast into permanent concrete Work unless approved by Engineer.

B. Install internal bracing if required to prevent spreading or distortion of braced frames.

C. Maintain bracing until structural elements are supported by other bracing, or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.5 REPAIR/RESTORATION

A. Remove excavation support and protection systems in stages to avoid disturbing underlying soils and rock, or damaging structures, pavements, facilities, and utilities.

B. Fill voids immediately with approved backfill compacted to density specified in accordance with Section 31 00 00.

C. Repair or replace adjacent Work damaged or displaced by removing excavation support and protection systems.

3.6 FIELD QUALITY CONTROL

A. Provide in accordance with Division 01 General Requirements.

B. Promptly correct detected bulges, breakage, or other evidence of movement to ensure that excavation support and protection system remains stable.

C. Promptly repair damages to adjacent facilities caused by installation or faulty performance of excavation support and protection systems.

3.7 CLOSEOUT ACTIVITIES

A. Provide in accordance with Division 01 General Requirements.

END OF SECTION 315000

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SECTION 315000.1 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Division 01 General Requirements apply to this Section.

1.2 SUMMARY

A. Section includes temporary excavation support and protection systems.

B. Refer to Section 315000 for excavation support and protection of utilities construction.

1.3 PERFORMANCE REQUIREMENTS

A. Design, provide, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.

1. Delegated Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
2. Prevent surface water from entering excavations per Division 01 General Requirements.
3. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
4. Monitor vibrations, settlements, and movements.

1.4 SUBMITTALS

A. Shop Drawings: For excavation support and protection system.

B. Delegated-Design Submittal: For excavation support and protection system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Other Informational Submittals:

1. Existing Conditions: per Division 01 Requirements.
2. Record Drawings: Identifying and locating capped utilities and other subsurface structural, electrical, or mechanical conditions.
   a. Note locations and capping depth of wells and well points.

1.5 QUALITY ASSURANCE

A. Provide in accordance with Division 01 General Requirements.

B. Pre-installation Conference: Conduct a pre-installation conference per Division 01 General Requirements.

1. Review methods and procedures related to excavation support and protection system including, but not limited to, the following:

a. Geotechnical report.
b. Existing utilities and subsurface conditions.
c. Proposed excavations.
d. Proposed equipment.
e. Monitoring of excavation support and protection system.
f. Working area location and stability.
g. Coordination with waterproofing.
h. Abandonment or removal of excavation support and protection system.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Notify Engineer and Owner no fewer than two days in advance of proposed interruption of utility.
2. Do not proceed with interruption of utility without Owner's/Engineer's written permission.

B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Engineer if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.

C. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.

1. Corners: Site-fabricated mechanical interlock or Roll-formed corner shape with continuous interlock.

D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

E. Tiebacks: Steel bars, ASTM A 722/A 722M.

F. Tiebacks: Steel strand, ASTM A 416/A 416M.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

1. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces are not impeded.

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 excavation support and protection systems remain stable.

E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.2 SOLDIER PILES AND LAGGING

A. Install steel soldier piles before starting excavation. Extend soldier piles below

excavation grade level to depths adequate to prevent lateral movement. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches (50 mm) from a horizontal line and not more than 1:120 out of vertical alignment.

B. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.

C. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

3.3 SHEET PILING

A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock to form a continuous barrier. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches (1500 mm). Accurately align exposed faces of sheet piling to vary not more than 2 inches (50 mm) from a horizontal line and not more than 1:120 out of vertical alignment. Cut tops of sheet piling to uniform elevation at top of excavation.

3.4 TIEBACKS

A. Tiebacks: Drill, install, grout, and tension tiebacks. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.

1. Test loading shall be observed by a qualified professional engineer responsible for design of excavation support and protection system.
2. Maintain tiebacks in place until permanent construction is able to withstand lateral soil and hydrostatic pressures.

3.5 BRACING

A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Architect.

2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.6 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.

1. Remove excavation support and protection systems to a minimum depth of 48 inches (1200 mm) below overlaying construction and abandon remainder.
2. Fill voids immediately with approved backfill compacted to density specified in Section 31 20 00 Earth Moving.
3. Repair or replace, as approved by Engineer, adjacent work damaged or displaced by removing excavation support and protection systems.

END OF SECTION 315000.1

SECTION 323215 - PRECAST MODULAR BLOCK GRAVITY RETAINING WALL

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes furnishing all materials and labor required for the design and construction of a precast concrete modular block (PMB) gravity retaining wall without geosynthetic reinforcement. Precast modular block retaining wall blocks under this section shall be cast utilizing a wet-cast concrete mixture, exhibit a final handling weight in excess of 1,000 pounds (450 kg) per unit, and may utilize concrete reinforcing steel.

B. Scope of Work: The work shall consist of furnishing materials, labor, equipment, and supervision for the construction of a precast modular block (PMB) retaining wall structure in accordance with the requirements of this section and in acceptable conformity with the lines, grades, design, and dimensions shown in the project site plans.

C. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 31, Division 32 and Division 33 also apply to this Section.

D. The Basis of Design in the construction documents is Redi-Rock product as licensed by Redi-Rock International of Petoskey, MI.

E. Retaining Wall Design Calculations and Construction Shop Drawings. Prior to construction, the General Contractor shall furnish construction shop drawings and the supporting structural calculations report to the Owner for review and approval. Unless specifically requested by the Owner, the submittal may be in electronic format. This submittal shall include the following:
    1, Signed, sealed and dated drawings and engineering calculations prepared in accordance with these specifications.

1.02 PRICE AND PAYMENT PROCEDURES

A. Allowances. No allowance shall be made in the price of the retaining wall for excavation beyond the limits required for retaining wall construction as shown on the project plans. The cost of excavation for the purposes of site access shall be the responsibility of the General Contractor. Removal of unsuitable soils and replacement with select fill shall be as directed and approved in writing by the Owner or Owner’s representative and shall be paid under separate pay items.

B. Unit Prices. In addition to a lump sum price pursuant to completion of the scope of work described in Part 1.01 of this Section, the General Contractor shall provide a unit price per

square foot of vertical wall face that shall be the basis of compensation for up to a ten (10) percent increase or reduction in the overall scope of the retaining wall work.

C. Measurement and Payment.
   1. The unit of measurement for furnishing the precast modular block retaining wall system shall be the vertical area of the wall face surface as measured from the top of the leveling pad to the top of the wall including coping. The final measured quantity shall include supply of all material components and the installation of the precast modular block retaining wall system.
   2. The final accepted quantities of the precast modular block retaining wall system will be compensated per the vertical face area as described above. The quantities of the precast modular block retaining wall as shown on the plans and as approved by the Owner shall be the basis for determination of the final payment quantity. Payment shall be made per square foot of vertical wall face.

1.03 REFERENCES

A. Where the specification and reference documents conflict, the Owner's designated representative will make the final determination of the applicable document.

B. Definitions:
   1. Precast Modular Block (PMB) Unit – machine placed, "wet cast" concrete modular block retaining wall facing unit.
   2. Geotextile – a geosynthetic fabric manufactured for use as a separation and filtration medium between dissimilar soil materials.
   3. Drainage Aggregate – clean, crushed stone placed within and immediately behind the precast modular block units to facilitate drainage and reduce compaction requirements immediately adjacent to and behind the precast modular block units.
   4. Unit Core Fill – clean, crushed stone placed within the hollow vertical core of a precast modular block unit. Typically, the same material used for drainage aggregate as defined above.
   5. Foundation Zone – soil zone immediately beneath the leveling pad.
   6. Retained Zone – soil zone immediately behind the drainage aggregate and wall infill for wall sections designed as modular gravity structures.
   7. Leveling Pad – hard, flat surface upon which the bottom course of precast modular blocks are placed. The leveling pad may be constructed with crushed stone or cast-in-place concrete. A leveling pad is not a structural footing.
   8. Wall Infill – the fill material placed and compacted between the drainage aggregate and the excavated soil face in retaining wall sections designed as modular gravity structures.

C. Reference Standards
   1. Design

a. AASHTO LRFD Bridge Design Specifications, 8th and 9th Edition.
b. Minimum Design Loads for Buildings and Other Structures – ASCE/SEI 7-16.
c. International Building Code, 2018 Edition.
d. Design Manual for Segmental Retaining Walls, National Concrete Masonry Association, 3rd Edition, 2010.

2. Precast Modular Block Units
   a. ACI 201 – Guide to Durable Concrete
   b. ACI 318 – Building Code Requirements for Structural Concrete
   c. ASTM C33 – Standard Specification for Concrete Aggregates
   d. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
   e. ASTM C94 – Standard Specification for Ready-Mixed Concrete.
   f. ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
   g. ASTM C143 – Standard Test Method for Slump of Hydraulic-Cement Concrete.
   h. ASTM C150 – Standard Specification for Portland Cement
   i. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
   j. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.
   k. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete.
   l. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
   m. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
   n. ASTM C666 – Standard Test Method for Concrete Resistance to Rapid Freezing and Thawing.
   o. ASTM C845 - Standard Specification for Expansive Hydraulic Cement.
   p. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
   q. ASTM C989 - Standard Specification for Slag Cement for Use in Concrete and Mortars.
   r. ASTM C1116 – Standard Specification for Fiber-Reinforced Concrete.
   s. ASTM C1157 - Standard Performance Specification for Hydraulic Cement.
   t. ASTM C1218 - Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
   u. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
   v. ASTM C1611 – Standard Test Method for Slump Flow of Self-Consolidating Concrete.
   w. ASTM C1776 – Standard Specification for Wet-Cast Precast Modular Retaining Wall Units.
   x. ASTM D6638 – Standard Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units (Modular Concrete Blocks).

y. ASTM D6916 – Standard Test Method for Determining Shear Strength Between Segmental Concrete Units (Modular Concrete Blocks).

3. Geosynthetics
   a. AASHTO M 288 – Geotextile Specification for Highway Applications.
   b. ASTM D3786 – Standard Test Method for Bursting Strength of Textile Fabrics Diaphragm Bursting Strength Tester Method.
   c. ASTM D4354 – Standard Practice for Sampling of Geosynthetics for Testing.
   d. ASTM D4355 – Standard Test Method for Deterioration of Geotextiles
   e. ASTM D4491 – Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
   f. ASTM D4533 – Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
   g. ASTM D4595 – Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
   h. ASTM D4632 – Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
   i. ASTM D4751 – Standard Test Method for Determining Apparent Opening Size of a Geotextile.
   j. ASTM D4759 – Standard Practice for Determining Specification Conformance of Geosynthetics.
   k. ASTM D4833 – Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.
   l. ASTM D4873 – Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.
   m. ASTM D6241 – Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe.
4. Soils
   a. AASHTO M 145 – AASHTO Soil Classification System.
   b. AASHTO T 104 – Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate.
   c. AASHTO T 267 – Standard Method of Test for Determination of Organic Content in Soils by Loss of Ignition.
   d. ASTM C33 – Standard Specification for Concrete Aggregates.
   e. ASTM D448 – Standard Classification for Sizes of Aggregates for Road and Bridge Construction.
   f. ASTM D698 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort. (12,400 ft-lbf/ft (2,700 kN-m/m)).
   g. ASTM D1241 – Standard Specification for Materials for Soil-Aggregate Subbase, Base and Surface Courses.
   h. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.
   i. ASTM D1557 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort. (56,000 ft-lbf/ft (2,700 kN-m/m)).

j. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
k. ASTM D2488 – Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).
l. ASTM D3080 – Standard Test Method for Direct Shear Test of Soils Under Consolidated Drained Conditions.
m. ASTM D4254 – Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
n. ASTM D4318 – Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
o. ASTM D4767- Test Method for Consolidated-Undrained Triaxial Compression Test for Cohesive Soils.
p. ASTM D4972 – Standard Test Method for pH of Soils.
q. ASTM D6913 – Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis.
r. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Aggregate by Nuclear Methods (Shallow Depth).
s. ASTM G51 – Standard Test Method for Measuring pH of Soil for Use in Corrosion Testing.
t. ASTM G57 – Standard Test Method for Field Measurement of Soil Resistivity Using the Wenner Four-Electrode Method.

5. Drainage Pipe
   a. ASTM D3034 – Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
   b. ASTM F2648 – Standard Specification for 2 to 60 inch [50 to 1500 mm] Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Land Drainage Applications.

1.04 ADMINISTRATIVE REQUIREMENTS

A. The General Contractor may choose to self-perform any or all of the work, and the Earthwork and Grading Contractor may or may not also be the Retaining Wall Installation Contractor (**RWIC**).

B. Preconstruction Meeting. As directed by the Owner, the General Contractor shall schedule a preconstruction meeting at the project site prior to commencement of retaining wall construction. Participation in the preconstruction meeting shall be required of the General Contractor, the Retaining Wall Design Engineer (**RWDE**), the RWIC, the Earthwork/Grading Contractor, and the Qualified Inspection Engineer. The General Contractor shall provide notification to all parties at least 10 calendar days prior to the meeting.

1. Preconstruction Meeting Agenda:

a. The RWDE shall be provided the opportunity to explain all aspects of the retaining wall construction drawings.
b. The RWDE shall communicate the required bearing capacity of the soil below the retaining wall structure and the shear strength of in-situ soils assumed in the retaining wall design to the Inspection Engineer.
c. The RWDE shall explain the required shear strength of fill soil in the retained and foundation zones of the retaining wall to the Inspection Engineer.
d. The RWDE shall explain any measures required for coordination of the installation of utilities or other obstructions in the retained fill zones of the retaining wall.
e. The RWIC shall explain all excavation needs, site access and material staging area requirements to the General Contractor and Earthwork/Grading Contractor.

1.05 SUBMITTALS

A. Product Data. At least 14 days prior to construction, the General Contractor shall submit the retaining wall product submittal package to the Owner's Representative for review and approval. The submittal package shall include technical specifications and product data from the manufacturer for the following:
   1. Precast Modular Block System brochure
   2. Precast Modular Block concrete test results specified in Part 2.01, Paragraph B of this section as follows:
      a. 28-day compressive strength
      b. Air content
      c. Slump or Slump Flow (as applicable)
   3. Drainage Pipe
   4. Geotextile

B. Installer Qualification Data. At least 14 days prior to construction, the General Contractor shall submit the qualifications of the business entity responsible for installation of the retaining wall, the RWIC, per Part 1.07, Paragraph A of this section.

C. Retaining Wall Design Calculations and Construction Shop Drawings. Prior to construction, the General Contractor shall furnish construction shop drawings and the supporting structural calculations report to the Owner for review and approval. Unless specifically requested by the Owner, the submittal may be in electronic format. This submittal shall include the following:
   1. Signed, sealed and dated drawings and engineering calculations prepared in accordance with these specifications.
   2. Qualifications Statement of Experience of the RWDE as specified in Part 1.07, subparagraph B of this section.
   3. Certificate of Insurance of the RWDE as specified in Part 1.06, Paragraph B of this section.

1.06 CONSTRUCTION SHOP DRAWING PREPARATION

A. The RWDE shall coordinate the retaining wall construction shop drawing preparation with the project Architect, project Geotechnical Engineer and Owner's Representatives. The General Contractor shall furnish the RWDE the following project information required to prepare the construction shop drawings. This information shall include, but is not limited to, the following:
   1. Current versions of the site, grading, drainage, utility, erosion control, landscape, and irrigation plans;
   2. electronic CAD file of the site plans listed in (1);
   3. report of geotechnical investigation and all addenda and supplemental reports;
   4. recommendations of the project Geotechnical Engineer regarding effective stress shear strength and total stress shear strength (when applicable) parameters for in-situ soils in the vicinity of the proposed retaining wall(s) and for any fill soil that may potentially be used as backfill in retained and/or foundation zones of the retaining wall.
   5. Information pertaining to the magnitude, location, and nature of surcharge loadings acting on or near the proposed wall.

B. The RWDE shall provide the Owner with a certificate of professional liability insurance verifying the minimum coverage limits of $1 million per claim and $1 million aggregate.

C. Design of the precast modular block retaining wall shall satisfy the requirements of this section. Where local design or building code requirements exceed these specifications, the local requirements shall also be satisfied.

D. The RWDE shall note any exceptions to the requirements of this section by listing them at the bottom right corner of the first page of the construction shop drawings.

E. Approval or rejection of the exceptions taken by the RWDE will be made in writing as directed by the Owner.

F. The RWDE shall determine the appropriate standard(s) to be utilized, and to which the precast modular block design shall be based upon, except as noted herein. Refer to Part 1.03, Paragraph C, Part 1. Some project Owners may also specify which standard shall be used.

G. In the event that a conflict is discovered between these specifications and a reasonable interpretation of the design specifications and methods referenced in Paragraph F above, these specifications shall prevail. If a reasonable interpretation is not possible, the conflict shall be resolved per the requirements in Part 1.03, Paragraph A of this section.

H. Soil Shear Parameters. The RWDE shall prepare the construction shop drawings based upon soil shear strength parameters from the available project data and the

recommendations of the project Geotechnical Engineer. If insufficient data exists to develop the retaining wall design, the RWDE shall communicate the specific deficiency of the project information or data to the Owner in writing.

I. Allowable bearing pressure requirements for each retaining wall shall be clearly shown on the construction drawings.

J. Global Stability. Overall (global) stability shall be evaluated in accordance with the principals of limit equilibrium analysis as set forth in the approved standards, as determined by the RWDE, as referenced in Section 1.06, Part F. The minimum recommended factors of safety shall be as follows, or as otherwise selected as appropriate by the RWDE:

Normal Service (static)	1.3 to 1.5*
Seismic	1.1
Rapid Drawdown (if applicable)	1.2

*High uncertainty/variability, wall supporting critical or sensitive facilities: 1.5; low uncertainty/variability, wall not supporting critical or sensitive facilities: 1.3

K. Seismic Stability. Seismic loading shall be evaluated in accordance with AASHTO Load and Resistance Factor Design (LRFD) methodology, or NCMA Allowable Stress Design (ASD) methodology as determined by the RWDE as referenced in Section 1.06, Part F.

1.07 QUALITY ASSURANCE

A. RWIC Qualifications. In order to demonstrate basic competence in the construction of precast modular block walls, the RWIC shall document compliance with the following:
   1. Experience.
      a. Construction experience with a minimum of 3,000 square feet (280 square meters) of the proposed precast modular block retaining wall system.
      b. Construction of at least three (3) precast modular block (large block) retaining wall structures within the past three (3) years.
      c. Construction of at least 5,000 square feet (465 square meters) of precast modular block (large block) retaining walls within the past five (5) years.
   2. RWIC experience documentation for each qualifying project shall include:
      a. Project name and location
      b. Date (month and year) of construction completion
      c. Contact information of Owner or General Contractor
      d. Type (trade name) of precast modular block system used
      e. Maximum height of the wall constructed
      f. Face area of the wall constructed

3. In lieu of the requirements set forth in items 1 and 2 above, the RWIC must submit documentation demonstrating competency in precast modular block retaining wall construction through a training program that is deemed acceptable by the Owner.

B. RWDE Qualifications and Statement of Experience. The RWDE shall submit a written statement affirming that he or she has the following minimum qualifications and experience.
   1. The RWDE shall be licensed to practice in New York State.
   2. The RWDE shall be independently capable of performing all internal and external stability analyses, including those for seismic loading, compound stability, rapid draw-down and deep-seated, global modes of failure. The project geotechnical engineer may provide global stability analysis.
   3. The RWDE shall affirm in writing that he or she has personally supervised the design of the retaining walls for the project, that the design considers all the requirements listed in paragraph 1.06 and that he or she accepts responsibility as the design engineer of record for the retaining walls constructed on the project.
   4. The RWDE shall affirm in writing that he or she has designed a minimum of approximately 3,000 face square feet (280 face square meters) of modular block earth retaining walls within the previous five (5) years.
   5. In lieu of these specific requirements, the engineer may submit alternate documentation demonstrating competency in Precast Modular Block retaining wall design.

C. The Owner reserves the right to reject the design services of any engineer or engineering firm who, in the sole opinion of the Owner, does not possess the requisite experience or qualifications.

1.08 QUALITY CONTROL

A. The Owner’s Representative shall review all submittals for materials, design, RWDE qualifications and the RWIC qualifications.

B. The Owner’s Representative shall retain the services of an Inspection Engineer who is experienced with the construction of precast modular block retaining wall structures to perform inspection and testing. The cost of inspection shall be the responsibility of the Owner. Inspection shall be continuous throughout the construction of the retaining walls.

C. The Inspection Engineer shall perform the following duties:
   1. Inspect the construction of the precast modular block structure for conformance with construction shop drawings and the requirements of this specification.
   2. Verify that soil or aggregate fill placed and compacted in the retained and foundation zones of the retaining wall conforms with paragraphs 2.04 and 2.05 of this section and exhibits the shear strength and bearing capacity parameters specified by the RWDE.

3. Verify that the shear strength of the in-situ soil assumed by the RWDE is appropriate.
4. Inspect and document soil compaction in accordance with these specifications:
   a. Required dry unit weight
   b. Actual dry unit weight
   c. Allowable moisture content
   d. Actual moisture content
   e. Pass/fail assessment
   f. Test location – wall station number
   g. Test elevation
   h. Distance of test location behind the wall face
5. Verify that all excavated slopes in the vicinity of the retaining wall are bench-cut as directed by the project Geotechnical Engineer.
6. Notify the RWIC of any deficiencies in the retaining wall construction and provide the RWIC a reasonable opportunity to correct the deficiency.
7. Notify the General Contractor, Owner and RWDE of any construction deficiencies that have not been corrected timely.
8. Document all inspection results.
9. Test compacted density and moisture content of the retained backfill with the following frequency:
   a. At least once every 500 square feet (45 square meters) (in plan) per vertical lift, and
   b. At least once per every 18 inches (460 mm) of vertical wall construction.

D. The Owner's engagement of the Inspection Engineer does not relieve the RWIC of responsibility to construct the proposed retaining wall in accordance with the approved construction shop drawings and these specifications.

E. The RWIC shall inspect the on-site grades and excavations prior to construction and notify the RWDE and General Contractor if on-site conditions differ from the elevations, assumptions, grading, and soil and groundwater conditions depicted in the retaining wall construction shop drawings.

1.09 DELIVERY, STORAGE AND HANDLING

A. The RWIC shall inspect the materials upon delivery to ensure that the proper type, grade and color of materials have been delivered.

B. The RWIC shall store and handle all materials in accordance with the manufacturer's recommendations as specified herein and in a manner that prevents deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, UV exposure or other causes. Damaged materials shall not be incorporated into the work.

C. Geosynthetics
   1. All geosynthetic materials shall be handled in accordance with ASTM D4873. The materials should be stored off the ground and protected from precipitation, sunlight, dirt and physical damage.

D. Precast Modular Blocks
   1. Precast modular blocks shall be stored in an area with positive drainage away from the blocks. Be careful to protect the block from mud and excessive chipping and breakage. Precast modular blocks shall not be stacked more than three (3) units high in the storage area.

E. Drainage Aggregate and Backfill Stockpiles
   1. Drainage aggregate or backfill material shall not be piled over unstable slopes or areas of the project site with buried utilities.
   2. Drainage aggregate material shall not be staged where it may become mixed with or contaminated by poor draining fine-grained soils such as clay or silt.

PART 2 – MATERIALS

2.01 PRECAST MODULAR BLOCK RETAINING WALL UNITS

A. All units shall be wet-cast precast modular retaining wall units conforming to ASTM C1776.

B. All units for the project shall be obtained from the same manufacturer. The manufacturer shall be licensed and authorized to produce the retaining wall units by the precast modular block system patent holder/licensor and shall document compliance with the published quality control standards of the proprietary precast modular block system licensor for the previous three (3) years, or the total time the manufacturer has been licensed, whichever is less.

C. Concrete used in the production of the precast modular block units shall be first-purpose, fresh concrete. It shall not consist of returned, reconstituted, surplus or waste concrete. It shall be an original production mix meeting the requirements of ASTM C94 and exhibit the properties as shown in the following table:

Concrete Mix Properties

Freeze Thaw Exposure Class[1]	Minimum 28-Day Compressive Strength[2]	Maximum Water Cement Ratio	Nominal Maximum Aggregate Size	Aggregate Class Designation[3]	Air Content[4]
Moderate	4,000 psi (27.6 MPa)	0.45	1 inch (25 mm)	3M	4.5% +/- 1.5%
Severe	4,000 psi (27.6 MPa)	0.45	1 inch (25 mm)	3S	6.0% +/- 1.5%
Very Severe	4,500 psi (30.0 MPa)	0.40	1 inch (25 mm)	4S	6.0% +/- 1.5%
Maximum Water-Soluble Chloride Ion (Cl^-) Content in Concrete, Percent by Weight of Cement[5,6]					0.15
Maximum Chloride as Cl^- Concentration in Mixing Water, Parts Per Million					1000
Maximum Percentage of Total Cementitious Materials By Weight [7,9] (Very Severe Exposure Class Only):					
Fly Ash or Other Pozzolans Conforming to ASTM C618					25
Slag Conforming to ASTM C989					50
Silica Fume Conforming to ASTM C1240					10
Total of Fly Ash or Other Pozzolans, Slag, and Silica Fume[8]					50
Total of Fly Ash or Other Pozzolans and Silica Fume[8]					35
Alkali-Aggregate Reactivity Mitigation per ACI 201					
Slump (Conventional Concrete) per ASTM C143[10]				5 inches +/- 1½ inches (125 mm +/- 40 mm)	
Slump Flow (Self-Consolidating Concrete) per ASTM C1611				18 inches – 32 inches (450 mm – 800 mm)	

[1]Exposure class is as described in ACI 318. "Moderate" describes concrete that is exposed to freezing and thawing cycles and occasional exposure to moisture. "Severe" describes concrete that is exposed to freezing and thawing cycles and in continuous contact with moisture. "Very Severe" describes concrete that is exposed to freezing and thawing cycles and in continuous contact with moisture and exposed to deicing chemicals. Exposure class should be specified by owner/purchaser prior to order placement.

[2]Test method ASTM C39.

[3]Defined in ASTM C33 Table 3 *Limits for Deleterious Substances and Physical Property Requirements of Coarse Aggregates for Concrete*.

[4]Test method ASTM C231.

[5]Test method ASTM C1218 at age between 28 and 42 days.

[6]Where used in high sulfate environments or where alkali-silica reactivity is an issue, water soluble chloride shall be limited to no more than trace amounts (from impurities in concrete-making components, not intended constituents.)

[7]The total cementitious material also includes ASTM C150, C595, C845, C1157 cement. The maximum percentages shall include:

(a) Fly ash or other pozzolans in type IP, blended cement, ASTM C595, or ASTM C1157.
(b) Slag used in the manufacture of an IS blended cement, ASTM C595, or ASTM C1157.
(c) Silica fume, ASTM C1240, present in a blended cement.

[8]Fly ash or other pozzolans and silica fume shall constitute no more than 25 and 10 percent, respectively, of the total weight of the cementitious materials.

[9]Prescriptive limits shown may be waived for concrete mixes that demonstrate excellent freeze/thaw durability in a detailed and current testing program.

[10]Slump may be increased by a high-range water-reducing admixture.

D. Each concrete block shall be cast in a single continuous pour without cold joints. With the exception of half-block units, corner units and other special application units, the precast modular block units shall conform to the nominal dimensions listed in the table below and be produced to the dimensional tolerances shown.

Block Type	Dimension	Nominal Value	Tolerance
28” (710 mm) Block	Height	18” (457 mm)	+/- 3/16” (5 mm)
	Length	46-1/8” (1172 mm)	+/- 1/2” (13 mm)
	Width*	28” (710 mm)	+/- 1/2” (13 mm)
41” (1030 mm) Block	Height	18” (457 mm)	+/- 3/16” (5 mm)
	Length	46-1/8” (1172 mm)	+/- 1/2” (13 mm)
	Width*	40-1/2” (1030 mm)	+/- 1/2” (13 mm)
60” (1520 mm) Block	Height	18” (457 mm)	+/- 3/16” (5 mm)
	Length	46-1/8” (1172 mm)	+/- 1/2” (13 mm)
	Width*	60” (1520 mm)	+/- 1/2” (13 mm)
52” (1320 mm) XL Block	Height	36” (914 mm)	+/- 3/16” (5 mm)
	Length	46-1/8” (1172 mm)	+/- 1/2” (13 mm)
	Width*	52” (1320 mm)	+/- 1/2” (13 mm)
72” (1830 mm) XL Block	Height	36” (914 mm)	+/- 3/16” (5 mm)
	Length	46-1/8” (1172 mm)	+/- 1/2” (13 mm)
	Width*	72” (1830 mm)	+/- 1/2” (13 mm)
96” (2440 mm) XL Block	Height	36” (914 mm)	+/- 3/16” (5 mm)
	Length	46-1/8” (1172 mm)	+/- 1/2” (13 mm)
	Width*	96” (2440 mm)	+/- 1/2” (13 mm)

* Block tolerance measurements shall exclude variable face texture

E. Individual block units shall have a nominal height of 18 inches (457 mm), or 36 inches (914 mm) for XL blocks.

F. With the exception of half-block units, corner units and other special application units, the precast modular block units shall have two (2), circular dome shear knobs that are 10 inches (254 mm), 7.5 inches (190 mm), or 6.75 inches (171 mm) in diameter and 4 inches (102 mm) or 2 inches (51 mm) in height. The shear knobs shall fully index into a continuous semi-cylindrical shear channel in the bottom of the block course above. The peak interface shear between any two (2) vertically stacked precast modular block units, with 10 inch (254 mm) diameter shear knobs, measured in accordance with ASTM D6916 shall exceed 6,500 lb/ft (95 kN/m) at a minimum normal load of 500 lb/ft (7kN/m). as well as an ultimate peak interface shear capacity in excess of 11,000 lb/ft (160 kN/m). The peak interlock shear between any two (2) vertically stacked precast modular block units, with 7.5 inch (190 mm) or 6.75 inch (171 mm) diameter shear knobs, measured in accordance with ASTM D6916 shall exceed 1,850 lb/ft (27 kN/m) at a minimum normal load of 500 lb/ft (7kN/m) as well as an ultimate peak interface shear capacity in excess of 10,000 lb/ft (146 kN/m).Test specimen blocks tested under ASTM D6916 shall be actual,

full-scale production blocks of known compressive strength. The interface shear capacity reported shall be corrected for a 4,000 psi (27.6 MPa) concrete compressive strength. Regardless of precast modular block configuration, interface shear testing shall be completed without the inclusion of unit core infill aggregate.

G. In certain configurations and/or combinations of blocks, some minor on-site trimming/partial removal of some of the shear knobs may be necessary to allow for proper alignment.

H. The 28” (710 mm) and 41” (1030 mm) precast modular block units may be cast with a 13” (330 mm) wide, continuous vertical core slot completely through the block, or solid concrete.

I. Without field cutting or special modification, the precast modular block units shall be capable of achieving a minimum radius of 14 ft 6 in (4.42 m).

J. The precast modular block units shall be manufactured with integrally cast shear knobs that establish a standard horizontal set-back for subsequent block courses. The precast modular block system shall be available in the four (4) standard horizontal set-back facing batter options listed below:

18-inch High Blocks:		36-inch High Blocks:	
Horizontal Set-Back/Blk. Course	Max. Facing Batter	Horizontal Set-Back/Blk. Course	Max. Facing Batter
3/8” (10 mm)	1.2˚	3-1/4” (83 mm)	5.2˚
1-5/8” (41 mm)	5.2˚		
9-3/8” (238 mm)	27.5˚		
16-5/8” (422 mm)	42.7˚		

The precast modular block units shall be furnished with the required shear knobs that provide the facing batter required in the construction shop drawings.

K. The precast modular block unit face texture shall be selected by the Owner from the available range of textures available from the precast modular block manufacturer. Each textured block facing unit shall be a minimum of 5.76 square feet (0.54 square meters) with a unique texture pattern that repeats with a maximum frequency of once in any 15 square feet (1.4 square meters) of wall face.

L. The block color shall be selected by the Owner from the available range of colors available from the precast modular block manufacturer. Concrete blocks can also be stained after installation based upon Owner’s selection of concrete stain colors.

M. All precast modular block units shall be sound and free of cracks or other defects that would interfere with the proper installation of the unit, impair the strength or performance of the constructed wall. PMB units to be used in exposed wall construction shall not exhibit chips or cracks in the exposed face or faces of the unit that are not otherwise permitted. Chips smaller than 1.5" (38 mm) in its largest dimension and cracks not wider than 0.012" (0.3 mm) and not longer than 25% of the nominal height of the PMB unit shall be permitted. PMB units with bug holes in the exposed architectural face smaller than 0.75" (19 mm) in its largest dimension shall be permitted. Bug holes, water marks, and color variation on non-architectural faces are acceptable. PMB units that exhibit cracks that are continuous through any solid element of the PMB unit shall not be incorporated in the work regardless of the width or length of the crack.

N. Basis of Design is a Redi-Rock Retaining Wall System as licensed by Redi-Rock International, LLC, 2940 Parkview Drive, Petoskey, MI 49770; Local contact: Katie Cucchiarella - Mid-Hudson Concrete; 845-590-0150; katie@midhudsonconcrete.com.

O. 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:
   i. Redi-Rock International, LLC, 2940 Parkview Drive, Petoskey, MI 49770; www.redi-rock.com
   ii. Versa-Lock, 6348 Hwy. 36 Blvd, Suite 1, Oakdale, MN 55128; (651) 770-3166; versalok@versa-lok.com
   iii. Recon Wall Systems, 11521 Eagle Street, Suite 3, Coon Rapids, MN 55448; (952) 922-0027; sales@reconwalls.com

P. Substitutions must be requested to the Architect and the Owner for approval in writing. Refer to Section 012500.

Q. Value Engineering Alternatives. The Owner may evaluate and accept systems that meet the requirements of this specification after the bid date that provide a minimum cost savings of 10% to the Owner. Construction expediency will not be considered as a contributing portion of the cost savings total.

2.02 GEOTEXTILE

A. Nonwoven geotextile fabric shall be placed as indicated on the retaining wall construction shop drawings. Additionally, the nonwoven geotextile fabric shall be placed in the v-shaped joint between adjacent block units on the same course. The nonwoven geotextile fabric shall meet the requirements Class 3 construction survivability in accordance with AASHTO M 288.

B. Preapproved Nonwoven Geotextile Products

1. Mirafi 140N
2. Propex Geotex 451
3. Skaps GT-142
4. Thrace-Linq 140EX
5. Carthage Mills FX-40HS
6. Stratatex ST 142

2.03 DRAINAGE AGGREGATE AND WALL INFILL

A. Drainage aggregate (and wall infill for retaining walls designed as modular gravity structures) shall be a durable crushed stone conforming to No. 57 size per ASTM C33 with the following particle-size distribution requirements per ASTM D6913:

U.S. Standard Sieve Size	% Passing
1-½" (38 mm)	100
1" (25 mm)	95-100
½" (13 mm)	25-60
No. 4 (4.76 mm)	0-10
No. 8 (2.38 mm)	0-5

2.04 LEVELING PAD

A. The precast modular block units shall be placed on a leveling pad constructed from crushed stone or unreinforced concrete. The leveling pad shall be constructed to the dimensions and limits shown on the retaining wall design drawings prepared by the RWDE.

B. Crushed stone used for construction of a granular leveling pad shall meet the requirements of the drainage aggregate and wall infill in section 2.04 or a preapproved alternate material.

C. Concrete used for construction of an unreinforced concrete leveling pad shall satisfy the criteria for AASHTO Class B. The concrete should be cured a minimum of 12 hours prior to placement of the precast modular block wall retaining units and exhibit a minimum 28-day compressive strength of 2,500 psi (17.2 MPa).

D. The engineered design for the Modular Block Retaining Wall prepared by the Retaining Wall Design Engineer (RWDE). including depth and composition of the leveling pad shall take precedence over recommendations in the Geotechnical Report of July 2023.

2.05 DRAINAGE

A. Drainage Pipe

1. Drainage collection pipe shall be a 4” (100 mm) diameter, 3-hole perforated, HDPE pipe with a minimum pipe stiffness of 22 psi (152 kPa) per ASTM D2412.
2. The drainage pipe shall be manufactured in accordance with ASTM D1248 for HDPE pipe and fittings.

B. Preapproved Drainage Pipe Products
   1. ADS 3000 Triple Wall pipe as manufactured by Advanced Drainage Systems.

PART 3 – EXECUTION

3.01 GENERAL

A. All work shall be performed in accordance with OSHA, State, and local safety standards, state and local building codes and manufacturer’s requirements.

B. The General Contractor is responsible for the location and protection of all existing underground utilities. Any new utilities proposed for installation in the vicinity of the retaining wall, shall be installed concurrent with retaining wall construction. The General Contractor shall coordinate the work of subcontractors affected by this requirement.

C. New utilities installed below the retaining wall shall be backfilled and compacted to a minimum of 98% maximum dry density per ASTM D698 standard proctor.

D. The General Contractor is responsible to ensure that safe excavations and embankments are maintained throughout the course of the project.

E. All work shall be inspected by the Inspection Engineer as directed by the Owner.

3.02 EXAMINATION

A. Prior to construction, the General Contractor, Grading Contractor, RWIC and Inspection Engineer shall examine the areas in which the retaining wall will be constructed to evaluate compliance with the requirements for installation tolerances, worker safety and any site conditions affecting performance of the completed structure. Installation shall proceed only after unsatisfactory conditions have been corrected.

3.03 PREPARATION

A. Fill Soil.
   1. The Inspection Engineer shall verify that retained backfill material placed within a horizontal distance of one (1.0) times the wall height behind the wall blocks satisfies the criteria of this section.

2. The Inspection Engineer shall verify that any fill soil installed in the foundation and retained soil zones of the retaining wall satisfies the specification of the RWDE as shown on the construction drawings.

B. Excavation.
   1. The Grading Contractor shall excavate to the lines and grades required for construction of the precast modular block retaining wall as shown on the construction drawings. The Grading Contractor shall minimize over-excavation. Excavation support, if required, shall be the responsibility of the Grading Contractor.
   2. Over-excavated soil shall be replaced with compacted fill in conformance with the specifications of the RWDE and “Division 31, Section 31 20 00 – Earthmoving” of these project specifications.
   3. Embankment excavations shall be bench cut as directed by the project Geotechnical Engineer and inspected by the Inspection Engineer for compliance.

C. Foundation Preparation.
   1. Prior to construction of the precast modular block retaining wall, the leveling pad area and undercut zone (if applicable) shall be cleared and grubbed. All topsoil, brush, frozen soil and organic material shall be removed. Additional foundation soils found to be unsatisfactory beyond the specified undercut limits shall be undercut and replaced with approved fill as directed by the project Geotechnical Engineer. The Inspection Engineer shall ensure that the undercut limits are consistent with the requirements of the project Geotechnical Engineer and that all soil fill material is properly compacted in accordance with project specifications. The Inspection Engineer shall document the volume of undercut and replacement, if required.
   2. Following excavation for the leveling pad and undercut zone (if applicable), the Inspection Engineer shall evaluate the in-situ soil in the foundation and retained soil zones.
      a. The Inspection Engineer shall verify that the shear strength of the in-situ soil assumed by the RWDE is appropriate. The Inspection Engineer shall immediately stop work and notify the Owner if the in-situ shear strength is found to be inconsistent with the retaining wall design assumptions.
      b. The Inspection Engineer shall verify that the foundation soil exhibits sufficient ultimate bearing capacity to satisfy the requirements indicated on the retaining wall construction shop drawings per paragraph 1.06 I of this section.

D. Leveling Pad.
   1. The leveling pad shall be constructed to provide a level, hard surface on which to place the first course of precast modular block units. The leveling pad shall be placed in the dimensions shown on the retaining wall construction drawings and extend to the limits indicated.
   2. Crushed Stone Leveling Pad. Crushed stone shall be placed in uniform maximum lifts of 6” (150 mm). The crushed stone shall be compacted by a minimum of 3 passes of a

vibratory compactor capable of exerting 2,000 lb (8.9 kN) of centrifugal force and to the satisfaction of the Inspection Engineer.

3. Unreinforced Concrete Leveling Pad. The concrete shall be placed in the same dimensions as those required for the crushed stone leveling pad. The RWIC shall erect proper forms as required to ensure the accurate placement of the concrete leveling pad according to the retaining wall construction drawings.

3.04 PRECAST MODULAR BLOCK WALL SYSTEM INSTALLATION

A. The precast modular block structure shall be constructed in accordance with the construction drawings, these specifications and the recommendations of the retaining wall system component manufacturers. Where conflicts exist between the manufacturer's recommendations and these specifications, these specifications shall prevail.

B. Drainage components. Pipe, geotextile and drainage aggregate shall be installed as shown on the construction shop drawings.

C. Precast Modular Block Installation
   1. The first course of block units shall be placed with the front face edges tightly abutted together on adjacent blocks, on the prepared leveling pad at the locations and elevations shown on the construction drawings. The RWIC shall take special care to ensure that the bottom course of block units are in full contact with the leveling pad, are set level and true and are properly aligned according to the locations shown on the construction drawings.
   2. Backfill shall be placed in front of the bottom course of blocks prior to placement of subsequent block courses. Nonwoven geotextile fabric shall be placed in the V-shaped joints between adjacent blocks. Drainage aggregate shall be placed in the V-shaped joints between adjacent blocks, and extend to a minimum distance of 12" (300 mm) behind the block unit.
   3. Drainage aggregate shall be placed in 9 inch to 12 inch maximum lifts (as specified by the Engineer) and compacted by a minimum of three (3) passes of a vibratory plate compactor capable exerting a minimum of 2,000 lb (8.9 kN) of centrifugal force, or by other suitable compaction methods.
   4. Unit core fill shall be placed in the precast modular block unit vertical core slot. The core fill shall completely fill the slot to the level of the top of the block unit. The top of the block unit shall be broom-cleaned prior to placement of subsequent block courses. No additional courses of precast modular blocks may be stacked before the unit core fill is installed in the blocks on the course below.
   5. Base course blocks for gravity wall designs (without geosynthetic soil reinforcement) may be furnished without vertical core slots. If so, disregard item 4 above, for the base course blocks in this application.

6. Nonwoven geotextile fabric shall be placed between the drainage aggregate and the retained soil (gravity wall design) if required on the retaining wall construction drawings.
7. Subsequent courses of block units shall be installed with a running bond (approximate half block horizontal course-to-course offset). With the exception of 90 degree corner units, the shear channel of the upper block shall be fully engaged with the shear knobs of the block course below. The upper block course shall be pushed forward to fully engage the interface shear key between the blocks and to ensure consistent face batter and wall alignment. Drainage aggregate, unit core fill, geotextile and properly compacted backfill shall be complete and in-place for each course of block units before the next course of blocks is stacked.
8. The elevation of retained soil fill shall not be less than 1 block course (18" (457 mm)) below the elevation of the retained backfill throughout the construction of the retaining wall.
9. If included as part of the precast modular block wall design, cap units shall be secured with an appropriate construction adhesive in accordance with the Manufacturer's recommendation.

D. Construction Tolerance. Allowable construction tolerance of the retaining wall shall be as follows:
   1. Deviation from the design batter and horizontal alignment, when measured along a 10' (3 m) straight wall section, shall not exceed 3/4" (19 mm).
   2. Deviation from the overall design batter shall not exceed 1/2" (13 mm) per 10' (3 m) of wall height.
   3. The maximum allowable offset (horizontal bulge) of the face in any precast modular block joint shall be 1/2" (13 mm).
   4. The base of the precast modular block wall excavation shall be within 2" (50 mm) of the staked elevations, unless otherwise approved by the Inspection Engineer.
   5. Differential vertical settlement of the face shall not exceed 1' (300 mm) along any 200' (61 m) of wall length.
   6. The maximum allowable vertical displacement of the face in any precast modular block joint shall be 1/2" (13 mm).
   7. The wall face shall be placed within 2" (50 mm) of the horizontal location staked.

3.05 WALL INFILL AND BACKFILL PLACEMENT

A. Backfill material placed immediately behind the drainage aggregate shall be compacted as follows:
   1. 98% of maximum dry density at ± 2% optimum moisture content per ASTM D698 standard proctor or 85% relative density per ASTM D4254.

B. Compactive effort within 3' (0.9 m) of the back of the precast modular blocks should be accomplished with walk-behind compactors. Compaction in this zone shall be within 95%

of maximum dry density as measured in accordance with ASTM D1557 modified proctor or 80% relative density per ASTM D 4254. Heavy equipment should not be operated within 3' (0.9 m) of the back of the precast modular blocks.

C. Backfill material shall be installed in lifts that do not exceed a thickness of 9 to 12 inches (230 to 330 mm), as specified by Engineer.

D. At the end of each work day, the RWIC shall grade the surface of the last lift of the granular wall infill to a 3% ± 1% slope away from the precast modular block wall face and compact it.

E. The General Contractor shall direct the Grading Contractor to protect the precast modular block wall structure against surface water runoff at all times through the use of berms, diversion ditches, silt fence, temporary drains and/or any other necessary measures to prevent soil staining of the wall face, scour of the retaining wall foundation or erosion of the reinforced backfill or wall infill.

3.06 OBSTRUCTIONS IN THE INFILL ZONE

A. The RWIC shall make all required allowances for obstructions behind and through the wall face in accordance with the approved construction shop drawings.

B. Should unplanned obstructions become apparent for which the approved construction shop drawings do not account, the affected portion of the wall shall not be constructed until the RWDE can appropriately address the required procedures for construction of the wall section in question.

3.07 COMPLETION

A. For walls supporting unpaved areas, a minimum of 12" (300 mm) of compacted, low-permeability fill shall be placed over the granular wall infill zone of the precast modular block retaining wall structure. The adjacent retained soil shall be graded to prevent ponding of water behind the completed retaining wall.

B. For retaining walls with crest slopes of 5H:1V or steeper, appropriate soil erosion/sedimentation control measures shall be installed along the wall crest immediately following construction and grading of the crest slope. The crest slope above the wall shall be immediately seeded and protected to establish vegetation. The General Contractor shall ensure that the seeded slope receives adequate irrigation and erosion protection to support germination and growth.

C. The General Contractor shall confirm that the as-built precast modular block wall geometries conform to the requirements of this section. The General Contractor shall notify the Owner of any deviations.

END OF SECTION 323215

SECTION 330000 - WATER AND SEWER SERVICES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes

1. Provide copper water service connections in accordance with this Section and applicable reference standards listed in Article 1.3.

2. Provide sewer service connections in accordance with this Section and applicable reference standards listed in Article 1.3.

B. Related Requirements

1. Section 31 00 00 – Earthwork

1.2 PRICE AND PAYMENT PROCEDURES

A. Measurement and payment requirements: per Division 01 General Requirements.

1.3 REFERENCES

A. Water Service Reference Standards

1. ASTM International (ASTM)

a. ASTM A48 Standard Specification for Gray Iron Castings

b. ASTM A240 Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

c. ASTM A536 Standard Specification for Ductile Iron Castings

d. ASTM B62 Standard Specification for Composition Bronze or Ounce Metal Castings

e. ASTM B88 Standard Specification for Seamless Copper Water Tube

f. ASTM B584 Standard Specification for Copper Alloy Sand Castings for General Applications

g. ASTM D2000 Standard Classification System for Rubber Products in Automotive Applications

2. American Water Works Association (AWWA)

a. AWWA C230 Stainless-Steel Full-Encirclement Repair and Service Connection Clamps for 2 in. Through 12 in. Pipe

b. AWWA C600 Installation of Ductile-Iron Mains and Their Appurtenances

c. AWWA C651 Disinfection of Water Mains

d. AWWA C800 Underground Service Line Valves and Fittings

3. NSF International (NSF)

a. NSF/ANSI 61 Drinking Water System Components – Health Effects

b. NSF/ANSI 372 Drinking Water System Components – Lead Content

4. Uni-Bell PVC Pipe Association

a. Uni-Bell Tapping Guide for PVC Pressure Pipe

5. Unified Number System (UNS) for Copper and Copper Alloys

a. UNS C89520

b. UNS C89833

6. Sewer Service References Standards

a. ASTM D1784 Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

b. ASTM D3034 Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings

c. ASTM D3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

d. ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

7. American Water Works Association (AWWA)

a. AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination, sequencing, and scheduling: per Division 01 General Requirements.

B. Schedule police details and coordinate traffic management for Right of Way Work with Owner.

1.5 SUBMITTALS

A. Submit in accordance with Division 01 General Requirements.

B. Product data: manufacturer's product data and installation instructions for each product specified.

C. Shop Drawings

D. Certificates

1. Manufacturer's notarized certificates certifying conformance with the Specifications and reference standards to accompany shipments

2. NSF/ANSI 61 and NSF/ANSI 372 certificates of compliance as certified by ANSI accredited organization

E. Closeout and maintenance material submittals: per Division 01 General Requirements.

1. Water Service - Record depth and take ties as directed by Engineer for conformed to construction records.

2. Sewer Service - Record pipe material and classes. Record depth and take ties to location of building service capped ends, cleanouts, bends, connection points to sewer main.

1.6 QUALITY ASSURANCE

A. Provide in accordance with Division 01 General Requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Provide in accordance with Division 01 General Requirements.

B. Packing, shipping, handling, and unloading

1. Ensure each shipment includes manufacturers’ certificate of conformance.

C. Acceptance at Site

1. Inspect upon delivery and reject pipe not in conformance with specified requirements, or damaged beyond repair. Immediately remove damaged pipe from Site and dispose of legally.

1.8 SITE CONDITIONS

A. Existing Conditions: per Division 01 General Requirements.

PART 2 – WATER SERVICE PRODUCTS

2.1 GENERAL

A. Comply with requirements of Westchester Joint Water Works, Westchester County Department of Health, Harrison's Public Works Departments and the requirements of AWWA C651 and AWWA C800.

B. Comply with State Plumbing Code and local plumbing codes and with more stringent code in cases of conflict.

C. Products in contact with potable water: in compliance with NSF/ANSI 61 and NSF/ANSI 372.

2.2 WATER SERVICE TUBING

A. Copper tubing: Type K, soft copper tubing in accordance with ASTM B88 and AWWA C800.

2.3 CORPORATION STOPS FOR WATER SERVICES

A. Materials in contact with potable water: cast no-lead brass UNS Copper Alloy No. C89520 or C89833 in accordance with the chemical and mechanical requirements of ASTM B584 and AWWA C800 and designated "NL" or other manufacturer's standard Lead Free designation cast into the main body.

B. Type: ball type with fluorocarbon coating; 360-degree turning radius; solid, one-piece body; solid one-piece stem and operating head; 300 psig working pressure; straight through, full port design, blow-out proof, double O-ring stem seals, and installed using standard tapping machine.

C. Inlet threads: AWWA standard (CC) inlet threads in accordance with AWWA C800.

D. Outlet connection: compression outlet for copper tube size (CTS) outside diameter (OD) tubing.

E. Installation: capable of being installed using a standard tapping machine.

F. NSF 61 certified.

G. Acceptable manufacturers

1. Mueller Corporation

2. Or equal

2.4 CURB STOPS FOR WATER SERVICES

A. Materials in contact with potable water: cast no-lead brass UNS Copper Alloy No. C89520 or C89833 in accordance with the chemical and mechanical requirements of ASTM B584 and AWWA C800 and designated “NL” or other manufacturer’s standard Lead Free designation cast into the main body.

B. Type: ball type, brass with fluorocarbon coating, double O-ring type stem seals, straight-through, full port, blow out proof design, compression inlet and outlet connections, positive shut-off in either direction with quarter turn check and rated to 300 psig working pressure.

C. NSF 61 approved.

D. Acceptable manufacturers

1. Mueller Corporation

2. Or equal

2.5 SERVICE BOXES FOR WATER SERVICES

A. Materials: heavy duty cast iron conforming to ASTM A48.

B. Style: 2-1/2 inch Buffalo style.

C. Type: two-piece, slide type.

D. Cover: heavy duty, flush fit, locking type with a brass pentagon head bolt and the word “WATER” cast in the cover.

E. Base: arch style. Provide enlarged base for 1-1/2 inch and 2-inch diameter water services.

2.6 SERVICE SADDLES FOR WATER SERVICES

A. Conform to requirements of AWWA C800, NSF/ANSI 61, and NSF/ANSI 372.

B. Materials: ductile iron body conforming to ASTM A536 with Type 304 stainless steel per ASTM A240, double straps wrap around design with heaving tapping boss, standard AWWA thread per AWWA C800 (CC thread) and fusion bonded epoxy coated in accordance with AWWA C213 or nylon coated per AWWA C224.

C. Studs, nuts and washers: Type 304 stainless steel. Nuts: coated to prevent galling.

D. Gaskets: Buna-N (Nitrile) or EPDM rubber gaskets per ASTM D2000.

E. Acceptable manufacturers

1. Smith Blair

2. Mueller Corporation

3. Ford Meter Box Company, Inc.

4. Or equal

2.7 REPAIR CLAMPS FOR WATER SERVICES

A. Comply with AWWA C230, NSF/ANSI 61 and NSF/ANSI 372.

B. Materials: ASTM A240 Type 304 heavy gauge stainless steel band, mold bonded into the gasket to insure uniform compression against the pipe.

C. Gaskets: gridded Nitrile (Buna-N) or Styrene Butadiene Rubber (SBR) face gasket with tapered ends per ASTM D2000.

D. Pressure rating: 150 psi working pressure.

E. Acceptable manufacturers

1. Romac Industries, Inc.

2. Ford Meter Box Company, Inc.

3. Smith-Blair, Inc.

4. Or equal

2.8 ACCESSORIES FOR WATER SERVICES

A. Service fittings

1. Materials: cast no-lead brass UNS Copper Alloy No. C89520 or C89833 in accordance with ASTM B584 and AWWA C800 and designated “NL” or other manufacturer’s standard Lead Free designation cast into the main body.

2. Pressure rating: greater than valve or fitting of fitting used.

3. Inlet connection: compression type.

4. Outlet connection: compression type.

5. Acceptable manufacturers

a. Mueller Corporation

b. Or equal

2.9 SOURCE QUALITY CONTROL

A. Provide in accordance with Division 01 General Requirements.

2.10 PVC GRAVITY SEWER PIPE

A. Furnish ASTM D3034 with push-on joints per ASTM D3212. Pipe gaskets: ASTM F477 elastomeric seals or nitrile gaskets. Materials: equal or exceed cell class 12454 or 12364 in accordance with ASTM D1784.

B. Pipe with less than 4-feet of cover or more than 16-feet of cover: ASTM D2241 standard dimension ratio (SDR) 21. Unavailable sizes: SDR 26.

C. Pipe 4-feet to 16-feet of cover: SDR 35.

2.11 FITTINGS FOR SEWER SERVICES

A. Furnish single piece gasket of same type and class of materials as pipe except as otherwise specified. Provide wyes or tee wyes for service connections.

2.12 INSULATION

A. Where service installations have less than 4 ft of cover, furnish and install 2-inch thick, 4-feet wide, extruded closed-cell rigid formed polystyrene. Acceptable level of quality: equivalent to Dow Styrofoam Highload 60.

2.13 DETECTABLE WARNING AND IDENTIFICATION TAPE FOR BURIED SERVICES

A. Acceptable level of quality: equivalent to Trumbull Manufacturing.

B. Aluminum core plastic encased tape: 6-inch minimum width, with warning and identification imprinted in bold black letters continuously over the entire tape length.

C. Warning tape color code:

1. Blue – Water Services

2. Green – Sewer Services

D. Color and printing: permanent and unaffected by moisture or soil.

E. Minimum thickness: 0.003 inches.

1. Minimum strength: 1,500 pounds per square inch lengthwise, and 1,250 pounds per square inch crosswise, with a maximum 350 percent elongation.

2.14 SOURCE QUALITY CONTROL

A. Provide in accordance with Division 01 General Requirements.

PART 3 – EXECUTION

3.1 GENERAL

A. Coordinate Work with Owner and Engineer.

B. Comply with requirements of Owner's Water, Sewer and Public Works Departments and the requirements of AWWA C651 and AWWA C800.

C. Comply with State Plumbing Code and local plumbing codes and with more stringent code in cases of conflict.

D. Perform excavation and backfill in accordance with Section 31 00 00.

E. Install utility service connections in accordance with manufacturer's installation instructions, as shown on Drawings, and as specified. Complete utility service connections after disinfection, flushing and bacteriological testing of water utility piping systems have been accepted by the Owner.

F. Provide service saddles for all services installed as part of this Project.

3.2 WATER SERVICE INSTALLATION

A. Corporation Stops

1. Install service saddles as required in Article 3.1 in accordance with manufacturer's instructions for all tapped connections. Install service saddles for PVC/PVCO pipe in accordance with Uni-Bell Tapping Guide for PVC Pressure Pipe.

2. Install wet tap connections using a tapping machine.

3. Install taps on customer side of the water main.

4. Cut through water main wall completely when tapping. Clean tapped threads and remove any remnants of water main materials.

5. Wrap threaded end with Teflon tape prior to installation.

6. Make service taps water-tight.

B. Water Service Tubing

1. Extend water service tubing of the size and in locations as indicated on Drawings or as directed by Owner.

2. Install in a single piece without joints between corporation stop and curb stop.

3. Install in a straight path from corporation stop to curb stop.

4. Avoid kinks, joints, gouges or crimps in the water service tubing.

5. Install with goose neck at corporation stop in accordance with the Drawings.

6. Connect to corporation stop, curb stop and existing water service tubing.

7. Connect to existing water service with approved service fitting.

8. Install with minimum of 4 feet of cover, measured from top of service tubing to finished grade as shown on the Drawings or otherwise approved in writing by the Owner.

9. Provide 6” of sand bedding and cover in accordance with the Drawings.

10. Insulate service tubing with less than 4 feet of cover with a minimum of 4-inch, 40 pound density Styrofoam material. Extend insulation the width of the trench a minimum of 4 feet above pipe envelope and on vertical sides of the trench bottom, from the bottom to above pipe envelope. Do not install water service tubing with less than 4 feet of cover without prior written approval of the Owner.

11. Remove and legally dispose of existing water service tubing and appurtenances.

C. Curb Stop and Box

1. Install in trench on a precast solid concrete block support at an elevation to provide a minimum cover of 5 feet.

2. Perform operational testing of curb stops by opening and closing under water pressure to ensure proper operation and to release any air in water service tubing.

3. Pressure test utility service connections under active line pressure in the presence of the Owner or Engineer. Do not backfill until approved by Owner or Engineer.

4. Provide a service box for each curb stop.

5. Set and brace curb box to ensure it remains in a vertical position centered on the curb stop during and after backfilling. Maintain proper alignment and height of curb box until completion of Project.

6. Install curb box so cover is flush with existing grade.

7. Remove and legally dispose of existing curb stop and box.

D. Repair and Restoration

1. Repair defective service taps with stainless steel split sleeve repair clamps.

2. Install repair clamps in accordance with AWWA C230. Do not re-tap water main within 12 inches of repair clamp.

3. Replace defective water service tubing with a single piece of tubing extending from corporation stop to curb stop.

4. Repair defective Work and retest until installation is accepted.

5. Repair leaks.

6. Repair indoor plumbing problems that occur as a result of Work performed at no additional cost to Owner.

7. Restore disturbed surface areas impacted by construction including paved areas, granite curbing, and lawn areas.

8. Replace other materials and items removed, restore disturbed areas to original conditions.

3.3 SEWER SERVICE INSTALLATION

A. Verify location and size of service laterals as shown on Drawings.

B. Provide tee wye or wye fittings on main line pipe and connect existing service connections to main line as shown on Drawings.

C. Provide clean-outs as required by Westchester Joint Water Works and Westchester County Department of Health.

D. Cap and stake ends of new service. Provide oak marker. Assist Engineer in measuring pipe installed and obtaining swing ties.

3.4 FIELD QUALITY CONTROL

A. Provide in accordance with Division 01 General Requirements.

3.5 CLEANING

A. Clean and flush piping after Work is completed, before final acceptance.

3.6 CLOSEOUT ACTIVITIES

A. Provide in accordance with Division 01 General Requirements.

END OF SECTION 330000

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SECTION 334100 - STORMWATER UTILITY DRAINAGE PIPING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes

1. Provide storm drainage systems in accordance with this Section and applicable reference standards listed in Article 1.3.

1.2 PRICE AND PAYMENT PROCEDURES

A. Measurement and payment requirements: per Division 01 General Requirements.

1.3 REFERENCES

A. Reference Standards

1. ASTM International (ASTM)

a. ASTM C1173 Flexible Transition Couplings for Underground Piping Systems

b. ASTM D1622 Standard Test Method for Apparent Density of Rigid Cellular Plastics

c. ASTM D6226 Standard Test Method for Open Cell Content of Rigid Cellular Plastics

2. American Water Works Association (AWWA)

a. AWWA/ANSI C111 - Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings

b. AWWA/ANSI C151 - Class 52, Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids

3. MassDOT

a. Standard Specifications and Supplements, and Construction Details

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination, sequencing, and scheduling: per Division 01 General Requirements.

1.5 SUBMITTALS

A. Submit in accordance with Division 01 General Requirements.

1. Product Data

2. Certificates

    a. Manufacturer's notarized certificate certifying conformance with the Specifications to accompany shipments

3. Design Data/Submittals

    a. Pipe manufacturer’s anti-floatation calculations for each pipe material and details, signed and stamped by engineer licensed in the state where Project is located based on the following criteria.

        1) Groundwater elevation shall be set at grade above the pipe.

        2) Factor of safety shall be 1.1; downward forces from the weight of the pipe and soils over pipe shall be 1.1 times the buoyant uplift forces.

        3) The pipe shall be considered empty. Calculations shall not consider the weight of internal water.

4. Manufacturer Instructions

5. Field Quality Control Submittals

    a. Test results

    b. Logs of inspection and testing

B. Closeout and maintenance material submittals: per Division 01 General Requirements.

1. Record depth and take ties to the location of the following.

    a. Pipe stub capped ends

    b. Locations of plugged pipes

    c. Manholes and catch basins

1.6 QUALITY ASSURANCE

A. Provide in accordance with Division 01 General Requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Provide in accordance with Division 01 General Requirements.

B. Packing, Shipping, Handling, and Unloading

1. Provide that each shipment of pipe, pipefittings and appurtenances includes manufacturers' Certificate of Conformance.

2. Inspect upon delivery and reject pipe immediately that does not conform to specified requirements or has been damaged beyond repair and immediately remove from Site.

C. Waste Management and Disposal

1. Remove damaged pipe from Site and legally dispose of it in accordance with local, State, and Federal regulations.

1.8 SITE CONDITIONS

A. Existing conditions: per Division 01 General Requirements.

PART 2 – PRODUCTS

2.1 GENERAL

A. Provide fittings of same type and class of materials as pipe with single piece gasket, unless otherwise specified.

B. Minimum "pipe stiffness" at 5% deflection: 46 psi for all sizes when tested in accordance with ASTM D2412.

C. Joint deflection: accommodate an offset along the pipe axis of a minimum of 7 inches over 20 horizontal feet.

D. Source Quality Control: in accordance with Division 01 General Requirements.

2.2 SMOOTH INTERIOR CORRUGATED POLYETHYLENE PIPE (HDPE)

A. Smooth Interior Corrugated Polyethylene Pipe shall be meet ASTM F2648 with an acceptable level of quality, equivalent to N-12 WT from Advanced Drainage Systems (ADS) or approved equal.

B. Pipe fittings may be fabricated or molded, conform to ASTM F2306, and be equal to that of the pipe with respect to physical and chemical properties. Fittings shall not reduce or impair the overall integrity or function of the pipeline. Only fittings supplied or recommended by the pipe manufacturer shall be used.

C. Joints shall be of watertight design, with electrometric gaskets meeting the requirements of ASTM F477.

2.3 MISCELLANEOUS

A. Pipe to Pipe Connection Flexible Couplings: ASTM C1173.

1. Type A: non-pressure application, elastomeric sleeve or rubber sleeve incorporating stainless steel tension bands and a tightening mechanism to provide a positive seal against both infiltration and exfiltration. Stainless steel bands: 300 series stainless steel. Coupling: resilient and unaffected by soil conditions, resistant to chemicals, ultraviolet rays, and fungus growth.

B. Underground Marking Tape: detectable marking tape with aluminum core with minimum 6-inch width and minimum 5 mils thickness with APWA uniform color-coding for quick and easy identification and location. Text or lettering: repeated continuously along length of tape at intervals no greater than 3 feet indicating “Caution Buried Drain Line Below”.

C. Drainage Structure Connections

1. To New Manholes: compression type flexible connector cast into the manhole wall or flexible boot connection per pipe or drainage structure manufacturer recommendations.

2. To Existing Manholes: by coring and installing a boot type flexible connector.

3. Refer to Section 33 49 00 for additional information.

D. Gasket lubricant: solution of vegetable soap or other solution supplied by the pipe manufacturer.

E. Anti-floatation system for each pipe material: per the design of the pipe manufacturer and provided where required.

2.4 SOURCE QUALITY CONTROL

A. Provide in accordance with Division 01 General Requirements. Comply with applicable reference standards listed in Article 1.3.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install storm drain piping in accordance with the manufacturer’s written installation instructions and the Drawings, and to the lines and grades and at the locations shown on the Drawings. Field verify elevations and slope and make adjustments as necessary.

B. Do not install unsound or damaged pipe or accessories.

C. Secure each length of pipe with bedding before placing next length. Bed pipe as shown on Drawings. Excavate bell/coupling holes or provide in the base material to receive the bell or coupling so that only the barrel of the pipe receives bearing

pressure from the supporting material. Do not permanently support pipe or fittings on blocks, wedges, boards or stones.

D. When each pipe has been properly bedded, place and compact enough of the backfill material between the pipe and the sides of the trench to hold the pipe in correct alignment.

E. Close open ends of pipe by suitable temporary bulkheads to prevent entrance of earth and other materials when pipe laying is not in progress.

F. Take necessary precautions to prevent floatation of the pipe as a result of the water in the trench. Complete all drainage installation work in dry conditions.

G. Maintain stormwater system operations and flows with means as methods as preferred by the Contractor to complete the Work.

H. Assist Engineer as needed to run level checks on pipe slopes, and take ties.

I. Lay pipe to line and grade shown on the Drawings. Field verify elevations and slope and make adjustments as necessary. If grade is not shown, determine elevations of start and finish points for each run of pipe. Lay pipe to a uniform grade between manholes. Line and grade may be adjusted by the Engineer as required by field conditions. Lay each pipe to form a close joint with the next adjoining pipe and bring the inverts continuously to the required line and grade.

J. Immediately lay pipe as soon as excavation is completed and the bedding material has been brought to the proper grade.

1. Clean spigot end of the pipe and enter into the rubber gasket in the bell, using care to keep the joint from contacting the ground. Lubricate as required per manufacturer’s written instructions.

2. Complete joint shall then be completed by forcing the plain end to the seat of the bell. Pipe which is not furnished with a depth mark shall be marked before assembly to assure that the spigot end is inserted to the full depth of the joint.

K. Do not lay next length of pipe until the previous length has had sufficient material tamped about it to firmly secure it in place so as to prevent any movement or disturbance.

L. Do not lay pipe in water or when trench conditions or weather are unsuitable for such Work, except as approved by Engineer. Do not use installed pipe to remove water from Work area.

M. Lay pipe with the bell ends facing the direction of the laying unless otherwise permitted by the Engineer. Make joints per pipe manufacturer recommendations.

N. Inspect and clean pipes and remove debris as required per method approved by Engineer prior to final acceptance. Gravity flushing is not acceptable.

O. Connections to manholes and catch basins: short length of pipe so that joints are located within 3 feet of inside surface of manholes and catch basins.

P. Use manufacturer recommended anti-floatation system for each specified pipe material.

Q. Lay underground detectable warning tape above piping and at the edges of subsurface detention system in accordance with details and applicable reference standards.

R. Flexible Couplings: used and located as approved by Engineer.

1. Pipe Connections to New Manholes: use compression type flexible connector cast into the manhole wall or flexible boot connection per pipe and structure manufacturer recommendations. Field coring of new manholes will not be allowed.

2. Pipe Connections to Existing Manholes: coring the existing manhole and installing a boot type flexible connector.

S. HDPE Installation

1. Bedding and burial of pipe and fittings: ASTM D2321 and the manufacturer’s recommended installation guidelines.

2. Minimum cover in traffic areas: 2 feet.

3. Join both solid and perforated HDPE pipe and fittings with couplings for soil tight joints in accordance with ASTM D2321.

4. Join piping made of different materials and dimensions with special couplings. Use couplings compatible with, and fitting both pipe materials and dimensions. Utilize neoprene gaskets with coupling to provide a soil tight joint.

3.2 PERFORATED PIPING INSTALLATION

A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and as specified.

1. Install piping pitched down in direction of flow at a minimum slope of 0.5 percent with a minimum cover of 12 inches, unless otherwise indicated.

2. Lay perforated pipe with perforations down.

3. Excavate recesses in trench bottom for bell ends of pipe. Lay pipe with bells facing upslope and with spigot end entered fully into adjacent bell.

B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Do not reduce pipe size in direction of flow.

C. Install HDPE piping in accordance with ASTM D2321. Do not allow holes in corrugation crests or sidewalls. Cut ends of pipe squarely and cleanly.

3.3 FIELD QUALITY CONTROL

A. Provide in accordance with Division 01 General Requirements. Comply with applicable reference standards listed in Article 1.3.

B. Subject pipe to thorough inspection and tests according to ASTM standards. Pipes may be rejected at Site if non-conforming or damaged, regardless of prior factory acceptance.

C. Remove and replaced damaged pipe found or encase in a Class A concrete collar or envelope as directed.

3.4 CLOSEOUT ACTIVITIES

A. Provide in accordance with Division 01 General Requirements.

END OF SECTION 334100

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SECTION 334422 - STORMWATER TREATMENT DEVICE

PART 1 – GENERAL

A. Contractor shall furnish all labor, equipment and materials necessary to install the storm water treatment devices (SWTD) as shown in the Drawings and these specifications.

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Section 31 00 00 – Earthwork

B. Section 33 41 00 - Storm Utility Drainage Piping

1.2 SUBMITTALS

A. Shop Drawings.

B. Product Data: Manufacturer's catalog sheets, performance data certification, and installation instructions.

C. Signage proofs.

1.3 QUALITY ASSURANCE

A. All components of the stormwater treatment device shall be inspected and rejected if deemed defective.

B. The manufacturer shall guarantee the stormwater treatment device components against manufacturer originated defects in materials or workmanship for a period of one (1) year.

PART 2 – PRODUCTS

2.1 HYDRODYNAMIC SEPARATOR PRE-TREATMENT STRUCTURE

A. The Stormwater Pre-Treatment Device shall meet the following performance criteria:

1. Capable of treating water quality flow rates and conveying minimum peak runoff rates as outlined in the following table:

Structure	Water Quality Flow (cfs)	Minimum Peak Runoff (cfs)
HDS-1	0.30	4.55
HDS-2	0.43	3.43

2. Structure and castings to be rated for AASHTO HS-20 loading.

B. Acceptable level of quality, equivalent to CDS Hydrodynamic Water Quality Structure CDS2015-4 (CDS-4) by Contech Engineered Solutions, LLC, or approved equal.

2.2 STORMWATER FILTER STRUCTURE

A. The Stormwater Treatment Device shall meet the following performance criteria:

1. Capable of treating a water quality flow rate of 0.30 cfs.

2. Structure and castings to be rated for AASHTO HS-20 loading.

B. Acceptable level of quality, equivalent to Jellyfish Filter JF4 Water Quality Structure by Contech Engineered Solutions, LLC, or approved equal.

2.3 STORMWATER MAINTENANCE SIGNAGE

A. Aluminum signs measuring 18” by 24”. Background color green and white text.

B. Signage mounted to 4’ height 4”x4” pressure treated wood post and fixed to post with stainless steel steel screws.

C. Provide 4 custom signs, with draft text included as sample below. Final text to be provided by Owner or Engineer during submittal and shop drawing review process.

STORMWATER MANAGEMENT PRACTICE – HYDRODYNAMIC SEPARATOR
PROJECT IDENTIFICATION - SPDES NYRXXXXXX
MUST BE MAINTAINED IN ACCORDANCE WITH O&M PLAN
DO NOT REMOVE OR ALTER
TOWN/VILLAGE OF HARRISON, NY

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install stormwater quality structures in accordance with the manufacturer's installation instructions, approved shop drawings, and the Drawings. Verify invert elevations during installation.

B. Direct bury signage posts. Embed posts minimum 48 inches. Install signage in accordance with manufacturer’s recommendations. Locate signage in close proximity to installed practices. Field verify locations with Engineer or Owner.

3.2 CLEANING

A. Clean stormwater treatment structures and confirm they are free of any accumulated sediment and debris prior to Final Acceptance.

END OF SECTION - 334422

SECTION 334611.13 - STORMWATER DETENTION SYSTEM

PART 1 – GENERAL

1.1 SUMMARY

A. Provide excavation and base preparation per geotechnical engineer's recommendations and/or as shown on the design drawings, to provide adequate support for project design loads and safety from excavation sidewall collapse. Excavations shall be in accordance with the owner's and OSHA requirements.

B. Provide and install R-TankXD, UD, & HD system (hereafter called R-Tank) and all related products including fill materials, geotextiles, geogrids, inlet and outlet pipe with connections per the manufacturer's installation guidelines provided in this section.

C. Provide and construct the cover of the R-Tank system including; stone backfill, structural fill cover, pavers, and pavement section as specified

D. Protect Stormwater Detention Tank system from construction traffic after installation until completion of all construction activity in the installation area.

E. Protect R-Tank system from construction traffic after installation until completion of all construction activity in the installation area.

1.2 PRICE AND PAYMENT PROCEDURES

A. Measurement and payment requirements: per Division 01 General Requirements.

1.3 REFERENCES

A. Drawings, technical specification and general provisions of the Contract as modified herein apply to this section.

B. Related Specification Sections:

1. Section 310000 Earthwork (Stormwater, Sanitary, Water Site Utilities)

2. Section 315000 Excavation Support and Protection (Stormwater, Sanitary, Water Site Utilities)

3. Section 334616 Subdrainage Piping

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination, Sequencing, and Scheduling: per Division 01 General Requirements.

1.5 SUBMITTALS

A. Submit proposed R-Tank layout drawings. Drawings shall include typical section details as well as the required base elevation of stone and tanks, minimum cover requirements and tank configuration.

B. Submit manufacturer's product data, including compressive strength and unit weight.

C. Submit manufacturer’s installation instructions.

D. Submit detention system layout, details, and shop drawings.

E. Submit tank system pipe boot shop drawings and installation instructions.

F. Submit R-Tank sample for review. Reviewed and accepted samples will be returned to the Contractor.

G. Submit material certificates for geotextile, geogrid, base course and backfill materials.

H. Submit required experience and personnel requirements.

1.6 QUALITY CONTROL

A. All materials shall be manufactured in ISO certified facilities.

B. Installation Contractor shall demonstrate the following experience:

1. A minimum of three Stormwater Detention Tank or equivalent type projects completed within 2 years; and,

2. A minimum of 25,000 cubic feet of storage volume completed within 2 years.

3. Contractor experience requirement may be waived if the manufacturer’s representative provides on-site training, review, and final inspection prior to backfill during construction.

C. Installation Personnel: Performed only by skilled workers with satisfactory record of performance on bulk earthworks, pipe, chamber, or pond/landfill construction projects of comparable size and quality.

D. Contractor must have manufacturer’s representative on-site for initial installation support and for review of installation prior to backfill as well as available for support throughout the installation on an as needed basis.

E. Contractor is responsible to perform bearing capacity testing on the subgrade, minimum 6 test locations spaced equally throughout the subgrade.

1.7 DELIVERY, STORAGE AND HANDLING

A. Protect R-Tank and other materials from damage during delivery, and store UV sensitive materials under tarp to protect from sunlight until installation. Storage of materials should be on smooth surfaces, free from dirt, mud and debris.

B. Handling is to be performed with equipment appropriate to the materials and site conditions, and may include by hand, handcart, forklifts, extension lifts, etc.

C. Cold weather:

1. Care must be taken when handling plastics when air temperature is 40 degrees or below as plastic becomes brittle.

2. Do not use frozen materials or materials mixed or coated with ice or frost.

3. Do not build on frozen ground or wet, saturated or muddy subgrade.

1.8 PRE-INSTALLATION CONFERENCE

A. Prior to the start of the installation, a preinstallation conference shall occur with the representatives from the engineer, the general contractor, the excavation contractor, the R-Tank installation contractor, and the manufacturer’s representative.

1.9 PROJECT CONDITIONS

A. Coordinate installation for the R-Tank system with other on-site activities to eliminate all non-installation related construction traffic over the completed R-Tank system. No loads heavier than the design loads shall be allowed over the system, and in no case shall loads higher than a standard AASHTO HS20 (or HS25, depending on design criteria) load be allowed on the system at any time.

B. Protect adjacent work from damage during R-Tank system installation.

C. All temporary erosion and sediment control and stormwater pre-treatment systems to remove debris and heavy sediments must be in place and functional prior to operation of the R-Tank Tank system. Additional pretreatment and/or maintenance measures may be needed if unit is operational during construction due to increased sediment loads. Perform

maintenance, repair, and replacement of all erosion and sedimentation controls and pre-treatment systems on an as needed basis.

D. Contractor is responsible for repairing any damage and cleaning the system of any debris and sediment during construction, up to final completion and acceptance of the Work.

PART 2 – PRODUCTS

2.1 STORMWATER DETENTION TANK UNITS

A. Stormwater Detention Tank Units: Injection molded plastic cells stacked to form a 90% to 95% void modular structure of predesigned height (custom for each project). With acceptable level of quality, equivalent to R-Tank XD, HD, & UD Single+Mini supplied by ACF Environmental 800-448-3636; www.acfenvironmental.com, or approved equal.

B. Stormwater Detention Tank units shall meet the following Characteristics:

PROPERTY	DESCRIPTION	R-Tank^{XD} VALUE	R-Tank^{HD} VALUE	R-Tank^{UD} VALUE
Void Area	Volume available for water storage	90%	95%	95%
Surface Void Area	Percentage of exterior available for infiltration	90%	90%	90%
Compressive Strength	ASTM D 2412 /ASTM F 2418	240.2 psi	33.4 psi (Vertical) & 22.4 psi (Lateral)	134.2 psi (Vertical) & N/A psi (Lateral)
HS-20 Minimum Cover	Cover required to support HS-20 loads	6”	20”	12” (Stone Backfill)
HS-25 Minimum Cover	Cover required to support HS-25 loads	6”	24”	15” (Stone Backfill)
Maximum Cover	Maximum allowable cover depth	< 16.7 feet	< 7 feet	5 feet
Unit Weight	Weight of plastic per cubic foot of tank	7.55 lbs / cf	3.62 lbs / cf	4.33 lbs / cf
Rib Thickness	Thickness of load bearing members	---	0.18 Inches	N/A
Service Temperature	Safe temperature range for use	-14 to 185° F	-14 to 167° F	-14 to 167° F

2.2 GEOSYNTHETICS

A. A geosynthetic envelope comprised of geotextile and geogrid is required to

prevent backfill material from entering the R Tank modules, in addition to geogrid reinforcement above the system. Refer to Section 313219.16 Geotextile Soil Stabilization for geotextile and geogrid materials associated with the Stormwater Detention Tank system.

1. Standard Application: The standard geotextile shall be a minimum 8 oz per square yard nonwoven geotextile (ACF N080 or equivalent).

2.3 GEOTEXTILES

A. For separation and grade stabilization provide:

1. 4-ounce non-woven polypropylene geotextile fabric of acceptable level of quality and equivalent to: Mirafi 140N by Tencate, or approved equal.

2. 8-ounce non-woven polypropylene geotextile fabric of acceptable level of quality and equivalent to: Mirafi 180N by Tencate, or approved equal.

2.4 BACKFILL AND COVER MATERIALS

A. Bedding Materials: Stone (angular and smaller than 1.5” in diameter) or soil (GW, GP, SW, or SP as classified by the Unified Soil Classification System) shall be used below the R-Tank system (3” minimum). Material must be free from lumps, debris, and any sharp objects that could cut the geotextile. Material shall be within 3 percent of the optimum moisture content as determined by ASTM D698 at the time of installation.

B. Side and Top Backfill

1. Deep Applications (> 12” total cover): Free draining stone (angular and smaller than 1.5” in diameter) or soil (GW, GP, SW, or SP as classified by the Unified Soil Classification System) shall be used adjacent to (12” minimum) and above (for the first 12”) the R-Tank system. Material must be free from lumps, debris and any sharp objects that could cut the geotextile. Material shall be within 3 percent of the optimum moisture content as determined by ASTM D698 at the time of installation.

2. Shallow Applications (< 12” total cover): Materials listed in section 2.4.1 above may be used adjacent to the modules. Top backfill must be well graded aggregate (angular and smaller than 0.75” in diameter) or soil (GW or SW as classified by the Unified Soil Classification System). Material must be free from lumps, debris and any sharp objects that could cut the geotextile. Material shall be within 3 percent of the optimum moisture content as determined by ASTM D698 at the time of installation.

C. Refer to the Drawings and Section 310000 Earthwork for additional information.

2.5 OTHER MATERIALS

A. Utility Marker: Install detectable warning tape continuously at the perimeter edges of Stormwater Detention Tank system to mark the area for future utility detection.

B. Pipe Boot Connections: Utilize manufacturer approved and recommended materials for pipe boot connection to the tank system.

PART 3 – EXECUTION

3.1 GEOTEXTILE PREPARATION

A. Provide smooth graded surface, free of large stones, tree roots and limbs, or other debris prior to placement of geotextiles. Notify Engineer when areas are readied for placement of geotextile.

3.2 GEOTEXTILE INSTALLATION

A. Install in accordance with manufacturer's instructions and the following where shown on Drawings or as directed by the Owner, in accordance with manufacturer's instructions.

B. Unroll fabric in area to be used, in down-slope direction. Minimize the amount of wrinkles.

C. Seams: either sewn or overlapped as indicated below.

1. Sewn seams: overlap adjacent fabric sides and ends a minimum of 6 inches. Sew a flat continuous seam, SSa-1, using a 401K two-thread lock stitch and 4 to 6-stitches per inch. Spot sewing is not permitted.

2. Overlap seams: overlap adjacent fabric sides and ends a minimum of 12 inches. Place overlaps so the uphill sheet is shingled over the downhill sheet.

3.3 GEOTEXTILE PROTECTION

A. Secure geotextile from wind damage during and after construction. Do not travel directly upon any in-place geotextiles with construction equipment or vehicles.

B. Patch rips and tears with a minimum 1-foot overlap in each direction from

the perimeter of the damaged area. If a damaged area is greater than half the width of the fabric roll, then cut out the entire roll width of the damaged area and place a new section over the area.

3.4 ASSEMBLY

A. Assembly of modules shall be performed in accordance with the R Tank Installation Manual, Section 2.

3.5 LAYOUT AND EXCAVATION

A. Installer shall stake out, excavate, and prepare the subgrade area to the required grades and dimensions, ensuring that the excavation is at least 2 feet greater than the outer Stormwater Detention Tank sidewall dimensions in each direction allowing for installation of geotextile filter fabric, Stormwater Detention Tank modules, and free draining backfill materials.

B. All excavations must be prepared with OSHA approved excavated sides and sufficient working space. Refer to Section 315000 Excavation Support and Protection for additional information.

C. Protect partially completed installation against damage from other construction traffic by establishing a perimeter with high visibility construction tape, fencing, barricades, or other means until construction is complete.

D. Base of the excavation shall be uniform, level, and free of lumps or debris and soft or yielding subgrade areas. A minimum 2,000 pounds per square foot bearing capacity is required. Compact subgrade to a minimum of 95% of Standard Proctor (ASTM D698) density or as required by the Engineer.

E. Unsuitable Soils or Conditions: All questions about the base of the excavation shall be directed to the Engineer or Owner's Designated Representative, who will approve the subgrade conditions prior to placement of geotextile and bedding stone. In no case shall a bearing capacity of less than 2,000 pounds per square foot be provided.

1. If unsuitable soils are encountered at the subgrade, or if the subgrade is pumping or appears excessively soft, repair the area in accordance with Contract Documents and/or as directed by the Engineer.

2. If indications of the water table are observed during excavation, the Engineer shall be contacted to provide recommendations.

3. Do not start installation of the Stormwater Detention Tank system until unsatisfactory subgrade conditions are corrected and the

subgrade conditions are accepted by the Engineer.

3.6 PREPARATION OF BASE

A. Place a thin layer (3” minimum unless otherwise specified) of bedding material (Section 2.4 A), over the subgrade to establish a level working platform for the R Tank modules. Level to within ½” (+/- ¼”) or as shown on the Drawings. Static roll or otherwise compact bedding materials until they are firm and unyielding.

B. Outline the footprint of the R Tank system on the excavation floor using spray paint or a chalk line to ensure a 24” perimeter is available around the R Tank system for proper installation and compaction of perimeter crushed stone backfill.

3.7 INSTALLATION

A. Where a geotextile wrap is specified on the stone base, cut strips to length and install in excavation, removing wrinkles so material lays flat. Overlap geotextile a minimum 12” or as recommended by manufacturer. Use tape, special adhesives, sandbags or other ballast to secure overlaps. As geotextiles can be damaged by extreme heat, smoking is not permissible on/near the geotextile, and tools using a flame to tack the overlaps, such as propane torches, are prohibited.

B. Install R Tank modules layers in accordance with the design drawings and manufacturer’s installation instructions. R-TankXD, HD, & UD pieces on each layer should be connected to all other pieces on that layer. Layers should stack on top of each preceding layer evenly. No vertical connection between layers is required. It is advisable to use a string line to form square corners and straight edges along the perimeter of the R-Tank system. The panels are to be oriented as per the design drawing with required depth as shown on plans and any approved shop drawings or other submittals.

C. Wrap the R-Tank top and sides in specified geotextile. Cut strips of geotextile so that it will cover the sides and top, encapsulating the entire system to prevent backfill entry into the system. Overlap geotextile 12” or as recommended by manufacturer. Take great care to avoid damage to geotextile (and, if specified, impervious liner) during placement.

D. Identify locations of inlet, outlet and any other penetrations of the geotextile (and optional liner). These connections should be installed flush (butted up to the R-Tank) and the geotextile fabric shall be cut to enable hydraulic continuity between the connections and the R-Tank units. These connections shall be secured using pipe boots with stainless steel pipe clamps. Support pipe in trenches during backfill operations to prevent pipe from settling and damaging the geotextile, impervious liner (if specified) or pipe. Connecting pipes at 90 degree angles facilitates construction, unless

otherwise specified. Ensure end of pipe is installed snug against R-Tank system.

E. Install inspection and maintenance ports and associated valve boxes in locations noted on the Drawings. At a minimum one maintenance port shall be installed within 10’ of each inlet and outlet connection. Install all ports as noted in the R Tank Installation Guide.

F. Inspection Port Valve Box Installation

1. Install equipment plumb, level, and true. Modify valve box to integrate with the stormwater detention tank system modules and inspection port piping.

2. Install in accordance with manufacturer’s written installation instructions and the Drawings.

3. Upon complete installation and prior to final acceptance, provide the Owner’s Representative all warranty information, operations and maintenance information, spare parts, hardware, and tools.

3.8 BACKFILLING

A. Backfill and fill with recommended materials as follows:

1. Place free draining backfill materials (Section 2.4 B) around the perimeter in lifts with a maximum thickness of 12”. Each lift shall be placed around the entire perimeter such that each lift is no more than 24” higher than the side backfill along any other location on the perimeter of the R Tank system. No fill shall be placed over top of tanks until the side backfill has been completed.

2. Each lift shall be compacted at the specified moisture content to a minimum of 95% of the Standard Proctor Density until no further densification is observed (for self-compacting stone materials). The side lifts must be compacted with walk behind compaction equipment. Even when “self-compacting” backfill materials are selected, a walk behind vibratory compactor must be used.

3. Take care to ensure that the compaction process does not allow the machinery to come into contact with the modules due to the potential for damage to the geosynthetics and R Tank units.

4. No compaction equipment is permissible to operate directly on the Stormwater Detention Tank modules.

5. Top Backfill: Install a minimum of 12” lift (or as shown on plans) of freely draining material over the R Tank Units, maintaining 12”

between equipment tracks and RTank System.

6. Lightly compact using a walk-behind trench roller. Alternately, a roller (maximum gross vehicle weight of 6 tons) may be used. Roller must remain in static mode until a minimum of 24" of cover has been placed over the modules. Sheep foot rollers should not be used. If less than a total of 24" of cover is proposed, the roller must remain in static mode.

7. Install geogrid as shown on Drawings. Geogrid shall extend a minimum of 3 feet beyond the limits of the excavation wall.

8. Following placement and compaction of the initial cover, subsequent lifts of structural fill (Section 2.4 C) shall be placed at the specified moisture content and compacted to a minimum of 95% of the Standard Proctor Density and shall cover the entire footprint of the R-Tank system. During placement of fill above the system, unless otherwise specified, a uniform elevation of fill shall be maintained to within 12" across the footprint of the R-Tank system. Do not exceed maximum cover depths listed in Table 2.1 B.

9. Place additional layers of geotextile and/or geogrid at elevations as specified in the design details. Each layer of geosynthetic reinforcement placed above the R-Tank system shall extend a minimum of 3 feet beyond the limits of the excavation wall.

B. Only low-pressure tire or track vehicles shall be operated over the R-Tank system during construction. Dump Trucks and Pans shall not be operated within the R-Tank system footprint at any time. Where necessary the heavy equipment should unload in an area adjacent to the R-Tank system and the material should be moved over the system with tracked equipment.

C. Ensure that all unrelated construction traffic is kept away from the limits of excavation until the project is complete and final surface materials are in place. No non-installation related loading should be allowed over the R-Tank system until the final design section has been constructed (including pavement).

D. Place surfacing materials over the stormwater detention tank system with care to avoid displacement of cover fill and damage to surrounding areas.

E. Backfill depth over R-Tank system must be within the limitations shown in the table in Section 2.1 B. If the total backfill depth does not comply with this table, contact engineer or manufacturer's representative for assistance.

3.9 MAINTENANCE REQUIREMENTS

A. Routine maintenance effort is required to ensure proper performance of the R-Tank system. The Maintenance program should be focused on pretreatment systems. Ensuring these structures are clean and functioning properly will reduce the risk of contamination of the R-Tank system and stormwater released from the site. Pre-treatment systems shall be inspected yearly, or as directed by the regulatory agency and by the manufacturer (for proprietary systems). Maintain as needed using acceptable practices or following manufacturer's guidelines (for proprietary systems).

B. Inspection and/or Maintenance Ports in the R-Tank system will need to be inspected for accumulation of sediments at least quarterly through the first year of operation and at least yearly thereafter. This is done by removing the cap of the port and using a measuring device long enough to reach the bottom of the R-Tank system and stiff enough to push through the loose sediments, allowing a depth measurement.

C. If sediment has accumulated to the level noted in the R-Tank Maintenance Guide or beyond a level acceptable to the Owner's engineer, the R-Tank system should be flushed.

D. A flushing event consists of pumping water into the Maintenance Port and/or adjacent structure, allowing the turbulent flows through the R-Tank system to re-suspend the fine sediments. If multiple Maintenance Ports have been installed, water should be pumped into each port to maximize flushing efficiency. Sediment-laden water can be filtered through a Dirtbag™ or approved equivalent if permitted by the locality.

END OF SECTION 224611.13

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SECTION 334900 - STORM DRAINAGE STRUCTURES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes

1. Provide storm drainage catch basins, manholes, inverts and castings in accordance with this Section and applicable reference standards listed in Article 1.3.

2. Related Requirements

a. 31 00 00 – Earthwork

b. 33 41 00 – Storm Utility Drainage Piping

1.2 PRICE AND PAYMENT PROCEDURES

A. Measurement and payment requirements: per Division 01 General Requirements.

1.3 REFERENCES

A. Reference Standards

1. American Association of State Highway Transportation Officials (AASHTO)

a. AASHTO M81 – Standard Specification for Cutback Asphalt (Rapid-Curing Type)

b. AASHTO M82 – Specification for Cutback Asphalt (Medium-Curing Type)

c. AASHTO M140 – Standard Specification for Emulsified Asphalt

2. ASTM International (ASTM)

a. ASTM A48 Standard Specification for Gray Iron Castings

b. ASTM A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

c. ASTM C139 Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes

d. ASTM C478 Standard Specification for Circular Precast Reinforced Concrete Manhole Sections

e. ASTM C923 Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals

f. ASTM C990 Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

g. ASTM C1244 Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill

h. ASTM D4101 Standard Specification for Polypropylene Injection and Extrusion Materials

i. ASTM A240/A240M Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

j. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

3. NYSDOT Standard Specifications, latest revision.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination, sequencing, and scheduling: per Division 01 General Requirements.

1.5 SUBMITTALS

A. Submit in accordance with Division 01 General Requirements.

B. Product Data

1. Manufacturer's descriptive data, technical literature, catalog cuts, and installation instructions

2. Dimensional data for each structure

3. Product data for manholes, joint sealants, catch basins, inverts, risers, frames, covers, grates and frost barriers

C. Shop Drawings

1. Precast manholes, catch basins and precast concrete items showing components to be used, elevations of top of precast sections, base and intermediate levels and pipe inverts, rim elevation, location of pipe

penetrations, cutouts, and steps for each manhole, and finish grade elevation at each proposed manhole location

D. Design Data/Submittals

1. Manufacturer's anti-floatation calculations for each structure, signed and stamped by a licensed Professional Engineer in the State of New York based on the following criteria:

a. Groundwater elevation shall be set at grade above the structure.

b. Factor of safety shall be 1.1; downward forces from the weight of the pipe and soils over pipe shall be 1.1 times the buoyant uplift forces.

c. The structure shall be considered empty. Calculations shall not consider the weight of internal water.

E. Design Data for precast structures including anti-flotation slabs

F. Qualification Statements

G. Source and Field Quality Control Submittals

1. Leakage test reports for each structure

2. Record as-built structure information neatly in a permanently bound notebook. Provide Engineer access to records. Submit copies to Engineer on a weekly basis.

H. Closeout and maintenance material submittals: per Division 01 General Requirements.

1. Location and rim elevations of precast concrete structures

2. Locations and invert elevations of pipe penetrations

1.6 QUALITY ASSURANCE

A. Provide in accordance with Division 01 General Requirements.

B. Qualifications: per Division 01 General Requirements and as follows for structure design.

1. Licensed engineer in the state where the Project is located with 5 years' minimum experience in design of similar structures.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Provide in accordance with Division 01 General Requirements.

B. Packing, Shipping, Handling, and Unloading

1. Handle and place concrete units in accordance with manufacturer's written rigging instructions.

2. Provide slings, straps, and other devices for handling and support of catch basin sections during lifting, installing, and final positioning using lifting holes.

1.8 SITE CONDITIONS

A. Existing conditions: per Division 01 General Requirements.

PART 2 – PRODUCTS

2.1 TRENCH DRAIN

A. Trench drain acceptable level of quality, equivalent to KlassikDrain trench system as manufactured by ACO, Inc., or approved equal.

1. Units: Polymer concrete with steel edge protection rail, grate lugs and locks to prevent dislodgement.

a. 12-inch nominal (300 mm) Trench System: K300 Trench System.

2. Load Class: Provide trench drain system designed, engineered and installed to support the minimum loads as defined by EN1433. Load Class shall be: C.

B. KlassikDrain grates as manufactured by ACO, Inc or approved equal.

1. Units: Type 878Q 0.5m Grate: Ductile iron longitudinal, EN1433 load class C or grate with equivalent hydraulic intake capacity.

2.2 ANTI-FLOTATION DESIGN

A. Provide precast structures with anti-flotation slabs and provide precast structures requiring anti-flotation slabs as 1 complete unit.

B. Structure Criteria

1. Factor of safety: minimum 1.1 against buoyancy with assumed flood elevation at top of structure. Do not include frictional resistance in calculation.

2. Weight of segments: include stainless steel mechanical connections to connect segments together where structure is composed of successive vertical segments.

3. Include positive anchorage to reinforced concrete anti-buoyancy slab of required size.

2.3 CASTINGS

A. Cast iron: in accordance with ASTM A48 Class 30.

B. Manufacturers

1. EJ Co.

2. U.S. Foundry

3. Neenah

4. Or equal

C. Storm Drain Manhole Frames and Covers

1. Manhole cover: 26 inches in diameter labeled DRAIN in 3-inch high raised letters.

a. Minimum 24 inches clear opening. Gray iron cover and frame per Drawings, meeting ASTM A48, AASHTO-M 306, heavy duty design load rated for H-20 traffic loading. Provide frame and cover from same manufacturer.

b. Cover: minimum weight 200 pounds

c. Manhole frame: minimum weight 240 pounds.

D. Catch basin/Drain Inlet frames and grates: heavy duty, bicycle safe, cascading type frame and grate; nominal 24 inches square grate.

1. Provide standard 4 flange, 3 flanges when adjacent to curb, fray iron catch basin square frame with square hole grate per Drawings, meeting ASTM A48, frame meeting AASHTO-M 306, heavy duty design load rated for H-20 traffic loading. Engraved letters: DUMP NO WASTE/DRAINS TO WATERWAYS or similar.

E. Acceptable level of quality for cast iron catch basin trap: equivalent to Neenah Foundry product number R-3704 or approved equal with vent holes, mounted in accordance with manufacturer specifications.

F. Hood trap assembly: gray iron per Drawings, meeting ASTM A48. Product shall match outlet pipe size. Install per manufacturer’s recommendations, watertight connection.

2.4 CATCH BASINS (DRAIN INLETS) AND DRAIN MANHOLES

A. Precast structures: ASTM C478 and as shown on Drawings, capable of supporting H-20 and HL-93 loading.

B. Precast concrete base and first riser: monolithic.

1. Include crystalline waterproofing additive in concrete prior to casting of riser section.

C. Precast bases and top slabs: same construction as precast riser sections (define) of dimensions shown on Drawings.

D. Anti-floatation slab: ASTM C139 precast monolithic base unit or cast-in-place, based on manufacturer's recommendation and as approved.

E. Wall Thickness

1. 4-foot diameter manholes: minimum 5-inch thick wall sections.

2. 5-foot and larger diameter manholes: minimum 6-inch thick wall sections.

F. Embed cast openings for pipe and materials in structure wall during manufacture.

G. Cone sections: precast sections of similar manufacture with varying heights to meet construction requirements.

H. Lift holes: maximum 2 cast or drilled in any section, with suitable rubber or concrete stopper or other approved device for plugging holes.

I. Clearly mark date of manufacture and name or trademark of manufacturer on inside of riser structure.

J. Factory applied coating: UV resistant, black bituminous damp proofing, AASHTO M81 or M82 cutback asphalt, or AASHTO M140 asphalt emulsion. Coat exterior surface of precast manhole, catch basin bases and walls at 5 gallons per 100 square feet minimum per coat.

K. All-weather joint sealant: butyl rubber material in flexible rope form, ASTM C990 Section 6.2.1. Factory seal joints between precast sections with watertight, shiplap-type seal.

L. Steps: positioned and embedded in concrete. Manufacture from deformed 1/2-inch steel reinforcement rod per ASTM A615 and encased in polypropylene per ASTM D4101 with pattern design to prevent lateral slippage off step. Size: 12 inches on center with minimum width of 16 inches and 7 inches from wall for full height of manhole.

2.5 PIPE CONNECTIONS (MANHOLES AND CATCH BASINS)

A. Compression type connector: ASTM C923 single rubber gasket constructed solely of synthetic or natural rubber.

B. Boot type connector: ASTM C923 rubber gasket or boot with metal expansion ring and double metal take-up clamps.

C. Refer to Section 33 42 20 for additional information.

2.6 SOURCE QUALITY CONTROL

A. Provide in accordance with Division 01 General Requirements

PART 3 – EXECUTION

3.1 INSTALLATION

A. Remove existing structures.

B. Set catch basin and manhole frames to finished lines and grades as specified

C. Set castings in bituminous concrete collars and underlay with cement concrete. Collars: minimum 9 inches deep and extend to radius of 1-foot beyond circumference of frame, as shown on Drawings.

1. Place so bottom of structure is plumb and pipe inverts are at proper elevations. Position tops of structures flush with finished grade.

2. Locate each structure and set accurate templates to required line and grade as shown on Drawings. Remove structures incorrectly and improperly located, oriented or aligned, and rebuild.

3. Establish sufficient length of proposed curb or edge of pavement adjacent to structure prior to construction of drain inlet and catch basin to ensure structure is correctly located and oriented.

4. Place foundation course on firm soil of uniform bearing. If soil below foundation course is classified as unsuitable, remove and replace with crushed stone as specified in Section 31 00 00.

5. Seal joints between precast sections with all-weather joint sealant as specified prior to backfill or completion of manhole, if above grade.

D. Touch up damp proofing in field prior to backfilling.

E. Adjust existing drainage structures as specified in Drawings or as directed. Refill excavated area with gravel and set casting into concrete collar. Engineer will determine new elevation of structure.

F. Remodeling: as specified in Drawings or as directed.

1. Provide remodeling of cone of structure where line or grade requires a change greater than 6 inches at existing drainage structures or where noted on Drawings.

2. Refill excavated area with gravel and set casting into concrete collar and overlay with 3-inch thick bituminous concrete top course when structures are in roadway. Engineer will determine new elevation of structure.

G. Frames and Covers/Grates

1. Set to final grade 1/2-inch below pavement/finished grade as shown on Drawings. Provide adequate temporary covers to prevent accidental entry until final placement of frame and cover.

2. Use 2 rings of 1-inch diameter butyl rubber sealant between frame and chimney joints. Provide downward force to frame to compress joint, provide a watertight seal and prevent future settlement. Point compressed joint with butyl rubber caulk sealant.

3. Set drainage structure frames and covers/grates to final grade only after pavement base course has been applied.

H. For pipes without flexible boot type connectors, seal drain pipe connections to catch basin/manhole structures with mortar in accordance with NYSDOT Standard Specifications.

I. Inverts: as indicated on Drawings.

J. Replace steps out of plumb and not to correct horizontal placement.

K. Use material removed from excavation for manholes that remain after backfilling finished structure wherever possible within location. Remove and legally dispose of material if not needed or unsuitable.

L. Backfill structures and pipes with controlled density fill (controlled low strength material) when installed with less than 18 inches of horizontal clearance from adjacent structures and pipe and as directed.

M. Do not pave over any utility appurtenances or structures unless specifically directed.

N. Remove and replace defective castings with new castings as directed. Repair or replace damaged castings.

O. Trench Drain Installation

1. Clean surfaces thoroughly prior to installation.

2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3. Install the trench drain as shown on the Drawings and in accordance with the manufacturer's written installation instructions. Coordinate the installation of the trench drain with the construction of the parking lot.

4. Install and lock into place all trench drain grates. Install trash buckets in all in-line catch basins.

5. Cut and/or modify trench drain in strict accordance with manufacturer's recommendations.

6. Install with minimum 10" concrete encasement on three sides of trench drain. Chamfer edges of concrete encasement. Protect trench drain during concrete pour.

7. Protect installed products until completion of project.

8. Touch-up, repair or replace damaged products before Substantial Completion

3.2 REPAIRS

A. Repair leaks after determining cause. Perform earthwork according to Section 31 00 00 required for repairs if manhole has already been backfilled.

1. Perform repairs by approved methods to bring leakage within allowable rate if less than 3 gallons per vertical foot per 24 hours but more than 1 gallon per vertical foot per 24 hours.

B. Perform repairs using approved methods and materials. Remove and replace or reconstruct if necessary. Remove and replace defective sections if required.

3.3 CLEANING

A. Use remaining material removed after excavation wherever possible. Remove and legally dispose of unused or unsuitable material at no additional cost to Owner.

B. Clean and flush all drainage structures after Work is completed and before Final Acceptance. Dispose of sediment and wastewater off-site in accordance with all local, State, and Federal regulations.

3.4 LEAKAGE TESTING

A. General: Tests shall be observed by Engineer. Manholes must be complete for final test acceptance except for shelf and invert brickwork. Plug pipes and other openings in the structure walls prior to test. The Contractor shall test precast concrete manholes soon as they are installed, and before backfilling, to demonstrate that the work conforms to these specifications.

B. Exfiltration Test:

1. Plug pipes into and out of manhole and secure plugs.

2. Lower groundwater table (GWT) to below manhole. Maintain GWT at this level throughout test. Provide means of determining GWT level at any time throughout test.

3. Fill manhole with water to bottom of flat slab.

4. Allow a period of time for absorption (determined by Contractor).

5. Refill to bottom of flat slab.

6. Determine volume of leakage in an 8-hour (minimum) test period and calculate rate.

7. Acceptable leakage rate: Not more than 1 gallon per vertical foot of manhole section per 24 hours.

8. If not satisfied with the exfiltration test, the Engineer reserves the right to require an infiltration test.

3.5 INSPECTION

A. Make drainage structures accessible for inspection by Engineer prior to backfilling. Failure to notify the Engineer prior to backfilling may result in rejection of payment.

3.6 CLOSEOUT ACTIVITIES

A. Provide in accordance with Division 01 General Requirements.

END OF SECTION 334900