

**Greater New Haven Water Pollution Control Authority
Protecting the Environment**



PROJECT:

**EAST STREET PUMP STATION
FUEL STORAGE TANK REPLACEMENT**

PROJECT NUMBER:

SSF 2015-05

BID OPENING:

**2:00 P.M.
Thursday
July 9, 2015**



**GREATER NEW HAVEN
WATER POLLUTION CONTROL AUTHORITY
260 EAST STREET
NEW HAVEN, CT 06511
PHONE: 203.466.5280 FAX: 203.772.2027
WEB: WWW.GNHWPCA.COM
EMAIL: ENGINEERING@GNHWPCA.COM**

EMERGENCY NUMBER: 203-466-5260

woodardcurran.com
COMMITMENT & INTEGRITY DRIVE



**Woodard & Curran, Inc.
980 Washington Street
Dedham, MA 02026
T 781.251.0200**

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**GREATER NEW HAVEN WATER POLLUTION CONTROL AUTHORITY
NEW HAVEN, CONNECTICUT**

EAST STREET PUMP STATION FUEL STORAGE TANK REPLACEMENT

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Consulting Engineers

980 Washington Street | Suite 315

Dedham, Massachusetts 02026

Tel: (781) 251-0200

Project No. 223133.07

June 2015

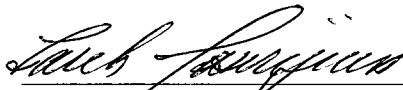
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SECTION 00007

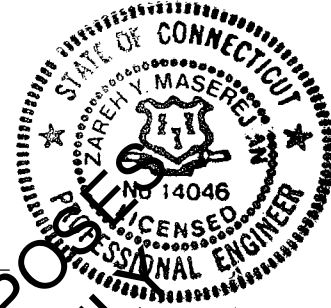
SEALS PAGE

The engineering material and data contained in these Contract Documents were prepared under the supervision and direction of the undersigned, whose seal as a registered professional engineer is affixed below.



Zareh Y. Maserejian, P.E.
Vice President
Woodard and Curran, Inc. (Engineer)

06/10/2015
Date of Issue



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END OF SECTION

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Greater New Haven
Water Pollution Control Authority

INVITATION TO BID

for Constructing

**PROJECT: East Street Pump Station Fuel Storage Tank
Replacement
New Haven, CT**

PROJECT NO.: SSF 2015-05

Sealed bids will be received at the Office of the Director of Finance and Administration of the Greater New Haven Water Pollution Control Authority (Authority) located at 260 East Street, New Haven, Connecticut 06511 for **PROJECT: East Street Pump Station Fuel Storage Tank Replacement** until **2:00 p.m. on Thursday, July 2, 2015** at which time and place said bids will be opened publicly and read aloud.

A non-mandatory pre-bid meeting will be held at **2:00 p.m. on Thursday, June 25, 2015** at the **East Street Pump Station** located at **1 East Street, New Haven, CT**.

All questions from Bidders must be received by the Authority by fax or via email in writing before **4:00 p.m. on Thursday, July 2, 2015**. (send emails to: engineering@gnhwpc.com)

The information for Bidders, Proposal, Form of Contract, and Specifications may be examined at the above address. The plans and a "bid package" containing the Invitation, Proposal, Special Specifications and Notes can be obtained upon a **non-refundable** payment of Twenty Five Dollars (\$25.00).

A certified check or bid bond in the amount of ten percent (10 %) of the total bid amount must accompany the bid. Said checks or bid bonds will be returned to the unsuccessful bidders upon Award of the Contract to the selected firm and execution of the Agreement. If any bid is not accompanied by a bid bond or check at the specified time for the bid opening, the incomplete bid will not be read and this action will constitute automatic rejection of the bid.

The successful bidder will be required to furnish a performance bond and a labor and materials payment bond in the form as attached to the Bid Documents for the amount of the total bid. A certified check cannot be substituted for either bond. The Greater New Haven Water Pollution Control Authority reserves the right to alter quantities and to accept or reject any or

all bids or any portion of any bids, for any or no reason, including unavailability of appropriated funds as it may deem to be in its best interests.

All bidders are to note that the award of this Contract is subject to the following conditions and contingencies:

1. The approval of such governmental agencies as may be required by law.
2. The appropriation of adequate funds by the proper agencies.

Gabriel Varca
Director of Finance and Administration

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This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

SECTION 00200]

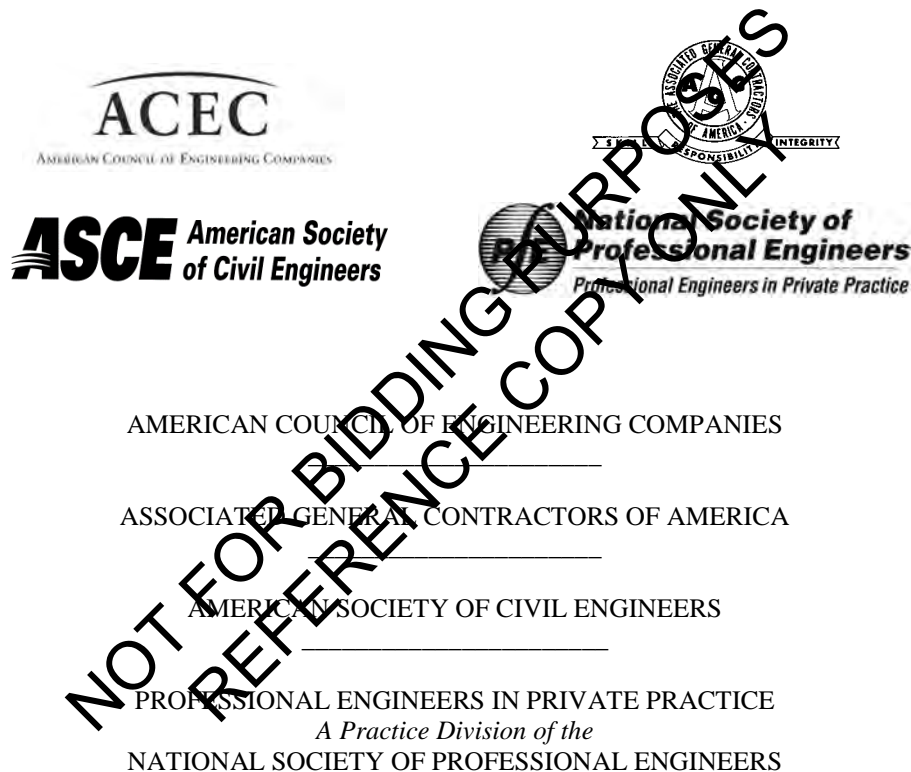
INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACTS

Based on that prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly by



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ARTICLE 1 – DEFINED TERMS

1.01 Terms used in these Instructions to Bidders have the meanings indicated in the Standard General and Special Conditions and the Additional Special Conditions (if any). Additional terms used in these Instructions to Bidders have the meanings indicated below and as may be included in the Supplementary Instructions to Bidders:

A. *Issuing Office* – The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered, identified as:

Office of the Director of Finance & Administration of GNHWPCA
260 East Street
New Haven, CT 06511
Telephone no. (203) 466-5280

B. *Supplements* – Those sections of the Bidding Requirements to be submitted with and made a condition of a Bid.

C. *Notice of Intent to Award* – The written notice to the selected responsive, responsible, and eligible Bidder indicating conditions precedent to receiving a Notice of Award and Agreement for execution.

ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

2.01 Sets of Bidding Documents may be examined at the Issuing Office on or after 10:00 a.m., June 11, 2015.

2.02 Sets of Bidding Documents may be obtained from the Issuing Office on or after 10:00 a.m. June 11, 2015, as follows.

Non-Refundable deposit for each set of Bidding Documents: \$25.00 payable by certified check, treasurer's or cashier's check, or postal money order to the Greater New Haven Water Pollution Control Authority. The deposit is non-refundable.

2.03 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of the incomplete sets of Bidding Documents, Bidding Documents provided by third parties, or for modifications to the Bidding Documents not made by official Addenda, including electronic conversion.

Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not authorize or confer a license for any other use.

ARTICLE 3 – QUALIFICATIONS OF BIDDERS

- 3.01 To demonstrate Bidder's qualifications to perform the Work, Bidder shall submit written evidence such as financial data, previous experience, present commitments, and such other data requested in the Bidding Documents, within the time frames stipulated, and upon Owner's request.
- 3.02 Bidders shall meet minimum criteria regarding experience and qualifications set forth in the General Requirements.

ARTICLE 4 – EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

4.01 *Subsurface and Physical Conditions*

- A. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.02 *Underground Facilities*

- A. Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site is based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.

4.03 *Hazardous Environmental Condition*

- A. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

- 4.04 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions, and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in Paragraphs 4.02, 4.03, and 4.04 of the Standard General and Special Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work, appear in Paragraph 4.06 of the Standard General and Special Conditions.

- 4.05 Upon request, Owner may provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall be responsible for obtaining permission and necessary permits and

INSTRUCTIONS TO BIDDERS

insurance for access to the Site. Bidder shall clean up and restore the Site to its former condition upon completion of any such explorations, investigations, tests, and studies. Bidder shall comply with all applicable Laws and Regulations relative to excavation and utility locates.

4.06 Reference is made to Article 7 of the Standard General and Special Conditions for the identification of the general nature of other work that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) that relates to the Work contemplated by these Bidding Documents. On request, Owner will provide to each Bidder for examination access to or copies of contract documents (other than portions thereof related to price) for such other work.

4.07 It is the responsibility of each Bidder before submitting a Bid to:

- A. examine and carefully study the Bidding Documents, and the other related data identified in the Bidding Documents;
- B. visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
- C. become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work;
- D. carefully study all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) that have been identified in Section 00805 as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site as containing reliable "technical data";
- E. consider the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs;
- F. agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;
- G. become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;

- H. correlate the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents;
 - I. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder; and
 - J. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.
- 4.08 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by Engineer are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

ARTICLE 5 – PRE-BID CONFERENCE

- 5.01 A pre bid conference will be held at 2:00 PM local time on Thursday, June 25, 2015 at the East Street Pump Station, 1 East Street, New Haven, CT 06511. Bidders are strongly encouraged to attend and participate in the conference. Addenda will be transmitted to all prospective Bidders of record considered necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 6 – SITE AND OTHER AREAS

- 6.01 The Site is identified in the Bidding Documents. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by Contractor.

ARTICLE 7 – INTERPRETATIONS AND ADDENDA

- 7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to the Issuing Office as follows. Submission of questions via email is acceptable.

Greater New Haven Water Pollution Control Authority

INSTRUCTIONS TO BIDDERS

WOODARD & CURRAN

00200-4

260 East Street
New Haven, CT 06511
Telephone (203) 466-5280
Email: Engineering@GNHWPCA.com

- 7.02 The deadline for questions is 7 days prior to the date for Bid opening. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect. Interpretations or clarifications considered necessary in response to such questions will be issued by Addenda.
- 7.03 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner or Engineer, will be available for examination at the Issuing Office and will be mailed to registered Bidders.

ARTICLE 8 – BID SECURITY

- 8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 10 percent of Bidder's maximum Bid price and in the form of a certified check, treasurer's or cashier's check, or postal money order, or a Bid bond issued by a surety meeting the requirements of Paragraphs 5.01 and 5.02 of the Standard General and Special Conditions and the Additional Special Conditions (if any).
- 8.02 The Bid security of the Successful Bidder will be retained until such Bidder has furnished the required contract security, met the conditions of the Notice of Intent to Award (if any) and Notice of Award, and executed the Contract Documents, whereupon the Bid security will be returned. If the Successful Bidder fails to comply with the conditions set forth in the Notice of Intent to Award (if any) and Notice of Award within the time specified therein, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults. See Supplementary Instructions to Bidders for additional information.
- 8.03 Bid security of other Bidders whom Owner believes do not have a reasonable chance of receiving the award will be returned within 5 days after the Bid opening.

ARTICLE 9 – CONTRACT TIMES

- 9.01 The number of days within which, or the dates by which, the Work is to be substantially completed and ready for final payment are set forth in the Agreement.

ARTICLE 10 – LIQUIDATED DAMAGES

- 10.01 Provisions for liquidated damages, if any, are set forth in the Agreement.

ARTICLE 11 – SUBSTITUTE AND “OR-EQUAL” ITEMS

- 11.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration of possible substitute or “or-equal” items. Whenever it is specified or described in the Bidding Documents that a substitute or “or-equal” item of material or equipment may be furnished or used by Contractor if acceptable to Engineer, application for such acceptance will not be considered by Engineer until after the Effective Date of the Agreement.

ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS AND OTHERS

- 12.01 The Bidding Documents may require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to Owner with the Bid.
- 12.02 As required in the Bidding Documents, or within 5 days after Bid opening if requested by Owner, Bidder shall submit a listing and experience statement with pertinent information regarding similar projects and other evidence of qualification for each Subcontractor, Supplier, individual, or entity. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute without an increase in the Bid.
- 12.03 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next leading Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to revocation of such acceptance after the Effective Date of the Agreement as provided in Paragraph 6.06 of the Standard General and Special Conditions and the Additional Special Conditions (if any).
- 12.04 Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.

ARTICLE 13 – PREPARATION OF BID

- 13.01 The Bid Form and Supplements are included with the Bidding Documents.
- 13.02 All blanks on the Bid Form shall be completed in ink or typewritten and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form.
- 13.03 Bids are to be submitted as indicated in the Bid Form.
- 13.04 A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. The

corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown.

- 13.05 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown.
- 13.06 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown.
- 13.07 A Bid by an individual shall show the Bidder's name and official address.
- 13.08 A Bid by a joint venture shall be executed by each joint venturer in the manner indicated on the Bid Form. The official address of the joint venture shall be shown.
- 13.09 All names shall be printed in ink below the signatures.
- 13.10 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.
- 13.11 Postal and e-mail addresses and telephone numbers for communications regarding the Bid shall be shown.
- 13.12 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder's state contractor license number, if any, shall also be shown on the Bid Form.
- 13.13 Bidders are advised to carefully review those portions of the Bid Form and Supplements requiring Bidder's representations and certifications that are to be submitted with a Bid or subsequent to the Bid opening, and made a condition of the Bid.

ARTICLE 14 – BASIS OF BID; COMPARISON OF BIDS

- 14.01 Bidders shall submit a Bid on a lump sum basis with breakdown as indicated in the Bid Form. Bid prices shall be stated in both words and figures.
- 14.02 Discrepancies between prices written in words and prices written in figures will be resolved in favor of prices written in words. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

ARTICLE 15 – SUBMITTAL OF BID

- 15.01 With each copy of the Bidding Documents, a Bidder is furnished a copy of the Bid Form and Supplements, and the Bid Bond Form. **An original signed hard copy** of the Bid Form and Supplements (as listed in the Bid Submittal Checklist), the Bid Submittal Checklist,

INSTRUCTIONS TO BIDDERS

and the **original Bid security** are to be completed and submitted to the place indicated in the Advertisement for Bids.

- 15.02 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the Advertisement for Bids and shall be enclosed in a plainly marked package with the Project title, the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A Bid sent by mail or courier shall be addressed to the place indicated in the Advertisement for Bids. Bidders shall be responsible to confirm the ability of overnight mailing or courier services to deliver to the place indicated in the Advertisement for Bids.

ARTICLE 16 – MODIFICATION AND WITHDRAWAL OF BID

- 16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.
- 16.02 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is re-Bid, that Bidder will be disqualified from submitting a Bid on the Work.

ARTICLE 17 – OPENING OF BIDS

- 17.01 Bids will be opened at the time and place indicated in the Advertisement for Bids and, unless obviously non-responsive, read aloud publicly.

ARTICLE 18 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE

- 18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 19 – EVALUATION OF BIDS

- 19.01 In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data as may be requested in the Bid Form or prior to the Notice of Award.
- 19.02 In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities are submitted.

- 19.03 In evaluating Bidders, Owner may also assess the Bids based on estimated lifetime costs, including, but not limited to, operating costs, maintenance requirements, estimated lifespan and replacement cost, performance data and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data is required to be submitted prior to the Notice of Award. These costs must be submitted with the bid form.
- 19.04 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work in accordance with the Contract Documents.
- 19.05 Owner may conduct reference checks for the projects listed by the Bidder. Poor references may be a basis for deeming Bidder as not responsible. Reference questions will include, but are not limited to, product quality and durability, overall work quality, performance, timely delivery/completion, customer service, and general customer satisfaction.
- 19.06 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to not be responsible (based on poor references or otherwise) or eligible or does not meet the specified qualification or quality requirements. Owner may also reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project or public to make an award to that Bidder. Owner also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate Contract terms with the Successful Bidder.

ARTICLE 20 – AWARD OF CONTRACT

- 20.01 If the Contract is to be awarded, Owner may award the Contract to the responsive, responsible, and eligible Bidder, whose Bid is in the best interests of the Project or public.

ARTICLE 21 – CONTRACT SECURITY AND INSURANCE

- 21.01 Article 5 of the Standard General and Special Conditions and the Additional Special Conditions (if any), set forth Owner's requirements as to performance and payment bonds and insurance. The Successful Bidder shall deliver such bonds and evidence of insurance coverage within 10 days of receipt of the Notice of Award.

ARTICLE 22 – SIGNING OF AGREEMENT

- 22.01 The Owner will issue a Notice Award to the Successful Bidder in the form included in Bidding Documents. Within 10 days of receipt of the Notice of Award, the Successful Bidder shall comply with the conditions precedent and provide requested information. Based on required reviews and approvals, Owner will thereafter provide the required number of counterparts of the Agreement and other Contract Documents which are identified in the Agreement. The Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and other Contract Documents to Owner within

INSTRUCTIONS TO BIDDERS

the time specified by the Owner. After obtaining required reviews and approvals for Contract execution, Owner shall return one fully signed counterpart the Agreement and other Contract Documents.

ARTICLE 23 – RETAINAGE

23.01 Provisions concerning retainage are set forth in the Agreement.

ARTICLE 24 – CONTRACTOR’S WARRANTY AND GUARANTEES; CORRECTION PERIOD

24.01 Provisions concerning Contractor’s general warranty and guarantees and correction period are set forth in Articles 6.19, 13.06, and 13.07 of the Standard General and Special Conditions and the Additional Special Conditions (if any).

ARTICLE 25 – SAFETY AND HEALTH REGULATIONS

25.01 This Project is subject to the Safety and Health Regulations of the U.S. Department of Labor set forth in Title 29 CFR, Part 1926 and to all subsequent amendments and other requirements identified Special Conditions.

25.02 All Bidders shall be prepared to submit a Health & Safety Plan, if identified as the successful Bidder. The Health & Safety Plan shall at a minimum, include description of measures taken to ensure safe working conditions, key emergency contacts, site rules, and evacuation procedures. Written verification of relevant employee training, including but not limited to, confined space, lock-out/tag-out, and hot work training, shall be included as an attachment to the Health & Safety Plan.

ARTICLE 26 – SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

26.01 Bidders are responsible to determine and obtain applicable Laws and Regulations and to review and interpret the full text of such Laws and Regulations.

END OF SECTION

SECTION 00330

EXISTING CONDITIONS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Information on Site Conditions
- B. Interfering Equipment

1.02 INFORMATION ON SITE CONDITIONS

- A. Information obtained by the Owner regarding site conditions, elevations, existing construction of site facilities as applicable and similar data will be available for inspection upon request to the Engineer.
 - 1. This information is offered as supplementary information only.
 - 2. Neither the Engineer nor the Owner assumes responsibility for the completeness or for the supplier's interpretation of this supplementary information.
- B. Electrical power supply is not expected to be a limiting factor in system selection.
 - 1. Owner is providing a transformer and 120V power distribution panel in the emergency generator room. All new equipment will be fed from this panel.
 - 2. Additional electrical data may be made available upon request to the Engineer.
- C. See Section 00015: List of Drawings

1.03 INTERFERING EQUIPMENT

- A. Complete necessary reviews to ensure Work will not negatively impact the operation of existing equipment.
 - 1. An attempt has been made to show major structures in available drawings.
 - 2. While the information has been compiled from the best available sources, its completeness and accuracy cannot be guaranteed, and it is presented as a guide.
- B. Complete necessary review to ensure Work will not be negatively impacted by the operation of existing equipment.

1. No requirements for the Owner to modify existing equipment shall be allowed under this Contract.
 2. The Supplier shall not be allowed to modify any existing equipment under this Contract.
 3. The Contractor shall be responsible for protecting the work area at all times.
 4. The Contractor shall be responsible for ensuring the emergency generator is supplied with fuel and remains operational at all times.
- C. Work shall be capable of being performed with no significant modifications to the existing facility.

PART 2 – PRODUCTS (not applicable)

PART 3 – EXECUTION (not applicable)

END OF SECTION

NOT FOR BIDDING PURPOSES
REFERENCE COPY ONLY

BID FORM

BID RECIPIENT

The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to supply all Proposed Equipment as specified or indicated in the Bidding Documents for the price(s) indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

BIDDER'S ACKNOWLEDGEMENTS

Bidder accepts all of the terms and conditions of the Instructions to Bidders. This Bid will remain subject to acceptance for 120 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

BIDDER'S REPRESENTATIONS

In submitting this Bid, Bidder represents that:

Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged.

Addendum No.	Addendum Date

(Bidder shall insert number of each Addendum received.)

Bidder has become familiar with and is satisfied as to the general, local, and Site conditions that may affect Proposed Equipment cost.

Bidder is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect Proposed Equipment cost.

Bidder has obtained and carefully studied (or accepts the consequences for not doing so) all additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions of surface and subsurface facilities at or contiguous to the Site which may affect Proposed Equipment cost .

Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for the Proposed Equipment at the price(s) Bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.

Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.

Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.

The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

FURTHER REPRESENTATIONS

Bidder further represents that:

This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation;

Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

Bidder has not solicited or induced any individual or entity to refrain from bidding; and

Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over Owner.

All required sales and use taxes are included in the stated Bid prices for the Work unless provision is made herein for the Bidder to separately itemize the estimated amount of sales tax.

BASIS OF BIDS

The Undersigned process to furnish the equipment required to replace the existing underground storage tank at the East Street Pump Station for the Greater New Haven Water Pollution Control Authority, New Haven, Connecticut, in accordance with the accompanying Plans and Specifications prepared by Woodard & Curran, for the Total Contract Price written below, subject to additions and reductions according to the terms of the Contract Documents.

The Contract Award shall be made to the eligible and responsible bidder whose bid is in the best interest of the Owner, based on the sum of the TOTAL BASE PRICE (total of Item 1) plus the TOTAL ALTERNATE PRICE (total of Item 2). The alternate bid (Alternate 1) may become part of the Contract solely at the discretion of the Owner. The Engineer shall complete the evaluation once all bids have been received. All bidders will receive results of the evaluation.

Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

BASE PRICE (Item 1):

_____ Dollars
(words)

and _____ Cents \$ _____
(numerals)

The subdivision of the proposed Contract Price is as follows (excluding sales and use tax).

Item 1 – Work of the General Contractor (being all Work other than that covered in Bid Item 2)

1A General Contractor Work to Remove and Dispose of existing underground storage tank. \$_____

1B General Contractor Work to Furnish and Install the new underground storage tank. \$_____

TOTAL ITEM 1 PRICE – ITEM 1A through 1B \$_____

TOTAL ALTERNATE 1 PRICE FOR ALL ITEMS (ITEM 1):

(words) Dollars
and _____ Cents \$ _____
(numerals)

Item 2 – Work of the General Contractor (being all Work other than that covered in Bid Item 1)

2A General Contractor Work to Remove and Dispose of existing underground storage tank. \$_____

2B General Contractor Work to Furnish and Install the new above ground storage tank. \$_____

TOTAL ITEM 2 PRICE – ITEMS 2A through 2B \$_____

ATTACHMENTS TO THIS BID

The following documents are attached to and made a condition of this Bid:

None

DEFINED TERMS

The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders.

BID SUBMITTAL

This Bid submitted by:

If Bidder is:

An Individual

Name (*typed or printed*): _____

By (*signature*): _____

Doing business as: _____

A Partnership

Partnership Name: _____ (SEAL)

By: _____
(*Signature of general partner – attach evidence of authority to sign*)

Name (*typed or printed*): _____

A Corporation

Corporation Name: _____ (SEAL)

State of Incorporation: _____

Type (General Business, Professional, Service, Limited Liability): _____

By: _____
(*Signature – attach evidence of authority to sign*)

Name (*typed or printed*): _____

Title: _____ (CORPORATE SEAL)

Attest: _____
(*Signature of Corporate Secretary*)

Date of Qualification to do business is: _____

A Joint Venture

Joint Venturer Name: _____(SEAL)

By: _____
(Signature of joint venture partner – attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

(Each joint venturer must sign. The manner of signing for each individual, partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)

Bidder's Business Address: _____

Phone No.: _____ FAX No.: _____

Email: _____

BID SUBMITTED on _____, 20____

Connecticut Contractor's License No.: _____

Contractor's License Class (where applicable): _____

END OF SECTION

SECTION 00520

AGREEMENT

THIS CONTRACT is by and between _____

(Owner) and _____

(Contractor).

Owner and Contractor, in consideration of the mutual covenants set forth herein, agree as follows:

WORK

Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

Project SSF 2015-05 – East Street Pump Station Fuel Storage Tank Replacement

ENGINEER

The Project has been designed by Woodard & Curran (Engineer), who is to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

CONTRACT TIMES

Time of the Essence. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

Days to Achieve Substantial Completion:

Subprojects	Start Constraint	Substantial Completion
East Street Pump Station Tank Replacement	Notice to Proceed (to be issued by August 1, 2015)	December 31, 2015

The GNHWPCA intends to have the new storage tank installed by December 31, 2015.

Contractor's Liability for Owner's Consequential Damages:

3.3.1. Contractor shall be liable to Owner for any and all direct, special, indirect, consequential and punitive damages suffered by Owner as a result of Contractor's acts or omissions in the performance of Contractor's duties and obligations under this Contract or Contractor's breach or default of any term or condition of this Contract. Contractor further acknowledges and agrees that time is of the essence with respect to Contractor's performance and completion of the Work. Contractor also acknowledges and agrees that the damages to the Owner from a delay in achieving any of the Milestone Dates including Substantial Completion and Final Completion of the Project will include, without limitation, costs, losses and expenses associated with Owner having to purchase certain energy credits until the Work is substantially complete.

3.3.2. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor acknowledges and agrees that Owner will suffer consequential damages including, without limitation, costs, losses and expenses associated with Owner having to purchase certain energy credits until the Work is completed and ready for final payment.

3.3.3. Contractor further acknowledges and agrees that the consequential damages described within this Article 3, along with any and all other consequential damages suffered by Owner or anticipated by Owner, may be deducted from any monies which may then be due or subsequently become due to Contractor under this Contract.

CONTRACT PRICE

The Owner shall pay the Contractor in current funds for performance of the Contract the Contract Price of \$_____, subject to additions and deductions as provided in the Contract Documents.

PAYMENT PROCEDURES

Submittal and Processing of Payments: Contractor shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

Progress Payments and Retainage: Owner will make progress payments on account of the Contract Price on the basis of Contractor's Application for Payment on the date of each month as established in the preconstruction conference during performance of the Work as provided herein. All such payments will be measured by the Schedule of Values established as provided in Paragraph 2.07.A of the General Conditions (and in the case of Unit Price Work based on the number of units completed).

Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Engineer may determine or Owner may withhold, including but not limited to any consequential damages suffered by Owner, in accordance with Paragraph 14.02 of the General Conditions:

Ninety-five percent of Work completed (with the balance being retainage). If the Work has been 50 percent completed as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, Owner, on recommendation of Engineer, may determine that as long as the character and progress of the Work remain satisfactory to them, retainage will be reduced to 2 percent on the remaining 50 percent of the work.

Ninety-five percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

Upon Substantial Completion of each grit collector equipment, Owner will pay an amount sufficient to increase total payments to Contractor to 100 percent of the Work completed, less such amounts as Engineer will determine in accordance with Paragraph 14.02.B.5 of the General Conditions and less 100 percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the tentative list of items to be completed or corrected attached to the certificate of Substantial Completion.

Final Payment:

Upon final completion and acceptance of the Work in accordance with Paragraph 14.07 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 14.07.

CONTRACT DOCUMENTS

The Contract Documents consist of the following:

The Contract Documents that are attached to this Contract (except as expressly noted otherwise) consist of the following:

This Contract.

Executed Performance Bond.

Executed Payment Bond.

General Conditions.

Specifications as listed in the table of contents of the Contract Documents for the East Street Pump Station Fuel Storage Tank Replacement.

Drawings consisting of 14 sheets with each sheet bearing the following general title: "East Street Pump Station Fuel Storage Tank Replacement".

Addenda (numbers_____ to_____, inclusive).

The Special Conditions to this Contract

Contractor's Bid including:

6.1.3.1. *Bidder's Experience and Qualifications.*

6.1.3.2. *List of Subcontractors.*

6.1.4. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:

6.1.4.1. *Notice to Proceed.*

6.1.4.2. *Work Change Directives.*

6.1.4.3. *Change Order(s).*

6.2. There are no Contract Documents other than those listed above in this Article.

6.3. The Contract Documents may only be amended, modified, or supplemented as provided in Paragraph 3.04 of the General Conditions.

INSURANCE

7.1. Contractor's Liability Insurance

7.1.1. Contractor shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and as will provide protection from any and all claims, including without limitation those claims set forth below, which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

7.1.1.1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;

- 7.1.1.2. claims of damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
- 7.1.1.3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
- 7.1.1.4. claims for damages insured by reasonably available personal injury liability coverage which are sustained: by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or by any other person for any other reason;
- 7.1.1.5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
- 7.1.1.6. claims for damages because of bodily injury or death of any person or property damage arising out of ownership, maintenance or use of any motor vehicle.
- 7.1.2. The policies of insurance required by this Paragraph 7.1 shall:
- 7.1.2.1. with respect to insurance required by Contractor under this Contract, include as additional insured the following parties or entities:
- 7.1.2.1.1. State of Connecticut;
- 7.1.2.1.2. City of New Haven;
- 7.1.2.1.4. GNHWPCA; and
- 7.1.2.1.5. Engineer,

all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, partners, officials, employees, agents, consultants, boards and commissions, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

- 7.1.2.2. include at least the specific coverages and be written for not less than the limits of liability provided by Laws or Regulations, whichever is greater;
- 7.1.2.3. include completed operations insurance;

- 7.1.2.4. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20 of the General Conditions;
- 7.1.2.5. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor will so provide);
- 7.1.2.6. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07 of the General Conditions;
- 7.1.2.7. contain an express provision providing that Contractor's insurer shall have no right of recovery or subrogation against the Owner, City of New Haven and the State of Connecticut;
- 7.1.2.8. be placed by an insurer with a current AM Best Rating of no less than A-, VII; and
- 7.1.2.9. with respect to completed operations insurance, remain in effect for at least two years after final payment.
- 7.1.3. Contractor shall furnish Owner and each other additional insured to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.
- 7.1.4. The limits of liability for the insurance required by the Contract shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:
- 7.1.4.1. Workers Compensation & Employer's Liability Insurance: Statutory coverage in compliance with all Laws and Regulations. Coverage shall include Employer's Liability with minimum of \$500,000 each accident, \$500,000 Disease – Policy Limit, \$500,000 each employee.
- 7.1.4.2. Commercial General Liability Insurance: \$1,000,000 combined single limit per occurrence for bodily injury, personal injury and property damage. Coverage shall include, Premises and Operations, Independent Contractors, Products and Completed Operations, Contractual Liability and Broad

Form Property Damage coverage. If a general aggregate is used, the general aggregate limit shall apply separately to the Project or the general aggregate limit shall be twice the occurrence limit.

7.1.4.3. Business Automobile Liability: \$1,000,000 combined single limit per accident for bodily injury. Coverage extends to owned, hired and non-owned automobiles.

7.1.4.4. Owner's and Contractor's Protective Liability Insurance for and in the name of GNHWPCA in the following amounts:

Public Liability per Occurrence:	\$1,500,000
Property Damage Liability:	
Per Occurrence:	\$ 500,000
Aggregate:	\$1,500,000

7.1.4.5. Umbrella Excess Liability Insurance:

Per Occurrence:	\$5,000,000
-----------------	-------------

7.1.4.6. Professional Liability: N/A.

7.1.5. Contractor agrees to pay any and all deductibles in the policies described in this Article 7.1.

MISCELLANEOUS

8.1. Terms used in this Contract will have the meanings stated in the General Conditions.

IN WITNESS WHEREOF, Owner and Contractor have signed 5 copies of this Contract. One counterpart each has been delivered to Connecticut DEEP, Contractor, and Engineer, and two copies to the Owner. All portions of the Contract Documents have been signed or identified by Owner and Contractor or on their behalf.

This Contract will be effective on _____, 20__ (which is the Effective Date of the Contract).

OWNER: _____

CONTRACTOR: _____

By: _____

By: _____

Title: _____

Title: _____

Address for giving notices:

[CORPORATE SEAL]

Attest: _____

Title: _____

Address for giving notices:

License No. _____

(Where applicable)

Agent for service or process: _____

(If Contractor is a corporation or a partnership, attach evidence of authority to sign.)

NOT FOR BIDDING PURPOSES
REFERENCE COPY ONLY

END OF SECTION

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**NOT FOR BIDDING PURPOSES
REFERENCE COPY ONLY**

SECTION 00611

PAYMENT BOND FORM

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

CONTRACTOR
(Name and Address):

SURETY
(Name and Address of Principal Place of Business):

OWNER (Name and Address):

CONTRACT

Date:
Amount:
Description (Name and Location):

BOND

Bond Number:
Date (Not earlier than Contract Date):
Amount:
Modifications to this Bond Form:

NOT FOR BIDDING PURPOSES
REFERENCE COPY ONLY

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

2. With respect to Owner, this obligation shall be null and void if Contractor:

2.1. Promptly makes payment, directly or indirectly, for all sums due Claimants, and

2.2. Defends, indemnifies, and holds harmless Owner from all claims, demands, liens, or suits by any person or entity whose claim, demand, lien or suit is for the payment of labor, materials, or equipment furnished for use in the performance of the Contract, provided Owner has promptly notified Contractor and Surety (at the addresses described in Paragraph 12) of any claims, demands, liens, or suits and tendered defense of such claims, demands, liens, or suits.

3. With respect to Claimants, this obligation shall be null and void if Contractor promptly makes payment for all sums due for labor, materials or equipment furnished for use in the performance of the Contract.

4. Surety shall have no obligation to Claimants under this Bond until:

4.1. Claimants who are employed by, or have a direct contract with Contractor have given notice to Surety (at the addresses described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.

4.2. Claimants who do not have a direct contract with Contractor:

1. Have furnished written notice to Contractor and sent a copy, or notice thereof, to Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials or equipment were furnished or supplied, or for whom the labor was done or performed; and

2. Have either received a rejection in whole or in part from Contractor, or not received within 30 days of furnishing the above notice any communication from Contractor by which Contractor had indicated the claim will be paid directly or indirectly; and

3. Not having been paid within the above 30 days, have sent a written notice to Surety and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to Contractor.

5. When the Claimant has satisfied the conditions of Section 4, the Surety shall promptly and at the Surety's expense take the following actions:

5.1. Send an answer to the Claimant, with a copy to the Owner and Contractor, within forty-five (45) days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.

5.2. Pay or arrange for payment of any undisputed amounts.

6. Reserved.

7. Absent bad faith, Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by Surety.

8. Amounts owed by the Owner to the Contractor under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any 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 Contract are dedicated to satisfy obligations of the Contractor and the Surety under the Contract and this Bond, subject to the Owner's priority to use the funds for the completion of the work.

9. The Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

10. Surety hereby waives notice of any change, including changes of time, to the Contract or to

related Subcontracts, purchase orders and other obligations.

11. Any action or proceeding seeking to enforce any provision of, or based upon any right arising out of, this Bond or the Contract may be asserted against any of the parties in the Connecticut Superior Court for the Judicial District of New Haven at New Haven, and each of the parties irrevocably consents to venue in and the exclusive personal and subject matter jurisdiction of such court in any such action or proceeding and waives any objection to jurisdiction laid therein. Notwithstanding the foregoing, if there is diversity of jurisdiction between the parties each of the parties irrevocably consents to the venue and the exclusive subject matter and personal jurisdiction of the United States District Court for the District of Connecticut. Process in any action or proceeding referred to in this paragraph may be served on any party anywhere in the world. 12. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, Owner, or Contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.

13. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement

shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory Bond and not as a common law bond.

14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.

15. Definitions:

15.1. Claimant: An individual or entity having a direct contract with the Contractor or with a subcontractor at any tier to furnish labor, materials or equipment for use in the performance of the Contract. 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 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.

15.2. Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed above, do each cause this Payment Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

Company:

Signature: _____ (Seal)
Name and Title

Surety's Name and Corporate Seal

By: _____
Signature and Title

(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

Attest: _____
Signature and Title

CONTRACTOR AS PRINCIPAL

SURETY

Company:

Signature: _____(Seal) _____(Seal)
Name and Title Surety's Name and Corporate Seal

By: _____
Signature and Title

(Attach Power of Attorney)

Attest: _____
Signature and Title

END OF SECTION

NOT FOR BIDDING PURPOSES
REFERENCE COPY ONLY

SECTION 00612

PERFORMANCE BOND FORM

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

CONTRACTOR
SURETY

(Name and Address):

(Name and Address of Principal Place of Business):

OWNER (Name and Address):

CONTRACT

Date:

Amount:

Description (Name and Location):

BOND

Bond Number:

Date (Not earlier than Contract Date):

Amount:

Modifications to this Bond Form:

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner for the performance of the Contract, all of the terms and conditions of which are incorporated herein by reference.

2. No change, extension of time, alteration or addition to terms of the Contract shall in any way affect the obligations assumed under this Bond and notice is hereby waived of any such change, extension of time,

alteration or addition to the terms of the Contract. The Surety also waives its right to terminate this Bond in the event of an assignment for the benefit of creditors, insolvency, receivership or bankruptcy by the Contractor.

3. The condition of this obligation is such that if Contractor promptly, faithfully and fully performs all of the covenants and conditions of the Contract, including during any warranty and guaranty period, then the obligation under this Bond shall be void; otherwise this Bond shall remain in full force and effect.

4. The Surety's obligation under this Bond shall arise if the Owner has declared the Contractor in default of any term or condition of the Contract. However, the Contractor's filing of a petition for bankruptcy, whether voluntary or involuntary, is an automatic event of default.

5. The Surety shall, as promptly as circumstances warrant, but no later than fifteen (15) calendar days upon the occurrence of the condition set forth in Paragraph 4, take one of the following actions:

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

5.2 Arrange for a contract to be prepared for execution by the Owner and a contractor selected by the Surety with the Owner's consent, which consent to the selected contractor may be withheld in the Owner's sole discretion, to be secured with performance and payment bonds

equivalent to the bonds issued on the Contract. In which case, the Surety will pay the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner resulting from the default; or

- 5.3. Waive its right to perform or arrange for a new contractor, and either (a) tender payment to the Owner for the amount for which it may be liable to the Owner to the limit of the amount of this Bond, or (b) deny liability in whole or in part and notify the Owner of the reason(s) therefor.

6. If the Surety does not proceed as provided in Paragraph 5, the Surety shall be deemed in default on this Bond (Surety Default), and the Owner shall be entitled to enforce any remedy available to it without further notice. If the Surety has denied liability, in whole or in part, the Owner shall be entitled to enforce any remedy available to the Owner without further notice.

7. If the Surety elects to act under Subparagraph 5.1 or 5.2 above, the Surety hereby assumes all of the obligations, liabilities, responsibilities and covenants of the Contractor pursuant to the terms and conditions of the Contract. To the limit of the amount of this Bond, but subject to commitment by the Owner of the Balance of the Contract Price to mitigation of costs and damages on the Contract, the Surety is obligated without duplication for:

7.1 The responsibilities of the Contractor for correction of defective work and completion of the Contract;

7.2 Additional legal, design professional and delay costs resulting from the default, including any costs incurred as a result of the Contractor filing a counterclaim for wrongful termination; and

7.3 Consequential damages including, without limitation, any damages caused by delayed performance or non-performance of the Contractor to the Owner.

8. The Owner's right, if exercised, under the Contract to supplement the Contractor's work force or to retain substitute contractors or to take whatever other actions are necessary to avoid delay in the Project shall continue post default of the Contractor or until the Surety acts under Paragraph 5, and the cost thereof shall be a deduction from the Balance of the Contract Price.

9. Any action or proceeding seeking to enforce any provision of, or based upon any right arising out of, this Bond or the Contract may be asserted against any of the parties in the Connecticut Superior Court for the Judicial District of New Haven at New Haven, and each of the parties irrevocably consents to venue in and the exclusive personal and subject matter jurisdiction of such court in any such action or proceeding and waives any objection to jurisdiction laid therein. Notwithstanding the foregoing, if there is diversity of jurisdiction between the parties each of the parties irrevocably consents to the venue and the exclusive subject matter and personal jurisdiction of the United States District Court for the District of Connecticut. Process in any action or proceeding referred to in this paragraph may be served on any party anywhere in the world.

10. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the address shown on the signature page.

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

12. Definitions.

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

12.2. Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.

12.3. Contractor Default: Failure of Contractor to perform or otherwise to comply with the terms of the Contract.

12.4. Surety Default: Failure of the Surety to perform or otherwise comply with the terms of this Bond.

--

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed above, do each cause this Performance Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

Company:

Signature: _____ (Seal)
Name and Title

Surety's Name and Corporate Seal

By: _____
Signature and Title
(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

Attest: _____
Signature and Title

CONTRACTOR AS PRINCIPAL

SURETY

Company:

Signature: _____ (Seal)
Name and Title

Surety's Name and Corporate Seal

By: _____
Signature and Title
(Attach Power of Attorney)

Attest: _____
Signature and Title

END OF SECTION

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

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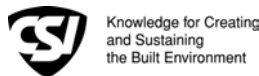
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GENERAL CONDITIONS

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*--Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Application for Payment*--The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

3. *Asbestos*--Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

4. *Bid*--The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

5. *Bidder*--The individual or entity who submits a Bid directly to Owner.

6. *Bidding Documents*--The Bidding Requirements and the proposed Contract Documents (including all Addenda).

7. *Bidding Requirements*--The Advertisement or Invitation to Bid, Instructions to Bidders, bid security of acceptable form, if any, and the Bid Form with any supplements.

8. *Change Order*--A document signed by Contractor and Owner authorizing an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Contract.

9. *Claim*--A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the

terms of the Contract. A demand for money or services by a third party is not a Claim.

10. *Contract*--The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

11. *Contract Documents*-- Those items so designated in the Contract. Only printed or hard copies of the items listed in the Contract are Contract Documents. Contractor's submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

12. *Contract Price*--The moneys payable by Owner to Contractor for completion of all the Work in accordance with the Contract Documents (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).

13. *Contract Times*--The number of days or the dates stated in the Contract to: (i) achieve Milestones, if any, (ii) achieve Substantial Completion; and (iii) complete all of the Work.

14. *Contractor*--The entity with whom Owner has entered into the Contract.

15. *Cost of the Work*--See Paragraph 11.01.A for definition.

16. *Drawings*--That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.

17. *Effective Date of the Contract*--The date indicated in the Contract on which it becomes effective, but if no such date is indicated, it means the date on which the Contract is signed and delivered by the last of the two parties to sign and deliver.

18. *Engineer*--The individual or entity named as such in the Contract.

19. *Field Order*--A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

20. *General Requirements*--Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.

21. *Hazardous Environmental Condition*--The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial

danger to persons or property exposed thereto in connection with the Work.

22. *Hazardous Waste*--The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

23. *Laws and Regulations; Laws or Regulations*--Any and all applicable laws, statutes rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction over the Project, the Owner or the Contractor.

24. *Liens*--Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

25. *Milestone*--A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

26. *Notice of Award*--The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Contract.

27. *Notice to Proceed*--A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.

28. *Owner*--The individual or entity with whom Contractor has entered into the Contract and for whom the Work is to be performed.

29. *PCBs*--Polychlorinated biphenyls.

30. *Petroleum*--Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

31. *Progress Schedule*--A schedule, prepared and maintained by Contractor and approved by the Engineer, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

32. *Project*--The total construction of the Work to be performed under the Contract Documents.

33. *Project Manual*--The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual,

which may be bound in one or more volumes, is contained in the table(s) of contents.

34. *Radioactive Material*--Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

35. *Related Entity* -- An officer, director, partner, employee, agent, consultant, or subcontractor.

36. *Resident Project Representative*--The authorized representative of Engineer who may be assigned to the Site or any part thereof.

37. *Samples*--Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

38. *Schedule of Submittals*--A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.

39. *Schedule of Values*--A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

40. *Shop Drawings*--All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

41. *Site*--Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.

42.a. *Specifications*--That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.

42.b. *Standard Specifications* -- Wherever in these Contract Documents reference is made to the Standard Specifications, said reference shall be understood as referring to those Standard Specifications, if any, identified in the Contract, which applicable parts are incorporated herein and made a part of these Contract Documents by specific reference thereto.

43. *Subcontractor*--An individual or entity having a direct contract with Contractor or with any other

Subcontractor for the performance of a part of the Work at the Site.

44. *Substantial Completion*--The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof. Substantial completion is further defined as (i) that degree of completion of the Project's operating facilities or systems sufficient to provide Owner the full time, uninterrupted, and continuous beneficial operation of the Work; and (ii) all required functional, performance and acceptance or startup testing has been successfully demonstrated for all components, devices, equipment, and instrumentation and control to the satisfaction of the Engineer in accordance with the requirements of the Specifications.

45. *Successful Bidder*--The Bidder submitting a responsive Bid to whom Owner makes an award.

46. *Supplier*--A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work.

47. *Underground Facilities*--All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

48. *Unit Price Work*--Work to be paid for on the basis of unit prices.

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

50. *Work Change Directive*--A written statement to Contractor issued on or after the Effective Date of the Contract and signed by Owner ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a

subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

51. *Specialist*--The term Specialist refers to a person, partnership, firm, or corporation of established reputation (or if newly organized, whose personnel have previously established a reputation in the same field), which is regularly engaged in, and which maintains a regular force of workers skilled in either (as applicable) manufacturing or fabricating items required by the Contract Documents, or otherwise performing Work required by the Contract Documents. Where the Specifications require the installation by a Specialist, that term shall also be deemed to mean either the manufacturer of the item, a person, partnership, firm, or corporation licensed by the manufacturer, or a person, partnership, firm, or corporation who will perform the Work under the manufacturer's direct supervision.

1.02 Terminology

A. The following words or terms are not defined but, when used in the Bidding Requirements or Contract Documents, have the following meaning.

B. *Meaning of Certain Terms or Adjectives*

1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action or determination will be solely to evaluate, in general, the Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day*

1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective*

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

a. does not conform to the Contract Documents, or

b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents, or

c. has been damaged prior to Engineer's - recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. Furnish, Install, Perform, Provide

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.

F. Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 - PRELIMINARY MATTERS

2.01 Delivery of Bonds and Evidence of Insurance

A. Within 15 days from date on which Owner gives a Notice of Award to Successful Bidder, Successful Bidder shall submit original bonds, original insurance certificates and other evidence of insurance required by Owner in a form acceptable to Owner. Within 15 days thereafter, Owner shall deliver the required number of unsigned counterparts of the Contract with the other Contract Documents that are identified in the Contract as attached thereto. Within 15 days thereafter, the Successful Bidder shall sign and deliver the required number of counterparts of the Contract and attached documents to Owner.

2.02 Copies of Documents

A. Owner will furnish to Contractor 10 copies of the Contract Documents, which include half-size drawings, specifications and 5 copies of full-size Drawings.

2.03 Commencement of Contract Times; Notice to Proceed

A. The Contract Times will commence to run on the date specified by the Owner within a Notice to Proceed issued to Contractor. However, in no event will the Contract Times commence to run later than 60 days after the Contract is executed by the Owner and Contractor.

2.04 Starting the Work

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 Before Starting Construction

A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Contract (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule; indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 Preconstruction Conference

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to review the requirements of the Contract Document.

2.07 Initial Acceptance of Schedules

A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided

below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it properly allocates the Contract Price to component parts of the Work.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all. In resolving inconsistencies among two or more components of the Contract Documents, precedence shall be given in the following order:

1. Contract, including any Special Conditions or Standard Specifications referenced therein
2. General Conditions
3. Specifications – Division 1
4. Specifications – Division 2 through 49
5. Drawings
6. Contractor's Bid

Written Amendments, Change Orders, Work Change Directives, Field Orders, Engineer's written interpretations and clarifications, Notice to Proceed and Addenda, in precedence list, will take precedence over all other Contract Document components referenced herein. Figure dimensions on drawings will take precedence over scaled dimensions. Detailed Drawings will take precedence over general Drawings. Notwithstanding the foregoing, in the event of a conflict between any requirements contained within the Contract Documents which impose any requirement, obligation, standard or guarantee upon Contractor, the higher or more stringent requirement, obligation, standard or guarantee shall apply. As used herein, the "most stringent" shall mean the applicable standards that are most beneficial to Owner, as determined by Owner.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided by Contractor whether or not specifically called for at no additional cost to Owner.

C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 *Reference Standards*

A. Standards, Specifications, Codes, Laws, and Regulations

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard, specification, manual or code, or any instruction of a Supplier shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, or Engineer, or any of, their Related Entities, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. Reporting Discrepancies

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor may discover and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.

2. *Contractor's Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents

or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor knew or reasonably should have known thereof.

B. Resolving Discrepancies

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

- a. the provisions of any standard, specification, manual, code, or instruction (not specifically incorporated by reference in the Contract Documents); or
- b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;
2. Engineer's approval of a Shop Drawing or Sample; (Subject to the provisions of Paragraph 6.17.D.3); or
3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

A. Contractor and any Subcontractor or Supplier or other individual or entity performing or furnishing all

of the Work under a direct or indirect contract with Contractor, shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or Engineer's consultants, including electronic media editions; or

2. reuse any of such Drawings, Specifications, other documents, or copies thereof on any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.

B. The prohibition of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

A. Copies of data furnished by Owner or Engineer to Contractor or Contractor to Owner or Engineer that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party..

C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities.

B. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings:* The Special Conditions identify:

1. those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Contract Documents; and

2. those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that Engineer has used in preparing the Contract Documents.

B. *Contractor's Review of Reports and Drawings:* Contractor should review the "technical data" contained in such reports and drawings in pricing, planning for and performing the Work, but such reports and drawings are not Contract Documents. Contractor may not rely upon or make any claim against Owner or Engineer, or any of their Related Entities with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. "technical data" or other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* 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 construction activities of the character provided for in the Contract Documents,

Contractor shall promptly provide written notice to Owner and Engineer before conditions are disturbed and in no event later than 3 days after first observance of the conditions. Contractor shall not further disturb such condition or perform any Work in connection therewith until receipt of written order to do so from the Engineer.

B. *Engineer's Review:* After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. Possible Price and Times Adjustments

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and

b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:

a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or execution of the Contract; or

b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by Contractor prior to Contractor's making such final commitment; or

c. Contractor failed to give the written notice as required by Paragraph 4.03.A.

3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. The parties agree that:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data; and

2. the cost of all of the following is included in the Contract Price, and Contractor shall have full responsibility for:

- a. reviewing and checking all such information and data,
- b. locating all Underground Facilities shown or indicated in the Contract Documents,
- c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction, and
- d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A) identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree

on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

A. No reports or drawings related to Hazardous Environmental Conditions are known to Owner or Engineer.

B. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.

C. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing).

D. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered to Contractor written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.

E. Upon receipt of such written notice, Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.

F. To the extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor and its officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents, and (ii) was not created by or exacerbated by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06. G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

G. Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, officials, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

H. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 - BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.

1. Conn. Gen. Stat. § 12-430(7) as amended by 2011 Conn. Pub. Acts 61, § 66; Conn. Gen. Stat. § 12-35; Conn. Gen. Stat. § 12-415; Conn. Gen. Stat. § 12-430(1) requires nonresident construction contractors to furnish security for Connecticut taxes arising from jobs performed in Connecticut. Under the law there are two classes of nonresident contractors: verified and unverified. Contractor must provide written proof that the requirements of these Laws and Regulations have been met before entering upon the performance of the Work under the Contract Documents.

B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent must be accompanied by a certified copy of the agent's authority and power of attorney to act.

C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required.

B. Surety and insurance companies from which the bonds and insurance for this Project are purchased shall have an A.M. Best's rating of no less than VII, in addition to the other requirements specified herein.

C. Failure of Owner to demand such certificates or other evidence of full compliance with these insurance requirements or failure of Owner to identify a deficiency from evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

D. By requiring such insurance and insurance limits herein, Owner does not represent that coverage and limits necessarily be adequate to protect Contractor, and such coverage and limits shall not be deemed as a

limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

5.03 *Certificates of Insurance*

A. Contractor shall deliver to Owner, with copies to each additional insured certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.

5.04 *Property Insurance*

A. Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided the Contract Documents or required by Laws and Regulations). This insurance shall:

1. include the interests of Owner, Contractor, and Subcontractors and any other individuals or entities identified in the Contract Documents, and the officers, officials, directors, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;

2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, (other than caused by flood) and such other perils or causes of loss as may be specifically required by the Contract Documents;

3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;

5. allow for partial utilization of the Work by Owner;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner and Contractor with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.

B. Owner shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Contract Documents or Laws and Regulations which will include the interests of Owner, Contractor and Subcontractors and the officers, officials, directors, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.

D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, Engineer or others in the Work to the extent of any deductible amounts. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, Engineer or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

5.05 *Waiver of Rights*

A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor and Subcontractors and the officers, officials, directors, partners, employees, agents, consultants and subcontractors of each and any of them, in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. Owner and Contractor waive all rights against each other and their respective officers, officials, directors, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and,

in addition, waive all such rights against Subcontractors and the officers, officials, directors, partners, employees, agents, consultants and subcontractors of each and any of them under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.

B. Consequential Damages Waiver The Contractor waives all Claims, claims, demands, suits, causes of action and demands against Owner for consequential damages arising out of or relating to this Contract. This waiver includes damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, lost productivity and for loss of profit.

Notwithstanding anything in this Contract to the contrary, in no event shall Owner be liable for or obligated in any manner to pay any special, consequential, incidental, punitive or indirect damages.

5.06 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.

B. Owner as fiduciary shall have absolute power to adjust and settle any loss with the insurers.

5.07 *Acceptance of Bonds and Insurance; Option to Replace*

A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to

any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.08 *Partial Utilization, Acknowledgment of Property Insurer*

A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy. The property insurance shall contain no partial occupancy restriction for utilization of the Project by Owner for the purpose intended.

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, coordinate and direct the Work to perform the Work in accordance with the Contract Documents. 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 Documents, unless the Contract Documents give other specific instructions concerning these matters. 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 fully and 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 written notice to the Owner and Engineer and will not proceed with that portion of the Work without further written instructions from the Engineer.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer. The superintendent will be Contractor's representative at the Site and shall have full authority to act on behalf of Contractor. All communications given to or received from the superintendent shall be binding on Contractor.

6.02 Labor; Working Hours

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer. Contractor (and Subcontractor) regular working hours consist of up to 10 working hours between 7:00 a.m. and 6:00 p.m. on a regularly scheduled basis, excluding Saturdays, Sundays, and holidays. Overtime work is work in excess of 40 hours per week.

6.03 Services, Materials, and Equipment

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 Progress Schedule

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjust-

ments will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 Substitutes and "Or-Equals"

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.

"Or-Equal" Items: If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. the Engineer determines that:

1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole,

3) it has a proven record of performance and availability of responsive service; and

b. Contractor certifies that, if approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times, and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. Substitute Items

a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.

b. Contractor shall submit sufficient information as provided below to allow Engineer to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.

c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented in the General Requirements and as Engineer may decide is appropriate under the circumstances.

d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

1) shall certify that the proposed substitute item will:

- a) perform adequately the functions and achieve the results called for by the general design,
- b) be similar in substance to that specified, and
- c) be suited to the same use as that specified;

2) will state:

- a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time;
- b) whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and
- c) whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;

3) will identify:

a) all variations of the proposed substitute item from that specified, and

b) available engineering, sales, maintenance, repair, and replacement services;

4) and shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change,

B. Substitute Construction Methods or Procedures: If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.

C. Engineer's Evaluation: Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by either a Change Order for a substitute or an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.

D. Special Guarantee: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

E. Engineer's Cost Reimbursement: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute item so proposed or submitted by Contractor, Contractor shall reimburse Owner for the charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute. Reimbursement rates for Engineer or Related Entities for evaluation of proposed substitutes shall be on the basis as established in Paragraph 14.02.D.4.

F. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's sole expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has objection. Contractor shall perform a minimum of 25 percent of the onsite labor with its own employees.

B. If the Contract Documents require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Contract, and if Contractor has submitted a list, Owner's acceptance of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

C. Contractor shall be fully responsible and liable to Owner for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity, nor

2. shall anything in the Contract Documents create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities per-

forming or furnishing any of the Work to communicate with Engineer through Contractor.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier, previously approved in writing by Owner, which specifically binds the Subcontractor or Supplier to the terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in Paragraph 5.05, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner and Contractor and the officers, officials, directors, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of Owner or Engineer its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed in the Contract Documents.

B. Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, officials, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Intentionally Omitted*

6.09 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Contract if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

D. While not intended to be inclusive of all Laws or Regulations for which Contractor may be responsible under Paragraph 6.09, the following Laws or Regulations are included as mandated by statute or for the convenience of Contractor:

1. *Prevailing Wage:*

a. The minimum wages to be paid various classes of mechanics, laborers, or field surveyors shall be not less than the prevailing wage rates established by the Commissioner of the Department of Labor of the State of Connecticut in accordance with the provisions of Conn. Gen. Stat. § 31-53.

b. Owner does not guarantee that labor can be procured for the minimum wages in the wage scale. The rates of wages listed are minimum only, below which Contractor cannot pay, and they do not constitute a representation that labor can be procured for the minimum listed.

c. Owner will not recognize any Claim for additional compensation because of payment by Contractor of any wage rate in excess of the prevailing wages set forth in the Contract Documents. The

possibility of wage increases is one of the elements to be considered by Contractor in determining its Bid, and will not under any circumstances be considered as the basis of a Claim against Owner.

2. *Employment Preference* – Attention is directed to the provisions of Conn. Gen. Stat. § 31-53 to Conn. Gen. Stat. § 31-52b concerning the employment of residents and apprentices on public projects.

3. *Labor Discrimination* –

a. Contractor agrees and warrants that in the performance of Work under these Contract Documents it will not discriminate or permit discrimination against any person or group of persons on the grounds of race, color, religious creed, age, marital status, national origin, sex, mental retardation, or physical disability, including but not limited to, blindness, unless it is shown by Contractor that such disability prevents performance of the Work involved, in any manner prohibited by the Laws or Regulations.

b. Contractor agrees and warrants that it will comply with the State requirements to employ minority business enterprises as Subcontractors and Suppliers of materials on this Project. Contractor further agrees to provide the Commission on Human Rights and Opportunities with such information requested by the Commission concerning the employment practices and procedures of Contractor as they relate to the provisions of Conn. Gen. Stat. §§ 4-114a and 46a-56.

c. For the purpose of this Paragraph, "minority business enterprise" means any Subcontractor or Supplier of materials where 51 percent or more of its capital stock, if any, or assets of which, are owned by a person or persons:

(1) Who are active in the daily affairs of the enterprise;

(2) Who have the power to direct the management and policies of the enterprise; and

(3) Who are members of a minority as defined in Conn. Gen. Stat. § 32-9n(a).

d. Contractor shall develop and maintain adequate documentation, in a manner prescribed by the Commission. Documentation shall be submitted as required by the State of Connecticut.

6.10 *Taxes*

A. Under the terms of the regulations issued by the Connecticut State Tax Commission in administration of the State Sales Tax and Use Tax, Contractor, its Subcontractors and Suppliers may purchase such materials and supplies as are to be physically incorporated in and will become a permanent part of the Work

performed under these Contract Documents without payment of tax.

6.11 *Use of Site and Other Areas*

A. Limitation on Use of Site and Other Areas

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas approved in writing by Owner and permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work or storage of materials and equipment. Contractor shall not enter upon nor use property not under Owner control until appropriate easements, leases, licenses or rental agreements have been executed and a copy is on file at the Site.

2. Should any claim be made by any such owner or occupant because of the performance of the Work or storage of materials and equipment, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, officials, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all costs of arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work or storage of materials and equipment.

B. Removal of Debris During Performance of the Work: During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations and shall be at Contractor's sole cost and expense.

C. Cleaning: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work, Contractor shall remove from the Site all tools, appliances, construction equipment and machinery and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. Loading Structures: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

6.13 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the Contract Documents.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

C. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor.

D. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.16 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer and Owner determine that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the acceptable Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. Shop Drawings

a. Submit number of copies specified in the General Requirements.

b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

2. *Samples*: Contractor shall also submit Samples to Engineer for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals.

a. Submit number of Samples specified in the Specifications.

b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. Submittal Procedures

1. Before submitting each Shop Drawing or Sample, Contractor shall have determined and verified:

a. all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

b. the suitability of all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;

c. all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto; and

d. shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations, that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawing's or Sample Submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submittal.

ted to Engineer for review and approval of each such variation.

D. Engineer's Review

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. Resubmittal Procedures

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and Samples, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

2. Contractor shall furnish required submittals with sufficient information and accuracy in order to obtain required approval of an item with no more than the number of submittals specified in Paragraph 14.02.D.4. Engineer will record time for reviewing subsequent submittals of Shop Drawings, samples or other items requiring and Contractor shall reimburse Owner for Engineer's charges for such time in accordance with Paragraph 14.02.D.4.

3. In the event that Contractor requests a substitution for a previously approved item, Contractor shall reimburse Owner for Engineer's charges for such time, unless the need for such substitution is beyond the control of Contractor.

6.18 Continuing the Work

A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed or stopped pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 Contractor's Representations, General Warranty and Guarantee

A. Contractor's Representations

In order to induce Owner to enter into this Contract, Contractor makes the following representations, covenants and warranties:

1. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.

2. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

3. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

4. Contractor has carefully studied all reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that have been identified in Article 7.2 through 7.4 of this Contract.

5. Contractor has obtained and carefully studied (or assumes responsibility for doing so) all examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto.

6. Contractor does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.

7. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that

relates to the Work as indicated in the Contract Documents.

8. Contractor has correlated the information known to Contractor, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.

9. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

10. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

11. Contractor is duly organized and validly existing and in good standing under the laws of the jurisdiction of its formation, with full legal right, power and authority to enter into and perform its obligations under this Contract. Contractor is authorized to do business in the State of Connecticut.

12. Contractor has duly authorized the execution and delivery of this Contract. This Contract has been duly executed and delivered by Contractor and constitutes the legal, valid and binding obligation of Contractor enforceable against Contractor in accordance with its terms and conditions except insofar as such enforcement may be affected by bankruptcy, insolvency, moratorium and other laws affecting creditors' rights generally.

13. Neither the execution nor the delivery by Contractor of this Contract nor the performance by Contractor of its obligations hereunder (i) conflicts with, violates or results in a breach of any of the terms of the articles of organization or partnership agreement of Contractor or any applicable Laws or Regulations, (ii) conflicts with, violates or results in a breach of any term or condition of any judgment, decree, agreement (including, without limitation, the certificate of incorporation of Contractor) or instrument to which Contractor is a party or by which Contractor or any of its properties or assets are bound, or constitutes a default under any such judgment, decree, agreement or instrument, (iii) will result in the creation or imposition of any encumbrance of any nature whatsoever upon any of the properties or assets of Contractor or Owner, or (iv) conflicts with, or results in or constitutes a default under or breach or violation of or grounds for termination of, any legal entitlements to which Contractor is a party or by which Contractor may be bound, or result in the violation by Contractor of any applicable Laws or Regulations to which Contractor or any assets of Contractor may be subject, which would materially adversely affect the transactions contemplated herein. No legal entitlements or other authorization, consent or approval of, notice to, or filing with, any other person or entity or public body or

authority is necessary in connection with the execution, delivery and performance by Contractor of this Contract.

14. There is no action, suit or other proceeding as of the date hereof, at law or in equity, before or by any court or governmental body, pending or, to the best of Contractor's knowledge, threatened against Contractor or any of its officers or directors which is or reasonably could be expected to materially and adversely affect (i) the execution or delivery of this Contract, or (ii) the validity or enforceability of this Contract or any other agreement or instrument entered into by Contractor in connection with the transactions contemplated hereby, or which would materially affect the performance by Contractor of its obligations hereunder or by Contractor under any such other agreement or instrument.

15. Neither Contractor nor any affiliate or related party has employed or retained any person, other than a bona fide full time salaried employee working solely for Contractor to solicit or secure this Contract and Contractor nor any affiliate or related party has paid or agreed to pay any person (other than payments of fixed salary to a bona fide full time salaried employee working solely for Contractor) any fee, commission, percentage, gift or other consideration, contingent upon or resulting from the award or making of this Contract. For any breach or violation of this Paragraph 6.1.15, without limiting any other rights or remedies to which Owner may be entitled or any civil or criminal penalty to which any violator may be liable, Owner shall have the right, in its discretion, to terminate this Contract without liability, and to deduct from any outstanding amounts due Contractor, or otherwise to recover, the full amount of such fees, commission, percentage, gift or consideration.

16. Contractor has, or will have prior to commencement of the Work, adequate capacity, technical knowledge and employees and subcontractors to fulfill all of Contractor's obligations, covenants and agreements pursuant to the terms and conditions of this Contract.

17. Contractor is presently in compliance in all material respects with all Laws or Regulations, and to the knowledge of Contractor, no event has occurred which would constitute reasonable grounds for a claim that non-compliance has occurred or is occurring.

18. No officer or director of Contractor is an employee of the Owner and, to the knowledge of Contractor, no employee of Owner owns, directly or indirectly, any interest in Contractor.

19. Contractor is not in arrears upon any debt nor in default of any obligation owed to Owner. Contractor has not filed, nor have creditors of Contractor filed, any type of proceeding under the United States Bankruptcy Code. As of the date of execution of this Contract, there has been no material adverse change in Contractor's ability to fulfill its obligations under this Contract. Contractor agrees to immediately report to Owner in writing any material adverse change in Contractor's business.

20. No statement, representation or warranty by Contractor within this Contract, or within any submission made by Contractor to obtain this Contract (including Contractor's Bid), contains any untrue statement of material fact, or, to the best of Contractor's knowledge, omits to state any material fact, necessary to make such statements, representations and warranties not misleading.

B. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations or inspections by Engineer;
2. recommendation by Engineer or payment by Owner of any progress or final payment;
3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
4. use or occupancy of the Work or any part thereof by Owner;
5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;
6. any inspection, test, or approval by others; or
7. any correction of defective Work by Owner.

6.20 Indemnification

A. Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, officials, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work but only to the extent caused by a breach of any of the terms or conditions of the Contract Documents by Contractor or any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer or any of their respective consultants, agents,

officers, directors, partners, or employees by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 Delegation of Professional Design Services

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.

B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed 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 Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals.

D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design

drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

ARTICLE 7 - OTHER WORK AT THE SITE

7.01 *Related Work at Site*

A. Owner may perform other work related to the Project at the Site with Owner's employees, or via other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then written notice thereof will be given to Contractor prior to starting any such other work; and

B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and shall properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of Engineer and the others whose work will be affected.

C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Legal Relationships*

A. Paragraph 7.01.A is not applicable for utilities not under the control of Owner.

B. Contractor shall be liable to Owner and any other contractor for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's action or inactions.

ARTICLE 8 - OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

8.02 *Replacement of Engineer*

A. In case of termination of the employment of Engineer, Owner shall appoint an engineer whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

8.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in Article 14.

8.05 *Lands and Easements; Reports and Tests*

A. Owner's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by Engineer in preparing the Contract Documents.

8.06 *Insurance*

A. Owner's responsibilities, if any, in respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility in respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for,

Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents and will not be changed without written consent of Owner and Engineer.

9.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding and installed in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

9.03 *Project Representative*

A. Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work.

B. Resident Project Representative (RPR) will be furnished by Engineer. The responsibilities, authority, and limitations of the RPR are limited to those of Engineer in accordance with Paragraph 9.09 and as set

forth elsewhere in the Contract Documents and are further limited and described below.

C. *Responsibilities and Authority:*

Resident Project Representative shall:

1. Schedules: Review and monitor Progress Schedule, Schedule of Submittals, and Schedule of Values prepared by Contractor and consult with Engineer concerning acceptability.

2. Conferences and Meetings: Conduct or attend meetings, with Contractor, such as preconstruction conferences, progress meetings, Work conferences and other Project related meetings.

3. Liaison: (i) Serve as Engineer's liaison with Contractor, working principally through Contractor's Superintendent and assist in understanding the intent of the Contract Documents; (ii) assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's onsite operations, (iii) assist in obtaining from Owner additional details or information when required for proper execution of the Work.

4. Submittals. Receive Submittals that are furnished at the Site by Contractor, and notify Engineer of availability for examination. Advise Engineer and Contractor of the commencement of any Work or arrival of Products at Site, when recognized, requiring a Shop Drawing or Sample if the Submittal has not been approved by Engineer.

5. Review of Work, Rejection of defective Work, Inspections and Tests: (i) Conduct onsite observations of the Work in progress to assist Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents; (ii) inform Engineer and Contractor whenever RPR believes that any Work is defective; (iii) advise Engineer whenever RPR believes that any Work will not produce a completed Project that conforms generally to the Contract Documents or will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or whenever RPR believes Work should be uncovered for observation, or requires special testing, inspection, or approval; (iv) monitor that tests, equipment and system startups and operating and maintenance training are conducted in the presence of appropriate personnel, and that Contractor maintains adequate records thereof; (v) observe, record and report to Engineer appropriate details relative to the test procedures and startups; and (vi) accompany visiting inspectors representing public or other agencies having jurisdiction over the Project, record the results of these inspections and report to Engineer.

6. Interpretation of Contract Documents. Inform Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to

Contractor for clarifications and interpretations as issued by Engineer.

7. Modifications. Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and provide recommendations to Engineer; transmit to Contractor the decisions issued by Engineer.

8. Records: (i) Maintain at the Site files for correspondence, conference records, Submittals including Shop Drawings and Samples, reproductions of original Contract Documents including all Addenda, signed Contract, Work Change Directives, Change Orders, Field Orders, additional Drawings issued after the Effective Date of the Contract, Engineer's written clarifications and interpretations, progress reports, and other Project related documents; (ii) keep a diary or log book recording pertinent Site conditions, activities, decisions and events.

9. Reports. (i) Furnish Engineer periodic reports of progress of the Work and of Contractor's compliance with the Progress Schedule and Schedule of Submittals; (ii) consult with Engineer in advance of scheduled major tests, inspections or start of important phases of the Work; and (iii) assist in drafting proposed Change Orders, Work Change Directives and Field Orders, obtain backup material from Contractor as appropriate.

10. Payment Requests. Review applications for payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the Schedule of Values, Work completed and materials and equipment delivered at the Site but not incorporated in the Work.

11. Certificates, Operation and Maintenance Manuals, Record Documents, and Site Records. During the course of the Work, monitor that these documents and other data required to be assembled, maintained and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have this material delivered to Engineer for review and forwarding to Owner prior to final payment for the Work.

12. Substantial Completion. (i) Conduct an inspection in the company of Engineer, Owner and Contractor and prepare a list of items to be completed or corrected; (ii) submit to Engineer a list of observed items requiring completion or correction.

13. Completion. (1) Conduct final inspection in the company of Engineer, Owner and Contractor; and (ii) notify Contractor and Engineer in writing of all particulars in which this inspection reveals that the Work is incomplete or defective; and (iii) observe that all items on final list have been completed, corrected, or accepted by Owner and make recommendations to Engineer concerning acceptance.

D. Limitations of Authority: Resident Project Representative will not:

1. have authority to authorize any deviation from the Contract Documents or substitution of materials or equipment, unless authorized by Engineer and Owner; or

2. undertake any of the responsibilities of Contractor, Subcontractors, or Contractor's superintendent; or

3. accept Submittals from anyone other than Contractor; or

4. authorize Owner to occupy the Project in whole or in part; or

5. participate in specialized field or laboratory tests or inspections conducted by others except as specifically authorized by Engineer.

9.04 *Authorized Variations in Work*

A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.

B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.

C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.

D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Contractor, subject to the provisions of Paragraph 10.05.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question

B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believe that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.

C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.

D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

10.01 *Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

C. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.B.

10.03 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:

1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *Notification to Surety*

A. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times) is required by the provisions of any bond to be given to a surety, the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

10.05 *Claims*

A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.

B. *Notice:* Written notice stating the general nature of each Claim, shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 45 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

C. *Engineer's Action and Executive Negotiation.:*

1. *Engineer's Action:*

a. Engineer will render a formal decision in writing within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any. Engineer's written decision on such Claim, dispute or other matter will be final and binding upon Owner and Contractor, unless within 10 days after issuance of Engineer's written decision, either party appeals the decision by giving the other party and Engineer written notice of request for executive negotiation.

b. In the event Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

2. *Executive Negotiation*

a. Within 10 days of the delivery of notice of appeal to Engineer's written decision regarding Claim, dispute or other matter, senior representatives of at least Owner and Contractor, having authority to settle the dispute, and Engineer shall meet at a mutually acceptable time and place, and thereafter as often as they reasonably deem necessary, to exchange relevant information and to attempt to resolve the dispute.

b. In the event a mutually acceptable decision cannot be reached through executive negotiation within 20 days of the appealing party's notice, or mutually agreeable longer period, or if the party receiving such notice will not meet within 10 days, Owner or Contractor may make a written declaration, delivered to the other party and Engineer, that the executive negotiation is deemed unsuccessful and may initiate further dispute resolution measures in accordance with Article 16.

c. If no such dispute resolution procedures have been set forth in Article 16, a written notice of intention to further appeal from Engineer's written decision is delivered by Owner or Contractor to the other and to Engineer within 30 days after the date upon which the executive negotiation has been declared unsuccessful, or within 60 days after Substantial Completion, whichever is later (unless otherwise agreed in writing by Owner and Contractor), to exercise such rights or remedies as the appealing party may have with respect to such Claim, dispute, or other matter in accordance with applicable Laws and Regulations.

D. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 - COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in Paragraph 11.01.B.

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall not be included in the Cost of the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall not be included in the above unless authorized by Owner in writing.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.

4. Costs of special consultants (including but not limited to Engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value,

of such items used but not consumed which remain the property of Contractor.

c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, imposed by Laws and Regulations.

e. Deposits lost or causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. The cost of utilities, fuel, and sanitary facilities at the Site.

g. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. Costs Excluded: The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of

defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A and 11.01.B.

C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Contract. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 Allowances

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. Cash Allowances

1. Contractor agrees that:

a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. Contingency Allowance

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 Unit Price Work

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Contract.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's general condition costs, overhead and profit for each separately identified item.

D. The unit price of an item of Unit Price Work shall be subject to reevaluation and adjustment under the following conditions:

1. if the Bid price of a particular item of Unit Price Work amounts to 1.5 percent or more of the Contract Price and the variation in the quantity of that particular item of Unit Price Work performed by Contractor differs by more than 50 percent from the estimated quantity of such item indicated in the Contract;

2. if there is no corresponding adjustment with respect to any other item of Work; and

3. if Contractor believes that Contractor has incurred additional expense as a result thereof or if Owner believes that the quantity variation entitles Owner to an adjustment in the unit prices, either Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Article 10 if the parties are unable to agree as to the effect of any such variation in the quantity of Unit Price Work performed.

ARTICLE 12 - CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 Change of Contract Price

A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;

b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraph 12.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor, except, the maximum total allowable cost to Owner shall be the Cost of the Work plus a maximum collective aggregate fee for Contractor and all tiered Subcontractors of 26.8 percent;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

e. the amount of credit to be allowed by Contractor to Owner for any change which

results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor's sole and exclusive remedy will be an increase in the Contract Times. Contractor's entitlement to an increase of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor's sole and exclusive remedy will be an increase in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times.

D. Owner, Engineer and the Related Entities of each of them shall not be liable to Contractor for any

claims, costs, losses, or damages (including but not limited to all fees and charges of Engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any delays in the performance or progress of the Work.

E. Notwithstanding anything to the contrary in the Contract Documents, an extension in the Contract Times shall be the sole and exclusive remedy of the Contractor for any (1) delay in the commencement, prosecution, or completion of all the Work, (2) hindrance or obstruction in the performance of the Work, (3) loss of productivity, or (4) other similar claims whether or not such delays are foreseeable, contemplated, or unanticipated, unless a delay is caused solely by acts of the Owner, constituting active interference with the Contractor's performance of the Work, and only to the extent such acts continue after the Contractor furnishes the Owner with written notice of such interference. In no event shall the Contractor be entitled to any compensation or recovery of any damage in connection with any delay, including without limitation, consequential damages, lost opportunity cost, impact damages or other similar remuneration. The Owner's exercise of any of its rights or remedies under the Contract Documents (including without limitation, ordering changes in the work, or directing suspension, rescheduling or correction of the work), regardless of the extent or frequency of the Owner's exercise of such rights or remedies, shall not be construed as active interference with the Contractor's performance of the Work.

1. In addition to the foregoing and to all other express provisions in the Contract Documents, the following are areas of delay which could occur and are clearly contemplated by the parties:

- a. delay caused by Change Order;
- b. delays caused by the bankruptcy or insolvency of Contractors or one or more Subcontractors;
- c. delays caused by changes necessitated by changes in Laws or Regulations;
- d. unavailability or shortage of building materials;
- e. job Site theft;
- f. weather conditions
- g. failure of Contractor or one or more Subcontractors to perform;
- h. vandalism or natural disaster requiring reconstruction.

ARTICLE 13 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 *Notice of Defects*

A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. All defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspecting, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's Site safety procedures and programs so that they may comply therewith as applicable.

13.03 *Tests and Inspections*

A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in said Paragraph 13.04.C; and

3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, it must, if requested by Engineer, be uncovered for observation.

F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense.

13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.

B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.

C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.

D. If, the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or Contractor fails to comply with any of the terms and conditions contained within the Contract Documents, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, (i) this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them; and (ii) these rights are in addition to and not in limitation of Owner's other rights allowed by Laws or Regulations or the Contract Documents.

13.06 *Correction or Removal of Defective Work*

A. Promptly after receipt of notice, Contractor shall correct all defective Work, whether or not

fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or
2. correct such defective Work; or
3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

C. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be

extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

D. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose. Nor shall this Paragraph 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 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 maybe 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.

13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Owner's issuance of final payment) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to issuance of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the

Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed and installed in accordance with the Contract Documents.

14.02 *Progress Payments*

A. Applications for Payments

1. At least 20 days before the date established in the Contract for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment completed and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is

required by the Engineer. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's obligations to those furnishing labor, materials, equipment or other services to the Project associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Contract.

B. Review of Applications

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations on the Site of the executed Work as an experienced and qualified design professional and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

- a. the Work has progressed to the point indicated;
- b. the quality of the Work is in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and to any other qualifications stated in the recommendation); and
- c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

- a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or
- b. that there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

- a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
- b. the Contract Price has been reduced by Change Orders;
- c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
- d. Engineer has knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. Payment Becomes Due

1. Sixty days after presentation of the Application for Payment to owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due and when due will be paid by Owner to Contractor.

D. Reduction in Payment

1. Owner may refuse to make payment of the full amount recommended by Engineer because:

- a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work or Owner has reasonable evidence indicating the probable filing of such claims;

b. Liens have been filed or threatened in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

c. there are other items entitling Owner to a set-off against the amount recommended;

d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A; or

e. Contractor is in material breach of the Contract.

2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor corrects to Owner's satisfaction the reasons for such action.

3. In the event Contractor is not in compliance with the Contract Documents or in the event Owner is entitled to indemnification pursuant to the terms of this Contract, Owner shall have the immediate right to offset any such indemnity claim or other amounts against the amounts then owing or to become owing by Owner to Contractor. The rights of Owner hereunder shall be in addition and not in limitation of any other rights which it may have. Items entitling Owner to retain set-offs from the amounts recommended, include but are not limited to:

a. Owner compensation to Engineer at an estimated average rate of \$120 per each extra personnel hour for labor plus expenses, if applicable, because of the following Contractor-caused events:

1. Submittal review in excess of two reviews by Engineer for substantially the same Submittal, in accordance with Paragraph 6.17.E;

2. evaluation of proposed substitutes and in making changes to Contract Documents occasioned thereby, in accordance with Paragraph 6.05.

3. Overtime worked by Contractor necessitating Engineer, Related Entities, Resident Project Representative or Resident Project Representative's Site staff, if any, to work extraordinary overtime in accordance with Paragraph 6.02.C. For purposes of administering this requirement, additional extraordinary overtime costs are defined as those hours in excess of 10 percent overtime in a given month.

b. Consequential, indirect and special damages suffered by Owner as a result of Contractor's acts or omissions; or

c. any and all other costs, expenses, attorneys' fees, consulting fees or other damages incurred by Owner as a result of Contractor's non-compliance with the Contract Documents.

E. Subcontractor Payments:

1. In accordance with Conn. Gen. Stat. § 49-41a, Contractor within 30 days after payment to Contractor by Owner, shall pay any amounts due any Subcontractor, whether for labor performed or materials furnished, when the labor or materials have been included in a requisition submitted by Contractor and paid by Owner. Contractor shall also include in each of its subcontracts a provision requiring each Subcontractor to pay any amounts due any of its subcontractors, whether for labor performed or materials furnished, within 30 days after the Subcontractor receives a payment from Contractor which encompasses labor or materials furnished by such Subcontractor.

14.03 Contractor's Warranty of Title

A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any

Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.

B. Promptly after Contractor's notification, , Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will within 14 days after submission of the tentative certificate to Owner notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will within said 14 days execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer and Owner will identify for Contractor in writing all of Contractor's remaining responsibilities pending final payment with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees.

E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to complete or correct items on the tentative list.

14.05 *Partial Utilization*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately

functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions.

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor will certify to Owner and Engineer that such part of the Work is substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons herefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and of the Contractor's remaining responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. Application for Payment

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents (as provided in

Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.7;

b. consent of the surety, if any, to final payment;

c. a list of all Claims against Owner that Contractor believes are unsettled; and

d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In addition to the releases or waivers of Liens specified in Paragraph 14.07.A.2 Owner may require Contractor to furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner or Owner's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. Engineer's Review of Application and Acceptance

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. Payment Becomes Due

1. Sixty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to consequential damages suffered by Owner, will become due and , will be paid by Owner to Contractor.

14.08 Waiver of Claims

A. The acceptance of final payment by Contractor will constitute a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

15.01 Owner May Suspend Work

At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an extension of the Contract Times directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 Owner May Terminate for Cause

A. The occurrence of any one or more of the following events will justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);

2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;

3. Contractor's disregard of the authority of Engineer; or

4. Contractor's breach or violation of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor seven days written notice of its intent to terminate the services of Contractor:

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion),

2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and

3. complete the Work as Owner may deem expedient.

C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. When exercising any rights or remedies under this Paragraph Owner shall not be required to obtain the lowest price for the Work performed.

D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 10 days of receipt of said notice.

E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

15.03 *Owner May Terminate For Convenience*

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus

fair and reasonable sums for overhead and profit on such expenses; and

3. all reasonable claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others.

B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor or breach or non-compliance of any term or provision of the Contract Documents by Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 60 days after it is submitted, or (iii) Owner fails for 60 days to pay Contractor any sum finally determined to be due, then Contractor may, upon fourteen days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.02.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 60 days after it is submitted, or Owner has failed for 60 days to pay Contractor any sum finally determined to be due, Contractor may, fourteen days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Times for delays directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 - DISPUTE RESOLUTION

16.01 *Methods and Procedures*

A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Contract. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely

submission of the request shall stay the effect of Paragraph 10.05.E.

B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

C. Notwithstanding any applicable statute of limitations, if Contractor gives notice under Paragraph 16.01.C.1, Contractor shall commence an action on the Claim within one year of giving such notice. Failure to do so shall result in Contractor's Claim being time-barred and Engineer's action or denial shall become final and binding.

ARTICLE 17 - MISCELLANEOUS

17.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period.

17.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents,

will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

17.06 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

17.07 *Recourse under This Contract*

All covenants, stipulations, promises, agreements and obligations of Owner contained in this Contract shall be deemed to be the covenants, stipulations, promises, agreements and obligations of Owner, and not of any commissioner, director, officer, official, employee or agent (including counsel) of Owner in such person's individual capacity, and no recourse shall be had on any reason whatsoever hereunder against any commissioner, director, officer, official, employee or agent (including counsel) of Owner or any natural person executing this Contract on behalf of Owner.

17.08 *Further Assurances*

Each party agrees to execute and deliver any instruments and to perform any acts as may be reasonably requested by the other party in order to give full effect to this Contract.

17.09 *Jurisdiction and Venue; Waiver of Trial by Jury*

Any action or proceeding seeking to enforce any provision of, or based upon any right arising out of, this Contract may be asserted against any of the parties in the Connecticut Superior Court for the Judicial District of New Haven at New Haven, and each of the parties irrevocably consents to venue in and the exclusive personal and subject matter jurisdiction of such court in any such action or proceeding and waives any objection to jurisdiction laid therein. Notwithstanding the foregoing, if there is diversity of jurisdiction between the parties each of the parties irrevocably consents to the venue and the exclusive subject matter and personal jurisdiction of the United States District Court for the District of Connecticut. Process in any action or proceeding referred to in this paragraph may be served on any party anywhere in the world.

CONTRACTOR KNOWINGLY, VOLUNTARILY AND INTENTIONALLY WITHOUT DURESS AND ONLY AFTER CONSIDERATION WITH ITS ATTORNEYS OF THE RAMIFICATIONS, WAIVES ANY RIGHT IT MAY HAVE TO A TRIAL BY JURY IN RESPECT OF ANY LITIGATION BASED HEREON OR ARISING OUT OF, UNDER OR IN CONNECTION WITH THIS

CONTRACT, OR ANY COURSE OF CONDUCT, COURSE OF DEALINGS, STATEMENTS (WHETHER ORAL OR WRITTEN), OR ACTIONS OF EITHER PARTY IN CONNECTION HEREWITH.

17.10 *Confidentiality*

Contractor shall maintain in confidence and not disclose to any person or entity or use to the detriment of Owner or Engineer any written, oral or other information obtained in confidence and designated in writing as confidential, unless disclosure of such information is required by Laws or Regulations.

17.11 *Actions of Owner in its Governmental Capacity*

Nothing in this Contract shall be interpreted as limiting the rights and obligations of the Owner in its governmental or regulatory capacity.

17.12 *Successors and Assigns:*

Owner and Contractor each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

17.13. *Severability:*

Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree the Contract Documents shall be reformed to replace such stricken

provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

17.14. *Assignment of Contract:*

No assignment by a party hereto of any rights under or interests in the Contract shall be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment shall release or discharge the assignor from any duty or responsibility under the Contract Documents.

17.15 *Enforcement:*

No delay or omission by a party to this Contract in exercising any of its rights under this Contract shall operate as a waiver of that or any other right. A waiver of consent given by a party to the Contract on any one occasion is effective only in that instance and will not be construed as a bar or waiver of any right on any other occasion.

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SECTION 00730

SPECIAL CONDITIONS

These Special Conditions supplement the Standard General Conditions of the Construction Contract and other provisions of the Contract Documents as indicated below. All provisions that are not so supplemented remain in full force and effect.

The terms used in these Special Conditions have the meanings stated in the Standard General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

1.0 Permits

- A. Contractor shall obtain and pay for the building permit and all other construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Contract. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.
- B. Authorities having jurisdiction include but are not limited to City of New Haven, and the State of Connecticut. If requirements of authority having jurisdiction modify or are in conflict with the information in these Contract Documents, the requirements of the authority having jurisdiction shall prevail.

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SECTION 00813

PREVAILING WAGE RATES

Prevailing Wage Rates for this project will be included by Addendum prior to Bid Opening.

The following is a list of the Connecticut Department of Labor Prevailing Wage Bid Package documents that will be included by Addendum prior to Bid Opening.

- Prevailing Wage Law Poster
- Section 31-53b: Construction Safety and Health Course
- Notice For All Mason Contractors
- CT General Statute 31-55a
- Contracting Agency Certification Form
- Contractor's Wage Certification Form
- Payroll Certification – Public Works Projects
- Occupational Classification Bulletin
- Footnotes

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INSERT WAGE RATES HERE (TO BE INCLUDED BY ADDENDUM)

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SECTION 01001

OVERALL GENERAL REQUIREMENTS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. PRICE AND PAYMENT PROCEDURES

Schedule of Values
Payment Procedures
Change Procedures
Measurement and Payment Requirements
Correlation of Submittals

B. ADMINISTRATIVE REQUIREMENTS

Project Management and Coordination; Meetings
Documentation of Progress
Submittal Procedures
Closeout Procedures

C. QUALITY REQUIREMENTS

Reference Standards and Regulatory Requirements
Qualifications

D. SOURCE QUALITY CONTROL

General
Independent Testing Agency Certification
Factory Testing

E. PRODUCT REQUIREMENTS

General
Transportation and Handling
Storage and Protection

F. TEMPORARY CONSTRUCTION FACILITIES

Barriers
Protection of Work
Security
Safety Facilities
Access Roads
Parking

Progress Cleaning and Waste Removal
Project Identification

G. TEMPORARY UTILITIES

H. TEMPORARY CONTROLS

Noise Control
Pollution Control

I. REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS

J. OVERALL EXECUTION REQUIREMENTS

Coordination
Existing Conditions
Field Engineering
Record Documents
Cutting and Patching
Quality Assurance and Control of Installation
Manufacturers' Field Services
Independent Testing

K. STARTUP, TESTING, AND COMMISSIONING

Spare Parts
Consumables
Checkout and Starting Systems
Starting, Adjusting, and Balancing
Performance Testing
Demonstration and Training

1.02 PRICE AND PAYMENT PROCEDURES

A. Schedule of Values

1. Submit preliminary and final Schedule of Values in accordance with Article 2 of the Standard General and Special Conditions and Additional Special Conditions.
2. Provide sufficient detail to allow for determination of the value of the Work at any degree of completion.

B. Payment Procedures

1. Reference Article 14 of Standard General and Special Conditions and Additional Special Conditions. Submit 6 copies of each Application for

Payment using the form included in the Project Forms section. Utilize latest approved Schedule of Values for listing items in Application for Payment.

2. Payment Period: at intervals stipulated in the Agreement.
3. Submit an updated Progress Schedule with each Application for Payment.

C. Change Procedures

1. Reference Articles 10 and 12 of Standard General and Special Conditions and Additional Special Conditions and forms included in the Project Forms sections.

a. Field Order: issued by Engineer or Owner to advise of minor changes in the Work not involving an adjustment to Contract Price or Contract Time as authorized by Paragraph 9.04 of the Standard General and Special Conditions and Additional Special Conditions.

b. Change Request: issued by Engineer, Owner or Contractor to amend or supplement the Contract Documents as authorized by Standard General and Special Conditions and Additional Special Conditions, Paragraph 3.04. Initiate requests for substitute items per Paragraph 6.05 of the Standard General and Special Conditions and Additional Special Conditions as a Change Request.

- 1) Engineer or Owner to include a detailed description of a proposed change with supplementary or revised Drawings and Specifications, including a change in Contract Times related to the change (with a stipulation for any overtime work required) and the period of time during which the requested price will be considered valid. Prepare and submit an estimate within 15 days.

Contractor to describe the proposed change and its full effect on the Work. Describe the reason for the change and the effect on the Contract Price and Contract Time with full documentation (and a statement describing the effect on Work by separate or other contractors). Document any requested substitutions in accordance with the Standard General and Special Conditions and Additional Special Conditions.

c. Work Change Directive: issued by Engineer or Owner, signed by Engineer or Owner and instructing Contractor to proceed with a change in the Work. Work authorized in a Work Change Directive will be included in a subsequent Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Price or Contract Time. Promptly execute the change.

- d. Change Order: issued by Engineer or Owner in accordance with the Standard General and Special Conditions and Additional Special Conditions.
- 1) *Stipulated Price Change Order*: based on Contractor's maximum price quotation or Contractor's request for a Change Order as approved by Engineer or Owner.
 - 2) *Unit Price Change Order*: for pre-determined unit prices and quantities and executed on a fixed unit price basis. Execute Work under a Work Change Directive for unit costs or quantities of work not pre-determined. Changes in Contract Price and Contract Time to be computed as specified for Time and Material Change Order.
 - 3) *Time and Material Change Order*: based on itemized account and supporting data after completion of change within time limits indicated in the Standard General and Special Conditions and Additional Special Conditions. Engineer or Owner and Contractor to determine the change allowable in Contract Price and Contract Time as provided in the Standard General and Special Conditions and Additional Special Conditions. Maintain detailed records of work done on this basis, provide full information required for evaluation of proposed changes, and substantiate costs for changes in the Work.
- e. Substitutes and "Or Equals": Request substitute items as a Change Request in accordance with Paragraph 3 above, with complete data substantiating compliance of proposed substitution with Contract Documents.
- 1) Substitute items will be processed in accordance with Article 1.03 Paragraph C below and Paragraph 6.05 of the Standard General and Special Conditions and Additional Special Conditions.
 - 2) Substitute items will not be considered when indicated or implied on Shop Drawing or material and equipment data submittals without separate written request, or when acceptance will require revision to the Contract Documents.

D. Measurement and Payment Requirements

1. Unit Prices

- a. Take measurements in presence of Engineer and compute quantities. Engineer or Owner to verify and also take measurements and

quantities. Notify Engineer or Owner in advance when measurements must be taken.

- b. Unit quantities and measurements indicated in the Bid Form and Bid Form Supplements, if any, are for contract purposes only. Actual quantities and measurements supplied or placed in the Work determine amount of payment.

2. Payment includes full compensation for required labor, material and equipment, tools, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; and overhead and profit.

E. Correlation of Submittals

1. Promptly revise Schedule of Values (if any) and Applications for Payment to record each authorized Change Order as a separate line item and adjust the Contract Price.
2. Promptly revise Progress Schedule to reflect any change in Contract Times and revise sub-schedules to adjust time for other items of the Work affected by the change.
3. Promptly enter changes in Project Record Documents.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Project Management and Coordination; Meetings

1. Contact information for Owner and other entities related to the Project and special coordination requirements and contacts during prosecution of the Work are included in the **Specific Project Requirements and Procedures**.
2. Inform Owner and Engineer of the address for sending official correspondence and the address and telephone number of Contractor's representative who will be project manager and Site superintendent for the Contract and identify responsible person available outside of normal working hours for emergency repairs and maintenance of safety devices.
3. During periods of construction and testing keep Owner and Engineer informed in writing with name, address, and telephone number of Contractor's representative who will be responsible and available outside of normal working hours for emergency repairs and the maintenance of safety devices.
4. Identify correspondence, drawings, data and materials, packing slips or other items associated with this Contract as specified in the **Specific Project Requirements and Procedures**.

5. Coordinate scheduling, submittals, and Work of the various Specifications to effectuate an efficient and orderly sequence for installing interdependent construction elements, with provisions for accommodating items installed later.
6. Preconstruction Conference and Site Mobilization Meeting
 - a. Owner to schedule an initial preconstruction conference in accordance with the Standard General and Special Conditions and Additional Special Conditions Paragraph 2.06.
 - b. Attendance required by Owner, Contractor, Engineer, Contractor's Superintendent, Project Manager, Suppliers and Subcontractors.
 - c. Agenda
 - Distribute Contract Documents
 - Discuss design concepts
 - Discuss preliminary Progress Schedule, Schedule of Submittals, Schedule of Values and preliminary cash flow projections.
 - Designate personnel representing each party; communication procedures
 - Procedures and processing of submittals, substitutions, applications for payments, Change Orders and Contract closeout procedures
 - Scheduling
 - Use of premises by Owner and Contractor
 - Owner's requirements and partial occupancy
 - Construction facilities and controls provided by Owner
 - Temporary utilities provided by Owner and Contractor
 - Survey and Site Layout
 - Security and housekeeping procedures
 - Schedules
 - Procedures for testing
 - Procedures for maintaining record documents
 - Requirements for start-up
 - Inspection and acceptance of equipment put into service during construction period
 - Access, laydown and coordination with others
 - d. Engineer will record minutes and distribute draft copies within 2 days after meeting to Owner and Contractor for review, then revise as required and distribute within 5 days thereafter to meeting participants, with copies to Owner and Contractor, and those affected by decisions made.
7. Progress Meetings

- a. Owner to schedule progress meetings beginning no later than 60 days after the Initial Conference and continue thereafter on a weekly, biweekly or monthly basis throughout progress of the Work as specified in the **Specific Project Requirements and Procedures**.
 - b. Attendance required by Contractor, Contractor's Superintendent, major Subcontractors and Suppliers, Owner and Engineer as appropriate to agenda topics for each meeting.
 - c. Agenda:
 - Review minutes of previous meetings
 - Unresolved Issues
 - Review Work progress
 - Observations, problems, and decisions
 - Identification of problems which impede planned progress
 - Review of Schedule of Submittals and status of submittals
 - Review of off-Site fabrication and delivery schedules
 - Maintenance of progress schedule
 - Corrective measures to regain projected schedules
 - Planned progress during succeeding Work period
 - Coordination of projected progress
 - Maintenance of quality and Work standards
 - Effect of proposed changes on Progress Schedule and coordination
 - Other business relating to Work
 - d. Engineer will record minutes and distribute draft copies within 2 days after meeting to Owner and Contractor for review, then revise as required and distribute within 5 days thereafter to meeting participants, with copies to Owner and Contractor, and those affected by decisions made.
8. Pre-installation Conference and Coordination Meetings
- a. When required, convene a pre-installation conference at Site before commencing certain Work that requires coordination or has special requirements or approvals or convene coordination meetings as may be generally required.
 - b. Attendance required by parties directly affecting, or affected by, Work of the specific Specification section. Notify Owner and Engineer 5 days in advance of pre-installation conference. Party requesting general coordination meeting to notify other party.
 - c. Review conditions, preparation and procedures, and coordination with related Work.

B. Documentation of Progress

1. Submit preliminary and final Progress Schedules as specified in Article 2 of the Standard General and Special Conditions and Additional Special Conditions or as established in Notice to Proceed.
2. Submit revised Progress Schedule on monthly basis and with each Application for Payment, identifying changes since previous version. Coordinate content with Schedule of Values, if any.
 - a. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
 - b. Indicate estimated percentage of completion for each item of Work at each submission.
 - c. Indicate dates for fabrication, factory testing, delivery, shipping and field testing, and material and equipment delivery dates, including those furnished by Owner. Coordinate with Schedule of Submittals.
3. Provide documentation of pre-construction conditions and construction progress using either or both of the following methods as specified in the **Specific Project Requirements and Procedures**.
 - a. Construction Photographs
 - 1) Prior to starting construction, submit photographs of existing Site conditions to Owner to establish a record of pre-construction conditions. Ensure existing conditions of roadway surfaces, curbing, berms, sidewalks, driveways, property bounds, landscaped areas, abutters property and any other items that might be affected by the Work are clearly recorded.
 - 2) Format: electronic in .PDF or JPG format and with maximum 4 prints, 8-1/2 by 11 sheets.
 - 3) Identify photographs with date, time, orientation and Project identification.
 - 4) Submit photographs during progress of Work monthly with Payment Application.
 - b. Digital Video Recording
 - 1) Prior to the start of construction, video record, in color, all areas of the Project Site in the presence of the Engineer to establish a record of pre-construction conditions. Ensure existing conditions of roadway surfaces, curbing, berms, sidewalks, driveways, property bounds, landscaped areas,

abutters' property and any other items that might be affected by the Work are clearly recorded.

- 2) Submit a copy of the first completed video recording to the Engineer for review of visual and audio quality. Once approved, submit 2 copies of video recordings. Re-record any recording furnished which, in the opinion of the Engineer, are poor quality or incomplete at no additional cost to Owner.

4. Reports

- a. Submit weekly Safety Reports signed by the responsible on-Site person.
- b. Submit other reports as specified in **Specific Project Requirements and Procedures**, if any.

C. Submittal Procedures

1. Schedule submittals to expedite the Project and coordinate with schedules required by Article 1.03 Paragraph B above. Deliver each submittal in the quantity indicated to Engineer (with copy to Owner where required) at the addresses specified in the **Specific Project Requirements and Procedures**. Coordinate submission of related items.
2. Present submittals in a clear and thorough manner and use sheet size of not less than 8 1/2 by 11 inches and not more than 24 by 36 inches. Provide space for Contractor, Engineer, and Owner's review stamps.
3. Revise and resubmit documents as required. Identify all changes made since previous submittal. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions. Submittals not requested on the submittal schedule may not be recognized or processed.
4. Submit preliminary and final schedule of submittals as specified in Article 2 of the Standard General and Special Conditions and Additional Special Conditions or as established in Notice to Proceed. Include all submittals specified in the Specifications and the Standard General and Special Conditions and Additional Special Conditions.
 - a. Include description of each Submittal, date by which each Submittal will be delivered to Engineer and Owner date by which each submittal must be approved to maintain project schedule, and relevant section reference.
 - b. Allow 15-30 days for Engineer review of submittals and possible resubmittal from receipt of submittal/resubmittal.

5. Shop Drawings and Samples: Submit in accordance with Paragraph 6.17 of the Standard General and Special Conditions and Additional Special Conditions and coordinate with the schedule of submittals required in Paragraph 4 above. Submission of any Shop Drawing or Sample bearing Contractor's and Engineer's approval shall constitute a representation to Owner that the requirements of Paragraph 6.17 of the Standard General and Special Conditions and Additional Special Conditions have been fulfilled.
- a. Complete the submittal transmittal form included as Attachment A to this Section as is indicated, numbering each submittal consecutively. Assign resubmittals the same transmittal number as the original with a suffix of a sequential letter to indicate the resubmittal (e.g. the first resubmittal of submittal 25 would be number 25A.) Include only those documents previously issued under original transmittal number in resubmittals. Do not combine new submittals with resubmittals.
 - b. Attach a transmittal form to each group of Shop Drawings, manufacturer's literature, equipment data and Samples submitted. Use a sufficient number of transmittal forms so that: items on a single transmittal form pertain to the same equipment item, specification section, or element of Work; items on a single transmittal form are either original submittals or the same number resubmittal; and each Sample is listed on a separate transmittal form.
 - c. Submittals which do not have a fully completed transmittal form will be returned along with unreviewed attachments. Returned submittals, even though incomplete, will be counted as a submittal in accordance with the Special Conditions.
 - d. Manufacturers' Installation Instructions and Certificates: Submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing. Indicate special procedures, perimeter conditions requiring special attention and special environmental criteria required for application or installation. Submit manufacturers' certificates for recent or previous test results on material or equipment, but they must be acceptable to Engineer and Owner. Indicate material or equipment conforms to or exceeds specified requirements and provide supporting reference date, affidavits, and certifications as appropriate.
 - e. Submit test results, data, and reports and certifications to Engineer based on tests performed. Submit test reports and certifications for independent testing services specified.
 - f. Submit hard copies and/or or electronic PDF files to the Engineer for review as specified in the **Specific Project Requirements and Procedures**.

- g. Identify variations from Contract Documents and material and equipment or system limitations which may be detrimental to successful performance of the completed Work and identify reasons therefor in accordance with Paragraph 6.17.C.3 of the Standard General and Special Conditions and Additional Special Conditions. Clearly identify requests for "Or-Equal" items and submit per Paragraph 6.05.A of Standard General and Special Conditions and Additional Special Conditions and Article 1.02 Paragraph C.6 above. Substitute items will not be considered when indicated or implied on Shop Drawing or material and equipment data submittals without separate written request, or when acceptance will require revision to the Contract Documents.
 - h. Engineer to complete review in accordance with Paragraph 6.17.D. of the Standard General and Special Conditions and Additional Special Conditions.
 - i. Per the Standard General and Special Conditions, Contractor shall reimburse Owner for Engineer's time beyond one re-submittal.
6. Record Documents and Closeout Submittals submit in accordance with Paragraph 6.12 of the Standard General and Special Conditions and Additional Special Conditions and Article 1.03 Paragraph D below.
- a. *As-Builts for Material and Equipment*: prints and electronic files in ".DXF", ".DWG" and/or "PDF" format as specified in the **Specific Project Requirements and Procedures**. Indicate "As-Supplied" in revision block and sign. Show all changes and revisions to Final Completion per Article 3.05 Paragraph D.
 - b. *Conformed to Construction Record Drawings*: full size prints and electronic files in ".DXF", ".DWG" and/or "PDF" format specified in the **Specific Project Requirements and Procedures**. Indicate "Conformed by Contractor to Construction Records" in revision block and sign. Show all changes and revisions to Final Completion per Article 3.05 Paragraph D.
 - c. *Warranties and Guarantees*: Submit duplicate notarized copies of warranty documents which are executed and transferable from Subcontractors, Suppliers, and manufacturers. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of Warranty Period. Assemble in three ring binders with durable plastic cover with a table of contents.
 - d. Operation and Maintenance Data
 - 1) Submit data in ring binders with durable plastic covers with 8 1/2 by 11 inch text pages. Cover: title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of Project, and subject matter of binder when multiple binders are required.

- 2) Subdivide binder contents with permanent page dividers, logically organized as described below with laminated plastic tabs and clearly print the contents. Prepare a Table of Contents for each volume, with material, equipment, or system description identified, in three parts as follows:

Part 1: Directory, listing names, addresses, and telephone numbers of Contractor, Subcontractors, and major equipment Suppliers, and service representative.

Part 2: Operation and maintenance instructions arranged by system and subdivided by Specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and Suppliers. Identify the following:

- Significant design criteria
- List of equipment with As-Builts certified "As-Supplied"
- Parts list for each component
- Operating instructions
- Inspection, maintenance and adjustment instructions for equipment and systems
- Lubrication and maintenance schedules
- Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents
- Troubleshooting guides
- Schematic diagrams

Part 3: Material Safety Data Sheets

Part 4: Other Project documents and certificates, including the following:

- Certificates
- Photocopies of warranties

- 3) Submit one draft copy of completed volumes 15 days prior to final inspection. Include 2 copies of completed manuals with major equipment when equipment is shipped. Draft copies will be reviewed and returned after final inspection, with Engineer's comments. Revise content of all sets as required prior to final submission. Submit 6 copies of revised final volumes, with electronic files in ".PDF" format on CD, within 10 days after final inspection.

D. Closeout Procedures

1. Substantial Completion shall have been achieved when the following has been completed and the requirements of Paragraph 14.04 of the Standard General and Special Conditions and Additional Special Conditions have been met.
 - a. Work is complete, systems are successfully operating, and final testing has been successfully completed.
 - b. A full inventory of the spare parts and special tools purchased by the Owner are replenished and in the custody of the Owner.
 - c. An inspection of the Work has been completed by the Engineer and the Owner.
 - d. An updated Punch List is provided.
 - e. A Certificate of Substantial Completion has been provided in accordance with Paragraph 14.04.C of the Standard General and Special Conditions and Additional Special Conditions.
2. The Contractor shall have sole care, custody, and control of the Work until achievement of Substantial Completion. During the period between Substantial Completion and the date for Final Completion, Contractor shall be given access to correct items on the Punch List and achieve Final Completion.
3. The date of achieving Substantial Completion is the date set forth in the Certificate of Substantial Completion that is accepted and signed by the Owner.
4. Final Completion shall have been achieved when the Work is complete, when the following is complete, and the requirements of Paragraphs 14.06 and 14.07 of the Standard General and Special Conditions and Additional Special Conditions have been met.
 - a. Substantial Completion has been achieved and liquidated damages for failure to meet Substantial Completion Date have been paid.
 - b. All Work including Punch List Items has been completed.
 - c. Final cleaning has been conducted and Contractor equipment and supplies including waste materials have been removed from the Site and legally disposed of.
 - d. A full set of record documents have been submitted as specified in Article 1.03 Paragraph C.6 above.
 - e. Inspections required by Laws and Regulations are complete. Certificates and permits to occupy and operate have been issued if required.
 - f. Spare parts, maintenance and extra materials have been delivered in quantities specified to Project Site and stored as directed.

- g. A request for final inspection in accordance with Paragraph 14.06 of the Standard General and Special Conditions and Additional Special Conditions has been submitted to the Engineer and the inspection has been completed and the results accepted by the Owner.
 - h. A Certificate of Completion has been provided in accordance with Paragraph 14.07.B of the Standard General and Special Conditions and Additional Special Conditions.
 - i. A Final Application for Payment has been submitted to the Engineer identifying total adjusted Contract Price, previous payments, and balance due along with required documentation in accordance with Paragraph 14.07.A. of the Standard General and Special Conditions and Additional Special Conditions.
5. Owner will make Final payment and acceptance in accordance with Paragraphs 14.07 C and 14.08 of the Standard General and Special Conditions and Additional Special Conditions.

1.04 QUALITY REQUIREMENTS

A. Reference Standards and Regulatory Requirements

- 1. Reference to standards, specifications, manuals or codes of any technical society, organization or association, or Laws or Regulations of any governmental authority are used in accordance with Paragraph 3.02 of the General Conditions.
- 2. Acronyms and abbreviations used are defined in the applicable versions of the Encyclopedia of Associations published by Gale (part of Cengage Learning) generally available in large libraries and on the internet.

B. Qualifications

- 1. Meet or provide capability to meet the criteria specified in connection with the Work of the Contract Documents.
- 2. As a minimum, Contractor shall:
 - a. have been regularly and actively engaged in similar Work as described in the Contract Documents, operating under the same business name and business organization structure, for the last 5 years on at least 5 projects;
 - b. have successfully completed at least 3 projects involving construction of similar facilities in the same state as the Project covered by the Contract Documents;

- c. have a full-time project manager in responsible charge of the Work with at least 10 years' experience as project manager on comparable projects;
- d. have a 24 hour, 7 days per week emergency response telephone or cell phone number that is staffed by a person (not a passive answering machine) or will provide that a phone call will be returned within one hour; and
- e. carry at least the insurance coverage and amounts required in Article 5 of the Standard General and Special Conditions and Additional Special Conditions.

PART 2 – PRODUCTS

2.01 SOURCE QUALITY CONTROL

A. General

- 1. Subject material and equipment furnished under these Contract Documents to a complete factory testing program as specified.
- 2. Shop Drawings and submittals reviewed by Engineer before initiating testing program.
- 3. Perform checks and tests in accordance with manufacturer's recommendations and referenced standards.
- 4. Evaluate test results and advise Owner immediately of any discrepancy between test results and test limits or the failure of any device or system under test. Include test limits for acceptability applicable to each test on the certified test records.
- 5. Record test information, including the evaluation of testing results, on forms approved by Owner and Engineer.

B. Independent Testing Agency Certification

- 1. If specified, furnish certificates from an independent testing agency.
- 2. Independent testing agency to certify that material and equipment components have been examined and tested and are in conformance with the requirements specified in the Contract Documents.
- 3. Take Samples in accordance with the requirements specified in the Contract Documents, as selected by Owner or independent testing agency. Furnish and ship at no additional cost to Owner.

C. Factory Testing

1. Provide 14 days prior written notice of factory inspections and tests to Owner and Engineer.
2. If failure to give proper written notice results in material and equipment being assembled or covered before a factory inspection or test, make material and equipment ready for inspection or test and reassemble or recover at no additional cost to Owner.
3. Owner may inspect any portion of material and equipment furnished at any reasonable time during manufacture and may witness testing of any portion of material and equipment wherever located. Owner and Engineer to witness tests only.
4. Furnish, set up and operate test equipment and facilities.
5. If facilities for conducting required tests are unavailable to the manufacturer, conduct tests elsewhere or have them performed by an independent agency approved by Owner.
6. Protect material and equipment after testing and checking to provide that subsequent testing of other equipment or systems does not disturb, damage or otherwise interfere with functional capability of material and equipment.
7. Assume responsibility for protection of material and equipment and safety of all personnel during factory testing program.
8. Grounds for rejection: failure to withstand tests; failure to meet ratings; failure to meet applicable standards.
9. In the event of failure
 - a. Submit revisions of documents requiring approval for changes required for rectification.
 - b. Obtain Owner's and Engineer's approval before making such changes.
 - c. Provide written details of any changes to be made not requiring approval.
 - d. Notify Owner and Engineer in writing before retesting.
 - e. Furnish new material and equipment which meets requirements of the specified in the Contract Documents if rejected material and equipment cannot be rectified to satisfaction of Owner and Engineer.
 - f. Retest after rectification in presence of Owner or Engineer.
10. Assume responsibility for all costs, including, but not limited to: loss or damage to materials and equipment resulting from testing; retesting;

rectification; new material and equipment to replace damaged or non-rectifiable material and equipment; removal, furnishing, transportation, unloading, and installation of replacement material and equipment; and witness of testing by Owner and Engineer including travel, lodging, meals, and payroll.

11. Submit certified test reports which define tests, list results, and are signed by Contractor's representative, and copies of raw data collected during tests in accordance with Article 1.03 Paragraph C above. Submission of certified test reports does not relieve Contractor of responsibility for material and equipment meeting requirements of the Contract Documents after installation.

2.02 PRODUCT REQUIREMENTS

A. General

1. Products include new material and equipment incorporated into the Work and may also include existing material and equipment required for reuse. This does not include machinery and equipment used for preparation, fabrication, conveying, installation and erection of the Work.
2. Do not use materials and equipment removed from existing Work Site, except as specifically permitted.
3. Provide complete with accessories, trim, finished, safety guards, and other devices and details need for a complete installation and for the intended use or effect.
4. Provide standard products which have been produced and used successfully on other similar projects for similar applications. Provide products which are likely to be available to Owner in the future for items required for maintenance and repair or replacement Work.
5. Furnish interchangeable components of the same manufacturer, for similar components.

B. Transportation and Handling

1. Transport and handle material and equipment in accordance with manufacturer's instructions.
2. Notify Engineer and Owner in writing upon acceptance of a shipment.
3. Promptly inspect shipments to assure that material and equipment comply with requirements, quantities are correct, and material and equipment are undamaged.

4. Furnish equipment and personnel to handle material and equipment by methods to prevent soiling, disfigurement, or damage.
5. Uncrate equipment and dispose of packing material properly.

C. Storage and Protection

1. Store and protect material and equipment in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive material and equipment in weather tight, climate controlled enclosures.
2. For exterior storage of fabricated material and equipment, place on sloped supports, above ground.
3. Equipment delivered to and/or stored at an off-site location will not be paid for by the Owner. All equipment deliveries to be incorporated into progress estimation must be stored on-site. Progress payments for delivered equipment shall be calculated in accordance with the General Conditions, not to exceed 80% of the value of the equipment.
4. Cover material and equipment subject to deterioration with impervious sheet covering. Furnish ventilation to avoid condensation or potential degradation of material and equipment.
5. Store loose granular materials on solid flat surfaces in a well-drained area. Avoid mixing with foreign matter.
6. Furnish equipment and personnel to store material and equipment by methods to prevent soiling, disfigurement, or damage.
7. Arrange storage of material and equipment to permit access for inspection. Periodically inspect to assure material and equipment are undamaged and are maintained in acceptable conditions.
8. After receipt of material and equipment, assume responsibility for loss and damage including but not limited to theft, breakage, corrosion, weather damage, and distortion. Ensuring on-site security of material and equipment shall be a Contractor responsibility.

PART 3 – EXECUTION

3.01 TEMPORARY CONSTRUCTION FACILITIES

A. Barriers

1. Comply with the requirements of Paragraph 6.11 of the Standard General and Special Conditions and Additional Special Conditions.

2. Furnish barriers to prevent unauthorized entry to and clear delineation of construction areas, to allow for Owner's use of Site, and to protect existing facilities and adjacent properties from damage from construction operations as recommended by OSHA and as otherwise required for the protection of life and property during construction.
3. Construct barricades and other protective facilities required at the end of each Collector channel to prevent water from flooding the work being performed in accordance with all local and state regulations. Furnish and install signs, lights, reflectors, and such protection facilities as may be required.
4. Furnish barricades required by governing authorities for public rights of way.
5. Provide protection for plant life designated to remain. Replace damaged plant life.
6. Protect non owned vehicular traffic, stored materials, Site and structures from damage.
7. If required, furnish commercial grade minimum 8 foot high chain link fence around construction Site. Equip with vehicular gates with locks.

B. Protection of Work

1. Protect Work and provide special protection where specified in Specifications or Drawings and in accordance with manufacturer recommendations.
2. Furnish temporary and removable protection for installed equipment and material. Control activity in immediate Work area to minimize damage.
3. Protect exterior areas of Work from damage. Prohibit traffic from landscaped areas.
4. Buildings and Enclosures
 - a. Furnish protective coverings at walls, projections, jambs, sills, and soffits of openings and protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
 - b. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
5. Whenever gale or high winds are forecast, take measures to secure loose material, equipment or other items that could be blown and be damaged or

cause damage. Do not leave such loose items unsecured at end of a working day. Particular attention shall be taken with scaffolding and items placed or stored on roofs or within a structure prior to being enclosed.

6. Provide for removal of snow and ice which may impede Work, damage the finishes or materials, be detrimental to workers, or impede trucking, delivery, or moving of materials at the Site, or prevent adequate drainage of the Site or adjoining areas.

C. Security

1. Provide protection to stored items, the Work and Owner's operations from unauthorized entry, vandalism, or theft, and against fire, storms and other losses.
2. Coordinate with Owner's security program.

D. Safety

1. Provide first aid and other safety facilities required by Laws and Regulations.
2. Equipment installation will require personnel to enter the grit chamber. All confined space entries will be carried out in a safe and responsible manner. At a minimum, the Contractor, including all subordinate personnel and sub-contractors, shall abide by all federal, state and local safety regulations, including, but not limited to, OSHA regulations and GNHWPCA policy.

E. Progress Cleaning and Waste Removal

1. Comply with the requirements of Paragraph 6.11. B and C of the Standard General and Special Conditions and Additional Special Conditions.
2. Maintain areas free of waste materials, debris, and rubbish and maintain the Site in a clean and orderly condition.
3. Remove debris and rubbish from spaces and other closed or remote spaces before enclosing the space.
4. Collect and remove waste materials, debris, and rubbish from Site at least weekly and legally dispose off-Site.
5. The contractor shall be responsible for dewatering and cleaning each grit channel. The debris removed shall be brought to the grit box at the East Shore WPAF for disposal.

3.02 TEMPORARY UTILITIES

- A. Furnish lighting for construction operations, exterior staging and storage areas and for security purposes. Maintain lighting and provide routine repairs.
- B. Furnish and pay for heat devices and heat and cooling devices as required to maintain specified conditions for construction operations.
- C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- D. Contractor personnel will be authorized to utilize existing site sanitary facilities.
- E. Fire Protection
 1. Use Work procedures that minimize fire hazards to the extent practicable and materials that are fire resistant where possible. Collect and remove combustible debris and waste materials from the Site each day. Store fuels, solvents, and other volatile or flammable materials away from the construction and storage areas in well-marked, safe containers in accordance with Laws and Regulations.

3.03 TEMPORARY CONTROLS

- A. Execute Work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere. Utilize the application of sprinkled water to reduce the emission of air-borne soil particulates from the Project Site.
- B. Noise Control
 1. Provide methods, means, and facilities to minimize noise from construction operation.
 2. Provide noise attenuation systems capable of meeting the Department of Environmental Protection Division of Air Quality Control regulations governed by the following policy:

"A source of sound will be considered to be violating the Department's noise regulation (310 CMR 7.10) if the source:

- *Increases the broadband sound level by more than 10 dB(A) above ambient, or*
- *Produces a "pure tone" condition when any octave band center frequency sound pressure level exceeds the two adjacent center frequency sound pressure levels by 3 decibels or more.*

"These criteria are measured both at the property line and at the nearest inhabited residence. Ambient is defined as the background A-weighted sound level that is exceeded 90% of the time measured during equipment operating hours. The ambient may also be established by other means with the consent of the Department."

3. Construct sound enclosures or utilize other noise reduction techniques if the equipment does not meet the noise level requirements.

C. Pollution Control

1. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

a. Water Pollution Control

- 1) Assure that sediment, debris, petroleum, chemicals, or other contaminants will not enter existing drainage facilities and channels. Use construction methods that will prevent entrance of pollutants and wastes into existing streams, rivers, lakes, and flowing and dry watercourses.
- 2) Obtain legal disposal sites and dispose of pollutants and wastes in a legal manner.
- 3) Respond immediately to emergencies as directed when water quality of existing streams, rivers, lakes and flowing and dry watercourses is threatened. Take corrective action to remove or contain pollutants until a permanent solution is determined.

b. Air Pollution Control

- 1) Equipment and vehicles that exhibit excessive exhaust emissions due to poor engine adjustments or inefficient operation will not be permitted to operate until corrective repairs or adjustments are made.
- 2) Burning of materials from clearing or grubbing operations, combustible construction materials, and rubbish will not be allowed.

3.04 REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, and facilities before Final Application for Payment inspection.

- B. Remove temporary underground installations and grade Site as indicated. Clean and repair damage caused by installation or use of temporary utilities, facilities, and controls.
- C. Restore existing facilities and areas used during construction to original condition. Restore permanent facilities used during construction to specified condition.

3.05 OVERALL EXECUTION REQUIREMENTS

A. Coordination

1. Conduct preconstruction and pre-installation meetings before commencing certain Work that requires coordination or has special requirements or approvals in accordance with Article 1.03 Paragraph A.
2. Coordinate space requirements and installation of Work. Utilize spaces efficiently to maximize accessibility for other installations, maintenance, and repairs.
3. Coordinate Work of the various Specifications with interdependent responsibilities for installing, connecting to, and placing in service, operating equipment.
4. Coordinate related Work at the Site in accordance with Article 7 of the Standard General and Special Conditions and Additional Special Conditions.
5. Coordinate completion and cleanup of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owner's partial occupancy.
6. After Owner occupancy of premises, coordinate access to Site for correction of defective Work and/or incomplete Work to minimize disruption of Owner's activities.
7. See other coordination requirements in **Specific Project Requirements and Procedures**.

B. Existing Conditions

1. See details in **Specific Project Requirements and Procedures**.
2. Existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning Work investigate and verify the existence and location of underground utilities and other utilities and construction.
3. Beginning Work means acceptance of existing conditions.

C. Record Documents

1. Provide Record Documents in accordance with Paragraph 6.12 of the Standard General and Special Conditions and Additional Special Conditions and Article 1.03 subparagraph C.6.
2. Store Record Documents separate from documents used for construction. Record information concurrent with construction progress.
3. Legibly mark each item to record description of actual equipment and material installed and actual construction on approved submittals, including the following.
 - a. Manufacturer's name and equipment and material model and number
 - b. Material and equipment substitutions or alternates utilized
 - c. Approved changes
 - d. Measured depths of foundations
 - e. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements
 - f. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work
 - g. Field changes of dimension and detail
 - h. Details not on original Contract Documents or Shop Drawings
4. Submit final record documents as specified in Article 1.03 Paragraph C.6.

D. Cutting and Patching

1. Employ skilled and experienced personnel to perform cutting and patching.
2. Submit written request in advance of cutting or alteration which affects:
 - a. structural integrity of any element of Project;
 - b. integrity of weather exposed or moisture resistant elements;
 - c. efficiency, maintenance, or safety element;
 - d. safety, traffic, or hazard barriers;
 - e. visual qualities of sight exposed elements; and
 - f. work of Owner or separate contractor.
3. Execute cutting, fitting, and patching including excavation and fill to complete Work and to:

- a. fit materials together, to integrate with other work;
 - b. uncover Work to install ill-timed Work;
 - c. remove and replace defective or non-conforming Work;
 - d. remove Samples of installed Work for testing when requested; and
 - e. provide openings in element of Work for penetration of mechanical and electrical work.
4. Execute Work by methods to avoid damage to other work and which will provide appropriate surfaces to receive patching and finishing.
 5. Provide adequate temporary support for Work to be cut.
 6. Restore Work with new materials in accordance with requirements of Contract Documents. Use materials identical with original materials where recognized that satisfactory results can be produced.
 7. Provide protection from elements for areas which may be exposed by uncovering work.
 8. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit. Restore exposed finishes of patched areas; and, where necessary extend finish restoration onto retained adjoining Work in a manner, which will eliminate evidence of patching.
 9. Identify any hazardous substance or condition exposed during the Work to Owner for decision or remedy in accordance with Paragraph 4.04 of the Standard General and Special Conditions and Additional Special Conditions.
 10. Cut work by methods least likely to damage Work to be retained and work adjoining. Cut Work with sawing and grinding tools, not with hammering, chopping, or burning tools. Cut masonry and concrete materials with masonry saw or core drill. Do not use pneumatic tools without prior approval. Core drill openings through concrete Work. Adhere to mandatory cutback requirements when saw cutting concrete and roadway openings.
 11. Do not cut and patch structural Work in a manner resulting in reduction of load-carrying capacity or load/ deflection ratio.
 12. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces. Maintain supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage and seal voids. For interior work at penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire resistant material, to full thickness of the penetrated element.

13. Do not cut and patch operational or safety-related components that reduce capacities to perform in manner intended. Do not cut and patch Work that reduces visual qualities. Remove and replace unsatisfactory cutting patching as directed by Engineer or Owner.

E. Electrolytic Corrosion Prevention

1. Prevent galvanic action, bimetallic corrosion, anodic or cathodic action, and electrolysis at all electrical grounds and for all galvanic scale (electromotive series or table of oxidation potentials). Do not allow contact of dissimilar metals further apart than 0.35 on the galvanic scale (electromotive series or table of oxidation potentials). The electrode potential of common metals is listed below.

	Electrode Potential Volts (Relative to Hydrogen)
Magnesium	+2.37
Aluminum	+1.70
Zinc+	+0.76
Chromium	+0.56
Iron and Steel	+0.44
Cadmium	+0.40
Nickel	+0.25
Tin	+0.14
Lead	+0.13
Copper	-0.34

2. Unless otherwise indicated, provide dielectric insulators between ferrous and nonferrous pipe and equipment.

F. Quality Assurance and Control of Installation

1. Monitor quality control of Subcontractors, Suppliers, manufacturers, material, equipment, services, Site conditions, and workmanship, to produce Work of specified quality. Conduct field quality control and testing specified.
2. Comply fully with manufacturers' installation instructions, including each step in sequence. If manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
3. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
4. Perform Work using persons qualified to produce workmanship of specified quality.

5. Install field Samples and mockups at the Site as required in Specifications for review. Acceptable Samples and mockups represent a quality level for the Work. Where field Sample or mockup is specified to be removed, clear area after field Sample or mockup has been accepted by Engineer or after Work is complete when mockup is to serve as a control reference.
6. Protect adjacent construction in accordance with Paragraph 6.11 of the Standard General and Special Conditions and Additional Special Conditions.

G. Manufacturers' Field Services

1. If required in the Specifications, arrange and pay for material or equipment Suppliers or manufacturers to provide qualified staff personnel (field representative) to perform the following services and services specified. Submit reports of activities, actions taken and test results to Engineer within 10 days of completion in accordance Article 1.03 Paragraph C above.
 - a. Observe Site conditions, conditions of surfaces and installation, quality of workmanship.
 - b. Report observations and Site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
 - c. Assist with field assembly as required.
 - d. Furnish, setup, and operate required test equipment and facilities.
 - e. Perform and record results of manufacturer recommended inspections and tests, and tests specified for material and equipment.
 - f. Be responsible for protection of material and equipment and safety of all personnel during testing.
 - g. Perform any other services normally provided by field representative's company.
 - h. Instruct operating personnel in proper use of material and equipment.
 - i. Instruct and supervise field repairs before acceptance by Owner.

H. Independent Testing

1. Employ and pay for specified services of an independent firm in accordance with Paragraph 13.03 of the General Conditions and Special Conditions to perform inspection and testing as may be specified.
2. Reports will be submitted by the independent firm to Owner, in duplicate indicating observations and results of tests and indicating compliance or noncompliance with Contract Documents.

3. Inspection, testing, and source quality control may occur on or off the Project Site.
4. Cooperate with independent firm. Furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.
5. Notify Owner and independent firm 24 hours before expected time for operations requiring services.
6. Make arrangements with independent firm and pay for additional Samples and tests required for Contractor's use.
7. Retesting required because of nonconformance to specified requirements will be performed by the same independent firm if instructed by Owner. Payment for retesting will be charged to Contractor by deducting inspection or testing charges from the Contract Price.
8. Testing or inspecting does not relieve Contractor from performing Work in accordance with requirements of the Contract Documents.

3.06 STARTUP, TESTING, AND COMMISSIONING

A. Spare Parts

1. Provide manufacturer's recommended spare parts required for construction, startup, testing and commissioning of the Work prior to achievement of Substantial Completion including spare parts for flushing and consumable supplies such as bolts, nuts, gaskets, filters, insulating tape, etc., normally consumed in the construction, commissioning and testing.
2. If spare parts are purchased by Owner, Contractor shall have the right to use the spare parts purchased by Owner provided that such spare parts are replaced prior to Substantial Completion at Contractor's expense. Replacement spare parts, replaced by Contractor, shall be new, unused and identical as the original spare part used.

B. Consumables

1. Provide initial fills of consumables including equipment lubricants, resins, chemicals and desiccants. Provide subsequent fills if required during Warranty Period if acts or omissions of Contractor cause such consumables to require replacement.
2. Coordinate with Owner for consumables required.

C. Checkout and Starting Systems

1. Coordinate schedule for startup and operation of various equipment and systems with Owner.
2. Notify Owner 7 days before startup of each major piece of equipment or system, including a staffing request for Owner's operations and maintenance personnel required to adequately and safely support each specific start-up and operation activity.
3. Verify that each system or piece of equipment item has been assembled, constructed, or completed in accordance with the Contract and capable of functioning as intended.
4. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, magnetic center alignment, belt tension, control sequence, or other conditions which may cause damage.
5. Verify that each piece of equipment or system has successfully completed construction testing and cold commissioning, including hydrostatic testing, loop checks, relay checks, calibration and continuity checks and that all tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
6. Verify wiring and support components for equipment are complete and tested.
7. Execute start up under supervision of responsible manufacturers' representative or Contractor's personnel in accordance with manufacturers' instructions utilizing Owner's qualified operations and maintenance staff trained by Contractor.
8. When specified in individual Specification Sections, require manufacturer to provide field representative to be present at Site to inspect, check and approve equipment or system installation before start up, and to supervise placing equipment or system in operation. Satisfaction of the requirement shall be verified and documented in writing by the manufacturer's field representative in the form of a certificate of proper installation or approved equivalent document.

D. Starting, Adjusting, and Balancing

1. Supply necessary equipment, material, construction power, and consumables (except for those provided by Owner) needed to startup and fully test the Work and replenish the same until Substantial Completion is achieved. Contractor may utilize Owner's operating spare parts, such use requiring timely replacement at Contractor's expense.
2. Coordinate as required for conduct of independent testing.

3. Perform specified and required adjusting and balancing concurrently to the maximum extent possible on individual equipment and systems and prior to startup and commissioning/performance testing.

E. Startup and Commissioning/Performance Testing

1. Conduct startup and commissioning/performance tests to demonstrate the Work meets the requirements of the Contract Documents, satisfies the Owner's requirements, and is in accordance with Paragraph 14.04. of the Standard General and Special Conditions and Additional Special Conditions. Conduct testing in accordance with the separate Startup and Commissioning section, if included.
2. Prepare and submit a written startup and commissioning/performance testing procedures no later than 60 days prior to start of testing for review and final test procedures no later than 30 days prior to start of testing. Submit a staffing request for Owner's operations and maintenance personnel.
3. Calibrate test equipment and instrumentation on Site or provide acceptable certificate of calibration conducted within 30 days of testing.
4. Complete functional testing prior to initiating the startup and commissioning/performance testing as specified.
5. Complete specified startup and commissioning/performance tests prior to Substantial Completion. Owner and Engineer will witness Performance Testing. Notify Owner and Engineer in writing at least 7 days prior to starting any startup and commissioning/performance testing. Coordinate for witnessing of tests by required regulatory representatives.
6. Submit written test reports per Article 1.03 Paragraph C.6 and D.

F. Demonstration and Training

1. Provide formal demonstration and training of Owner's personnel as specified in individual Specification sections or in accordance with the separate Demonstration and Training section per **Specific Project Requirements and Procedures**.

3.07 ATTACHMENTS

- A. Transmittal form

END OF SECTION

TRANSMITTAL FORM

[illegible]

☐ The material and equipment, and requirements for construction/installation contained in Submittal No. _____ have been reviewed and we certify that they are correct and in strict conformance with the requirements specified (no exceptions or deviations)

☐ The material and equipment and requirements for construction/installation contained in Submittal No. (s) _____ have been reviewed and we certify that they are correct and in strict conformance with the requirements specified except for the following deviations (list below or attach listing): _____

CONTRACTOR'S NAME

ADDRESS

BY: _____ DATE: _____

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**NOT FOR BIDDING PURPOSES
REFERENCE COPY ONLY**

SECTION 01002

SUMMARY OF WORK

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Project Description
- B. Description of the Work
- C. Work Sequence and Coordination

1.02 PROJECT DESCRIPTION

- A. The East Street Pump Station, operated by the Greater New Haven Water Pollution Control Authority (GNHWPCA), utilizes an emergency generator for emergency power, which is fueled by a 6,000 gallon diesel fuel underground storage tank (UST) system. The UST system is in need of replacement. The GNHWPCA is seeking the replacement the UST system.
 - 1. This project shall include the removal and disposal of one (1) existing underground storage tank in accordance with the Contract requirements herein.
 - 2. The base bid of this project shall include the procurement and installation of a new underground storage tank in accordance with the Contract requirements herein.
 - 3. The alternate bid of this project shall include the procurement and installation of a new above ground storage tank in accordance with the Contract requirements herein.
- B. The requirements for the successful installation and operation of the aforementioned fuel storage tank equipment is a requirement of this contract, as outlined herein.

1.03 DESCRIPTION OF THE WORK

- A. The Work includes labor, material and equipment, services required for construction, testing, and commissioning of the Project in accordance with the Contract Documents and as more specifically described in the Specifications and Drawings and includes, but is not limited to, the following principal features:
 - 1. Demolition of the existing underground storage tank, including all mechanical, electrical, and control components:

2. Installation of the civil, structural, mechanical, electrical and control components of new underground or above ground storage tank.
- B. Work Site locations: at East Street Pump Station in the City of New Haven, Connecticut.
- C. Existing conditions and Site data: per the Drawings and Section 00330.

1.04 WORK SEQUENCE AND COORDINATION

- A. The East Street Pump Station is a fully operational facility and must remain fully operational during prosecution of the Work in accordance with Section 01140. Coordinate the sequence of construction with the Owner and the Engineer to minimize operational impacts throughout the construction period.
- B. The emergency generator must remain operational during the entire construction period.
- C. Access to businesses and residences must be maintained during prosecution of the Work.

PART 2 – PRODUCTS (not applicable)

PART 3 – EXECUTION (not applicable)

END OF SECTION

SECTION 01003

SPECIFIC PROJECT REQUIREMENTS AND PROCEDURES

The following supplement or modify the requirements and procedures of Section 01001 using the same Article heading to which the supplement or modification applies.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Pursuant to Paragraph A, Project Management and Coordination,

1. and per subparagraph 1, the Project contact list is included as Attachment C to this Section.
2. and per subparagraph 4, identify documents and items for the Project as follows:

**Greater New Haven Water Pollution Control Authority
(GNHWPCA)
East Street Pump Station Fuel Storage Tank Replacement**

3. and per subparagraph 7.a, Progress Meetings, monthly progress meetings will be held for this Project.

B. Pursuant to Paragraph B, Documentation of Progress,

1. and per subparagraph 3, provide digital video recording or digital photographs prior to start of construction to establish pre-construction conditions in accordance with subparagraph 3.b.
2. and per subparagraph 4, reports, submit weekly progress reports detailing work performed.

C. Pursuant to Paragraph C, Submittal Procedures,

1. and per subparagraph C.1, address submittals as follows:

Engineer: Woodard & Curran, Inc.
980 Washington Street, Suite 325
Dedham, MA 02026
Attn: Brent Sutter
Phone: 781-251-0200

2. Per subparagraph 5.f, Shop Drawings, submit 6 hard copy prints and electronic files in “.PDF” format. Electronic files may be submitted by email or CD.

3. Per subparagraph 6.a, As-Built for Material and Equipment, submit 3 prints and electronic files in “.DWG” format. Electronic files may be submitted by email or CD.
 4. Per subparagraph 6.b, Conformed to Construction Record Drawings, submit 3 prints and electronic files in “.DWG” format for Engineer’s use in preparing final Record Drawings. Electronic files may be submitted by email or CD.
- D. Pursuant to subparagraph D.1, achievement of Substantial Completion shall also require restoration of the Project Site to the satisfaction of the Owner and Engineer.

1.04 QUALITY REQUIREMENTS

- A. Pursuant to Paragraph B., Qualifications, qualifications must include specialty experience as follows:
1. Other qualifications specified in individual Specification sections.

PART 2 – PRODUCTS

2.02 PRODUCT REQUIREMENTS

- A. Pursuant to Paragraph A, General,
1. Store materials as shown on the Drawings.

PART 3 – EXECUTION

3.01 TEMPORARY CONSTRUCTION FACILITIES

- A. Pursuant to Paragraphs B, C, and D, provide and maintain protection of Work, security and safety facilities during working and non-working hours.

3.06 STARTUP, TESTING AND COMMISSIONING

- A. Pursuant to Paragraph E, Starting and Commissioning/Performance Testing, refer to Specification sections specific to individual pieces of equipment for equipment specific startup and testing requirements.
- B. Pursuant to Paragraph F, Demonstration and Training, refer to Specification sections specific to individual pieces of equipment for equipment specific demonstration and training requirements.

ATTACHMENTS

- A. Project Contact List

END OF SECTION

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ATTACHMENT A

East Street Pump Station Fuel Storage Tank Replacement – Master Contact List					
GNHWPCA	Greater New Haven Water Pollution Control Authority				
Address:	260 East Street, New Haven, CT 06511				
Name	Title	Office Phone	Cell Phone	Fax	Email
Charlie Biggs	Operation/Engineering Coordinator	(203) 466 5280	(203) 410 3488	(203) 466-5282	cbiggs@gnhwpca.com
Joe Megale	Deputy Director of Operations	(203) 466 5280	(203) 836 1740	(203) 772-1564	jmegale@gnhwpca.com
Gary Zrelak	Director of Operations	(203) 466-5285			gzrelak@gnhwpca.com
24-hour Contact	GNHWPCA Control Room “PCC”	(203) 466-5260			
Woodard & Curran					
Office Address:	980 Washington Street, Suite 325, Dedham MA 02026				
Name	Title	Office Phone	Cell Phone	Fax	Email
Glenn Almquist	Client Manager	(800) 285-7897	(401) 525-1237	(401) 273-5087	galmquist@woodardcurran.com
Brent Sutter	Technical Lead	(800) 446-3518	(508) 280-3846	(781) 251-0847	bsutter@woodardcurran.com

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SECTION 01140

WORK RESTRICTIONS

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. The Greater New Haven Water Pollution Control Authority (GNHWPCA) has over 500 miles of sewer mains and 30 pump stations that convey the flow to the East Shore Water Pollution Abatement Facility (WPAF). The existing facilities will be maintained in continuous operation by the Owner at all times during the entire construction period.
- B. The Contractor shall schedule and conduct his work at East Street Pump Station such that the emergency generator is in service at all times including adequate fuel supplies. The Contractor's work shall not create potential hazards to operating equipment and/or personnel. It shall be the Contractor's responsibility to ensure complete compatibility with the facility operations in his working schedules.

1.02 SUBMITTALS

- A. The Contractor shall at all times conduct his operations so as minimize interference with existing works. The Contractor shall develop a sequence of operation, in cooperation with the Engineer and Owner, which shall provide for the construction and start-up of the new works in the most orderly manner possible. Within 30 calendar days of the Notice to Proceed, the Contractor shall submit complete descriptions of procedures to maintain pump station operation to supplement the construction schedule. The description shall include:
 - 1. Step-by-step procedures, required durations, and specific procedures required to be performed by the Contractor as well as assistance from the Owner's personnel that the Contractor will request. The procedures shall include a minimum two week notification to the Owner for any alterations that affect operation of the treatment facility. Coordinate with the Owner again seven days before and on the day of such alterations.

1.03 EXISTING PUMP STATION AND WPAF OPERATIONS

- A. Unless permitted in writing by the Owner and Engineer, the construction activities under this Contract shall not reduce the treatment capability of the pump station. The pumping capability of the pump station refers to all portions of wastewater pumping including but not limited to the items directly impacted by this Work.
- B. The Owner will continue to operate the pump station during the construction period and will be responsible for maintaining system operation to prevent overflows. The Contractor shall be required to fully cooperate with the Owner, coordinate the

construction schedule with the Owner and Engineer, and provide the necessary labor, equipment and materials to prevent interruption of flow.

1.04 WORK DURING LOW FLOW CONDITIONS

- A. The proposed work sequence described herein shall be accomplished at such times that will be acceptable or agreed to by the Owner. Any construction activity defined herein to be performed during a low flow period shall meet the following criteria. Low influent flow periods are defined as early weekday and weekend mornings (between midnight and 6:00 a.m.), during dry weather periods only. Overtime work by the Contractor to conform to these requirements shall be considered as normal procedure under this Contract, and the Contractor shall make no claim for extra compensation as a result thereof. It is not envisioned that any work would be performed during low flow periods.

1.05 LIMITATIONS ON EXISTING PUMP STATION OPERATIONS

- A. All work connecting with, cutting into, and reconstructing existing pipes or structures shall be planned to minimize interference with the operation of the existing facilities and when the demands on the facilities best permit such interference, even though it may be necessary to work outside of normal working hours to meet these requirements.
- B. Before starting work which will interfere with the operation of existing facilities, the Contractor shall do all possible preparatory work and shall see that all labor, tools, materials, and equipment are made ready. The Contractor shall also assist in instructing operations and maintenance personnel in any new operating procedures.
- C. The Contractor shall provide, maintain, and operate all necessary temporary facilities.
- D. Flow to and through the pump station generally shall not be interrupted. Flow through portions of the pump station may only be shut-down to perform work as delineated herein. All shut-downs shall occur only upon written request and with prior written authorization from the Owner. Such authorizations will be limited to times when the hydraulic capacity of units remaining in service shall not be exceeded. When work requires that a portion of the pump station be shut down, the Contractor shall be fully prepared to execute the work in the most expeditious manner. The Contractor shall plan the work by taking into consideration all potential problems that may be encountered. Spare pumps, pipe and fittings, and any other equipment appropriate for the work to be done shall be readily available for use in an emergency. The Contractor shall be prepared to work continuously (24 hrs per day, 7 days per week) during the time when any units or pipelines are out of service that affects the treatment process.

PART 2 – PRODUCTS (not applicable)

PART 3 – EXECUTION (not applicable)

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SECTION 01805

STARTUP AND COMMISSIONING

PART 1 – GENERAL

1.01 SYSTEM DESCRIPTION

- A. To establish a basis of understanding for system description for this Project, the Contractor shall observe the following:
1. Definition: A system is defined as an arrangement of items of equipment, components, piping, wiring, materials, or incidentals so related or connected as to form a functional and operational unit.
 2. Project Classified Systems: For this Project, system classifications shall include but not necessarily be limited to the following:
 - Fuel Storage Tank System
 - Tank Monitoring System
 - Electrical System

1.02 SYSTEM STARTUP AND DEMONSTRATION REQUIREMENTS

- A. Pre-Startup Requirements
1. Prior to startup, the Contractor shall undertake the following procedures, in the order listed:
 - a. Ensure that all required written statements and/or guarantees from manufacturers by individual Specification Sections comply with Contract Documents. Contractor shall use a checklist to identify all such requirements, by Specification Section, and shall submit a copy of the completed checklist to the Engineer. All such written statements and/or guarantees from manufacturers shall be submitted to the Engineer.
 - b. Ensure Work is complete before startup of any unit or system. Certify to Owner that specifically required services or respective equipment manufacturers' representative by individual section of specification have been performed in accordance with Contract Documents.
 - c. Ensure systems are tested hydraulically, mechanically, and electrically. Ensure systems which require calibration, commissioning, and balancing are fully certified as complete in

performance, in accordance with Contract Documents. Ensure required tagging, identification, and/or stenciling is complete.

- d. Schedule startup a minimum of 30 days prior, with written notice issued to but not necessarily limited to: Owner, Engineer, Subcontractors, and applicable Regulatory Agencies.
- e. Provide all labor, supervision, utilities, chemicals, equipment, tools, materials, vehicles or any other items necessary to startup, operate, and demonstrate the system.
- f. Gauges, meters, recorder and monitors shall be provided by the Contractor, as required by the Engineer, to supplement or augment the instrumentation system provided under this Contract to properly demonstrate that all equipment fully satisfies the requirements of the Contract Documents. All devices employed for the purpose of measuring the performance of the facility's equipment and systems shall be specially selected to provide a level of certainty consistent with the variables to be monitored. All instruments shall be recently calibrated, and the Contractor shall be prepared at all times to demonstrate, through recalibration, the certainty of all instruments employed for testing purposes. Calibration procedures shall be in accordance with applicable standards of ASTM, ISA and IEEE. The adequacy of all gauges, meters, recorders and monitors shall be subject to review of the Engineer.
- g. The Contractor shall provide sign off forms for all installed and operation testing to be accomplished under this contract. Sign off forms shall be provided for each item of mechanical, electrical and instrumentation equipment provided or installed under this Contract and shall contain provisions for recording relevant performance data for original testing, and not less than three retests. Separate sections on the form shall be provided to record values for pre-operation checkout, initials of representatives of the equipment manufacturers, the Contractor and the Engineer.
- h. The Contractor shall maintain a master file of all equipment sign off forms, which shall be available for inspection by the Engineer. Upon completion of all equipment testing, the Contractor shall furnish the Engineer with the original and two copies of the sign off forms for each equipment item.

B. System Startup and Demonstration

- 1. The Contractor shall startup, operate and demonstrate specified performance of each item of equipment and each system at full operation without interruption of equipment or system or need of adjustment or repair until the satisfaction of the Engineer has been met.

2. During startup of equipment, the Contractor shall provide knowledgeable and experienced person(s) to instruct Owner's designated personnel on the Operation and Maintenance of each system. This service shall be in addition to services provided by equipment manufacturer's authorized representative(s) prescribed by individual Sections of this specification. Instructions during the startup period shall be in the form of a comprehensive "overview," and not simply a repeat of previous Operation and Maintenance instructions. Provide a minimum of 8 hours of Operation and Maintenance instructions on each system per the specific section in the Contract Documents.
3. The Contractor shall pay for all chemicals used during startup.

1.03 EQUIPMENT START-UP and PERFORMANCE TEST PROTOCOL

- A. Start-up shall consist of the following items, in the order shown:
 1. Equipment Pre-Start-up Check
 2. Equipment Start-up and Performance Testing
 3. Manufacturer's Equipment Testing
- B. Pre-Equipment Start-Up
 1. Contractor shall check out each item of equipment in the presence of the Engineer, to show that it is properly installed, and is functioning and ready for equipment start-up and performance testing.
 2. As a minimum, the Contractor shall do the following:
 - a. Assure that equipment is properly installed, painted, leveled, wired and/or insulated.
 - b. Assure that all equipment is properly lubricated.
 - c. Assure that all safety related accessories are properly installed.
 - d. Bump or momentarily jog equipment to establish operation and proper rotation.
 3. Contractor shall arrange for equipment manufacturers to be present, or verify that these procedures may be done without the manufacturer's representatives being present.
- C. Equipment Start-up
 1. Prior to testing any equipment, the Contractor shall obtain written certification, from the manufacturer, that the equipment is properly installed, calibrated and ready for safe and efficient operation as intended by the Engineer and manufacturer.

2. Prior to start-up and testing of any item of equipment, the equipment and associated channels shall be thoroughly cleaned and flushed.
3. The Contractor, with assistance from the manufacturer's factory trained service engineer, and in the presence of the Engineer, shall start-up and operate each item of equipment to show that it is performing according to the requirements of the specifications. With this step, the Contractor shall assure that the equipment is ready for performance testing.

D. Performance Tests

1. General

- a. Full tests shall be made at the Site on each item of equipment after it has been properly installed, started and certified ready for operation. These tests shall demonstrate that each item of equipment will operate properly by itself and in conjunction with all other pump station equipment, in accordance with the performance specification and manufacturer performance specifications.
- b. The Contractor shall furnish all necessary labor, tools, equipment, power, chemicals and clean water, to perform field tests to determine that the supplied equipment, including controls and alarms, meet hydraulic, electric, mechanical and performance requirements in accordance with the Contract Documents and manufacturer specifications.
- c. All incomplete and/or unsuccessful tests shall be done over, to the satisfaction of the Engineer.

2. Process Equipment, Instrumentation, and Controls

- a. Calibrate and/or verify calibration and proper operation and function of all process and analytical instruments, and documents results, for the following:
 - 1) Level monitors and controls
 - 2) Indicating controllers
 - 3) Indicators
 - 4) Electrical relays and current trips
 - 5) Annunciator and alarm horn
 - 6) PLCs and/or RTUs and transmitting and receiving equipment
 - 7) Power supplies and UPS systems

- 8) dp cells
- 9) Selector switches
- 10) Electricity actuated process control valves
- 11) Misc. equipment

E. Manufacturer's Training

1. Contractor shall refer to specifications for requirements of manufacturer's training.
2. The Contractor shall note the following:
 - a. No training can be conducted until the Owner has received approved Manufacturer's Operation & Maintenance Manuals.
 - b. Owner will not accept any item of equipment prior to receiving approved manufacturer training for the equipment. This applies only to equipment requiring manufacturer's training in accordance with the specifications.
 - c. Engineer shall approve the completeness of all training and verify completion by completing a "Verification of Manufacturer's Equipment Training" form.
 - d. Training shall be conducted in addition to, and exclusive of start-up and performance testing.

PART 2 – PRODUCTS (not applicable)

PART 3 – EXECUTION (not applicable)

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SECTION 02220

SELECTIVE DEMOLITION

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Demolition includes, but is not limited to the modification, removal, relocation, and/or disposal of the following: Removal of equipment, underground storage tank, related piping and other appurtenances including any liquids or sludges within the underground tank system, remove and reset curbing, and incidentals as indicated on drawings and as required to accommodate new construction in accordance with all applicable Federal, State, and local and applicable reference standards listed in Article 1.02.

1.02 JOB CONDITIONS

- A. Occupancy: Conduct selective demolition work in manner that will minimize need for disruption of Owner's normal operations. Weatherproof all structural openings. Maintain continuous treatment capacity at all times unless shutdown is specifically provided elsewhere in these documents.
- B. Condition of Structures: The Owner assumes no responsibility for actual condition of structures to be demolished.
 - 1. Conditions existing at time of inspection for bidding purposes will be maintained by Owner in so far as practicable. However, variations within structure may occur by Owner's removal and salvage operations prior to start of demolition work.
- C. Partial Removal: Items must be removed from structure as work progresses. Salvaged items must be transported from site as they are removed.
 - 1. Items property of Owner: Coordinate with Owner before removing any items. Owner reserves right to retain demolished items or portions thereof at designated location on site. Allow Owner to remove components from demolished items. Items Owner does not retain become property of Contractor and must be removed and disposed of properly.
- D. Explosives: Use of explosives will not be permitted.
- E. Traffic: Conduct demolition operations and removal of debris to ensure no interference with roads, streets, walks, and other adjacent occupied or used facilities.

1. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways.
- F. Protections: Ensure safe passage of persons around area of demolition. Conduct operations to prevent injury to adjacent buildings, structures, other facilities, and persons.
 1. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of adjacent facilities to remain.
- G. Damages: Promptly repair damages caused to adjacent facilities by demolition operations at no cost to Owner.
- H. Utility Services: Maintain existing utilities indicated to remain in service and protect against damage during demolition operations.

1.03 RELATED WORK

- A. Equipment: Division 11
- B. Electrical: Division 16

PART 2 – PRODUCTS (not applicable)

PART 3 – EXECUTION

3.01 DEMOLITION

- A. Demolition Operations: Conduct demolition operations in a manner that will prevent damage to adjacent structures, utilities, pavements and other facilities to remain. Provide and maintain all protective devices, including fences, barricades, bracing, shoring, warning lights, and signs as necessary or required for protection against personal injury or damage to property in compliance with the applicable provisions of ANSI A10.6. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from the Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- B. Pollution Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations, permits, laws, ordinances, etc. pertaining to environmental protection.
 1. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to the start of work. Reform adjacent concrete areas and repair to previous condition.

- C. Cease demolition operations immediately if any damage, settlement or other adverse effect on adjacent structures or utilities occurs and immediately notify the Engineer. Do not resume operations until conditions are corrected, damage repaired, and approval has been received from the Engineer.

3.02 REMOVAL OF UNDERGROUND STORAGE TANK

A. Notification:

1. Contractor shall notify the City of New Haven Fire Department of the scheduled tank removal as soon as schedule is approved by Owner and if possible, at least 48 hours in advance. The Contractor shall be responsible for insuring all other notifications and permits have been obtained for the Project.
2. Schedule removal, transportation, and disposal of residues or products with sufficient time to notify Owner a minimum of 24 hours in advance.

B. Utilities:

1. Prior to any excavation in the vicinity of the underground storage tank a utility check of subsurface and above ground utilities shall be completed by the Contractor. Locate utilities and repair damaged utilities resulting from construction at no additional cost to Owner. Provide temporary utility service required to ensure utilities are uninterrupted at Owner's operating facilities throughout construction and support and protect the utility services, or replace impacted sections of any services. Restore utility services to full working condition upon completion of Work.
2. Emergency generator shall remain in service at all times. Contractor shall provide temporary fuel tank system as described in Section 11413 Underground Fuel Storage Tank (Base Bid) or sequence work for Bid Alternates such that new aboveground storage tank is installed and operational before existing underground storage tank is taken out of service and removed.

C. Tank Cleaning & Removal:

1. Remove all ignition sources from the vicinity of the tank.
2. Barricade the area from vehicle and pedestrian traffic.
3. Drain and flush product piping into tank. All piping shall be removed from the ground whenever practicable. Piping that cannot be removed will be blown clear of residual product with an inert gas and securely plugged at all ends, if approved by the Engineer. All necessary precautions to prevent spillage or ignition in the entire area shall be taken.

4. Remove sludge and liquid from tank using explosion-proof or air-driven pumps. Dispose of sludge and liquid in accordance with all applicable Federal, State, and local Regulations. Labor, equipment, and materials associated with cleaning the tanks are incidental to the Work.
5. Remove and dispose of any asphalt or concrete over the tank (described in Section 02300 Earthwork).
6. Excavate down to the top of the tank and stockpile soil in a location designated by the Owner. All excavated soil should be managed as described in Division 01 General Requirements and Section 02300.
7. Remove fill tube. Disconnect and remove fill, gauge, and product lines from tank, cap, or plug open ends of pipe. Vent line should remain connected until after inerting process. Plug any other tank openings. Implement all measures necessary to prevent liquid spills within the excavation.
8. Test the excavation area and tank atmosphere regularly for flammable or combustible vapor concentrations until the tank is removed from both the excavation and the Site. Such tests shall be made with a combustible gas indicator.
9. Follow inerting procedure described in Section 3.04).
10. Complete the excavation to expose the tank. Any additional soil removed from the excavation should be handled as described above in Item F and test as follows.
11. Collect soil Samples from the excavation and within 10 feet of the underground storage tank (UST) to evaluate the potential for reporting conditions. This Work should be performed by a qualified environmental professional. If reporting conditions are identified, immediately stop Work and notify Engineer and Owner.
12. Dewatering of ground water shall be as described in Division 01 General Requirements and in accordance with applicable Federal, State, and Local Regulations and By-Laws.
13. Cut straps (if any) used in anchoring the tank.
14. Remove tank from excavation and place it on a level surface. Block the tank to prevent any movement during temporary storage.
15. Final tank cleaning shall be performed at a Site acceptable to local public safety officials.
16. The tank shall be transported to the final Site no more than 24 hours from removal and Contractor shall be responsible for security during this time.

All holes and major openings should be plugged or sealed leaving a 1/8 inch vent hole.

17. Remove all related vent piping.

D. Inerting Procedures:

1. The tank shall be inerted in accordance with recommended practices and in compliance with all applicable codes, standards, and Regulations.

E. Transportation Requirements:

1. If transported, the tanks shall be scraped to remove all loose backfill material adhering to the tank.
2. All tanks removed from the ground, regardless of condition, shall be labeled in legible letters at least 2 inches high with the following information: Federal Regulations under the authority of the U.S. Department of Transportation (40 CFR Section 172.500 et seq.) also require that tanks which have not been purged but are being transported must be properly placarded on the ends and sides with a "Flammable" placard with the appropriate UN Number (1203 or 1993) attached.
3. TANK HAS CONTAINED FLAMMABLE LIQUID
4. NOT VAPOR FREE
5. DATE OF REMOVAL MONTH/DAY/YEAR
6. Provide labor and equipment required to safely load tank onto Contractor supplied truck and secure for transport.
7. If transported, the tank shall be secured on a truck such that the 1/8 inch vent hole is located on the uppermost point on the tank. The tank should always be positioned with the vent plug at the top during transport and storage.

3.03 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Do not remove from site debris, rubbish, and other materials resulting from demolition operations without prior permission by Owner. Store all demolished materials that Owner wishes to retain at on-site location designated by Owner.
1. Burning removed materials from demolished structures will not be permitted on site.
 2. Dispose demolition debris in a lawful manner.

3. The Contractor shall leave the site in a safe, clean, and relatively orderly condition upon completion of the work under this section.
4. Disposal of the underground storage tank shall be at a facility approved by CTDEP for the disposal of used underground fuel storage tanks.

END OF SECTION

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SECTION 02300

EARTHWORK

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Section Includes:

1. Furnish all labor, equipment and materials, and perform all operations in connection with removal and disposal of pavements and soils, excavating, filling, backfilling, stockpiling, bedding, compacting, grading, protection, installation and removal of support of excavation and other Work necessary for the construction of pipelines, structures, pavements, and appurtenant Work in accordance with this Section, the Drawings and applicable reference standards listed in Article 1.03.
2. Off-site disposal of excess material

1.02 PRICE AND PAYMENT PROCEDURES

- A. Measurement and payment requirements per Division 01 General Requirements.

1.03 REFERENCES

A. Reference Standards

1. Local State DOT Specifications and Supplements
2. Greater New Haven Water Pollution Control Authority Specifications and Supplements
3. ASTM D1556: Density and Unit Weight of Soil in Place by the Sand-Cone Method
4. ASTM D1557: Laboratory Compaction Characteristics of Soil Using Modified Effort
5. ASTM D6938: Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination, Sequencing, and Scheduling: per Division 01 General Requirements.

1.05 SUBMITTALS

- A. Submit in accordance with the Division 01 General Requirements.
 - 1. Product Data
- B. Closeout and Maintenance Material Submittals: per Division 01 General Requirements.
- C. Test Reports
 - 1. Material gradations
 - 2. Backfill material moisture-density relationships
 - 3. Field compaction testing
- D. Blasting plan and records: as specified in Part 3.

1.06 QUALITY ASSURANCE

- A. Provide in accordance with Division 01 General Requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Provide in accordance with Division 01 General Requirements.

1.08 SITE CONDITIONS

- A. Site Information: Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that Owner will not be Responsible for interpretations or conclusions drawn therefrom by Contractor. Data is made available for convenience of Contractor. Additional test borings and other exploratory operations may be made by Contractor at no cost to Owner.
- B. Existing Utilities: The locations of existing underground utilities shown on the Drawings have been determined from available plans, physical survey, information provided by local utilities or a combination thereof and are approximate only. The Owner or its representative in no way warrants that the locations shown are correct. The Contractor shall be Responsible for determining the exact location of all existing utilities before commencing Work, and agrees to be fully responsible for any and all damages resulting from Contractor's failure to exactly locate and preserve any and all underground utilities.
- C. Where existing structures and utilities not shown on the Drawings interfere with new construction, notify the Owner of the location of the structure or utility and reroute or relocate the structure or utility as directed by the Owner.

- D. Exercise care by hand excavating to locate all existing structures and utilities. Utilities which do not interfere with the Work shall be carefully protected against damage. Structures or utilities damaged in any way by the Contractor's operations shall be restored or replaced with new material of the same size and type at the Contractor's expense.
- E. Provide temporary supports of approved design for structures and utilities crossing over the Work. Provide bedding and blanket material in accordance with the utilities rules and Regulations and acceptable to the Owner for structures and utilities crossing over the Work. Compact material to adequately support and protect the utility crossing from damage. Temporary supports, bedding and blanket material and compaction shall be considered incidental to the Work.
- F. Refer to Division 01 General Requirements and the notes on the Drawings.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. General
 - 1. Suitable materials: As shown on the Drawings or as specified.
 - 2. Unsuitable materials: Material containing excessive clay, vegetation, organic matter, debris pavement, stones or boulders over 6 inches in greatest dimension, wet or frozen material, and material, which in the opinion of the Owner, will not provide a suitable foundation or structural support for the pipe and is unsuitable for use in backfill.
 - 3. On-Site Material: Any suitable material from on-site excavation. Supply additional material as required to completely backfill trenches. Unless specifically stated elsewhere, suitable material brought on Site for trench backfill shall not be considered for payment.
 - 4. Material for embankments and general fills may contain pieces of excavated ledge having maximum dimension of 12 inches if approved by the Engineer.
 - 5. Owner reserves the right to inspect off Site sources of materials and order tests of these materials to verify compliance with these Specifications. The Contractor shall provide the location of off Site sources and access to off Site sources whenever requested by Owner.
- B. Gravel Borrow: Consisting of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings, deleterious material. Gradation requirements shall be determined by AASHTO-T11 and T27. Sieve analysis by weight:

Sieve Size	Percent Passing by Weight
1/2 inch	50-85
#4	40-75
#50	8-28
#200	0-10

Type a: maximum stone size = 6-inches in largest dimension
Type b: maximum stone size = 3-inches in largest dimension

- 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. Crushed Stone: Shall be well-draining 3/4" in diameter uniformly blended consisting of durable, hard, clean, angular fragments free from clay, loam or other deleterious material;. Sieve analysis by weight:

Sieve Size	Percent Passing by Weight
1-inch	100
3/4-inch	90-100
1/2-inch	10-50
3/8-inch	0-20
#4	0-5

- E. Dense Graded Crushed Stone: crusher run coarse aggregates of crushed stone and fine aggregates of natural sand or stone screenings uniformly pre-mixed with a predetermined quantity of water. Sieve analysis by weight:
- F. Loam Borrow: Loam borrow shall be in accordance with MHD SSHB and consist of fertile, friable, natural topsoil similar in nature to topsoil in Project location, without admixture of subsoil, refuse or other foreign materials and shall be obtained from a well-drained arable Site. The loam shall be a mixture of sand, silt and clay particles. The mixture shall contain approximately equal portion of each material so as to exhibit sandy and clayey properties. The loam shall be reasonably free of stumps, roots, heavy or stiff clay, stones larger than 1-inch in diameter, lumps, coarse sand, noxious weeds, stick brush, trash, debris or other objectionable materials. The loam shall be reasonably well draining, shall not contain toxic amounts of either acid or alkaline elements and shall contain not less than 4% nor more than 20% organic matter as determined by the loss on ignition of oven-dried

samples. Test samples shall be oven-dried to a constant weight at a temperature of 230°F (±9°).

- G. Refill Material: Use crushed stone for refilling excavation below grade or rock excavation unless otherwise directed by the Engineer.
- H. Common Fill: friable material and no objects greater than 6 inches in diameter, no more than 30 percent by weight finer than No. 200 sieve, and free from ice and snow, roots, sod, rubbish and other deleterious or organic matter. Excavated material from on-Site sources which meet these Specifications may be used for Common Fill.
- I. Select Backfill: as specified for Gravel Borrow with no stones larger than 3 inches in the largest dimension.

2.02 SOURCE OF QUALITY CONTROL

- A. Provide in accordance with Division 01 General Requirements.

PART 3 – EXECUTION

3.01 PREPARATION AND PROTECTION

- A. Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.
- B. Protect paved surfaces from damage. Use rubber tired equipment or provide rubberized track protection when using track powered equipment to prevent damage to paved surfaces.
- C. Barricade open excavations with approved barricades, fencing, lights, and signs in compliance with local and State requirements to protect life and property until the excavation has been filled and graded to finished grade.
- D. Maintain excavations with approved barricades, lights, and signs to protect life and property until excavation is filled and graded to an acceptable condition.
- E. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.
- F. Observe the respective utilities rules and Regulations in execution of all Work. Protect active utilities and structures from damage. Where noted, remove and relocate utilities as indicated or specified and in accordance with respective utility rules and Regulations. Where inactive or abandoned utilities are encountered during excavation, immediately notify Owner of the location and type of utility encountered in writing and remove, plug or cap utility when directed.

- G. Exercise extreme care when performing Work in the vicinity of existing utilities. Hand excavate around existing utilities to prevent damage to the utility and provide support for the encountered utility until excavation is complete, Work is installed and backfilled to a level where support is no longer necessary. Provide suitable backfill around utilities encountered in accordance with the respective utilities rules and Regulations.
- H. Provide shoring in accordance with this Specification.
- I. Clear within limits of earthwork operations as shown in the Drawings. Work includes removal and disposal of trees, shrubs, fences, foundations, incidental structures, paving, debris, trash, and other obstacles. Remove and dispose materials in a legal manner in accordance with this Specification.
- J. Remove stumps and roots 3 inches and larger diameter. Undisturbed sound stumps, roots up to 3 inches diameter, and nonperishable solid objects a minimum of 3 feet below subgrade or finished embankment may be left. Remove and dispose material in a legal manner and in accordance with this Specification.
- K. Trees and shrubs, not shown for removal, may be removed from areas within 15 feet of new construction and 7.5 feet of utility lines when removal is approved in advance by the Engineer. Remove and dispose materials in a legal manner and in accordance with this Specification.

3.02 SITE MONITORING

- A. 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.
- B. 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.

3.03 EXCAVATION

- A. Demolish and completely remove existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.
- B. Remove materials encountered to the limits shown on the Drawings or designated in the Specifications.
- C. Earth excavation: removal and disposal of pavements 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 removal or unauthorized excavation.

D. Special classifications: Rock and Boulder Removal and Excavation to Remove and Dispose of Unsuitable Material.

1. Do not perform rock removal or excavation of unsuitable materials until material to be excavated has been cross-sectioned and classified by Owner.
2. Predrilling and blasting of bedrock through overburden may be allowed. However, if this method is used, the rock excavation quantities will be adjusted downward in proportion to the ground swell from this blasting method.

E. Rock excavation: removal and disposal of materials that cannot be excavated without drilling and blasting, except such materials that are classified as earth excavation and removal and disposal of boulders larger than one cubic yard in volume, as measured by the Owner. Use of explosives: permitted.

1. Typical materials classified as rock are solid rock and rock in ledges, one cubic yard or more in volume.
2. Intermittent drilling or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.
3. Rock excavation does not include:
 - a. Removal of material which can be removed with a hand pick, excavator or power shovel.
 - b. Loose or previously blasted rock or broken stone in rock fills or elsewhere.
 - c. Removal of rock or boulders less than one cubic yard in volume.

F. Rock Payment Limits:

1. Two feet outside of concrete work for which forms are required, except footings and base slabs.
2. Outside dimensions of concrete for concrete work where no forms are required.
3. One foot outside perimeter of footings, base slabs and precast structures.
4. Pipe trenches: As shown on Drawings.
5. Under slabs on grade: 6-inches below bottom of concrete slab or as shown on Drawings.

- G. Excavation to Remove and Dispose of Unsuitable Material: When excavation has reached required subgrade elevations, notify Owner who will make an inspection of conditions. If unsuitable materials are encountered at required subgrade elevations, carry excavations deeper as directed by Owner and replace excavated material with gravel or crushed stone, compacted in maximum 6-inch lift depths. Removal and disposal of unsuitable materials for unauthorized excavations and replacement of said material with gravel or crushed stone shall not be considered for payment.
- H. Excavation for Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 feet, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.
1. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to find grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other Work.
- I. Pipe trenches: as shown on Drawings or as required for installation of pipe and bedding material.
- J. Excavation in Paved Areas: saw cut, grind, or reclaim existing pavement, as permitted by Owner, prior to excavation to the limits shown on the Drawings. Provide a clean, uniform edge and minimize disturbance of remaining pavement. Cut and removed the minimum amount of pavement required to perform the Work.
- K. Excavation for Trenches: excavate to the minimum width required for installation of the pipe, structure or shoring system.
1. Provide shoring and bracing required to protect worker, support walls of excavation and prevent undermining of adjacent pavement surfaces.
 2. Produce an evenly graded, flat trench bottom at the subgrade elevation required for installation of pipe or structure and bedding material.
 3. Load excavated material directly into trucks unless otherwise permitted by the Owner.
 4. Place suitable backfill material directly into trench or excavation. Do not stockpile material to be used as backfill in roadways.
- L. 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.
- M. Refilling Unauthorized Excavation

1. Trenches: crushed stone or gravel, as specified or directed by Owner.
 2. Elsewhere: backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Engineer.
- N. Material Storage: Stockpile and maintain suitable surplus excavated materials for re-use as backfill anywhere within the project limits as approved by the Owner. Place, grade, and shape stockpiles for proper drainage. Provide erosion controls as required by the local Conservation Commission to prevent erosion of stockpiles from entering adjacent drainage systems or waterways. Locate and retain soil materials away from edge of excavations.
- O. Removal and Disposal of Asbestos Cement (AC) Pipe: When encountered, remove and dispose of in accordance with Paragraph 4.06.D. of the Standard General and Supplementary Conditions and Additional Supplementary Conditions, if AC pipe is encountered.
1. The preferred method for handling existing AC pipe is to abandon the pipe in place. New pipe may be laid alongside the AC pipe provided the new pipe is laid a minimum 3 feet (outside pipe wall to outside pipe wall) from the existing water main. Crushing AC pipe in place is not permitted. Take precautions necessary to ensure AC pipe remains intact and left in place.
 2. Where disturbance of existing AC pipe is unavoidable due to conflicts with new construction, comply with applicable Laws and Regulations for handling, removing, disposing or otherwise disturbing AC pipe.
 - a. Submit a plan for approval by the Owner for handling, removal and disposal of AC pipe by licensed asbestos abatement contractor.
 - b. Provide permitting, manifesting, shipping, excavation, removing, disposing, handling, signs, designation of a storage area, and storing AC pipe.
- P. Concrete Slabs and Paving: Score deeply or sawcut to insure a neat, straight cut, sections of existing concrete slabs and paving to be removed where excavation or trenching occurs. Extend pavement section to be removed a minimum of 12 inches on each side of widest part of trench excavation and insure final score lines are approximately parallel unless otherwise indicated.

3.04 STABILITY OF EXCAVATIONS

- A. Slope sides of excavations to comply with OSHA Regulations and local Codes. Shore and brace where sloping is not possible due to space restrictions or stability of material excavated in accordance with this section.
- B. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

3.05 SHORING AND BRACING

A. General

1. Provide temporary sheeting, shoring, and bracing in locations where required to protect excavated areas as required for safety or compliance with OSHA and Laws and Regulations per Section 00 73 19, 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.
2. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state and federal safety Law and Regulations per Section 00 73 19. As a minimum, follow the current OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926.
3. Provide system to resist earth and hydrostatic pressures, including surcharges from surface loads.
4. Maintain shoring and bracing while excavation is open.
5. 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 Connecticut 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 and Laws and Regulations per Section 00 73 19 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.
3. 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.

- C. Movable box: used where a shoring system is required but steel piling is not called for as determined by Contractor as not all areas of Work will be conducive to the use of a movable box.

3.06 DEWATERING

- A. Provide in accordance with Division 01 General Requirements as necessary to facilitate work.
- B. Do not allow water to accumulate in excavations. Provide and maintain pumps and dewatering system components necessary to convey water away from excavations. Convey water removed from excavations and rain water to collecting or run-off areas. Establish and maintain temporary drainage ditches and other diversions outside excavation limits for each structure.
- C. Do not use trench excavations as temporary drainage ditches. In cases where trench excavation requires dewatering during construction, a temporary containment basin will be constructed utilizing haybales and filter fabric materials. Haybales will be stacked to sufficient height to contain volume of water to be dewatered with filter fabric barrier along outside edge of haybales to prevent channeling of flows. Water will drain in controlled fashion from haybale structure trapping sediment within the containment. Any remaining sediment trapped inside the containment basin will be collected and disposed.

3.07 BACKFILL AND FILL

- A. Do not backfill excavations and trenches until new utilities have been inspected and, if required, tested satisfactorily for conformance with the Drawings and Specifications unless directed otherwise by the Owner.
- B. Placement
 - 1. Place acceptable soil material in layers to required elevations as shown on the Drawings and as listed below. Fill, backfill, and compact 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.
 - 2. Place backfill and fill materials in layers not more than 6 inches in loose depth for material compacted by heavy compaction equipment (vibratory roller compactor, backhoe with vibratory tamper, etc.) and not more than 6 inches in loose depth for material compacted by hand-operated tampers. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice. Adjust methods as necessary to achieve specified compaction requirements.

3. 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.
4. Do not allow heavy machinery within 5 feet of structure during backfilling and compacting.

C. Backfilling Excavations

1. Backfill excavations promptly as Work permits, but not until completion of the following.
 - a. Acceptance of construction below finish grade including, dampproofing, waterproofing, and perimeter insulation
 - b. Inspection and recording locations of underground utilities
 - c. Removal of concrete formwork
 - d. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required
 - e. Removal of trash and debris
2. Backfill cast-in-place concrete structures when the concrete has developed adequate strength.
3. Use care in backfilling to avoid damage or displacement of underground structures and pipe.
4. Backfill under existing utility pipes crossed by new utility pipes with sand, unless otherwise noted, and extend continuously from the bedding of the new pipe to the utility pipe crossed, including a 6 inch thick envelope of sand, unless otherwise noted, all around the existing utility pipes.
5. "Haunching" or "forming" with common fill will not be allowed.

D. Backfilling Trenches

1. See Trench Detail on the Drawings.
2. Bed pipe in a 12 inch envelope of crushed stone, unless otherwise noted. Limits of bedding and requirements for remaining trench backfill are shown on the Drawings.
3. Trenches in cross-country runs: Restore surface to that existing prior to construction. Mound trench 6-inches above existing grade if required by the Engineer.

E. Remove and Dispose of Unsuitable Material

1. Below normal grade: in accordance with Paragraph 3.02.G. above.
2. Above normal grade: replace unsuitable material with suitable on-Site material. Use Select Backfill if additional material is required.

3.08 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. Compact each layer as Work progresses.

Compaction Method	Maximum Stone Size	Maximum Loose Lift Thickness		Minimum Number of Passes	
		Below Pavement	Less Critical Areas	Below Pavement	Less Critical Areas
Hand-operated vibratory plate or light roller in confined areas	4 inches	6 inches	8	4	4
Hand-operated vibratory drum rollers weighing at least 1,000 lbs. in confined areas	6 inches	10 inches	12 inches	4	4
Light vibratory drum roller min. weight at drum 5,000 lbs., min. dynapac force 10,000 lbs.	8 inches	6 inches	18 inches	4	4
Medium vibratory drum roller min. weight at drum 10,000 lbs., min. dynapac force 20,000 lbs.	8 inches	6 inches	24 inches	6	6

B. Degree of Compaction (minimum densities):

Fill and Backfill Location	Density
Under structure foundations	95%
Under building slab	95%
Top 2 feet under pavement grade	95%
Below top 2 feet under pavement grade	95%
Trenches through unpaved areas	95%
Embankments	95%
Pipe Bedding	95%
Beside structure foundation walls, tank walls, and retaining walls	95%
Under pipes through structural fills	95%
Maximum density:	ASTM D1557, modified
Field density tests	ASTM D6938

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.

C. Testing

1. Determine actual in place densities using nuclear density compaction tests, (ASTM D2292) as directed by the Owner and in accordance with Division 01 General Requirements.
2. Perform additional Work to obtain proper compaction if in-place densities do not meet the specified densities. Additional compensation will not be made for Work required to meet the specified densities.

D. Minimum Number of Tests: Minimum number of compaction tests performed shall be in accordance with local requirements and as stated below. Where conflict exists between local requirements and requirements herein, the more stringent requirement shall apply.

1. Suitable Backfill: Compact backfill in maximum loose lifts per table above. For each lift make one field density test every 50 linear feet.
2. Trenches: Take at least one field density test per compacted fill layer every 200 linear feet of trench.
3. Paved Areas and Building Subgrade: Make at least 1 field density test of subgrade for every 2,000 square feet of paved area or building slab, but in no case less than 3 tests.
4. Other Areas: In each compacted fill layer, make 1 field density test for every 2,000 square feet of overlaying building slab or paved area, but in no case less than 3 tests.

3.09 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' 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 1/2 inch above or below required subgrade elevation.
 - 3. Fill Under Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2 inch when tested with a 10 foot straightedge.
- D. Compaction: After grading, compact subgrade surfaces to the percentage of maximum density for each area classification.

3.10 MAINTENANCE

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- C. 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.

3.11 DISPOSAL OF EXCESS MATERIALS

- A. Removal from Owner's Property: Upon completion of Work, remove excess excavated material, surplus loam and reclaimed pavement and dispose of it off Owner's property. Restore Site to existing or like new condition, as directed by Owner.
- B. 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.

- C. Legally dispose of excess or unsuitable material at no additional cost to the Owner.

END OF SECTION

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SECTION 02740

FLEXIBLE PAVING

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes

1. Provide and install flexible pavement in accordance with this Section and applicable reference standards listed in Article 1.03.
2. Provide pavement markings as specified and as directed by the Engineer.

1.02 PRICE AND PAYMENT PROCEDURES

- A. Measurement and payment requirements: per Division 01 General Requirements.

1.03 REFERENCES

A. Reference Standards

1. “Standard Specifications for Roads, Bridges, and Incidental Construction,” current revision, Connecticut Department of Transportation

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination, Sequencing and Scheduling: per Division 01 General Requirements.

1.05 SUBMITTALS

- A. Submit in accordance with Division 01 General Requirements.
- B. Material Certificates: Certificates signed by material producer and Contractor stating that each material complies with specified requirements
- C. Mix Design: Provide mix design for each grade of pavement to be used at least 20 days prior to start of paving
- D. Certified Weigh Slips: If required by the Owner, provide for each truck load of bituminous material.
- E. Closeout and Maintenance Material Submittals: per Division 01 General requirements.

1.06 QUALITY ASSURANCE

- A. Provide in accordance with Division 01 General Requirements.

- B. Comply with any road opening permits issued for the Work
- C. The Contractor shall establish and control the pavement (aggregate or asphalt base course and asphalt surface course) alignments, grades, elevations, and cross sections as shown on the Drawings.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Provide in accordance with Division 01 General Requirements.

1.08 SITE CONDITIONS

- A. Existing Conditions: per Division 01 General Requirements.

1.09 MAINTENANCE

- A. Extra Materials: Furnish as specified below. Make interchangeable with and same material and workmanship as corresponding original parts.

PART 2 – PRODUCTS

2.01 AGGREGATE BASE AND SUBBASE

- A. Per Earthwork: Section 02300 and the Drawings

2.02 BITUMINOUS PAVEMENT

- A. Comply with materials requirements of the CTDOT Standard Specifications Section M.04.01 and the Drawings.

2.03 BITUMINOUS TACK COAT

- A. Comply with materials requirements of the CTDOT Standard Specifications

2.04 SOURCE QUALITY CONTROL

- A. Provide in accordance with Division 01 General Requirements.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Do not begin paving operations until base and sub base have been accepted by Engineer.
- B. Apply bituminous prime and tack coats only when the ambient temperature in the shade is at least 50 degrees F for 12 hours immediately prior to application. Do not apply when the base surface is wet or contains an excess of moisture which would prevent uniform distribution and the required penetration.

3.02 BITUMINOUS PAVEMENTS

- A. Comply with installation requirements of the CTDOT Standard Specification
- B. Saw cuts and butt joints shall be used in existing pavement as indicated on the Drawings to facilitate the installation of new pavement.

3.03 BITUMINOUS TACK COAT

- A. Apply tack coat immediately prior to placing pavement adjacent to curbing, gutters, manholes, pavement, etc. for adequate bond. Generally a tack coat will not be required for pavement placed immediately following the rolling of the underlying course.
- B. Comply with installation requirements of the CTDOT Standard Specifications
- C. Bituminous pavement should be compacted to 92 to 97 percent of its theoretical maximum density, as determined by ASTM D 3047.

3.04 TRENCH PATCHING

- A. Do not leave more than 1000 linear feet of backfilled trench unpaved at any one time. Place aggregate base and sub base as shown on the Drawings.
- B. Permanent Patching
 - 1. Remove all existing pavement and re-grade base material and compact as required.
 - 2. Provide base and surface courses to the depths shown on the Drawings.

3.05 TRAFFIC AND PARKING LOT MARKINGS

- A. Sweep and clean surface to eliminate loose material and dust

3.06 PROTECTION

- A. Protect the asphaltic concrete paved areas from traffic until the bituminous asphalt is set and cured and does not pick up under foot or wheeled traffic.

3.07 FINAL CLEANUP

- A. Remove all debris, rubbish, and excess material from the work area.

3.08 FIELD QUALITY CONTROL

- A. Provide in accordance with Division 01 General Requirements.

3.09 CLOSEOUT ACTIVITIES

- A. Provide in accordance with Division 01 General Requirements.

END OF SECTION

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SECTION 02830

RETAINING WALLS

PART 1 – GENERAL

1.01 SUMMARY

- A. This section includes furnishing and installing segmental retaining wall units to the lines and grades designated on the construction drawings and as specified herein. The Contractor shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install the modified segmental retaining wall.

1.02 PRICE AND PAYMENT PROCEDURES

- A. Measurement and payment requirements: per Division 01 General Requirements.

1.03 REFERENCES

- A. Related Specifications: Section 02390 EARTHWORK.
- B. The documents listed below are referenced in this Section. The publications are referred to within the text by the basic designation only. References shall be the most current publications and active standards in effect at the time of receipt of Contract Documents.
- C. ASTM INTERNATIONAL (ASTM)
 - 1. ASTM C140 (2012) Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units
 - 2. ASTM C1372 (2011) Standard Specification for Dry-Cast Segmental Retaining Wall Units
 - 3. ASTM D6638 (2011) Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units (Modular Concrete Blocks)
 - 4. ASTM D6706 (2001; R 2007) Standard Test Method for Measuring Geosynthetic Pullout Resistance in Soil

1.04 SUBMITTALS

- A. Submit the following in accordance with the submittal procedures in Division 1 General Requirements:
 - 1. SD-02 Shop Drawings

- a. Shop Drawings: Complete shop drawings, signed and sealed by a State of Connecticut licensed professional engineer, with installation details to include, but not be limited to, excavation limits, wall layout and elevations, leveling pad, and backfill material.
2. SD-03 Product Data
 - a. Product Data: Manufacturer's product data and manufacturer's recommended installation instructions and details.
 - b. Color: Manufacturer's standard color and texture samples.
3. SD-07 Certificates
 - a. Manufacturer's Certification: Contractor shall submit a Manufacturer's certification, prior to start of Work, that the retaining wall system components meet the requirements of this specification and the structure design.

1.05 QUALITY ASSURANCE

- A. All retaining wall units and accessories shall be provided by a single manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Contractor shall deliver, store, and handle products as specified herein and in accordance with Section 01002 Summary of Work.
- B. Contractor shall check the materials upon delivery to assure proper material has been received.
- C. Contractor shall prevent excessive mud, wet cement, and like materials from coming in contact with the retaining wall units.
- D. Contractor shall protect the materials from damage. Damaged materials shall not be incorporated into the project.

PART 2 – PRODUCTS

2.01 APPROVED MANUFACTURER

- A. Provide segmental retaining wall units from the following Manufacturers:
 1. Keystone, 4444 West 78th Street, Minneapolis, MN 55435, (800)747-8971
 2. Versa-Lok, 6348 Hwy, 36 Blvd. Suite 1, Oakdale, MN 55128, (651)770-3166
 3. Approved Equal

2.02 WALL UNITS

- A. Segmental wall units shall be equal to Keystone or Versa-Lok Retaining Wall System, flat face units, as produced by a licensed manufacturer.
- B. Concrete materials shall conform to the requirements of ASTM C1372, and ASTM C140, latest revision, and per the following:
1. 28 Day Compressive Strength: 3,000 psi
 2. Absorption: 8 % (6% in northern states) for standard weight aggregates;
 3. Dimensional tolerances: $\pm 1/8"$ (3 mm) from nominal unit dimensions not including rough split face, $\pm 1/16"$ (1.5 mm) unit height - top and bottom planes;
 4. Unit size: 8" (203 mm) (H) x 12" (457 mm)(W) x 12" (457 mm)(D) minimum;
 5. Unit weight: 100-lbs/unit (45 kg/unit) minimum for standard weight aggregates;
 6. Inter unit shear strength in accordance with ASTM D6916 (NCMA SRWU-2): 1500-plf (21 kN/m) minimum at 2-psi (13 kPa) normal pressure;
 7. Geogrid/unit peak connection strength in accordance with ASTM D6638(NCMA SRWU-1); 900-plf (13 kN/m) minimum at 2-psi (13 kPa) normal force;
 8. Vertical setback: $\pm 3/8"$ (3 mm) \pm per course (near vertical) or 1" (25 mm) + per course per the design;
 9. Alignment and grid positioning mechanism: fiberglass pins, two per unit minimum; and
 10. Horizontal gap between erected units shall be 1/2 inch (13 mm).
- C. Provide cap, corner, and end units as required to complete the approved wall layout.
- D. Exterior face shall be finished as specified. Other surfaces shall be smooth form type. Dime-size bug holes on the block face may be patched and/or shake-on color stain can be used to blend into the remainder of the block face.
- E. Exposed face shall be finished as specified. Other surfaces shall be smooth form type. Dime-size bug holes on the block face may be patched and/or shake-on color stain can be used to blend into the remainder of the block face.
- F. Color and texture to be selected by the Owner.

2.03 LEVELING PAD AND FREE DRAINING BACKFILL

- A. The leveling pad shall be crushed stone, as specified in Section 02300 EARTHWORK.
- B. Free Draining Backfill material shall be crushed stone, as specified in Section 02300 EARTHWORK.
- C. Backfill material shall be select backfill, as specified in Section 02300 EARTHWORK.
- D. Non-woven geotextile separation fabric shall be placed between the Free Draining Backfill and retained soil, equal to Mirafi 106N.
- E. Where additional fill is needed, the Contractor shall submit sample and specifications to the Engineer for approval.

2.04 GEOGRID CONNECTION

- A. Geosynthetic reinforcement shall consist of geogrids manufactured specifically for soil reinforcement applications and shall be manufactured from high tenacity polyester yarn or high density polyethylene. Polyester geogrid shall be knitted from high tenacity polyester filament yarn with a molecular weight exceeding 25,000 g/m and a carboxyl end group values less than 30. Polyester geogrid shall be coated with an impregnated PVC coating that resists peeling, cracking, and stripping.
- B. The maximum design tensile load of the geogrid shall not exceed the laboratory tested ultimate strength of the geogrid/facing unit connection divided by a factor of safety of 1.5. The connection strength testing and computation procedures shall be in accordance with ASTM D6638 Connection Strength between Geosynthetic Reinforcement and Segmental Concrete Units (NCMA SRWU-1).
- C. The Soil Interaction Coefficient, C_i , values shall be determined per ASTM D6706 (GRNGG5) at a maximum 0.75-inch (19 mm) displacement.
- D. The geogrid manufacturer shall have a manufacturing quality control program that includes QC testing by an independent laboratory. The QC testing shall include:
 - 1. Tensile Strength Testing
 - 2. Melt Flow Index (HDPE)
 - 3. Molecular Weight (Polyester)

2.05 SHEAR CONNECTORS

- A. Shear connectors shall be capable of holding the geogrid in the proper design position during grid pre tensioning and backfilling.

- B. Shear connectors shall be 1/2-inch (12 mm) diameter thermoset isophthalic polyester resin pultruded fiberglass reinforcement rods to provide connection between vertically and horizontally adjacent units with the following requirements:
 - 1. Flexural Strength in accordance with ASTM D4476: 128,000 psi (882 MPa) minimum;
 - 2. Short Beam Shear in accordance with ASTM D4475: 6,400 psi (44 MPa) minimum.

PART 3 – EXECUTION

3.01 EXCAVATION

- A. The Contractor shall excavate to the lines and grades shown on the Construction Drawings, and as specified in Section 02300 EARTHWORK.

3.02 FOUNDATION SOIL PREPARATION

- A. Native foundation soil shall be compacted as specified by the wall design engineer prior to the placement of the Leveling Pad material.
- B. In-situ foundation soil shall be examined by the Engineer to ensure that the actual foundation soil strength meets or exceeds assumed design strength. Soil not meeting the required strength shall be removed and replaced with acceptable, compacted material.

3.03 LEVELING PAD PLACEMENT

- A. The Leveling Pad shall be placed as shown on the Drawings.
- B. The Leveling Pad shall be placed on undisturbed native soils or suitable replacement fills.
- C. The Leveling Pad shall be compacted as specified by the wall design engineer to ensure a level, hard surface on which to place the first course blocks. The Pad shall be constructed to the proper elevation to ensure the final elevation shown on the Drawings.
- D. The Leveling Pad dimensions shall extend beyond the blocks in all directions to a distance and depth as designed by the wall design engineer.

3.04 WALL UNIT INSTALLATION

- A. The first course of wall units shall be placed on the prepared Leveling Pad with the aesthetic surface facing out and the front edges tight together. All units shall be checked for level and alignment as they are placed.

- B. Ensure that units are in full contact with the Leveling Pad. Proper care shall be taken to develop straight lines and smooth curves on base course as per the approved wall layout.
- C. The backfill in front and back of the entire base row shall be placed and compacted to firmly lock them in place. Check all units again for level and alignment. All excess material shall be swept from the top of the units.
- D. Install the next course of wall units on top of the base row:
 - 1. Position the blocks to be offset from seams of blocks below.
 - 2. The blocks shall be placed fully forward so knob and groove are engaged.
 - 3. Check each block for proper alignment and level.
 - 4. Backfill behind the block with Free Draining Backfill.
 - 5. Spread backfill in uniform lifts not exceeding nine inches.
 - 6. Employ methods using lightweight compaction equipment that will not disrupt the stability or batter of the wall. Hand-operated plate compaction equipment shall be used around the block and within three feet of the wall to achieve consolidation.
 - 7. Compact backfill as specified by the wall design engineer.
- E. Install each subsequent course in like manner. Repeat procedure to the extent of wall height.
- F. Allowable construction tolerance at the wall face is two degrees vertically and 1.5 inch and ten feet horizontally.
- G. All walls shall be installed in accordance with local building codes and requirements.

3.05 GEOGRID INSTALLATION

- A. As prescribed by the manufacturer.

END OF SECTION

SECTION 02900

SEEDING AND PLANTING

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes

1. Provide seeding in accordance with this Section.
2. Provide landscape development Work as required, including
 - a. Preparation of subgrade to receive topsoil
 - b. Spreading topsoil
 - c. Seeding
 - d. Hydroseeding
 - e. Maintaining seeded areas until acceptance
3. Repair all grassed areas disturbed during performance of the Work. Where existing topsoil remains, provide seed to re-establish grass. Where necessary, provide additional topsoil.

1.02 PRICE AND PAYMENT PROCEDURES

- A. Measurement and payment requirements: per Division 01 General Requirements.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination, Sequencing, and Scheduling: per Division 01 General Requirements.

1.04 SUBMITTALS

- A. Submit in accordance with Division 01 General Requirements.
- B. Certificates
1. Submit manufacturers or vendors certified analysis for soil amendments and fertilizer materials. Submit other data substantiating that materials comply with specified requirements.
 2. Submit seed vendor's certified statement for each grass seed mixture required, stating botanical and common name, percentage by weight, and percentages of purity germination, and weed seed for each grass seed species.

C. Samples

1. Submit Sample of topsoil material from the on-site stockpile and all off-site sources to be used for approval by Engineer.
2. Submit proposed planting schedule indicating dates for each type of landscape work during normal seasons for such Work in area of Site. Correlate with specified maintenance periods to provide maintenance from date of substantial completion. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.

D. Closeout and Maintenance Material Submittals: per Division 01 General Requirements.

1.05 QUALITY ASSURANCE

- A. Analysis and Standards: Package standard products with manufacturers certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Provide in accordance with Division 01 General Requirements.
1. Deliver grass seed in original containers showing analysis of seed mixture, percentage of pure seed, year of production, net weight, date of packaging, and location of packaging. Damaged packages are not acceptable.
 2. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.07 SITE CONDITIONS

- A. Proceed with, and complete landscape work as rapidly as portions of Site become available, working within seasonal limitations for each kind of landscape work required. When conditions detrimental to plant growth are encountered, notify Engineer before planting.
- B. Locate underground utilities. Perform Work in a manner that will avoid damage.
- C. Plant or install materials during normal planting seasons for each type of landscape work required.
- D. Beginning Work means acceptance of existing conditions.

PART 2 – PRODUCTS

2.01 TOPSOIL

- A. Provide new topsoil which is fertile, friable, natural loam surface soil found at a depth of not less than 4-inches from the original ground surface, reasonably free of subsoil, clay lumps, brush, weeds and other litter, and free of roots, stumps, stones larger than 2-inches in any dimension, and debris.
- B. Obtain topsoil from local sources or from areas having similar soil characteristics to that found at Project Site. Obtain topsoil only from naturally, well-drained sites where topsoil occurs in a depth of not less than 4-inches; do not obtain from bogs or marshes.

2.02 SOIL AMENDMENTS

- A. Lime: Natural limestone containing not less than 90 percent total carbonates, ground, so that not less than 98 percent passes a 40-mesh sieve and not less than 40 percent passes a 100-mesh sieve.

2.03 GRASS MATERIALS

- A. Grass Seed: Provide fresh, clean, new-crop seed complying with tolerance for purity and germination established by Official Seed Analyst of North America. Do not use seed that has become wet, moldy, or damaged. All seed mixtures listed are proportions by weight.
 - 1. Germination: not less than 80 percent
 - 2. Purity: not less than 85 percent
 - 3. Weed content: not more than 1 percent
- B. New England Conservation Seed Mixture (As manufactured by New England Wetland Plants or approved equal) and approved by the Owner
 - 1. Big Bluestem (*Andropogon gerardii*)
 - 2. Switchgrass (*Panicum virgatum*)
 - 3. Little Bluestem (*Schizachyrium scoparium*)
 - 4. Canada Wild Rye (*Elymus canadensis*)
 - 5. Fox Sedge (*Carex vulpinoidea*)
 - 6. Partridge Pea (*Chamaecrista fasciculata*)
 - 7. Fringed Bromegrass (*Bromus ciliatus*)

8. Pennsylvania Smartweed (*Polygonum pensylvanicum*)
9. Common Milkweed (*Asclepias syriaca*)
10. Showy Tick-Trefoil (*Desmodium canadense*)
11. New England Aster (*Aster novae-angliae*)
12. Flat-top Aster (*Aster umbellatus*)
13. Nodding Bur Marigold (*Bidens cernua*)

2.04 MISCELLANEOUS LANDSCAPE MATERIALS

- A. Erosion control mesh: Uniform, open weave jute matting or flexible vinyl mat equal to Mira Mat erosion control, and revegetation mat as manufactured by TenCate Mirafi or equal.

2.05 SOURCE QUALITY CONTROL

- A. Provide in accordance with Division 01 General Requirements.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Protect existing underground improvements from damage.
- B. Remove foreign materials, plants, roots, stones, and debris from Site. Do not bury foreign material.
- C. Remove contaminated subsoil.
- D. Preparation for Planting Grass
 1. Loosen subgrade of grass areas to a minimum of 3-inches. Remove stones over 1-1/2 inches in any dimension, sticks, roots, rubbish and other extraneous matter. Limit preparation to areas that will be planted promptly after preparation.
 2. Spread top soil to minimum depth of 6-inches after light rolling and natural settlement. Add specified soil amendments and mix thoroughly into upper 6-inches of topsoil.
- E. Where grass is to be planted in areas that have not been altered or disturbed by excavating, grading, or stripping operations, prepare soil for planting as follows: Till to a depth of not less than 6-inches; apply soil amendments and initial fertilizers as specified; remove high areas and fill in depressions; till soil to a homogenous

mixture of fine texture, free of lumps, clods, stones, roots and other extraneous matter.

- F. Fine Grade areas to, smooth, even surface with loose, uniformly fine texture. Roll, rake and remove ridges, and fill depressions as required to meet finish grades. Limit fine grading to areas that can be planted immediately after grading. Assure positive drainage away from buildings.
- G. Moisten prepared areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before planting lawns. Do not create a muddy soil condition.
- H. Restore grassed areas to specified condition if eroded or otherwise disturbed after fine grading and prior to planting.

3.02 SEEDING NEW AREAS

- A. Sow seed using a spreader or seeding machine. Do not seed when wind velocity exceeds 5 miles per hour. Distribute seed evenly over entire area by sowing equal quantity in 2 directions at right angles to each other. Do not sow immediately following rain or when ground is too dry.
- B. Seed application rate
 - 1. New England Conservation Seed Mix: 1 pound per 1,750 square feet.
 - 2. All others: 1 pound per 1,000 square feet.
- C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with a fine spray.

3.03 HYDROSEEDING NEW AREAS

- A. Mix specified seed and pulverized mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
- B. Apply slurry using an approved machine. Seed and suitable corn fiber mulch may be applied in one operation. Mix materials with water in machine and agitate to keep mixture uniformly suspended. Use spraying equipment that will distribute slurry uniformly at required rates.
- C. Immediately following hydroseeding, mulch areas by means of mulch blower at rate of 1,200 pounds per acre on level grades, 2,000 pounds on slopes if mulch is not part of slurry. Use mulch as described in 2.05A of this section. Do not seed area in excess of that which can be mulched on same day.

3.04 PROTECTION OF SEEDED SLOPES

- A. Protect seeded slopes against erosion with erosion netting or other methods acceptable to the Engineer.

- B. Spread specified lawn mulch after completion of seeding operations to form a continuous blanket not less than 1-1/2-inches loose measurement over seeded areas.
- C. Anchor mulch by spraying with asphalt emulsion at the rate of 10 to 13 gallons per 1000 square feet. Take precautions to prevent damage or staining of construction or other plantings adjacent to mulched areas.
- D. Cover seeded slopes where grade is 3:1 or greater, unless otherwise noted, with jute matting. Roll matting down over slopes without stretching or pulling.
- E. Lay matting smoothly on soil surface, burying top end of each section in narrow 6-inch trench. Leave 12-inch overlap from top roll over bottom roll. Leave 4-inch overlap over adjacent section.
- F. Staple outside edges and overlaps at 36-inch intervals.
- G. Lightly dress slopes with topsoil to ensure close contact between matting and soil.
- H. In ditches, unroll matting in direction of flow. Overlap ends of strips 6 inches with upstream section on top.

3.05 PLANTING OF SHRUBS AND TREES

- A. Perform planting within the planting season when weather and soil conditions are suitable, and in accordance with local conditions. Do not install plants in topsoil that is in a muddy or frozen condition.
- B. Prune injured roots or branches to make clean-cut ends prior to planting, utilizing clean, sharp tools, removing only injured or diseased branching.
- C. Remove planting containers, baskets, and non-biodegradable materials from root balls during planting. Cut natural fiber burlap from around the trunk of trees and folded down against the root ball prior to backfilling.
- D. Position trees and shrubs at intended locations shown on the Drawings and obtain Engineer's approval prior to excavating pits, making necessary adjustments as directed.
- E. Dig planting pits with level bottoms, with the width twice the diameter of root ball. Rest root ball on undisturbed grade. Backfill each plant pit in layers with thoroughly, mixed prepared soil as indicated on the Drawings.
- F. Fill prepared soil around ball of plant halfway, and insert plant tablets. Complete backfill, and water thoroughly.
- G. Shrub type shall be approved by the Owner prior to installation.

3.06 RECONDITIONING EXISTING GRASSED AREAS

- A. Recondition existing lawn areas damaged by Contractor's operations and existing lawn areas where minor re-grading is required.
- B. Provide fertilizer, seed, or sod, and soil amendments as specified for new lawns and as required to provide a satisfactorily reconditioned lawn. Provide new topsoil as required to fill low spots and meet new finish grades.
- C. Cultivate bare and compacted areas thoroughly to provide a satisfactory planting bed.
- D. Remove diseased and unsatisfactory lawn areas. Do not bury into soil. Remove topsoil containing foreign materials resulting from Contractor's operations.
- E. Water newly planted areas and keep moist until new grass is established.

3.07 MAINTENANCE

- A. Begin maintenance immediately after planting.
- B. Maintain grassed areas for not less than 60 days after substantial completion, and longer as required to establish an acceptable lawn.
- C. If seeded in fall, and not given full 60 days of maintenance, or if not considered acceptable at that time, continue maintenance during the following spring until acceptable lawn is established.
- D. Maintain grass by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, re-grading, and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas.
- E. Maintain trees and shrubs until final completion.

3.08 CLEANUP AND PROTECTION

- A. Keep pavements clean. Maintain protection during installation and maintenance periods.
- B. Restore pavement, grassed areas and planted areas damaged during execution of Work of this section.

3.09 INSPECTION AND ACCEPTANCE

- A. Landscape work may be inspected for acceptance in parts agreeable to Engineer, provided Work offered for inspection is complete, including maintenance.
- B. Replace rejected Work and continue specified maintenance until re-inspected by Engineer and found to be acceptable.

3.10 FIELD QUALITY CONTROL

- A. Provide in accordance with Division 01 General Requirements.

3.11 CLOSEOUT ACTIVITIES

- A. Provide in accordance with Division 01 General Requirements.

END OF SECTION

NOT FOR BIDDING PURPOSES
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SECTION 09900

PAINTS AND COATINGS

PART 1 – GENERAL

1.01 SCOPE:

- A. This section shall include surface preparation and painting for the following types of painting work and as included in the schedule at the end of this Section:
 - 1. Painting of equipment where indicated, and labeling of all equipment.
 - 2. Touch-up painting of factory coated equipment.

1.02 SUBMITTALS:

- A. The following shall be submitted in accordance with Submittal Procedures in Section 01001, Overall General Requirements:
- B. Product Data: Provide product data for each paint system specified, including:
 - 1. Block Fillers
 - 2. Primers
 - 3. Manufacturer's technical information including label analysis and instructions for handling, storage, and application of each material proposed for use.
- C. List each material and cross-reference the specific coating, finish system, and application. Identify each material by the manufacturer's catalog number and general classification.
- D. Samples: Provide samples for initial color selection in the form of manufacturer's color charts.
 - 1. After color selection, the Contractor will furnish color chips of selections made for surfaces to be coated.
- E. Provide samples of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate:
 - 1. Provide stepped samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.

2. Provide a list of material and application for each coat of each sample. Label each sample as to location and application.
3. Submit samples on the following substrates for the Owner's review of color and texture only:
 - a. Concrete Masonry: Provide two 4-by-8-inch samples of masonry, with mortar joint in the center, for each finish and color
 - b. Ferrous Metal: Provide two 4-inch-square samples of flat metal and two 8-inch-long samples of solid metal for each color and finish.
- F. Certificates: Provide certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

1.03 QUALITY ASSURANCE:

- A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to those indicated for the Project that have resulted in a construction record of successful in-service performance.
- B. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats
- C. Field Samples: On wall surfaces and other exterior and interior components, duplicate finishes of prepared samples. Provide full-coat finish samples on at least 100 sq. ft. of surface until required sheen, color, and texture are obtained; simulate finished lighting conditions for review of in-place work.
 1. Final acceptance of colors will be from job-applied samples.
 2. The Engineer will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted. Apply coatings in this room or surface according to the schedule or as specified.

1.04 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver materials to the job Site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
 1. Product name or title of material.
 2. Product description (generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume, for pigment and vehicle constituents.

5. Thinning instructions.
 6. Application instructions.
 7. Color name and number.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
1. Protect from freezing: Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.05 JOB CONDITIONS:

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F and 90 deg F
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg F and 95 deg F
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or to damp or wet surfaces.
 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

1.06 COLOR SELECTION:

- A. Colors of finish coats shall be as indicated or specified. Where not indicated or specified; colors shall be selected by the Owner. Manufacturers' names and color identification are used for the purpose of color identification only. Named products are acceptable for use only if they conform to specified requirements. Products of other manufacturers are acceptable if the colors approximate colors indicated and the product conforms to specified requirements.
- B. Color for metal surfaces shall be gray.

1.07 EXTRA MATERIALS:

- A. Deliver extra materials to Owner. Furnish extra materials that match products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.
 1. Paint: Furnish summary table with product information for each color and type.

PART 2 – PRODUCTS

2.01 MANUFACTURERS:

- A. Manufacturer: Subject to compliance with requirements, provide products as specified in the painting schedule or approved equal by Tnemec, Sherwin Williams (S-W), Glidden and Devco.

2.02 PAINT MATERIALS:

- A. Material Compatibility: Provide block fillers, primers, finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.
- B. Material Quality: Provide the manufacturer's best-quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.
 - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish the manufacturer's material data and certificates of performance for proposed substitutions.
- C. Colors: Provide color selections from the manufacturer's full range of standard colors.

PART 3 – PART 3 - EXECUTION

3.01 EXAMINATION:

- A. General: Examine substrates and conditions under which painting will be performed for compliance with paint application requirements. Surfaces receiving paint must be thoroughly dry before paint is applied.
 - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected
 - 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify the Engineer about anticipated problems using the materials specified over substrates primed by others.

3.02 PREPARATION:

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items, if necessary, to completely paint the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease prior to cleaning. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to the manufacturer's instructions for each particular substrate condition and as specified.
1. Provide barrier coats over incompatible primers or remove and reprime. Notify Engineer in writing about anticipated problems using the specified finish-coat material with substrates primed by others.
 2. Existing painted surfaces shall be structurally sound, dry, clean, and free of oil, grease, dirt, mildew, form release agents, curing compounds, efflorescence, loose and flaking paint, or other foreign material. Resident engineer shall approve condition of prepared substrate prior to application of coating system. Old coatings should be tested for lifting per coating manufacturer's recommendations.
 3. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen, as required, to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by the paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
 4. Ferrous Metals: Clean ungalvanized ferrous metal surfaces that have not been shop-coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council (SSPC).

5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Materials Preparation: Carefully mix and prepare paint materials according to manufacturer's directions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
 3. Use only thinners approved by the paint manufacturer and only within recommended limits.

3.03 APPLICATION:

- A. General: Apply paint according to manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
- B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
1. Paint colors, surface treatments, and finishes are indicated in the schedules.
 2. Provide finish coats that are compatible with primers used.
 3. The number of coats and the film thickness required are the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce a smooth even surface according to the manufacturer's directions.
 4. Apply additional coats if undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
 5. The term exposed surfaces includes areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.

6. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 7. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, nonspecular black paint.
 8. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 9. Finish exterior doors on tops, bottoms, and side edges same as exterior faces.
 10. Sand lightly between each succeeding enamel or varnish coat.
 11. Omit primer on metal surfaces that have been shop-primed and touch-up painted.
 12. Prime cmu walls and apply (1) finish coat prior to installation of any wall mounted equipment, piping, conduits, or fixed objects that would limit access for application of coating system and/or conceal portions of the wall surface. Apply second finish coat after all Work of other trades is completed.
- C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- D. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to the manufacturer's directions.
1. Brushes: Use brushes best suited for the material applied.
 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- E. Minimum Coating Thickness: Apply materials no thinner than the manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

- F. Mechanical and Electrical Work: Painting mechanical and electrical work is limited to items exposed in mechanical equipment rooms and in occupied spaces.
- G. Mechanical items to be painted include the following as specified:
 - 1. Screens.
 - 2. Motors and mechanical equipment.
 - 3. Accessory items.
- H. Electrical items to be painted include the following:
 - 1. Conduit and fittings as specified.
- I. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

3.04 PRIME COATS:

- A. Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime-coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing. Apply prime coat to all previously painted surfaces if finish coats are not compatible with existing coating.

3.05 PIGMENTED (OPAQUE) FINISHES:

- A. Completely cover to provide a smooth, opaque surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ripples, or other surface imperfections will not be acceptable.

3.06 COMPLETED WORK:

- A. Match approved samples for color, texture, and coverage. Remove, refinish, or repaint Work not complying with specified requirements.

3.07 FIELD QUALITY CONTROL:

- A. The Owner reserves the right to invoke the following test procedure up to four times during the period when paint is being applied:
 - 1. The Contractor shall engage the services of an independent testing agency with five years' experience to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.

2. The testing agency shall perform appropriate tests at no additional cost to the Owner for the following characteristics as required by the Owner:
 - a. Quantitative materials analysis.
 - b. Abrasion resistance.
 - c. Apparent reflectivity.
 - d. Flexibility.
 - e. Washability.
 - f. Absorption.
 - g. Accelerated weathering.
 - h. Dry opacity.
 - i. Accelerated yellowness.
 - j. Recoating.
 - k. Skinning.
 - l. Color retention.
 - m. Alkali and mildew resistance.
3. If test results show material being used does not comply with specified requirements, the Contractor shall be directed to stop painting, remove noncomplying paint, repaint surfaces coated with rejected paint, and remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are incompatible.

3.08 CLEANING:

- A. At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the Site.
 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.09 PROTECTION:

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Engineer.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.10 PAINT SCHEDULE:

- A. Number of coats scheduled is as a minimum. Notwithstanding anything in the following schedule to the contrary, painting and finishing shall conform to the applicable laws and building code regarding fire hazard classifications and volatile organic content of finish materials. Provide products by the manufacturers named or approved equal.

1. The paint and coating systems listed below shall be provided where the Drawings refer to this specification section or reference any item to be painted or coated, unless a specific paint or coating system is specified elsewhere. All the paint and coating systems listed below may not be included within the scope-of-work. This list is intended to cover all potential conditions that may require painting.

2. Interior Galvanized Steel (where listed on Drawings to be field painted) for Epoxy Coating:

Galvanizing Repair at Field Welds

1. Tnemec "Series 90-97 Tneme-Zinc"
2. S-W "Zinc-Clad 2 Plus"
3. Devoe "Cathacoat 302H"

Field Applied Prime Coat

1. Tnemec "Series N69 Hi-Build Epoxoline" DFT 2-3 mils
2. S-W "Macropoxy 646" DFT 5-10 mils
3. Devoe "Devran 203" DFT 2-4 mils

Field Applied Finish Coat

1. Tnemec "Series N69 Hi-Build Epoxoline" DFT 2-3 mils
2. S-W "Macropoxy 646" DFT 5-10 mils
3. Devoe "Bar-Rust 235H" DFT 4-7 mils

3. Exterior Galvanized Steel (where listed on Drawings to be field painted) for Epoxy / Polyurethane Coating:

Galvanizing Repair at Field Welds

1. Tnemec "Series 90-97 Tneme-Zinc"
2. S-W "Zinc-Clad 2 Plus"
3. Devoe "Cathacoat 302H"

- Field Applied Prime Coat
1. Tnemec "Series 27 Typoxy" DFT 2-3 mils
 2. S-W "Macropoxy 646" DFT 5-10 mils
 3. Devoe "Devran 203" DFT 3-4 mils
- Field Applied Two Finish Coats
1. Tnemec "Series 175 Endura-Shield" DFT 2-5 mils/coat
 2. S-W "High-Solids Polyurethane 100" DFT 3-4 mils/coat
 3. Devoe "Devthane 379H" DFT 3-5 mils/coat
4. Factory/Shop Primed Steel Per Paragraph 3.10.16, Previously Painted surfaces Interior Exposure for Epoxy Coating:
- Shop Applied Prime Coat
1. Manufacturer's Standard Primer
- Field Applied Two Finish Coats
1. Tnemec "Series N69 Hi-Build Epoxoline" DFT 2-3 mils
 2. S-W "Macropoxy 646" DFT 5-10 mils
 3. Devoe "Bar-Rust 235H" DFT 4-7 mils
5. Factory/Shop Primed Steel Per Paragraph 3.10.16, Previously Painted Surfaces- Exterior Exposure for Epoxy / Polyurethane Coating:
- Shop Applied Prime Coat
1. Manufacturer's Standard Primer
- Field Applied Intermediate Coat
1. Tnemec "Series N69 Hi-Build Epoxoline" DFT 2-3 mils
 2. S-W "Macropoxy 646" DFT 5-10 mils
 3. Devoe "Bar-Rust 235H" DFT 4-7 mils
- Field Applied Two Finish Coats
1. Tnemec "Series 175 Endura-Shield" DFT 2-5 mils/coat
 2. S-W "High Solids Polyurethane 100" DFT 3-4 mils/coat
 3. Devoe "Devthane 379H" DFT 2-3 mils/coat

6. Ferrous metals listed in Section 05120 Structural Steel and Section 05500 Miscellaneous Metals Interior Exposure for Epoxy Coating:

Shop Applied Prime Coat

1. Tnemec "Series 27 Typoxy"
DFT 2-3 mils
2. S-W "Recoatable Epoxy
Primer" DFT 4-6 mils
3. Devoe "Devran 223" DFT 4-6
mils

Field Applied Two Finish Coats

1. Tnemec "Series N69 Hi-
Build Epoxoline" DFT 2-3 mils
2. S-W "Macropoxy 646"
DFT 5-10 mils
3. Devoe "Bar-Rust 235H"
DFT 4-7 mils

7. Ferrous metals listed in Section 05120 Structural Steel and Section 05500 Miscellaneous Metals Exterior Exposure for Epoxy Coating:

Shop Applied Prime Coat

1. Tnemec "Series N69 Hi-Build
Epoxoline" DFT 2-3 mils
2. S-W "Macropoxy 646" DFT 5-10
mils
3. Devoe "Bar-Rust 235H" DFT 4-7
mils

Field Applied Two Finish Coats

1. Tnemec "Series 175 Endura-
Shield"
DFT 2-5 mils/coat
2. S-W "High Solids Polyurethane
100"
DFT 3-4 mils/coat
3. Devoe "Devthane 379H"
DFT 2-3 mils/coat

8. Ductile, Cast Iron, Copper, Aluminum or PVC - Interior or Exterior Exposure for Epoxy/Polyurethane Coating:

PVC Surface Preparation

Scarify

Field Applied Prime Coat

1. Tnemec "Series N69 Hi-
Build
Epoxoline" DFT 2-3 mils
2. S-W "Macropoxy 646"
DFT 5-10 mils

3. Devoe "Devran 224HS"
DFT 4-8 mils
- Field Applied Intermediate Coat
1. Tnemec "Series N69 Hi-Build Epoxoline" DFT 4-6 mils
 2. S-W "Macropoxy 646" DFT 5-10 mils
 3. Devoe "Devran 224HS" DFT 4-8 mils
- Field Applied Finish Coat
1. Tnemec "Series 175 Endura-Shield" DFT 2-5 mils
 2. S-W "High Solids Polyurethane 100" DFT 3-4 mils
 3. Devoe "Devthane 379H" DFT 2-3 mils
9. Insulated Pipe Interior or Exterior Exposure for Acrylic:
- Field Applied Prime Coat
1. Tnemec "Series 151-1051 Elasto-Grip Primer" DFT 1-1.5 mils
 2. S-W "DTM Acrylic/Primer" DFT 2.5-4 mils
 3. Devoe "Devflex 4020PF" DFT 2.2-3.5 mils
- Field Applied Two Finish Coats
1. Tnemec "Series 1029 Enduratone" DFT 2-3 mils/coat
 2. S-W "Sher-Cryl HPA" DFT 2.5-4 mils/coat
 3. Devoe "Devflex 4216HP" DFT 1.5-4 mils/coat
10. Interior Gypsum Drywall for Waterborne Epoxy:
- Field Applied Prime Coat
1. Tnemec "Series 151-1051 Elasto-Grip FC" DFT 1-2 mils
 2. S-W "PrepRite ProBlock" DFT 1-2 mils
 3. Devoe "Gripper 3210" DFT 2-3 mils

- Field Applied Two Finish Coats
1. Tnemec "Series 113 Tufcoat"
DFT 2-3 mils/coat
 2. S-W "Waterbased Catalyzed Epoxy"
DFT 2.5-3 mils/coat
 3. Devoe "Tru-Glaze-WB 4406"
DFT 2-5 mils/coat
11. Interior Wood for Waterborne Epoxy:
- Field Applied Prime Coat
1. Tnemec "Series 151-1051 Elasto-Grip FC" DFT 1-2 mils
 2. S-W "PrepRite ProBlock" DFT 1-2 mils
 3. Devoe "Devflex 4020PF" DFT 2.2-3.5 mils
- Field Applied Two Finish Coats
1. Tnemec "Series 113 Tufcoat"
DFT 2-3 mils/coat
 2. S-W "Waterbased Catalyzed Epoxy"
DFT 2.5-3 mils/coat
 3. Devoe "Tru-Glaze-WB 4406"
DFT 2-5 mils/coat
12. Interior CMU walls for Waterborne Epoxy:
- Field Applied Prime Coat
1. Tnemec "Series 130 Envirofill" at 60-80 sf/gal
 2. S-W "Kem Cati-Coat HS Epoxy Filler/ Sealer" at DFT 10-18 mils
 3. Devoe "Tru-Glaze-WB 4015" at DFT 10-15 mils
- Field Applied Two Finish Coats
1. Tnemec "Series 113 Tufcoat"
DFT 4-6 mils/coat
 2. S-W "Waterbased Catalyzed Epoxy"
DFT 2.5-3 mils/coat
 3. Devoe "Tru-Glaze-WB 4406"
DFT 2-5 mils/coat
13. Interior Concrete Ceilings and Walls for Waterborne Epoxy:
- Field Applied Prime Coat
1. Tnemec "Series 114 Tufcoat"
DFT 4-6 mils
 2. S-W "Waterbased Tile-Clad Epoxy"
DFT 2-4 mils

3. Devoe "Tru-Glaze-WB 4408"
DFT 10-15 mils
- Field Applied Two Finish Coats
1. Tnemec "Series 114 Tufcoat"
DFT 4-6 mils/coat
2. S-W "Waterbased Tile-Clad Epoxy"
DFT 2-4 mils/coat
3. Devoe "Tru-Glaze-WB 4408"
DFT 2-5 mils/coat
14. Interior and Exterior Wood Trim, Fiber-Cement/Composite Trim for Acrylic Coating, semi-gloss:
- Field Applied Prime Coat
1. Tnemec "Series 10-99W"
DFT 2-3 mils
2. S-W "Exterior Latex Wood Primer"
DFT 2-3 mils
3. Glidden "Stain Stomper 2110"
DFT 2-3 mils
- Field Applied Two Finish Coats
1. Tnemec "Tneme-Cryl Series 6"
DFT 2-3 mils/coat
2. S-W "A-100 Exterior Acrylic Latex"
DFT 1.5-2 mils/coat
3. Glidden "Fortis 350"
DFT 1.5-2 mils/coat
15. Interior Concrete Floors for Waterbased Epoxy:
- Field Applied Prime Coat
1. Tnemec "Series 287 Envio-Pox"
DFT 3.0-4.0 mils
2. S-W "ArmorSeal Floor-Plex 7100 Primer"
DFT 1.5-2.0 mils
3. Devoe Approved Equal
- Field Applied Finish Coats
1. Tnemec "Series 287 Envio-Pox"
DFT 3.0-4.0 mils (1 coat)
2. S-W "ArmorSeal Floor-Plex 7100 Epoxy"
DFT 1.5-2 mils/coat (2 coats)
3. Devoe Approved Equal
16. All mechanical, electrical, HVAC, process equipment, and other utility items shall be painted as indicated on the Drawings or as specified. Paint all

items throughout the project according to this specification, except for items that are factory painted with an approved manufacturer's painting system that shall meet or exceed the performance, quality, thickness and warranty of the coating systems contained herein. Coating systems shall be factory applied as indicated where the product or item is specified.

17. All ferrous metals indicated on the Drawings to be painted shall be provided with a shop primer that is compatible with the coatings contained herein.

3.11 TRASH REMOVAL:

- A. The Subcontractor for work of this section shall, at the end of each work day, clean up all debris resulting from his work and shall gather it and deposit it in an on-site trash receptacle furnished, maintained, emptied, and removed by the Contractor.

END OF SECTION

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SECTION 11142

PIPING

PART 1 – GENERAL

1.01 GENERAL:

- A. Specification shall supplement, but not supersede, all applicable legal requirements which may be more severe in application. Fuel conveying systems constructed shall conform to all local, State, and Federal codes or laws currently in effect at the site location. In case of the conflict, CONTRACTOR shall obtain a decision from ENGINEER as to which requirement shall govern.
- B. Description: Work included under this section:
 - 1. Piping, fittings and valves necessary to convey fuel from new underground storage tank (Base Bid) or new aboveground storage tank (Bid Alternate) to existing product supply and return piping manifold within the Emergency Generator Room.
 - 2. Piping necessary for tank venting.
 - 3. Appurtenances include all materials necessary and specified by manufacturer(s) to insure all sumps are water tight, all pipe junctions are leak tight, all piping and equipment are securely fastened, and product lines are properly secured, bedded and backfilled.

1.02 SUBMITTALS:

- A. Product Data: Manufacturer's literature with specifications, engineering data, and installation instructions for all auxiliary materials, fixtures, and equipment.
- B. Installer Certification: Submit proof that the personnel are trained by the piping manufacturer(s) on techniques for installing their products.
- C. Testing Specifications: Manufacturer's testing specifications for primary and secondary piping.
- D. Shop Drawings: Furnish technical data prepared specifically for the appurtenances being furnished including dimensioned drawings, fitting locations, support details, data sheets, instructions, schematics for all custom fabrications and assemblies, and similar information pertinent to the installed equipment.

1.03 QUALITY ASSURANCE:

- A. Submit a written warranty or warranties for product and vent piping and containment sumps. All warranties shall be executed by manufacturer agreeing to repair failures or replace piping, fittings, sumps or any other manufacturer supplied

accessory, complete with delivery and installation. Warranty shall protect OWNER for a period no less than 10 years from date of original purchase against failure of component due to manufacturing defects. Warranty shall be in addition to, and not a limitation of, other rights OWNER may have against CONTRACTOR under Contract Documents.

- B. Piping to be constructed in accordance with applicable Federal, State, and Local requirements.

PART 2 – PRODUCTS

2.01 UST FUEL SYSTEM PIPING (BASE BID): Unless otherwise specified, materials shall conform to the following:

- A. Interior Aboveground Product Piping: Carbon steel pipe shall be used for all above ground product piping installed within the pump station building and shall be screwed construction with screwed or flanged connections to equipment or existing piping as required. Steel pipe shall be Schedule 40 carbon steel pipe, ANSI B36.10, ASTM A120.
- B. Exterior Underground Product Piping: Flexible, double-walled, stainless steel pipe and fittings shall be used for all exterior underground product piping. All primary and secondary piping shall be connected in such a way as to permit integrity testing of both during installation, as well as at periodic intervals in the future. Piping system shall be Brugg Flexwell-HL or approved equal.
- C. Underground vent piping: Fiberglass Reinforced Plastic (FRP) or continuous flexible piping shall be used for all underground vent piping. Material of construction shall be compatible with diesel fuel and all possible additives.
- D. Aboveground vent piping: Galvanized carbon steel pipe shall be used for all aboveground vent piping. Steel pipe shall be Schedule 40 galvanized steel pipe, ASTM A120.
- E. Appurtenances: Provide all fittings, double-tapped bushings, adapter couplings, isolation couplings (no grommets) and pipe, etc., all as required for piping systems and connections in piping sumps, tanks, and existing piping or equipment.

2.02 AST FUEL SYSTEM PIPING (BID ALTERNATE): Unless otherwise specified, materials shall conform to the following:

- A. Interior Aboveground Product Piping: Carbon steel pipe shall be used for all above ground product piping installed within the pump station building and shall be screwed construction with screwed or flanged connections to equipment or existing piping as required. Steel pipe shall be Schedule 40 carbon steel pipe, ANSI B36.10, ASTM A120.

- B. Exterior Underground and Aboveground Product Piping: Flexible, double-walled, stainless steel pipe and fittings shall be used for all exterior underground and aboveground product piping. All primary and secondary piping shall be connected in such a way as to permit integrity testing of both during installation, as well as at periodic intervals in the future. Piping system shall be Brugg Flexwell-HL or approved equal.
- C. Aboveground vent piping: Galvanized carbon steel pipe shall be used for all aboveground vent piping. Steel pipe shall be Schedule 40 galvanized steel pipe, ASTM A120.
- D. Appurtenances: Provide all fittings, double-tapped bushings, adapter couplings, isolation couplings (no grommets) and pipe, etc., all as required for piping systems and connections in piping sumps, tanks, and existing piping or equipment.
- E. Anti-Siphon Valve: Provide an anti-siphon valve for the AST. Anti-siphon valve to be installed within pipe transition sump on fuel supply pipe. Anti-siphon valve shall be Morrison Model 910ER or approved equal.

PART 3 – EXECUTION

3.01 DELIVERY:

- A. CONTRACTOR shall coordinate all deliveries with OWNER and ENGINEER. It is responsibility of CONTRACTOR to carefully inspect all deliveries of pipe, containment sumps, and associated appurtenances and equipment immediately upon delivery. All deliveries shall be checked for physical damage such as cracks or deformations. Any damage or shortages shall be documented in the presence of shipper.

3.02 HANDLING:

- A. Store pipe and fittings inside. Where approved by ENGINEER to store outside, elevate above grade and enclose with durable, light proof, and weather proof wrapping.

3.03 INSTALLATION:

- A. Installation of all product and vent piping shall be in accordance with manufacturer's recommendations. CONTRACTOR shall submit manufacturer's specifications for cutting, coupling, installing, securing, etc. to ENGINEER prior to commencement of work.
- B. Pipe installer(s) shall be certified by manufacturer as being properly trained in techniques of installing their products. Certification requirements are manufacturer specific but usually consists of on-the-job training for first installation. Written proof of certification shall be provided to ENGINEER. All sump penetrations including small diameter electrical penetrations shall be cut and installed only by

certified personnel. All equipment needed, including manufacturer's proprietary equipment, shall be furnished as necessary by CONTRACTOR for completion of this work.

3.04 PIPE TESTING:

- A. Testing shall be performed after piping systems have been completed. Testing procedures for both primary and secondary pipe shall be in accordance with manufacturer's specifications. Testing procedures shall be supplied in writing to ENGINEER at least five (5) days before testing. All testing shall be done in presence of ENGINEER.
- B. Periodic or intermittent integrity testing may be required by local or federal code and is a desirable option to have regardless. CONTRACTOR shall install the necessary fittings to make intermittent testing possible. Fittings shall be installed in accessible locations. CONTRACTOR is responsible for furnishing ENGINEER and OWNER with manufacturer's testing assembly.

END OF SECTION

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SECTION 11143

TANK MONITORING EQUIPMENT

PART 1 – GENERAL

1.01 DESCRIPTION:

- A. Provide and install tank monitoring system to be used for monitoring the new UST (Base Bid) or new AST (Bid Alternate). The equipment will be capable of providing continuous inventory monitoring and fuel system leak detection. Monitoring systems shall be Veeder-Root TLS-300C or approved equal.
- B. Equipment: CONTRACTOR shall provide specified equipment and all required and affiliated products including, but not limited to, materials necessary and specified by the manufacturer to properly install and integrate all equipment referred to in this specification and related equipment, including power relays, junction box(es), power panel box(es), electrical and sensor wiring, conduits, fasteners, etc. unique to the equipment being provided by CONTRACTOR. CONTRACTOR will also be responsible for installing conduit and incidentals between the monitoring system consoles and the USTs.
- C. Conflicts: It is the responsibility of the CONTRACTOR to provide equipment not specifically mentioned in this specification but that is needed to comply with applicable regulations or codes, or which is part of the manufacturer's equipment package. In case of code or regulatory conflict, the CONTRACTOR shall obtain a decision from the OWNER and ENGINEER as to which requirement shall govern.
- D. Submittals: The CONTRACTOR shall submit to the ENGINEER and OWNER manufacturer's literature and shop drawings with specifications, engineering data, system component details, schematics and similar pertinent information for all major equipment components and fixtures to demonstrate the equipment meets requirements. The OWNER and or ENGINEER reserves the right to reject (with explanation) any equipment which the OWNER feels is inadequate.
- E. Product Literature: CONTRACTOR shall provide three (3) sets of necessary product literature to OWNER to facilitate proper maintenance, including but not limited to site preparation and installation instructions for tank monitoring system, system operating instructions for tank monitoring system, system setup instructions for tank monitoring system, magnetostrictive probe instruction manual, interstitial space sensor instruction manual, piping sump sensor instruction manual, overflow alarm and acknowledgment switch instruction manual, etc.

1.02 QUALITY ASSURANCE:

- A. System Warranty: Submit written warranties for the equipment provided. All warranties shall be executed by the equipment manufacturer agreeing to repair failures or replace CONTRACTOR supplied equipment during delivery and

installation. Warranty shall protect the OWNER for a period no less than the manufacturer's standard warranty period as specified in manufacturer brochures but which will not be less than one year from date of installation. Coverage shall be from the date of original purchase and shall protect against failure of the component due to manufacturing defects. Warranty is to include parts and labor with all warranty work performed on site by an authorized manufacturer's representative. These warranties shall be in addition to, and not a limitation of, other rights the OWNER may have against the CONTRACTOR.

- B. Extended Warranty: The CONTRACTOR'S equipment manufacturer shall offer a one-year extension on the standard warranty for an additional cost to the OWNER. The OWNER may have until the expiration date of the original system warranty to purchase the option of an extended warranty.

PART 2 – PRODUCTS

2.01 TANK MONITORING/LEAK DETECTION EQUIPMENT.

- A. General Description: CONTRACTOR shall provide one (1) VEEDER-ROOT TLS-300C tank monitoring system or approved equal capable of providing continuous in-tank leak detection, inventory measurement, overfill prevention with remote alarm, interstitial space leak detection, and water level measurement. This system shall also monitor the tank interstitial space and piping sump for leakage, and shall provide inventory management capabilities. At a minimum, audible/visual alarms are to be actuated at the tank monitoring system console in the following events: presence of liquid in the sumps or interstitial space, high/low product levels in the tank; high water alarm; delivery needed alarm; and sudden loss.
- B. Standards and Codes: The tank monitoring system shall meet all applicable standards, codes, and regulatory agency requirements and shall perform in accordance with continuous underground monitoring and leak detection in Subpart D of 49 CFR 280.
- C. In-Tank Leak Detection: CONTRACTOR shall provide one (1) VEEDER-ROOT Mag Plus in-tank probe or approved equal based on magnetostrictive principle for liquid level measurement and in-tank leak detection. Tank probes shall be capable of performing a static tank tightness test to an accuracy of 0.1 GPH with at least a 98% probability of detection and no more than 1% probability of false alarm. Float kits shall be provided, as required, for high and low product level alarming and water level measurement.
- D. Interstitial Leak Detection for Double-Walled Tanks: CONTRACTOR shall provide automatic, continuous leak sensing systems for the replacement UST (Base Bid) or AST (Bid Alternate) in the interstitial space of the tank to detect a breach. Sensors shall have the ability to sense the presence of hydrocarbons and/or fluid and provide an alarm if liquids are detected. System shall be capable of providing continuous monitor of sensor integrity.

- E. Containment Sump Monitoring: CONTRACTOR shall provide automatic, continuous leak sensing systems for the replacement tank pipe containment/transition sump. Containment sump sensors shall be capable of detecting the presence of, and differentiating between, hydrocarbons and/or water in the piping sump and provide an alarm condition. The system must have the ability to indicate when the sensing device has failed and is no longer providing environmental compliance.
- F. Environmental Compliance Reports: The system shall have the ability to provide a record of the last three occurrences of each type of alarm or warning condition detected by the system. The following reports related to monitoring include: system status messages; liquid sensor warning and alarm messages; normally-closed sensor warning and alarm conditions; hydrostatic sensor warning and alarm conditions/high or low level liquid level conditions; external input messages; and software module alarm message.
- G. Product Inventory Control: The tank management system shall collect product height and temperature data from magnetostrictive level probe and compute gross and temperature compensated net gallons. OWNER shall have the ability to generate product inventory and delivery reports. System shall automatically generate an inventory increase report when delivery of product to the tank has taken place. Inventory reports will include: fuel volume; fuel height; water height; fuel temp; ullage; fuel volume; last inventory increase amount; last in-tank leak test results; time and date; tank id; fuel type; and 90% ullage. Each UST Monitoring System console must have printer capabilities.
- H. Communications: Tank monitoring system shall be equipped with a VEEDER-ROOT Site Fax/modem or approved equal. CONTRACTOR shall provide VEEDER-ROOT InformaTIV Site Management Software or approved equal for OWNER to install on OWNER's computer(s). OWNER will be responsible for installing phone lines to tank monitoring system console.
- I. Remote Overall Alarm: CONTRACTOR shall provide one (1) VEEDER-ROOT or approved equal external audible and visual alarms with acknowledgment switch suitable for outdoor environment applications to provide early warning of tank delivery overfill conditions.

PART 3 – EXECUTION:

- A. Installation: Installation of all equipment shall be in accordance with manufacturer's recommendations and applicable codes and standards. CONTRACTOR shall submit to OWNER and ENGINEER equipment installation instructions prior to installation.
- B. System Startup and testing shall be performed by the tank monitoring system manufacturer's authorized service representative and shall be done in the presence of the OWNER and ENGINEER. This system startup and testing shall be provided by the CONTRACTOR. CONTRACTOR shall also provide the OWNER with a

minimum of two (2) hours of training demonstrating the operation and maintenance of the tank monitoring system and associated tank management software.

END OF SECTION

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SECTION 11412

ABOVEGROUND FUEL STORAGE TANK (BID ALTERNATE)

PART 1 – GENERAL

1.01 DESCRIPTION:

- A. CONTRACTOR shall provide one (1) 6,000-gallon AST with secondary containment and a minimum 2-hour fire rating, and all appurtenances and products as specified, as shown on the Drawings and as necessary to complete the Work. AST shall be constructed in accordance with UL Standard 2085. AST shall be manufactured by ConVault or approved equal. Appurtenances include fuel oil supply, fuel oil return, and vent piping; valves; emergency vents; pipe containment/transition sump; spill containment manhole and fill; electronic leak detection/overfill alarm system, direct reading level gauge, premanufactured stairway for access to top of tank, fuel return pump and associated controls; and all required electrical and control wiring and associated conduit and appurtenances. Sizes and location shall be as specified herein and as indicated on the Drawings.
- B. Furnish all labor, materials, equipment, permits, inspections, registrations, and incidentals required to install aboveground storage tank and appurtenances for the AST System for fully functional operating systems that are free of defects, including all work as shown on the Drawings and as specified. .

1.02 SUBMITTALS:

- A. Product Data: Prior to ordering equipment, CONTRACTOR shall submit to the ENGINEER and OWNER shop drawings and manufacturer literature with specifications, engineering data, and installation instructions for the tanks and all appurtenances to demonstrate the equipment meets requirements. Shop drawings shall include dimensioned drawings, system component details, data sheets, instructions, schematics and similar pertinent information. The OWNER and or ENGINEER reserves the right to reject (with explanation) any equipment which the OWNER feels is inadequate.

1.03 QUALITY ASSURANCE:

- A. Warranty Requirements:
1. Tanks: CONTRACTOR shall submit written warranty for tanks executed by manufacturer agreeing to repair failures of tank through no fault of the OWNER or CONTRACTOR, replace failed tanks with a new tank including delivery, or refund of original purchase price. Warranty shall protect OWNER for a period no less than 30 years from the date of original purchase against failure of tank due to corrosion (internal or external), structural failure, or manufacturing defects. Warranty shall be in addition to, and not a limitation of, other rights OWNER may have against

CONTRACTOR. CONTRACTOR shall repair tank damage that results from CONTRACTOR'S work.

2. Other Products: Not less than one year unless specified otherwise. Longer than one year if normally supplied for greater than one year.

B. Code Requirements:

1. Tank shall be approved for listing under UL Standard 2085. The primary tank shall be rectangular in shape, constructed with a minimum of 10 gauge thick carbon steel, listed per UL Standard 142, and meet the requirements of NFPA 30. Welds shall be continuous on all sides, conforming with the American Welding Society Standard for continuous weld.
2. Specification shall supplement, but not supersede, all applicable legal requirements which may be more severe in application. Vessels constructed under this Specification shall conform to all local, State, or Federal codes or laws currently in effect at site location.
3. Latest editions and/or revisions of all codes and standards referenced in this specification shall be strictly followed.

C. Reference Specifications: Unless otherwise specified, materials shall conform to the following:

1. UL 142
2. UL 2085
3. NFPA 30 and 30A
4. Other applicable codes and standards.

PART 2 – PRODUCTS

2.01 ABOVEGROUND STORAGE TANK:

- A. Tank, fittings, and manways are as indicated on drawing M-102 and as specified herein. The tank to be furnished shall have the necessary penetrations and fittings to accommodate the following accessories and shall be provided with the following accessories:
1. Standard primary tank vent.
 2. 18" diameter manway with 8" diameter primary tank emergency vent.
 3. Secondary tank emergency vent.

4. Pipe Containment/Transition Box with leak sensor and level sensor. Pump containment box shall be provided by tank manufacturer. Size of box shall be large enough to accommodate all piping connections, leak sensor and level sensor.
5. Interstitial space monitoring with leak sensor.
6. Pipe transition box and tank leak sensors, level sensor and other devices, including tank monitoring system shall be as specified in Section 11143.
7. Direct reading level gauge visible from tank fill area. Gauge shall be OPW Model 200TG or approved equal.
8. Spill Container. The tank system shall include a U.L. listed 7 gallon spill container surrounding the fill pipe. The spill container shall include a normally closed valve to release spilled product into the main tank.
9. Overfill prevention valve. Provide an overfill prevention valve rated for pressurized delivery located within fill pipe to close automatically at 95% full level. Overfill prevention valve shall be OPW Model 61fSTOP1000 with OPW Model 61FT Drop Tube or approved equal.
10. Spare penetrations as suggested by manufacturer or owner.
11. Pre-manufactured steel stairs to provide access to the tank fill.

2.02 FUEL RETURN PUMP AND CONTROL SYSTEM:

- A. Provide fuel return pump and control system as specified below:
1. Fuel Return Pump: Provide fuel return pump used to return fuel to AST in the event of high fuel level in the existing day tank. Fuel return pump flowrate shall be at least 1.5 times greater than existing fuel supply pump flowrate. CONTRACTOR to coordinate pump selection with existing day tank manufacturer (Simplex).
 2. Fuel Return Pump Control System: Provide fuel return pump control system including new high level switch mounted in day tank to be used for controlling the operation of the fuel return pump. Pump control system shall consist of a NEMA 4 enclosure housing pump starter. Pump starter shall be equipped with a control transformer and a Hand/Off/Auto switch to allow for the manual operation of the fuel transfer pump. Pump controller to be located in same location as existing day tank fuel supply pump controller in generator room. Fuel return pump control system shall be by existing day tank manufacturer (Simplex).

PART 3 – EXECUTION:

3.01 SHOP TESTING:

- A. Tank performance, manufacturing and production testing shall be performed in accordance with the applicable UL requirements and other applicable codes and standards.

3.02 DELIVERY COORDINATION:

- A. CONTRACTOR shall coordinate delivery of AST and associated appurtenances and equipment with OWNER.

3.03 HANDLING:

- A. The handling equipment shall be of adequate size to lift and set the tank. The tank shall be carefully handled to prevent damage to the tank or the tank coating. It is the responsibility of the CONTRACTOR to touch-up and repair any damage to the coating that occurs during transportation, installation or piping installation. All bolts, nuts, clamps, turnbuckles, etc. shall be furnished as necessary by the CONTRACTOR for the installation of this work.

3.04 INSTALLATION:

- A. The tank system and appurtenances shall be installed by the CONTRACTOR in strict accordance with the manufacturer's recommendations and applicable fire, electrical and environmental codes. State and local permits shall be obtained by CONTRACTOR prior to installation.
- B. The tank shall be installed on reinforced concrete slabs as indicated on the drawings. CONTRACTOR shall protect all underground utilities during installation of slab.
- C. CONTRACTOR shall supply all labor and materials required to wire tank monitoring system control panel and remote audible/visual alarm to existing electrical panel in locations as shown on drawings or as indicated by OWNER and ENGINEER.
- D. Tank shall be electrically grounded in accordance with NFPA 78. All electrical wiring shall comply with requirements of N.E.C and N.F.P.A Sections 30 and 30A, if applicable. Electrical work shall be in accordance with applicable codes and shall be rated for hazardous area as required. Electric feed for pump shall include an emergency shutoff switch located per code requirements.
- E. Installation of aboveground fuel oil storage tank shall comply with requirements of N.F.P.A. Sections 30 and 30A, and all other local and state applicable codes and standards.

3.05 FIELD TESTING REQUIREMENTS:

- A. The primary and secondary tanks and fuel oil suction and return piping shall be independently pressure tested, and CONTRACTOR shall provide OWNER with said testing results. All field testing shall be per manufacturer's recommendations and shall be performed in the presence of the ENGINEER. The ENGINEER reserves the right to request at least five working days notification prior to such tests. The cost of repair and/or any additional testing shall be the responsibility of the CONTRACTOR.

3.06 SYSTEM START-UP:

- A. CONTRACTOR shall provide all labor and equipment necessary for initial start-up of tank systems. Start-up to be conducted in presence of ENGINEER. Fuel to be supplied by OWNER.

END OF SECTION

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SECTION 11413

UNDERGROUND FUEL STORAGE TANK (BASE BID)

PART 1 – - GENERAL

1.01 DESCRIPTION:

- A. CONTRACTOR shall provide and install one (1) 6,000-gallon (8-foot nominal diameter) Double-Wall fiberglass reinforced plastic (FRP) underground storage tank and appurtenances as specified and as shown on the Drawings. The tank shall be manufactured by Xerxes Corporation or approved equal and shall be constructed in accordance with Underwriters Laboratories Standard 1316.

1.02 SUBMITTALS:

- A. Product Data: Prior to ordering equipment, CONTRACTOR shall submit to the ENGINEER and OWNER shop drawings and manufacturer literature with specifications, engineering data, and installation instructions for the tanks and all appurtenances to demonstrate the equipment meets requirements. Shop drawings shall include dimensioned drawings, system component details, data sheets, instructions, schematics and similar pertinent information. The OWNER and or ENGINEER reserves the right to reject (with explanation) any equipment which the OWNER feels is inadequate.

1.03 QUALITY ASSURANCE:

- A. Warranty Requirements:
1. Tank Warranty: CONTRACTOR shall submit written warranty for underground fuel storage tanks executed by manufacturer agreeing to repair failures of tank through no fault of the OWNER or CONTRACTOR, replace failed tanks with a new tank including delivery, or refund of original purchase price. Warranty shall protect OWNER for a period no less than 30 years from the date of original purchase against failure of tank due to corrosion (internal or external), structural failure, or manufacturing defects. Warranty shall be in addition to, and not a limitation of, other rights OWNER may have against CONTRACTOR.
- B. Code Requirements:
1. Tank shall be designed, fabricated, tested, and inspected in accordance with latest editions of UL 1316. The UL listing shall cover the entire tank assembly.
 2. Specification shall supplement, but not supersede, all applicable legal requirements which may be more severe in application. Vessels constructed

under this Specification shall conform to all local, State, or Federal codes or laws currently in effect at site location.

3. Latest editions and/or revisions of all codes and standards referenced in this specification shall be strictly followed.
- C. Tank Supports and Anchorage: Provide size and quantity of anchor straps as recommended by manufacturer. Design straps and anchors for empty tank condition with groundwater table at surface using concrete hold-down pads as specified.
- D. Reference Specifications: Unless otherwise specified, materials shall conform to the following:
 1. UL 1316
 2. NFPA 30 and 30A
 3. Other applicable codes and standards.

PART 2 – PRODUCTS

2.01 TEMPORARY FUEL TANK SYSTEM:

- A. Provide all labor, materials and equipment required for a temporary diesel fuel tank system to maintain emergency generator operations during the tank removal and installation activities. Temporary fuel tank system shall be maintained until start-up of new systems. CONTRACTOR shall be responsible for transfer of product between existing tank and temporary tank prior to removal of existing tank. Work shall be performed in conformance with all Federal, State, and local regulations and codes. Temporary tank shall be set at a location determined by the ENGINEER and OWNER to be away from the work area and without adversely affecting vehicular and foot traffic. Spill containment shall be provided by CONTRACTOR in a capacity equal to 110% of temporary tank's capacity. CONTRACTOR shall be responsible for transfer of any useable product remaining in temporary fuel tanks to the new tanks once installation and system start-up is complete. Cost for cleaning and removal of temporary fuel tank system shall be included in Contractor's Base Bid.
- B. The Contractor shall be responsible for all costs associated with providing temporary fuel tank systems, but not limited to, costs for installation, maintenance and removal of any and all piping required to convey fuel from temporary tanks to Owner's emergency generator. All costs shall be included in Contractor's Base Bid.
- C. Materials may be new or used, but must be adequate for purpose required, and must not violate requirements of applicable codes.

- D. Install work in a neat and orderly manner and make structurally and mechanically sound throughout.

2.02 DOUBLE-WALL FIBERGLASS REINFORCED PLASTIC (FRP) UNDERGROUND STORAGE TANK:

A. Loading Conditions:

1. Interstitial Pressure – The interstitial space of the tank shall withstand a minimum 20-psig pressure test.
2. Internal Load – Tank shall withstand a 5-psig air-pressure test with a 5:1 safety factor.
3. Surface Loads – Tank shall withstand surface H-20 and HS-20 axle loads when properly installed according to Xerxes' current Installation Manual and Operating Guidelines.
4. External Hydrostatic Pressure – Tank shall be designed for 7' of overburden over the top of the tank, the hole fully flooded and a safety factor of 5:1 against general buckling.

B. Product Storage:

1. The primary compartment of double-wall tanks shall be vented and operated at atmospheric pressure only.
2. Tank shall be capable of storing liquids with a specific gravity up to 1.1.
3. Tank shall be capable of storing products identified in the manufacturer's standard limited warranty in effect at the time of purchase.

2.03 ACCESSORIES:

A. Tank Anchoring:

1. Anchor straps shall be as supplied by tank manufacturer and designed for a maximum load of 25,000 lbs.
2. Galvanized turnbuckles (two per anchor strap) shall be supplied by the tank manufacturer.

B. Manways:

1. The standard manway shall be flanged, 22" I.D. and complete with UL-listed gaskets, bolts and covers as shown on tank drawing.

C. Threaded Fittings:

1. All threaded fittings shall be NPT half or full couplings, 4" diameter.
2. Fittings shall be installed on the tank-top centerline or in the cover of the manway as shown on the tank drawing.

D. Containment Collars and Sumps:

1. The tank shall have factory-installed 42"-or 48"-diameter containment collars as shown on the tank drawings.
2. Containment sumps in 48"-diameter, provided by the tank manufacturer and designed for mounting on the containment collars, shall be supplied as shown on the tank drawing.
3. Adhesive shall be provided by the tank manufacturer with each containment collar and sump.
4. Containment collars and sumps shall be designed and supplied as a containment system. Only sumps provided by the manufacturer shall be allowed.

E. Composite Manhole:

1. Provide 39" fiber reinforced composite, bolted, water tight manhole and 10" minimum skirt for access to tank containment sump. Composite Manhole shall be EBW SAFE-LITE FRC or approved equal.

F. Hydrostatic Monitoring System:

1. Tank shall be continuously monitored with the Xerxes TRUCHEK® hydrostatic leak monitoring system or approved equal.
2. The continuous monitoring system shall include monitoring fluid factory-installed in the interstitial space and within a fiberglass tank-top mounted reservoir.
3. The monitoring system shall be independently tested by a qualified third party and verified to be capable of detecting leaks as small as .05 gallons per hour when TRUCHEK tank-tightness test procedures are followed.

G. Spill Container:

1. Provide 15-gallon below grade spill container on UST fill pipe as shown on Drawings and as specified. Container shall be watertight to prevent surface water from entering the spill container. Spill container shall be OPW Model 101BG-2115 or approved equal.

H. Tank Monitoring System:

1. Refer to specification Section 11143.
- I. Piping:
 1. Refer to specification Section 11142.

PART 3 – EXECUTION:

3.01 SHOP TESTING AND INSPECTION:

A. Testing Procedures:

1. Tank performance, manufacturing and production testing shall be performed in accordance with UL 1316 requirements for double-walled FRP underground tanks. Both inner and outer walls of tank shall be tested prior to shipment to the OWNER.
2. CONTRACTOR shall arrange to test the equipment after it has been delivered in accordance with the manufacturer's specifications. Testing procedures shall be supplied to the OWNER at least five (5) days before testing. All testing shall be done in the presence of the OWNER and/or ENGINEER to insure delivered equipment is fully functional and operational at the time of delivery. Whereas some test(s) cannot be performed until after installation by OWNER'S tank installer, CONTRACTOR shall continue to warrantee said equipment during the installation and until acceptance of Project by OWNER (all standard warranties, whether written or implied shall remain in effect). CONTRACTOR shall be permitted to inspect equipment during installation.
3. Cost of repair and/or any additional testing shall be borne by CONTRACTOR.

- B. Notice of Tests: ENGINEER reserves right to request at least five (5) working days notification prior to such tests to permit OWNER or ENGINEER representative to witness the testing.
- C. Clean-Up: Prior to final inspection and testing, inside and outside of vessel shall be cleaned of all dirt, oil, etc. Special attention shall be taken to remove all paint and dye marks from inside of vessels including fittings.
- D. Dimensional Check and Check of Assembly: A complete dimensional and assembly check of each piece of equipment shall be made. OWNER reserves right to inspect tank for compliance with approved fabrication drawings at time of delivery to the OWNER'S site. Any major discrepancies shall be corrected at manufacturer's expense.

3.02 INSTALLATION:

- A. CONTRACTOR shall install UST in accordance with the manufacturer's installation instructions.

3.03 DELIVERY COORDINATION:

- A. CONTRACTOR shall coordinate delivery of USTs and associated appurtenances and equipment with OWNER.

END OF SECTION

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SECTION 15075

MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

- A. Identification of piping.

1.02 RELATED WORK:

- A. Section 09900: Painting
- B. Section 11142: Piping

1.03 REFERENCES:

- A. ANSI/ASME A13.1 - Scheme for the Identification of Piping System; The American Society of Mechanical Engineers, 1981 (Reapproved 1985)

1.04 SUBMITTALS:

- A. Product Data: Provide manufacturer's catalog literature for each product required.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. Brady
- B. Emed Co., Inc.
- C. Marking Services, Inc.
- D. Seton
- E. Lab Safety Supply

2.02 MATERIALS:

- A. Color: Unless specified otherwise, conform with ANSI/ASME A13.1

- B. Pipe Markers: Pipes shall be labeled on two sides at 6' intervals. A flow direction arrow shall follow the label legend and be of the same color. The labels shall meet or exceed ANSI A13.1-1981 standards. The legend letters shall be CAPITALIZED and be black or white, depending on the background color. The markers shall equal KWIK KOIL labels, with snap-around style for pipes under 6" outer diameter (O.D.) and spring or nylon tie fastened for pipes 6" O.D. and larger. Labels shall be placed over insulation on all new piping. Markers shall be sized in accordance with outside diameter of insulation for piping which is insulated.

Labels and Colors:

Service	Label Legend	Legend Lettering Color	Label Background Color
Fuel Supply	FUEL SUPPLY	Black letters	Yellow
Fuel Return	FUEL RETURN	Black letters	Yellow

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Prepare surfaces to receive adhesive for identification materials in accordance with manufacturers instructions.
- B. Verify Owner's existing tagging and labeling scheme. Installed markings shall be consistent with the existing. Ensure that tags are numbered in accordance with Drawings and with Owner's scheme.

3.02 INSTALLATION:

- A. Pipe Markers: Install in accordance with manufacturer's instructions.

END OF SECTION

SECTION 16050

BASIC ELECTRICAL REQUIREMENTS

PART 1 – GENERAL

1.01 SCOPE:

- A. The work included under this section shall include all electrical work associated with the Greater New Haven Water Pollution Control Authority (GNHWPCA) East Street, Boulevard and Morris Cove Bar Screens project in accordance with the Drawings and as specified herein.
- B. The Electrical Contractor shall provide the labor, tools, equipment, and materials necessary to furnish and install all electrical work in accordance with the Drawings and as specified herein. Work shall include installation and termination of all control and signal wiring for instrumentation and process control equipment as indicated in the Contract Documents. Work shall include installation and mounting of new control panel hardware furnished under Division 11 in accordance with the Drawings.
- C. In general, electrical Work shall include but not be limited to the following:
1. All motor wiring, safety disconnects, and motor starters unless integral with equipment.
 2. Power distribution equipment.
 3. Equipment connections.
 4. Control wiring.
 5. System grounding.
 6. All support material and hardware for raceway and electrical equipment.
 7. Branch circuit wiring.
 8. Termination & labeling of all cable and wire unless otherwise noted. This includes, but is not limited to, final termination of all control and instrumentation wiring in Process Equipment; all final terminations within the main pump station control panels shall be by others.
 9. Building wall, floor and roof penetrations for raceways.
 10. Start up, acceptance testing test reports and instruction of systems operation to the Owner.

11. Mounting and connection of panels and instruments furnished by Division 11.

1.02 REQUIREMENTS OF REGULATORY AGENCIES:

A. Codes and Standards:

1. Electrical equipment, materials, installation and workmanship shall comply with all state and local building codes, safety and fire law regulations at the location of the Work and shall conform to the latest edition of the applicable codes and standards of the organizations listed:
 - a. National Electrical Code (NEC).
 - b. Underwriters' Laboratories (UL).
 - c. Institute of Electrical and Electronics Engineers (IEEE C2).
 - d. American National Standards Institute, Inc (ANSI).
 - e. National Fire Protection Association (NFPA).
 - f. National Electrical Manufacturers Association (NEMA).
 - g. Insulated Power Cable Engineers Association (IPCEA).
 - h. Association of Edison Illuminating Companies (AEIC).
 - i. Occupational Safety Health Act (OSHA).
 - j. Americans with Disabilities Act (ADA).
2. Where the Contract requires the Work or any part of the same, to be above the standards required by applicable laws, ordinances, rules and regulations and other statutory provisions pertaining to the Work, such Work shall be performed and completed in accordance with the Contract requirements.
3. Should any changes in the specifications and Drawings be necessary to conform to the requirements of any of the above mentioned codes or standards, the Contractor shall so notify the Engineer.

- B. Drawings required by governing authorities: Prepare any detailed diagrams or Drawings which may be required by the governing authorities.

C. Permits, Certificates, Inspections, Fees and Utility Costs:

1. The Contractor shall obtain and make payments for all permits, licenses, and certificates which are required for the associated Work.
2. Following completion of the Work, the Contractor shall obtain certificates of approval from the responsible agencies concerned with the Work.
3. Arrange for timely inspections required for Work under this section.

4. All utility company and municipal back charges shall be the responsibility of the Owner. Cost of electricity shall be borne by the Contractor until substantial completion as determined by the Owner.

1.03 COORDINATION OF WORK:

- A. The electrical work shall be coordinated with the work of other trades to prevent interferences and so that the progress in construction of the building will in no way be retarded.
- B. Refer to other sections of these specifications and Drawings for related work which may affect the work of this section.
- C. Coordinate with all local utility companies and make all installations for their services in accordance with all utility company requirements.
- D. Where lighting fixtures and other electrical items are shown in conflict with locations of structural members and mechanical or other equipment, furnish and install all required supports and wiring to clear the encroachment for a complete installation.
- E. Any Work installed contrary to or without acceptance by the Engineer shall be subject to change as directed by the Engineer, and no extra compensation will be allowed to the Contractor for making these changes.

1.04 DRAWINGS

- A. All electrical equipment such as junction and pull boxes, panelboards, switches, controls and such other apparatus as may require maintenance and operation from time to time shall be made easily accessible and properly labeled.
- B. The Contractor shall examine all contracts and reference Drawings, and verify and properly coordinate the placement of outlets. Contractor shall also check all Drawings including mechanical Drawings and shop drawings for apparatus for which he must rough-in and to which he must connect.

1.05 SUBMITTALS:

- A. Furnish manufacturer's product data, test reports, and materials certifications as required.
- B. Follow the procedures specified in the General Requirements and in addition, the Contractor shall prepare and submit a complete submittal list to the Engineer. The submittal list shall include all submittal items covered in the Division 16 specification sections.
- C. Shop Drawings shall be submitted to the General Contractor who shall review and approve them prior to submittal to the Engineer for approval. Shop Drawings shall

identify the specific equipment and material being supplied; the quantity being supplied; and all accessories, dimensions, descriptions, mounting and connection details, wiring diagrams, elementary control diagrams, equipment interface diagrams and any other information necessary to determine compliance with the plans and specifications. Fabrication and installation shall be in accordance with the approved Shop Drawings.

- D. As-built copies of all Shop Drawings shall be submitted to the Engineer.
- E. Permits and Easements. Submit copies of reports, permits, and easements necessary for installation, use, and operation.
- F. Test Reports. Submit copies of reports of tests, inspections, and meter readings as specified.

1.06 RECORD DRAWINGS:

- A. The Contractor shall maintain a complete and separate set of prints of Contract Drawings and specifications at job Site for duration of the contract. The Contractor shall record Work completed and all changes from original Contract. Drawings shall clearly and accurately include Work installed as a modification or as an addition to the original design.
- B. At completion of Work and prior to final request for payment, the Contractor shall submit a complete set of reproducible Record Drawings showing all systems as actually installed.

1.07 JOB CONDITIONS:

- A. Existing Conditions:
 - 1. Existing Utilities: Locate existing underground utilities in excavation areas. If utilities are indicated to remain, support and protect services during excavation operations.
 - 2. Prior to all Work of this section, carefully inspect the installed Work of all other trades and verify that all such Work is complete to the point where this installation may properly commence.
 - 3. Verify that the electrical installation may be made in complete accordance with all pertinent codes and regulations and the original design.
- B. Coordination:
 - 1. Coordinate the installation of electrical items with the schedules for Work of other trades to prevent unnecessary delays in the total Work.
 - 2. Coordinate with all local utility companies and make all installations for their services in accordance with all utility company requirements.

3. Any changes shall be done at the Contractor expense.
4. Where lighting fixtures and other electrical items are shown in conflict with locations of structural members and mechanical or other equipment, furnish and install all required supports and wiring to clear the encroachment for a complete installation.
5. Any Work installed contrary to or without acceptance by the Engineer shall be subject to change as directed by the Engineer, and no extra compensation will be allowed to the Contractor for making these changes.

C. Accuracy of Data:

1. The Drawings are diagrammatic and functional only, and are not intended to show exact circuit layouts, number of fittings, components and place in satisfactory operational power, lighting, and other electrical systems shown. Install additional circuits, components and material wherever needed to conform to the specific requirements of the equipment whether or not indicated or specified.
2. Information and components called for in the specification but not shown on plans or vice versa shall apply and shall be provided as though required expressly by both.
3. The locations of equipment, fixtures, outlets and similar devices shown on the Drawings are approximate only. Field measurements shall take precedence over scaled dimensions from Drawings. Exact locations shall be as accepted by Engineer during construction. Obtain in the field all information relevant to the placing of electrical Work and, in case of any interference with other Work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the Work in an acceptable manner.
4. In case of difference between building codes, specifications, state laws, industry standards and the Contract Documents, the most stringent shall govern. Should the Contractor perform any Work that does not comply with the requirements of the applicable building codes, state laws, and industry standards, he shall bear all cost arising in correcting these deficiencies.
5. Verify size and ratings of motors and other electrically operated devices supplied by others.
6. Check with Engineer before installation of Work for outlets not specified as to location or for Work that interferes with other trades.

1.08 FLASHING, CUTTING, FIREPROOFING AND WATERPROOFING:

- A. Flashing around all electrical items penetrating roof or exterior walls shall be the responsibility of the General Contractor.
- B. All cutting of surfaces, including core drilling of walls and slabs, shall be done by the Electrical Contractor.
- C. Patching shall be done by the General Contractor.
- D. The General Contractor shall fireproof, waterproof and seal all openings in slabs and walls.

1.09 PRODUCT DELIVERY, STORAGE, AND HANDLING:

- A. Protection. Use all means necessary to protect electrical system materials 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 to the acceptance of the Engineer and at no additional cost to the Owner. If any apparatus has been subjected to possible injury by water, it shall be thoroughly dried out and put through such special tests as directed by the Engineer, at the cost and expense of the Contractor, or shall be replaced by the Contractor at his own expense.
- C. Protect the Work of other trades. Restore any damage caused to other trades to the condition existing prior to damage at no additional cost to the Owner.
- D. Investigate each space in the building through which equipment must pass to reach its final location. If necessary, the manufacturer shall be required to ship his material in sections sized to permit passing through such restricted areas in the building.

1.10 WORK PERFORMANCE:

- A. Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished in this manner for the required work, the following requirements are mandatory:
 - 1. Electricians must use full protective equipment (i.e., certified and tested insulating material to cover exposed energized electrical components, certified and tested insulated tools, etc.) while working on energized systems in accordance with NFPA 70E.
 - 2. Electricians must wear personal protective equipment while working on energized systems in accordance with NFPA 70E.
 - 3. Before initiating any work, a job specific work plan must be developed by the Contractor and the Owner. The work plan must include procedures to

be used on and near the live electrical equipment, barriers to be installed, safety equipment to be used and exit pathways.

4. Work on energized circuits or equipment cannot begin until prior written approval is obtained from the Owner.

1.11 SPECIAL WARRANTY:

- A. Compile and assemble the warranties specified in Division 16 into a separate set of vinyl covered three ring binders, tabulated and indexed for easy reference.
- B. Provide complete warranty information for each item. Information to include:
 1. Product or equipment list.
 2. Date of beginning of warranty or bond.
 3. Duration of warranty or bond.
 4. Names, addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.

1.12 DEFINITIONS:

- A. As used in this specification, "provide" means "furnish and install", "furnish" means "to purchase and deliver to the project Site complete with every necessary appurtenance and support and to store in a secure area in accordance with manufacturers instructions" and "install" means "to unload at the delivery point at the Site or retrieve from storage, move to point of installation and perform every operation necessary to establish secure mounting and correct operation at the proper location in the Project".
- B. Finished Areas. In general, areas with carpet or tile floors, lay-in or fixed ceiling tile, special architectural ceiling treatment, or tiled, plastered, or paneled walls shall be considered finished areas.
- C. Interior. For the purposes of this specification, interior is any area within the boundaries of the foundation of any building within the superstructure or other structures not classified as a building.

1.13 TEMPORARY POWER:

- A. If applicable, the GNHWPCA shall provide temporary electrical power sources. The Contractor shall install, maintain, and remove such temporary electrical power and lighting systems, and pay for all labor, materials and equipment required therefore. All such temporary electrical Work shall meet the requirements of the National Electrical Code, the local utility company, and OSHA.

- B. The Contractor shall make all necessary arrangements with the local utility company as to where the temporary electric service can be obtained.
- C. The Contractor shall secure and pay for all required permits and back charges for Work performed by others, and other expenses incidental to the installation of the temporary electric service.

1.14 POSTED OPERATING INSTRUCTIONS:

- A. Provide for each system and principal item of equipment as specified in the technical sections for use by operation and maintenance personnel. The operating instructions shall include the following:
 - 1. Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - 2. Start up, proper adjustment, operating lubrication, and shutdown procedures.
 - 3. Safety precautions.
 - 4. The procedure in the event of equipment failure.
 - 5. Other items of instruction as recommended by the manufacturer of each system or item of equipment.
- B. Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions where directed. For operating instructions exposed to the weather, provide weather-resistant materials or weatherproof enclosures. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

1.15 MANUFACTURER'S NAMEPLATE:

- A. Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.16 FIELD FABRICATED NAMEPLATES:

- A. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified in the technical sections or as indicated on the Drawings. Each nameplate inscription shall identify the name of the equipment, function and, when applicable, the position. Nameplates shall be melamine plastic, 0.125 inch thick, black with white letters. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be one by 2.5 inches. Lettering shall be a minimum of 0.25 inch

high normal block style. All electrical equipment shall be labeled with the following:

1. Panel Name
2. Fed from "Panel Name" & "CKT #"
3. Amps
4. Volts
5. Phase

1.17 ARC FLASH LABEL:

- A. Provide arc flash labels for all electrical equipment with operating voltages greater than 50 volt per NEC 110.16.

1.18 WARNING SIGNS:

- A. Exterior warning and caution signs shall be weather resistant, nonfading, preprinted cellulose acetate butyrate signs with 20 gauge, galvanized steel backing, with colors, legend, and size appropriate to the location.
- B. Interior warning and caution signs shall be aluminum signs with preprinted baked enamel finish and punched for fasteners. Colors, legend, and size appropriate to location.

1.19 WIRE AND CABLE MARKERS:

- A. Underground line marking tape shall be permanent, bright colored, continuous printed, metal backed, plastic tape compounded for direct burial service not less than 6 inches wide. Printed legend indicative of general type of underground line below.
- B. Wire labels for wires smaller than No. 4. shall be vinyl or vinyl cloth, self-adhesive, wraparound, wire markers with preprinted numbers and letters. Wire sizes No. 4 and larger and multi conductor cables shall be marked with one-piece, nylon locking marker ties equal to Panduit PLM Series.
- C. Reference Specification 16116 "Underground Electrical Construction" for further requirements.

PART 2 – PRODUCTS

2.01 MATERIALS:

- A. Materials and equipment shall be listed by UL unless it can be demonstrated that no UL standards exist for a specific item or class of equipment.

- B. All other materials, not specifically described but required for a complete and operable electrical installation, shall be new, first quality of their respective kinds, specification grade or better, and as selected by the Contractor subject to the acceptance by the Engineer.
- C. All materials and equipment furnished and installed on this project shall meet the most stringent efficiency standards of the local utility to qualify for the maximum rebate.

2.02 MATERIAL AND CONSTRUCTION REQUIREMENTS:

- A. Unless otherwise shown or specified, all enclosures, motors, wiring and other materials and all construction methods shall conform to the following:
 - 1. Indoor, Above Ground, Dry Areas - NEMA 12, General Purpose, with gasketing for applications where atmospheric conditions are normal. Enclosures shall be sheet steel, treated to resist corrosion, prime painted and finished with a gray baked-on enamel. Control stations shall have NEMA 13, oil tight and dust-tight enclosures.
 - 2. Outdoors, Moist Areas and Indoor Below Grade Areas - NEMA 4, watertight. Enclosures shall be cast aluminum or stainless steel. Where indicated on electrical plans provide NEMA 4X enclosures of stainless steel or reinforced non-metallic (Krydon) construction. All installations shall utilize only stainless steel fasteners/hardware.
 - 3. Indoor-Outdoor, Subject to Submersion in Liquid - NEMA 6, submersible, liquid tight construction. Enclosures shall be cast aluminum.
 - 4. Hazardous Areas - NEMA 7 & 9, explosion-proof construction for Class 1, Division 1, Group D areas. Enclosures shall be cast aluminum.
 - 5. Corrosive Atmospheres - All Work located in corrosive atmospheres, such as atmospheres in the filter area and the chemical feed pump areas shall be of such construction that the corrosive agent cannot enter into and damage the electrical Work. All materials in these areas shall be non-corrodible or finished with an inert coating. Stainless steel, or reinforced PVC electrical enclosures and PVC coated rigid conduit and fittings are required. In addition, provide gas tight seals in all conduits passing from or into corrosive areas (similar to Crouse Hinds Type EYS), to minimize migration of corrosive fumes to other building areas.

2.03 INTERCHANGEABILITY:

- A. In all design and purchasing, interchangeability of items of equipment, subassemblies, parts, motors, starters, relays and other items is essential. All similar items shall be of the same manufacturer, type, model and dimensions.

- B. For ease of maintenance and parts replacement, to the maximum extent possible, use equipment of a single manufacturer.
- C. The Engineer reserves the right to reject any submittal which contains equipment from various manufacturers if suitable materials can be secured from fewer manufacturers and to require that source of materials be unified to the maximum extent possible.

PART 3 – EXECUTION

3.01 COORDINATION:

- A. Prior to all Work of this section, carefully inspect the installed Work of all other trades and verify that all such Work is complete to the point where this installation may properly commence.
- B. Field verify all locations and dimensions to ensure that the equipment will be properly located, readily accessible, and installed in accordance with all pertinent codes and regulations, the Contract Documents, and the referenced standards.
- C. The Work shall be carefully laid out in advance, and where cutting, drilling, etc., of floors, walls, ceilings, or other surfaces is necessary for the proper installation, this Work shall be carefully done, and any damage to building, piping, or equipment shall be repaired by skilled mechanics of the trades involved at no additional cost to the Owner.
- D. In the event any discrepancies are discovered, immediately notify the Owner's Representative in writing. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 INSTALLATION:

- A. Install all equipment and fixtures in complete accordance with the manufacturer's recommendations and all pertinent codes and regulations.
- B. Thoroughly inspect all items of equipment and any items dented, scratched, or otherwise damaged in any manner shall be replaced or repaired and painted to match original finish. All items so repaired and refinished shall be brought to the attention of the Engineer for inspection and acceptance.
- C. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete or supported from or on other structural components, as they are constructed.
- D. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building and equipment which must be placed in service before further construction can take place.

- E. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
- F. The final routing of raceways shall be determined by structural conditions, interferences with other trades and by terminal locations on apparatus. The Engineer reserves the right of a reasonable amount of shifting at no extra cost up until time of roughing in the Work.
- G. Where circuits are shown as “home-runs” all necessary fittings and boxes shall be provided for a complete raceway installation.
- H. In general, wiring and raceway systems for security alarm, fire alarm, telephone and intercommunications systems are not indicated on the Drawings but shall be furnished and installed under this section.
- I. Each lighting and each receptacle circuit shall have its own neutral, dedicated to that circuit. A common neutral for more than one single phase circuit is not allowed.
- J. Surface mounted panel boxed, junction boxes, conduits, etc., shall be supported by spacers to provide a clearance between wall and equipment.
- K. Upon completion of all installation, lamping, and testing, thoroughly inspect all exposed portions of the electrical installation and completely remove all exposed labels, soils, markings and foreign material.

3.03 MARKING AND LABELING:

- A. All panelboards, indoor transformers, cabinets, control panels and other specified equipment shall be labeled with engraved laminated plastic plates with engraved letters. Punch tapes with mastic backings are not acceptable.
- B. All starters, disconnect switches and other specified equipment shall be marked with engraved laminated plastic plates and engraved letters. Where individual switches are circuit breakers in power or distribution panelboards do not have cardholders, they shall be marked with ½” high labels.
- C. All empty conduits shall have labels tied to the pull string at each end of each empty conduit, marked as to identification of each end. Junction boxes with circuits provided for future use shall be labeled with appropriate circuit designation.
- D. All panelboards directories shall be filled out with typewritten identification of each circuit.

3.04 WIRE AND CABLE MARKERS:

- A. Tag control circuit conductors at both ends and at junction box splices using wire and cable markers with identification numbers as designated on equipment wiring diagrams. Provide typed listing to identify conductors by number and use.

- B. Identify spare conductors, individually, at both ends and at junction box splices with number between 1 and 999. Do not duplicate numbers.
- C. Identify wire numbers on terminal block marking strips.
- D. Provide permanent plastic name tag indicating load for each feeder for all junction boxes, handholes and manholes. Label all process motor wires to yard equipment in handholes and manholes.

3.05 TESTS & SETTINGS:

- A. Provide the services of an independent Testing Agency to perform the specified tests for the following systems:

- 1. Ground resistance.

The Testing Company shall perform all testing in accordance with National Electrical Testing Association (NETA) standards and procedures. All testing results shall be submitted on NETA forms and the testing data shall be certified by the respective agency. Test results shall indicate recommended action for a sub-par test results. Results shall list recommended test values that should be obtained for new installation.

- B. Provide necessary material, equipment, labor and technical supervision to perform and complete the Electrical Acceptance Tests as required.
 - C. Acceptance tests as herein specified are defined as those tests and inspections required to determine that the equipment involved is acceptable as delivered to the job Site, that the equipment may be energized for final operational tests and is in accordance with the Specifications.
 - D. Final acceptance of the equipment and/or workmanship will depend upon performance characteristics as determined by the subject tests, in addition to complete operation tests, on all electrical equipment to show that it will perform the functions for which it was designed.
 - E. If the test and inspection data submitted should indicate deficiencies in the operation of the electrical apparatus or in the manufacturer thereof, the Contractor shall promptly implement the necessary adjustments, corrections, modifications and/or replacements necessary to be made to meet the specified requirements.
 - F. Upon completion of the remedial Work, the Testing Agency shall repeat all of the tests on components previously found deficient on the first test or any additional test if they be required. It shall be the responsibility and obligation of the Contractor to have all remedial Work accomplished as may be required by second and/or additional tests.

3.06 CLEANING:

- A. General. When all Work is completed and has been tested and accepted by the Owner's Representative, the Contractor shall clean all light fixtures, equipment, and exposed surfaces that have been directly affected by this Work. The Contractor, insofar as the Work is concerned, shall at all times keep the premises in a neat and orderly condition and at the completion of the Work shall properly clean up and remove from the Site any excess materials.

END OF SECTION

NOT FOR BIDDING PURPOSES
REFERENCE COPY ONLY

SECTION 16116

UNDERGROUND ELECTRICAL CONSTRUCTION

PART 1 – GENERAL

1.01 SUMMARY:

- A. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install underground duct banks, manholes and handholes including all necessary excavation, backfill and surface restoration.
- B. Provide underground conduit duct banks with manholes and pullboxes for power, and lighting circuits as shown on the Drawings.
- C. Coordination: Duct bank routing when shown on the Drawings is diagrammatic. Coordinate installation with piping and other underground systems and structures and locate clear of interferences. Coordinate manhole and handhole installation with piping, sheet piling and other underground systems and structures and locate clear of interferences.

1.02 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Division 16, Section “Basic Electrical Requirements.”
- C. Division 16, Section “Raceways, Boxes, & Supporting Devices.”
- D. Division 16, Section “Wire & Cables.”
- E. Division 16, Section “Grounding.”
- F. Division 16, Section “Service Entrance.”

1.03 QUALITY ASSURANCE:

- A. Reference Standards: Electrical material and equipment shall conform in all respects to the latest approved standards of the following:
 - 1. National Electrical Manufacturers Association (NEMA).
 - 2. The American National Standards Institute (ANSI).

3. The Institute of Electrical and Electronic Engineers (IEEE).
4. Insulated Cable Engineers Association (ICEA).
5. National Electrical Code (NEC).
6. National Electrical Safety Code (NESC).
7. ASTM A 48, Gray Iron Castings.
8. ANSI A14.3, Safety Requirements for Fixed Ladders.
9. OSHA.

1.04 SUBMITTALS:

A. Shop Drawings: Submit for approval the following:

1. Layouts showing the proposed routing of duct banks and the locations of manholes, handholes and areas of reinforcement.
2. Profiles of duct banks showing crossings with piping and other underground systems.
3. Typical cross sections.
4. Installation procedures.
5. Manufacturer's technical information for manholes, handholes and accessories proposed for use.
6. Drawings showing interior and exterior manhole and handhole dimensions and details of openings, jointing, inserts, reinforcing, size and locations of openings, and accessory locations.
7. Certificate of concrete and steel used in underground pre-cast concrete utility structures, according to ASTM C858.
8. Product Data for nonmetallic conduit and manhole accessories.

B. Record Drawings:

1. Layouts showing the actual routing of duct banks including the dimensions and depth of the top of duct bank below grade. Record drawings for duct

banks should also include cross sections of the duct bank indicating the circuit, use, conduit size, orientation and number of conduits.

2. Locations of manholes, handholes and areas of reinforcement.

1.05 DEFINITIONS:

- A. Duct: Electrical conduit and other raceway, either metallic or nonmetallic, used underground, embedded in earth or concrete.
- B. Duct bank: 2 or more conduits or other raceway installed underground in the same trench or concrete envelope.
- C. Handhole: An underground junction box in a duct or duct bank with cover accessible from grade.
- D. Manhole: an underground utility structure, large enough for a person to enter, with facilities for installing and maintaining cables. Where required manholes shall comply with the Utility Companies requirements.

1.06 PROJECT CONDITIONS AND COORDINATION

- A. Coordination with other Underground Utilities:
 1. Locate all existing underground utilities through the use of an underground utility piping location services company. Locate the existing underground utilities and piping before any excavation is to begin.
 2. Coordinate conduit routing, duct bank and manholes with other new and existing underground utilities. Revise locations and elevations as required to suit field conditions and ensure that conduits, duct runs, manholes and handholes do not interfere with existing and new underground utilities and piping.

PART 2 – PRODUCTS

2.01 DUCT BANK CONDUIT:

- A. Duct: Schedule 40 and Schedule 80 PVC conduit and fittings in accordance with Division 16 Section “Raceways, Boxes and Supporting Devices.”
- B. Rigid Steel Conduit: Rigid steel conduit and fittings in accordance with Division 16 Section “Raceways, Boxes and Supporting Devices.”

- C. All shielded instrumentation and communications cable shall be installed in ferrous metal, steel conduit throughout the entire run of conduit from end to end.

2.02 MANHOLES:

- A. Manholes shall conform to the requirements as shown and detailed on the Drawings.
- B. Material and Construction:
 - 1. Pre-cast reinforced concrete.
 - 2. Minimum interior dimensions as indicated on the Drawings or required by the Utility Company.
 - 3. Duct entrances sized and located to suit duct banks. Duct-bank penetration shall be watertight.
 - 4. Modular sections with tongue-and-groove joints. Joints shall be gasketed and water tight.
 - 5. Nominal inside dimensions as shown.
 - 6. Base Section: Shall include sump and grate and ground rod openings.
 - 7. Sump Covers, ASTM A48; Class 30B galvanized iron.
- C. Frames and Covers:
 - 1. Material: Cast iron conforming to ASTM A 48, Class 30A.
 - 2. Covers: 42" minimum diameter, watertight, sealed type marked "ELECTRICAL" in raised two inch letters.
 - 3. Frame shall be grouted on the manhole.
 - 4. Manufacturer: Provide frames and covers of one of the following:
 - a. Neenah Foundry Company.
 - b. Flockhart Foundry Company.
 - c. Campbell Foundry Company.
 - d. Approved equal.

D. Pulling Irons:

1. Material: Galvanized steel.
2. Cast in the wall opposite to the centerline of each incoming duct bank and 12 inches below centerline of bottom line of ducts.
3. Product and Manufacturer: Provide one of the following:
 - a. Cat. No. DU2T3 by McGraw Edison Company.
 - b. Cat. No. 8119 by A.B. Chance Company.
 - c. Approved equal.

E. Cable Racks:

1. Cable racks shall adequately support cables with space allowed for future cables. Provide as indicated to support mounting channels and racks. Cast-in Place anchors with minimum rated pullout working capacity of 2000 pounds. Pennsylvania Insert Corp. #8-11-INSERT, with 5/8-11 hex head cap screw made from 316 stainless steel.
2. Each rack shall be a vertical assembly of 24 inch cable racks extending from within 6 inches of the manhole roof slab to within 6 inches of the manhole floor.
3. Cable Rack Mounting Channel: Heavy duty non-metallic stanchions. Underground Devices, Inc. model C36 or approved.
4. Cable Racks: Heavy duty non-metallic racks. 8, 14, 20 inches as indicated.
5. Product and Manufacturer: Provide one of the following:
 - a. Underground Devices, Inc. model RA 08, RA14, RA20 or approved.
 - b. Approved equal.

F. Insulators:

1. Material: Porcelain.
2. Product and Manufacturer: Provide one of the following:

- a. Cat. No. J-5122 by Joslyn Manufacturing and Supply Company.
- b. Cat. No. 2120 by Hubbard and Company.
- c. Approved equal.

G. Manhole Steps:

1. Material: Extruded aluminum.
2. Steps spaced evenly at approximately twelve to sixteen inch centers and shall project evenly from manhole walls.
3. Manufacturer: Provide manhole steps of one of the following:
 - a. Flockhart Foundry Company.
 - b. Neenah Foundry Company.
 - c. Approved equal.

2.03 HANDHOLES:

- A. The pull/splice box underground enclosures shall be constructed of polymer concrete consisting of sand and aggregate bound together with a polymer resin. Internal reinforcement may be provided by means of steel, fiberglass, or a combination of the two. Handholes for installation in roadways shall be concrete reinforced H20 traffic rated.
- B. Enclosure.
 1. The enclosure must be manufactured with an open or closed bottom and a removable cover. The enclosures shall be green or concrete gray in color.
 2. The enclosures shall be designed to be installed flush to grade with the cover fitting flush to the box.
 3. The enclosures shall be suitable for installation in either direct or buried native soil, embedded in concrete, or embedded in asphalt surfacing. (A concrete collar is required for installation in asphalt).
 4. The enclosures shall be of a stackable design for greater installation flexibility.

5. All covers are to be equipped with a minimum of two stainless steel lockdown mechanisms. All covers shall have a logo recessed into the cover and it shall read electric.
6. All enclosure covers will have some type of recessed access point to allow removal of the cover with a hook. The access points will be placed in such a location to allow for the greatest amount of leverage and safety possible.
7. Enclosures shall be designed and suitable for installation and use through a temperature range of -40°C (-40°F) to 60°C (140°F).
8. A certified copy of all test reports must be signed and stamped by a registered professional engineer and submitted prior to shipment of products.

C. Material Requirements:

1. Permanent deflection of any surface shall not exceed 10 percent of the maximum allowable static design load deflection.
2. The covers shall be skid resistant and have a maximum coefficient of friction of 0.50 on the top surface of the cover. Coatings will not be allowed.
3. Any point on the covers must be able to withstand a 70 foot-pound impact administered with a 12 pound weight having a "C" tup (ASTM D-2444) without puncturing or splitting. The test shall be performed with the cover resting on a flat rigid surface such as concrete or a 1" steel plate.
4. Covers shall have molded lettering, ELECTRIC or COMM as applicable.
5. Fastening devices used to secure the cover to the box shall be capable of withstanding a minimum torque of 15 foot-pounds and a minimum straight pullout strength of 750 pounds.
6. The material is tested according to the requirements of ASTM D543, Section 7, Procedure 1, for chemical resistance. The manufacturer is responsible for proof of compliance with the latest version of the ASTM standards.
7. Other required acceptance standards are:
 - a. ASTM D756, Procedure E: Accelerated Service Exposure.

- b. ASTM G53: Recommended Practice for Operating Light and Water Exposure on Nonmetallic Materials (with a U.V.A. 340 bulb).
 - c. ASTM D570, Section 5, 6.1, 6.5: Water Absorption.
 - d. ASTM D790: Flexural Properties
 - e. ASTM D635: Flammability Test.
- D. Manufacturers: Provide handholes as manufactured by
- 1. Strongwell Quazite or approved equal.

PART 3 – EXECUTION

3.01 GENERAL:

- A. Concrete shall be measured, mixed and placed, and compacted as required in Division 3.
- B. Provide not less than 3 inches of concrete between the outside of a duct and the earth. Provide not less than 2 inches of concrete between adjacent ducts. Refer to Drawings for spacing requirements. Provide side forms for each duct bank.
- C. All duct line concrete pours shall be continuous between manholes or handholes and between manholes or handholes and structures.
- D. Where duct lines pass through concrete walls, concrete envelopes shall be extended through the finished flush with inside surfaces. Watertight construction joints of an approved type shall be provided.
- E. Duct banks shall be reinforced when laid on backfill covering new pipelines, roads, parking lots or any are subject to vehicular traffic. Beneath these areas, install reinforcing bars as shown on the Drawings, extending 10 ft beyond area needing protection.
- F. Duct lines shall be laid in trenches on mats of gravel not less than 6 inches thick and well graded.
- G. All electrical duct banks shall be colored red for safety purposes.
- H. Install raceways to drain away from buildings. Raceways between manholes or handholes shall drain toward the manholes or handholes. Raceway slopes shall not be less than 3 in per 100 ft.

- I. Make raceway entrances to buildings and vaults with hot dipped rigid galvanized steel conduit not less than 10 ft long. Conduits which are not concrete encased for runs below floor slabs in slab-on-grade construction shall be hot dipped rigid galvanized steel conduit. Conduits which are concrete encased for runs below floor slabs in slab-on-grade construction shall be encased under the slab to their respective equipment.
- J. Raceway terminations at manholes shall be with end bells for PVC conduit and insulated throat grounding bushings with lay-in type lugs for metal conduit.

3.02 INSTALLATION:

- A. Provide excavation and backfilling required for ductbank manhole and handhole installation.
- B. Make duct bank installations and penetrations through foundation walls watertight.
- C. Assemble duct banks using non-magnetic saddles, spacers and separators. Position separators to provide 3 inch minimum separation between the outer surfaces of the ducts.
- D. Firmly fix ducts in place during pouring of concrete. Carefully spade and vibrate the concrete to insure filling of all spaces between ducts.
- E. Make bends with sweeps of not less than 48-inch radius or 5 degree angle couplings.
- F. Make a transition from non-metallic to PVC coated rigid steel conduit where duct banks enter structures or turn upward for continuation above grade. Terminate the ducts in insulated grounding bushings. Continue ducts inside buildings with steel, metallic conduit.
- G. Where ducts enter manholes and handholes, terminate the ducts in suitable end bells.
- H. Provide expansion/deflection fittings in accordance with the requirements specified in Division 16, Section "Raceways, Boxes and Supporting Devices".
- I. Do not backfill with material containing large rock, paving materials, cinders, large or sharply angular substances, corrosive material or other materials which can damage or contribute to corrosion of ducts or cables or prevent adequate compaction of fill.

- J. Slope duct runs for drainage toward manholes and away from buildings with a slope of approximately 3 inches per 100 feet.
- K. After completion of the duct bank and prior to pulling cable, pull a mandrel, not less than 12 inches long and with a cross section approximately one-fourth inch less than the inside cross section of the duct, through each duct. Then pull a rag swab or sponge through to make certain that no particles of earth, sand or gravel have been left in the duct.
- L. Install a bare stranded copper duct bank ground cable in each duct bank envelope. Make ground electrically continuous throughout the entire duct bank system. Connect ground cable to building and station ground grid or to equipment ground buses. In addition, connect ground cable to steel conduit extensions of the underground duct system. Provide ground clamp and bonding of each steel conduit extension, where necessary to maintain continuity of the ground system. Terminate ground conductor at last manhole or handhole for outlying structures.
- M. Install a warning ribbon approximately 12 inches below finished grade over all underground duct banks. The identifying ribbon shall be a PVC tape, 3-inches wide, yellow color, permanently imprinted with "CAUTION BURIED ELECTRIC LINE BELOW" in black letters.
- N. Plug and seal all empty spare ducts entering buildings and structures. Seal all ducts in use entering buildings and structures. Seal shall be watertight, O-Z/Gedney Type Dux Duct Sealing Compound or equal.
- O. Install duct banks in conformance with National Electrical Code and National Electrical Safety Code.
- P. Install manholes and handholes where shown on Drawings. Verify final locations in field.
- Q. Complete installation of manholes and handholes so that structures are watertight. Provide expansion/deflection fitting for each conduit entry into the manholes.
- R. Provide sump opening in manhole floor.
- S. Provide grading rings or brick stacks for manholes when required to adjust manhole cover to proper grade. Stacks shall be minimum of 12 inches in height, constructed on the roof slab or cone section on which the manhole frame and cover shall be placed. The height of the stack shall be such as is necessary to bring the manhole frame to the proper grade.
- T. Cable Racks:

1. Provide cable hooks to support each cable on each rack along the cable run within the manholes.
 2. Individually support each cable at each hook on porcelain insulators.
 3. In the manhole securely tie each cable in place at each insulator block to prevent excessive movement of insulators, cables, or fireproof tape. Tie cables with non-metallic 3/4-inch strapping tape as manufactured by 3M or tie down with nylon straps.
- U. Conduits shall extend 3 inches above concrete slab surface, unless otherwise indicated. All conduits shall be bushed to protect cables and provide means for grounding.
- V. Duct Bank Conduit Spacers: Non-metallic, snap together intermediate and bottom pieces, sized for conduit diameter and code spacing. Carlon "Span-Loc" or approved. Separators shall be compatible with the conduit utilized. The joints of the conduits shall be staggered by rows and layers so as to provide a duct line having the maximum strength. During construction, partially completed duct lines, shall be protected from the entrance of debris such as mud, sand, and dirt by means of suitable conduit plugs. As each section of a duct line is completed, a testing mandrel not less than 12 inches long with a diameter 1/4 inch less than the size of the conduit, shall be drawn through each conduit, after which a brush having the diameter of the duct, and having stiff bristles shall be drawn through until the conduit is clear of all particles of earth, sand and/or gravel; conduit plugs shall then be immediately installed. Provide a plastic pull rope, having a minimum of 3 additional feet at each end, in all spare ducts.

3.03 DUCT BANK INSTALLATION:

- A. All bends shall have a radius greater than 36 inches or 12 times conduit inside diameter whichever is greater.
- B. Install duct with minimum slope of 4 inches per 100 feet. Slope duct away from building entrances.
- C. Install no more than equivalent of three 90-degree bends between pull points.
- D. Provide suitable fittings to accommodate expansion and deflection where required.
- E. Use suitable separators and chairs installed not greater than 4 feet on centers. Conduit separation shall be per code, and not less than 3 inches.

- F. Securely anchor duct to prevent movement during concrete placement. Use re-bar holders at spacers and secure with #4 re-bar driven into earth minimum of 1 foot.
- G. Connect to manhole wall using No. 6 re-bar dowels. Dowels shall be located at each corner, and 12 inches on center. Insert dowels minimum 3 inches into manhole and 3 feet into duct bank.
- H. Tops of concrete-encased ducts shall be:
 - 1. Not less than 24in and not less than shown on the Drawings, below finished grade.
 - 2. Not less than 30in and not less than shown on the Drawings, below roads and other paved surfaces.
- I. Tops of direct burial ducts and conduits shall be:
 - 1. Not less than 24in and not less than shown on the Drawings, below finished grade.
 - 2. Not less than 30in and not less than shown on the Drawings, below roads and other paved surfaces.

3.04 PRE-CAST MANHOLE INSTALLATION

- A. Install and seal pre-cast sections in accordance with manufacturer's instructions.
- B. Install manholes plumb.
- C. Attach cable racks to inserts after manhole installation is complete.
- D. Provide 12 inches minimum gravel bedding under manholes, and 12 inches gravel fill around manholes.
- E. Conduit/Ductwork penetration shall be grouted and sealed. Penetration shall be watertight.

3.05 CONDUIT WATERPROOFING:

- A. Waterproofing of conduit joints shall conform to the following:
 - 1. Non-metallic PVC Conduit, temperature rated for 90 degrees C. The end of the conduit shall be liberally coated with an approved wall weather quick-set clear cement before joining. Joint shall be inserted into the

coupling, pushing firmly and rotating conduit until it reaches the pre-formed stopping ridge within the coupling.

2. The entire work area of the joint, plus a minimum distance of 6 inches both ways, shall be thoroughly cleaned (with a solvent if recommended by the respective manufactures) removing all foreign debris such as dirt, sand and mud prior to the following Work being started.
3. Pipe insulating putty shall be applied to the entire circumference of the coupling ends to provide a smooth tapered surface.
4. Apply a quick-drying, non-sag, rubber based primer to the conduit joints, extending the primer application the entire length of the proposed tape wrap.
5. Apply an all weather, corrosion protection tape to the conduit joint area providing two full half-lap wraps the entire length of the joint; which is considered a minimum distance of 4 inches past the end of the coupling in both directions.
6. Install a heat-shrinkable tubing to the conduit joint area. Tubing shall extend a minimum distance of 2 inches past the end of the tape wrap in both directions.

3.06 CABLE PULLING:

- A. The inspection, handling, storage, temperature conditioning prior to installation, bending and training limits, pulling limits, and calculation parameters for installation of all cables must comply with the manufacturer's recommendations. For ease of installation and prevention of cable damage, the Contractor shall utilize quadrant blocks located properly along the cable run. Failure to comply with any of the above shall make this Contractor responsible for any cable failures that occur within the manufacturer's warranty period.
- B. Cable lubricant shall be soapstone, graphite or talc for rubber or plastic jacketed cables.
- C. Lubricants for assisting in the pulling or jacketed cables shall be those specifically recommended by the cable manufacturer.
- D. Cable pulling tensions shall not exceed the maximum pulling tensions recommended by the cable manufacturer.
- E. All medium voltage cables shall be individually fire/arc proofed.

3.07 CABLE TERMINATING:

- A. Terminations of insulated power and lighting cables shall be protected from accidental contact, deterioration of coverings and moisture by the use of terminating devices and materials. Terminations shall be made using materials and method as indicated or specified herein or as designed by the written instruction of the cable manufacturer and termination kit manufacturer.

3.08 GROUNDING:

- A. Duct banks shall be grounded with a bare stranded copper ground wire that is run within the duct bank and is bonded and grounded at both ends. Conduit shall not be used as the ground conductor.
- B. Manholes shall be grounded with ground rods. A bare stranded copper ground wire from the ground wire loop shall be used to bond together and ground the manhole cover frame, ladder support bracket, concrete inserts, cable racks, duct bank ground conductors, and the shields on any medium voltage cables that are spliced in the manhole.
- C. Grounding: Install a ground rod for each manhole. Bond all exposed metal manhole accessories and the concrete reinforcing rods with bare copper wire and connect to the ground rod and to the ductbank ground cable. Provide foam sealant for rod penetration in manhole floor for water tight seal.
- D. Install a bare stranded copper duct bank ground cable in each duct bank envelope. Make ground electrically continuous throughout the entire duct bank system. Connect ground cable to building and station ground grid or to equipment ground buses. In addition, connect ground cable to steel conduit extensions of the underground duct system, manholes and handholes. Provide ground clamp and bonding of each steel conduit extension, where necessary to maintain continuity of the ground system.

END OF SECTION

SECTION 16120

WIRE AND CABLES

PART 1 – GENERAL

1.01 SCOPE:

- A. The Contractor shall provide the labor, tools, equipment, and materials necessary to install wires, cables, and connectors in accordance with the plans and as specified herein.
- B. This section includes wires, cables, and connectors for power, lighting, signal, control, and related systems rated 600 volts and less.

1.02 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to this section.
- B. Related Sections:
 - 1. Division 16: Section, "Basic Electrical Requirements".

1.03 QUALITY ASSURANCE:

- A. Reference Standards:
 - 1. National Fire Protection Association (NFPA) 70 "National Electrical Code (NEC)
 - 2. Underwriter's Laboratories, Inc. (UL) Compliance.
 - a. UL Standard 83 Thermoplastic Insulated Wires and Cables.
 - b. UL Standard 486A Wire Connectors and Soldering Lugs for Use with Copper Conductors.
 - c. UL Standard 854 Service Entrance Cable.
 - 3. National Electrical Manufacturers Association (NEMA) Compliance.

- a. WC-5 Thermoplastic Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
 - b. WC-7 Cross Linked Thermosetting Polyethylene Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
 - c. WC-8 Ethylene Propylene Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
4. Institute of Electrical and Electronic Engineers (IEEE) Compliance.
- a. Standard 82 Test Procedure for Impulse Voltage Tests on Insulated Conductors.

1.04 SUBMITTALS:

- A. Furnish manufacturer's product data, test reports, and materials certifications as required.
- B. Submit the following in accordance with Conditions of Contract and Division 1 specification sections:
 - 1. Product data for electrical wires, cables, and connectors.
 - 2. Product data for Megger insulation testing instrument.
 - 3. Report sheets for Megger testing.

1.05 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver wire and cable properly packaged in factory fabricated type containers, or wound on NEMA specified type wire and cable reels.
- B. Store wire and cable in clean dry space in original containers. Protect products from weather, damaging fumes, construction debris, and traffic.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. General:

1. Provide factory-fabricated wires of sizes, ampacity ratings, and materials for applications and services indicated. Where not indicated, provide proper wire selection as determined by Installer to comply with project's installation requirements, NEC and NEMA standards. Select from the following UL types those wires with construction features which fulfill project requirements:
2. Provide color-coding for phase identification as specified herein.
3. Provide factory applied nylon or polyvinyl chloride (PVC) external jackets on wires and cables for pulls in raceways over 100 feet in length, for pulls in raceways with more than three equivalent 90 degree bends, for pulls in conduits underground or under slabs on grade, and where indicated.

B. Service & Distribution Wiring:

1. 98 percent conductivity copper.
2. 600 volt insulation, type XHHW or XHHW-2.
3. U.L. listed for underground use in wet locations at 75° C.

C. Building Wiring:

1. 98 percent conductivity copper.
2. 600 volt insulation, type, THWN/THHN, XHHW, or XHHW-2.
3. Stranded conductor: #14 AWG and larger.
4. Minimum branch circuit: #12 AWG.
5. Minimum #10 AWG for 120 volt circuits more than 100 feet long.
6. Minimum #10 AWG for 277 volt circuits more than 230 feet long.

D. Control Wiring:

1. Control wiring for digital/discrete signal wiring, shall be 600V, minimum #14AWG, THHN/THWN, copper stranded, unless specifically indicated otherwise.
2. Instrument cable for analog signal wiring (4-20mA DC) shall be shielded, 2-conductor, 300 volt rated, minimum #18 AWG, Belden No. 8760, Alpha Wire, or approved equal. Provide 600 volt rated cable where cable occupies the same enclosure and/or raceway with voltages greater than 300 volt as specified below.
3. Single Shielded Pair Instrument Cable.
 - a. Tinned copper, XLPE insulated stranded conductors, No. 18 AWG minimum, twisted pair with overall shield, stranded tinned No. 18 AWG copper drain wire and overall PVC jacket. Rated for 600 volts minimum and conforming to UL 1581. Cables shall be rated for tray cable "TC" use where installed within a cable tray.
 1. Belden Company
 2. Okonite Company.
 3. Dekoron Wire and Cable Company.
4. Multi-paired Shielded Instrument Cable.
 - a. Tinned copper, XLPE insulated stranded conductors, No. 16 AWG minimum, twisted pairs with shield over each pair, stranded tinned No. 18 AWG copper drain wire, and overall PVC outer jacket. Rated for 600 volts minimum and conforming to UL 1581 or UL 158. Cables shall be rated for tray cable "TC" use where installed within a cable tray.
 1. Belden Company.
 2. Okonite Company.
 3. Dekoron Wire and Cable Company.

E. VFD Cable:

1. VFD load-side power cable shall be shielded type specifically listed for use with Variable Frequency Drives.
2. VFD cable shall be UL listed with 600V black XLPE insulation.

3. Cable shall be equipped with 100% foil shield.
4. Cables shall be stranded type with number and sizes of conductors as indicated on the Drawings.
5. Cables shall include full-sized, insulated ground.
6. Cable shall be equal to Belden Series 295XX, or Engineer approved equal.

F. Splices:

1. No. 10 and smaller with 600-volt pressure type insulated connector of wire-nut type, or equal; soldered and crimped type not allowed. Ideal type "wire nut" Buchanan type "B-Cap" and Minnesota Mining (3M) type "Scotchlok".
2. No. 8 and larger with solderless lugs or solderless connectors of Lock-tite or similar type properly taped with plastic insulating tape, Minnesota Mining Co. #33, or equal, then two half lap servings of friction tape, Manson, or equal.'
3. Wire connector system for use with underground conductors shall be UL listed specifically for such use.
4. Service entrance conductors shall be installed without splices. Electrical equipment feeders shall be spliced only where shown or specifically approved. Control and metering conductors shall be installed without splices.
5. All splices shall be made only by specific permission of the Engineer and then only in manholes or pull boxes and shall be sealed watertight with a heat-shrunk insulation.
6. Tighten electrical connectors and terminals in accordance with manufacturer's published torque tightening values. Where manufacture's torqueing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A and 486B.
7. Use UL listed splice for all underground wires, ducts buried, in conduit and in ducts. Connectors and splices shall be waterproof.

PART 3 – EXECUTION

3.01 WIRE AND CABLE INSTALLATION:

- A. All wire and cables shall be installed in conduit of size and type indicated on the drawing and specifications.
- B. Install electrical cables, wires, and connectors in compliance with NEC.
- C. Pull conductors simultaneously where more than one is being installed in same raceway. Use UL listed pulling compound or lubricant, where necessary.
- D. Use pulling means including, fish tape, cable, rope, and basket weave wire/cable grips which will not damage cables or raceways. Do not use rope hitches for pulling attachment to wire or cable.
- E. Conceal all cable in finished spaces.
- F. Install exposed cable parallel and perpendicular to surfaces or exposed structural members, and follow surface contours where possible.
- G. Conductors shall be sized such that voltage drop does not exceed 3 percent for branch circuits or 5 percent for feeder/branch circuit combination.
- H. Provide adequate length of conductors within electrical enclosures and train the conductors to terminal points with no excess. Bundle multiple conductors, with conductors larger than No. 10 AWG cabled in individual circuits. Make terminations so there is no bare conductor at the terminal.
- I. All feeder and branch circuit wiring shall be color coded at all termination and splice locations. System neutrals shall be designated in addition to phase conductors. Equipment grounds shall be green.
- J. The number of conductors shown on the Drawings is not necessarily the correct number required. As many conductors as are required in each case shall be installed. In general, grounding conductors are not scheduled.
- K. In general, wiring for the following systems shall be installed in separate conduits. Do not mix categories in a single raceway.
 - 1. 120 volt power wiring.
 - 2. 120 volt control wiring, including, digital input and output signals.
 - 3. 24 volt DC control wiring, including, digital input and output signals.

4. 24 volt DC analog control wiring (4-20mA).
 5. Communications wiring.
 6. Special & Emergency Systems
- L. Conductors 600 volts and below shall be color coded in accordance with the following:

<u>CONDUCTOR</u>	120/208 <u>COLOR</u>	480/277 <u>COLOR</u>
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	White/Gray
Equipment Grounds	Green	Green

3.02 FIELD QUALITY CONTROL:

- A. The Contractor shall test each electrical circuit after permanent cables are in place with terminators installed, but before cable or wire is connected to equipment or devices to demonstrate that each circuit is free from improper grounds and short circuits.
- B. The Contractor shall Megger Test, the insulation resistance between phases and from each phase to ground for each of the following feeder and motor branch circuits:
1. Secondary Service Entrance
 2. Distribution Equipment
 3. Generator and ATS
 4. Transformers
 5. Variable Frequency Drives.
 6. Motors.
- C. The Megger Testing shall be witnessed by the Engineer/Architect. The Engineer/Architect shall be notified at least 48 hours in advance of testing.

- D. Measure the insulation resistance with a digital "Megger" insulation testing instrument in accordance with manufacturer's recommendations. All test instruments are to be provided by the Contractor.
- E. If any insulation resistance measures less than 50 megohms, the cable shall be considered faulty with the cable failing the insulation test. In moist environments, bag the ends of the cable to prevent a faulty Megger test.
- F. Any cable which fails the insulation tests or which fails when tested under full load conditions shall be replaced with new cable for the full length and retested at no additional cost to Owner.
- G. The below grade service or feeder splice shall be water immersion Megger tested in the presence of the Engineer. Each splice shall be immersed in a grounded water immersion bath for 24 continuous hours prior to and during the test. Criteria for failure shall be as described for cable above.

END OF SECTION

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SECTION 16130

RACEWAYS, BOXES AND SUPPORTING DEVICES

PART 1 - GENERAL

1.01 SCOPE:

- A. The Contractor shall provide the labor, tools, equipment, and materials necessary to furnish and install raceways, boxes and supporting devices in accordance with the plans and as specified herein.
- B. Types of products specified in this section include:
 - 1. Conduit, Raceways & Fittings
 - 2. Supporting Devices
 - 3. Boxes and fittings.

1.02 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to this section.
- B. Related Sections:
 - 1. Division 16: Section, "Basic Electrical Requirements".
 - 2. Division 16: Section, "Wire & Cables".

1.03 QUALITY ASSURANCE:

- A. Reference Standards.
 - 1. Underwriter's Laboratories, Inc. (UL) Listing and Labeling. Items provided under this section shall be listed and labeled by UL.
 - 2. National Electrical Code (NEC).
 - 3. National Electrical Manufacturers Association (NEMA).

1.04 SUBMITTALS:

- A. Furnish manufacturer's product data, test reports, and material certifications as required.
- B. In accordance with Conditions of Contract and Division 1 specification sections:
 - 1. Product data for cabinets and enclosures with classification higher than NEMA 1.
 - 2. Shop drawings for floor boxes and boxes, enclosures and cabinets that are to be shop fabricated (non-stock items).

PART 2 - PRODUCTS

2.01 CONDUIT, RACEWAYS & FITTINGS:

- A. Provide conduit with $\frac{3}{4}$ -inch diameter minimum, except where specifically shown smaller on the Contract Drawings.
- B. Conduit, connectors, and fittings shall be approved for the installation of electrical conductors.
- C. Refer to Table 3.01A for approved conduit installation guidelines.
 - 1. Electrical Metallic Tubing (EMT):
 - a. EMT shall be rigid metallic conduit of the thin-wall type in straight lengths, elbows, or bends and must conform to NEMA C80.3 and the requirements of UL 797.
 - b. Couplings and connectors shall be steel compression fittings. Where EMT enters outlet boxes, cabinets, or other enclosures, connectors must be the insulated-throat type, with a locknut. Fittings must meet the requirements of NEMA FB 1.
 - 2. Rigid Galvanized Steel Conduit:
 - a. Rigid steel conduit (RGS), including couplings, elbows, bends, and nipples, shall conform to the requirements of UL 6 and NEMA C80.1 Steel fittings shall be galvanized by the hot-dip process.
 - b. Fittings for rigid steel conduit shall be threaded and shall conform to NEMA FB 1.

- c. Gaskets shall be solid for fittings sized 1-1/2 inches and less. Conduit fittings with blank covers shall have gaskets except in clean, dry areas or at the lowest point of a conduit run where drainage is required.
 - d. Covers shall have captive screws and be accessible after the Work has been completed.
- 3. PVC-Coated Rigid Metal Conduit:
 - a. Rigid galvanized metal conduit coated with 40 mils thick polyvinylchloride coating.
 - b. Fittings, elbows, supporting devices and accessories shall include factory applied 20 mils thick polyvinylchloride coating and be manufactured by the same as that of the conduit.
 - c. Use tools as recommended by the manufacturer so as not to damage PVC coating. Where coating is damaged, touch-up with PVC paint in the field after installation.
- 4. Rigid Plastic Conduit:
 - a. PVC Schedule 40: Conduit shall be made of polyvinyl chloride compound that shall be homogeneous plastic material free from cracks, holes or foreign inclusions. Conduit shall be rated for use with 90 degree C conductors, UL Listed. Use solvent cement to join conduits as manufactured the same as the conduit manufacturer.
 - b. PVC Schedule 80: Heavy wall PVC conduit that shall be made of polyvinyl chloride compound that shall be homogeneous plastic material free from cracks, holes or foreign inclusions. Conduit shall be rated for use with 90 degree C conductors, UL Listed. Use solvent cement to join conduits as manufactured the same as the conduit manufacturer.
- 5. Flexible Metallic Conduit:
 - a. Flexible metallic (FM) conduit shall meet the requirements of UL 1.
 - b. Liquid-tight flexible metallic conduit shall be provided with a protective jacket of PVC extruded over a flexible interlocked galvanized steel core to protect wiring against moisture, oil, chemicals, and corrosive fumes.

- c. Fittings for flexible metallic conduit shall meet the requirements of UL 514B, Type I box connector, electrical, Type III coupling, electrical conduit, flexible steel, or Type IV adapter, electrical conduit.
6. Wireways:
- a. Wireways and auxiliary gutters for use in exposed, dry locations shall be a prefabricated channel-shaped sheet metal trough with hinged or removable covers, associated fittings, and supports for housing, and protecting electrical wires and cables in accordance with UL 870.
 - b. Straight sections of trough, elbows, tees, crosses, closing plates, connectors, and hanging brackets shall be constructed from sheet steel of commercial quality not less than 16-gage. Sheet metal component parts shall be cleaned, phosphatized, and coated with a corrosion-resistant gray paint.
 - c. Straight sections of wireways and auxiliary gutters shall be solid or have knockouts as indicated on both sides and bottom, 3 inches on center.
 - d. Straight sections shall be not more than 5-feet long, with covers held closed with screws.
7. Conduit Seals:
- a. Provide factory fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit, or tubing passing through concrete floors and walls. Provide a cast in place water stop wall sleeve with a mechanical pipe seal between the conduit and the sleeve. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.
 - b. Provide E.Y.S. seal fittings with appropriate potting material where conduits enter or leave a Class 1, Division 1 or 2 environments or a Class 2, Division 1 or 2 environment, and chemical rooms.

2.02 SUPPORTING DEVICES:

- A. Supports, support hardware, and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic. Products for use outdoors shall be hot dip galvanized unless material is inherently corrosion resistant.
- B. Refer to Table 2.02A for approved supporting device installation guidelines.
1. Conduit Supports:
 - a. Single run hangers: Galvanized steel conduit straps or clamps, or cast metal beam clamps. Perforated straps and spring steel clips and clamps will not be permitted.
 - b. Group run hangers: Minimum 12-gauge galvanized performed U-channel rack with conduit fittings, 25 percent spare capacity.
 - c. Hanger rods: Threaded steel 3/8-inch diameter, or as identified on the Drawings.
 - d. Vertical run supports: Minimum 12-gauge galvanized performed U-channel struts with conduit fittings.
 2. Equipment and Lighting Supports:
 - a. U-channel: 12-gauge galvanized performed U-channel struts with fixture and conduit fittings, as applicable, unless indicated otherwise on the Drawings.
 3. Corrosive Area Supports:
 - a. Clamp Hangers, Pipe Straps, and Clamp Back Spacers for use with PVC-coated rigid metal conduit shall have 40mil gray PVC exterior coating.
 - b. Clamp Hangers, Pipe Straps, etc. for use with PVC nonmetallic conduit shall be of nonmetallic PVC material.
 - c. Hanger Rods: 20mil gray PVC exterior coated rod with threaded ends only 3/8" and 1/2" sizes as required.
 - d. Strut Support: 20mil gray PVC exterior coating strut. Standard channel, slotted channel, and back to back channel are acceptable.

- e. Provide stainless steel supports and accessories in lieu of PVC coated supports when indicated in Table 2.02A below.

TABLE 2.02A – Supporting Devices

Location/Equipment	Acceptable Support Type
Interior Finished Spaces	Electrical Metallic Tubing
Exterior	Rigid Galvanized Steel

2.03 BOXES AND FITTINGS:

- A. Boxes must have sufficient volume to accommodate the number of conductors entering the box in accordance with the requirements of NFPA 70 and UL 514A.
- B. In general, boxes that are exposed to weather, process areas, normally wet locations, and locations exposed in mechanical spaces shall be cast-metal. Boxes in all other finished areas shall be sheet metal. Boxes installed in corrosive areas, such as the chemical feed room, shall be non-metallic.
- C. Refer to Table 2.03A for approved enclosure types.
1. Sheet Metal Outlet Boxes:
- a. Sheet Metal Outlet Boxes: Standard type galvanized steel, minimum four inch square or octagon by 1-1/2 inch deep.
- b. Luminaire and Equipment Supporting boxes: Rated for weight of equipment supported; include 2 inch male fixture studs where required.
- c. Single Wall Type: Minimum size, four inch square by 1-1/2 inch or 2-1/8 inch deep, except as noted. Provide dry wall device covers raised 3/4 inch minimum to insure flush finish mounting.
- d. Ganged Wall Type: Minimum depth three inches except as noted, ganged as required under common plate to contain devices shown. On 277 volt circuits ganged boxes for switches shall contain only one circuit or equip box with permanent barriers per NEC Art 404-8.
2. Cast Outlet Boxes:
- a. Type FS shallow and type FD deep, cast ferroalloy.
- b. Provide number of threaded hubs as required.

- c. Use in all exterior, damp and locations exposed in mechanical spaces.
 - d. Provide gasketed cover and accessories by box manufacturer for complete weatherproofing. Provide correct box to accept weatherproof covers as specified.
3. Sheet Metal Pull & Junction Boxes:
- a. Sheet metal boxes shall be standard type galvanized steel and must conform to UL 50.
 - b. Box dimensions shall be minimum four inch square or octagon by 2 1/2 inch deep.
 - c. Sizes up to 12x12x6 inch: Provide screw-type or hinged covers.
 - d. Sizes greater than 12x12x6 inch: Provide hinged covers.
 - e. Boxes shall be sized to accommodate all incoming raceways.
4. Nonmetallic Outlet, Device, and Wiring Boxes:
- a. Conform to NEMA SS 2, "Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports," and UL 514C, "Nonmetallic Outlet Boxes, Flush Device Boxes and Covers." Boxes shall be molded polyvinyl chloride (PVC), or fiberglass units of type, shape, size, and depth to suit location and application.
 - b. Boxes shall be equipped with threaded screw holes for device and cover plate mounting. Each box shall have a molded cover of matching material suitable for the application and location installed.

TABLE 2.03A – Electrical Enclosure Types

Location/Equipment	Acceptable Enclosure Type
Pump Stations	
Interior Finished Spaces	NEMA 4X
Exterior	NEMA 4X

PART 3 – EXECUTION

3.01 CONDUIT:

A. Uses Permitted:

1. Use liquid tight flexible metal conduit for the final 24 inches of connections to motors or control items subject to movement or vibration.
2. Use RGS for all exterior aboveground installations unless otherwise noted.
3. Use PVC coated rigid steel conduit, or as scheduled below, for installation in corrosive areas, and other areas as identified on the Contract Drawings.
4. Exposed raceways in Manufacturing Area's, Utility Rooms, Mechanical Rooms, Warehouse Area's, etc., shall be Rigid Galvanized Steel below 15 ft.
5. Conduit and raceway runs in finished areas concealed in or behind walls, above ceilings, or exposed on walls and ceilings 15 feet or more above finished floors and not subject to mechanical damage may be electrical metallic tubing (EMT).
6. Use Schedule 40 PVC conduit for exterior direct buried installations. Use Schedule 40 PVC conduit for exterior concrete encased installations. Use Schedule 80 PVC conduit for underground installations under driveways. The transition from underground and from concrete encasement to riser shall be PVC coated rigid steel conduit to a minimum of 12" above finished floor and/or finished grade elevation. All elbows shall be prefabricated Rigid Steel to prevent wire burn through. Reference specification 16116 "Underground Electrical Construction" for further requirements.
7. Install conduit seals for conduit penetrations of slabs on grade and exterior walls below grade and where indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal. Provide seals for the interior of conduits that penetrate exterior or water bearing walls, consisting of gland type sealing bushings or RTV closed cell silicone foam.
8. Refer to Table 3.01A below for approved conduit types:

TABLE 3.01A – Conduit Types

Location/Equipment	Approved Conduit Type
Interior Finished Spaces	Electrical Metallic Tubing
Exterior	Rigid Galvanized Steel

- B. Power, lighting, control, emergency light and power, and special-service systems and all related components shall be installed in accordance with NFPA 70, and shall be enclosed in separate conduit or separate conduit systems as indicated on the Contract Drawings and as specified herein.
- C. Any run of conduit between outlet and outlet, between fitting and fitting, or between outlet and fitting shall contain not more than the equivalent of three 90-degree bends, including those bends located immediately at the outlet or fitting. Field bends shall be made in accordance with the manufacturer's recommendations, which normally require use of a one-size-larger bender than would be required for uncoated conduit. Installed conduit and fittings shall be free of dirt and trash and shall not be deformed or crushed. Empty conduit shall have a pull rope stalled.
- D. Conduit shall be installed with a minimum of 3 inches of free air space separation from mechanical piping.
- E. Conduit in finished areas shall be installed concealed. Conduit passing through masonry or concrete walls shall be installed in sleeves. Conduit shall be securely clamped and supported at least every 10 feet vertically and 8 feet horizontally. Galvanized pipe straps shall be fastened to structure with bolts, screws, and anchors. Wooden masonry plugs shall not be used.
- F. Install exposed conduits, parallel or perpendicular to walls, ceilings, or structural members. Do not run through structural members. Avoid horizontal runs within partitions or sidewalls. Avoid ceiling inserts, lights, or ventilation ducts or outlets. Do not run conduits across pipe shafts or ventilation duct openings and keep conduits a minimum of 6 inches from parallel runs of flues, hot water pipes, or other sources of heat. Wherever possible, install horizontal raceway runs above water and steam piping.
- G. Do not run conduits exposed on the exterior surface of buildings. Conduits penetrating exterior walls below grade, at grade floors, or below grade floors shall be sealed to prevent moisture migration. The exterior of the conduit shall be sealed with a mechanical pipe seal. The interior conduit seal shall be a gland type sealing bushing or RTV closed cell silicone foam. Ensure that conduits do not retain water against these seals.

- H. Raceways penetrating fire rated walls, floors, and partitions shall be sealed with a fire rated sealant.
- I. All conduits shall be supported with materials specifically made for this purpose. Do not use wire hangers. Do not attach any parts of the raceway system to ventilation ducts. Conduit supports shall be attached to the building. Support conduits on each side of bends and on a spacing not to exceed the following: 6 feet for conduits smaller than 1 1/4 inches and 8 feet for conduits 1 1/4 inches and larger. Support riser conduits at each floor level with clamp hangers. All underground conduits shall be securely anchored to prevent movement during placement of concrete or backfill. Use precast separators and heavy gauge wire ties or other approved fasteners.
- J. Provide E.Y.S. seal fittings with appropriate potting material where conduits enter or leave a Class 1, Division 1 or 2 environments or a Class 2, Division 1 or 2 environment, and chemical rooms.
- K. Conduit connections to boxes and fittings shall be supported not more than 36 inches from the connection point. Conduit bends shall be supported not more than 36 inches from each change in direction. Conduit shall be installed in neat symmetrical lines parallel to the centerlines of the building construction and the building outline. Multiple runs shall be parallel and grouped whenever possible on common supports. Exposed ends of conduit without conductors shall be sealed with watertight caps or plugs.
- L. Bonding wires shall be used in flexible conduit for all circuits. Flexible conduit shall not be considered a ground conductor.
- M. Liquid tight flexible metallic conduits shall be used in wet and oily locations and to complete the connection to motor-driven equipment.
- N. Electrical connections to vibration-isolated equipment shall be made with flexible metallic conduit in a manner that will not impair the function of the equipment.
- O. A polypropylene pull rope with a tensile strength not less than 130 pounds shall be installed in empty conduit.
- P. Electrical conduit may be embedded in concrete according to the provisions of Article 6.3 of ACI 318 "Building Code Requirements for Reinforced Concrete", provided the following conditions are met:
 - 1. Outside diameter of conduit shall not exceed 1/3 of concrete thickness. Maximum conduit outside diameter shall not exceed 3 inches when embedded in slab.

2. Conduit shall not be placed closer than three diameters on center. Route conduit to minimize crossing of different conduit runs.
3. Conduit shall not be embedded in structural concrete slabs less than four inches thick.
4. A 1 1/2 inch minimum concrete cover shall be provided for conduits in structural concrete slabs.

Q. Installation of Underground Conduit:

1. Minimum of 3/4 inch conduit in or under concrete slab on grade.
2. Where conduits are installed in concrete slabs, on the ground, underground, or exposed to the weather, make all joints liquid tight and gas tight.
3. Bury all underground conduit, except under concrete slabs placed on fill, to a depth of at least 30 inches below finished grade unless otherwise indicated on the Drawings.
4. Slope ducts to drain away from buildings into manholes and/or handholes. Adjust final slopes to coordinate with existing site utilities.
5. Install on undisturbed soil where possible. Concrete encase conduits as shown on Drawings. Use pit run gravel and sand, placed 8 inch lifts and compacted for backfill.
6. Reference Specification 16116 "Underground Electrical Construction" for further requirements.

R. Installation of Rigid Metal Conduit:

1. Ends of conduit shall be cut square, reamed and threaded, and joints shall be brought butt-to-butt in the couplings. Joints shall be mechanically tight. Conduit shall be protected against damage and the entrance of water or foreign material during construction.
2. Ninety-degree bends of conduit with a diameter larger than 1 inch shall be made with factory-made elbows. Conduit elbows larger than 2 1/2 inches shall be long radius. Field-made bends and offsets shall be made with an approved hickey or conduit-bending machine. Changes in directions of runs shall be made with symmetrical bends or cast-metal fittings.
3. At connections to sheet metal enclosures and boxes, a sufficient number of threads shall project through to permit the bushing to be drawn tight

against the end of the conduit, after which the locknut shall be pulled up sufficiently tight to draw the bushing into firm electrical contact with the box. Conduit shall be fastened to sheet metal boxes and cabinets with two locknuts where required by NFPA 70 where insulating bushings are used, where bushings cannot be brought into firm contact with the box, and where indicated.

4. Conduit joints shall be made with tapered threads set firmly. Each length of conduit cut in the field shall be reamed before installation. Where conduit is threaded in the field, each threaded end shall consist of at least five full threads. Corrosion-inhibitive compound (cold galvanizing paint) shall be used on all conduit threads or any locations where the original hot galvanized surface has been compromised.
5. Conduit stubbed-up through concrete floors for connections to free-standing equipment except motor-control centers, cubicles, and other such items of equipment shall be provided with a minimum of a 12" riser above the floor slab is of sufficient thickness. If not, a floor box shall be provided and set flush with the finished floor. Conduits installed for future use shall be terminated with a coupling and plug set flush with the floor.

3.02 SUPPORTING DEVICES:

- A. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.
- B. Coordinate with the building structural system and with other electrical installations.
- C. Conform to manufacturer's recommendations for selection and installation of supports.
- D. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
- E. Support parallel runs of horizontal raceways together on trapeze type hangers.
- F. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1 1/2 inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 1/4 inch diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.

- G. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.
- H. Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.
- I. Install sleeves in concrete slabs and walls and all other fire rated floors and walls for raceways and cable installations. For sleeves through fire rated wall or floor construction, apply UL listed fire-stopping sealant in gaps between sleeves and enclosed conduits and cables.

3.03 BOXES AND FITTINGS:

- A. Pullboxes shall be furnished and installed where necessary in the conduit system to facilitate conductor installation. Conduit runs longer than 100 feet or with more than three right-angle bends shall have a pull box installed at a convenient intermediate location.
- B. Boxes and enclosures shall be securely mounted to the building structure with supporting facilities independent of the conduit entering or leaving the boxes.
- C. Bonding jumpers shall be used around concentric or eccentric knockouts.
- D. Installation of Outlet Boxes:
 - 1. Use nonmetallic boxes in corrosive areas such as chemical feed area and as designated on the plans.
 - 2. Use explosion proof boxes in Hazardous areas as identified on the Drawings.
 - 3. Use cast metal boxes in all other locations. Each box with associated covers and fittings shall have a NEMA rating for each location installed.
- E. Installation of Pull and Junction Boxes:
 - 1. Use general purpose boxes (NEMA 1) in finished areas with framed construction.
 - 2. Use dust-tight and oil-tight boxes (NEMA 12) in other dry interior areas.
 - 3. Use explosion proof boxes (NEMA 7) in hazardous areas as designated on the plans.

4. Use watertight boxes (NEMA 4) for exterior and wet locations on outdoor structure where moisture is present.
5. Use corrosion resistant watertight boxes (NEMA 4X) for wet locations and corrosion filled areas, such as the chemical feed area, and as identified on the Drawings.

END OF SECTION

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SECTION 16450

GROUNDING

PART 1 - GENERAL

1.01 SCOPE:

- A. The Contractor shall provide the labor, tools, equipment, and materials necessary to furnish and install grounding materials in accordance with the plans and as specified herein.
- B. This section includes solid grounding of electrical systems and equipment.

1.02 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 16 specification sections, apply to this section.
- B. Related Sections:
 - 1. Division 16: Section, "Basic Electrical Requirements".
 - 2. Division 16: Section, "Wiring Devices".

1.03 QUALITY ASSURANCE:

- A. Reference Standards:
 - 1. "National Electrical Code" (NEC), as applicable to electrical grounding and bonding, Art. 250. Use of conduit system for ground conductor shall not be allowed.
 - 2. Underwriters' Laboratories, Inc. (UL). UL 467 "Electrical Grounding and Bonding Equipment."
 - 3. Institute of Electrical and Electronic Engineers (IEEE) IEEE 81 and 142.
 - a. 1-1983, "IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounded System (Part 1)."
 - b. 141-1993, "IEEE Recommended Practice for Electric Power Distribution for Industrial Plants."

- c. 142-1991, "IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems."

1.04 SUBMITTALS:

- A. Submit the following in accordance with Conditions of Contract and Division 1 specification sections:
 - 1. Product data for each type of product specified.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Provide each electrical grounding system with assembly of materials required for complete installation including wires/cables, connectors, lugs, clamps, ground rods, bonding jumpers and accessories.
- B. Provide electrical grounding conductors for grounding connections matched to power supply wiring materials and sized according to NEC.
- C. Provide electrical connectors, lugs, clamps, bonding jumpers and accessories as recommended by the respective manufacturer for the particular application, unless other indicated.
- D. Ground rods; Solid copper clad, 3/4-inch diameter by 10 feet long.
- E. Insulated conductors. Green in color.
- F. Ground Bus. Bare annealed copper bars of rectangular cross section, 1/4-inch x 3-inch x length as required, with 98 percent conductivity, rigidly attached to structure.
- G. Bonding Strap Conductor/Connectors. Soft copper, 0.05 inch thick and 2-inches wide, except as indicated.
- H. Pressure Connectors. High conductivity plated units.
- I. Bolted Clamps. Heavy-duty units listed for the application.
- J. Exothermic Welded Connections. Provided in kit form and selected for the specific types, sizes, and combinations of conductors and other items to be connected.

PART 3 - EXECUTION

3.01 GROUNDING AND BONDING:

- A. Ground main service entrance ground bus or lug to neutral of incoming service, to enclosure, to building steel, to ground rods/grounding ring, to rebar in concrete footing, and to main cold water pipe. Install grounding bushings or service conduits. Use exothermic style ground connections to the ground rods and building steel.
- B. Provide and install 600 volt insulated bonding conductors throughout the distribution system with connection to bonding (or grounding) terminal on each panel and panelboard with connections to other equipment where specifically indicated and noted.
- C. Bonding conductors shall be continuous where possible. Where splices are required, provide T & B, or equal, compression connectors of approved pattern. Insulate connectors to equivalent thickness of conductors.
- D. Provide grounding system for grounded circuit conductors of dry type transformer secondaries as indicated and required. Use exothermic style ground connections to building steel. Enclose grounding conductors in schedule 40 PVC conduit.
- E. Provide equipment grounding conductors in all conduits containing power, control, or instrumentation conductors on the load side of the service equipment or on the load side of a separately derived system.
- F. Comply with NEC Article 250 for sizes and quantities of equipment grounding conductors except that larger sizes indicated or shown on the Contract Documents shall take precedence. Use of metallic conduit systems for equipment grounding as recognized by the NEC shall not be permitted under this specification.
- G. Install grounding bushings on conduits at both primary and secondary entrances to transformers. Ground transformer enclosures to bushings.
- H. Install bonding jumper for flexible metal conduit unless fittings are approved for grounding or otherwise comply with NEC.
 - 1. Size jumper to match over-current device.
 - 2. Green insulation.
 - 3. Connect to grounding bushing at each end.

- I. Ensure that entire electrical system is electrically continuous and permanently and effectively grounded, including all electrical equipment and motors.
 - 1. Locate ground rods with a minimum of two rod length from each other and at least the same distance from any other grounding electrode. Connect ground conductors to ground rods by means of exothermic welds except at test wells and as otherwise indicated. Drive rods until tops are 24 inches below finished floor or final grade except as otherwise indicated.
- J. Route grounding electrode conductors along the shortest and straightest paths possible without obstructing access or placing conductors where they may be subjected to strain, impact, or damage, except as indicated.
- K. Ensure that grounding electrode conductor connections to interior piping, structural members, and the like are accessible for periodic inspection during the life of the structure.

3.02 BONDING FOR OTHER TRADES:

- A. Signal raceways, water piping, heating piping and metallic air ducts shall be bonded together and to the grounding conductor with No. 8 soft drawn bare solid conductors. Connections to pipes shall be made with cast clamps of like material as the pipes to which attached to ducting terminated in a secure manner by best practical means, bonding across any flexible or insulated connections.
- B. All bonding conductors shall be installed in a neat and workmanlike manner properly shaped for contour of surface involved and properly supported. At locations remote from the main service entrance panelboards, bond to the largest raceway nearby.

3.03 FIELD QUALITY CONTROL:

- A. Independent Testing Organization. Arrange and pay for the services of a qualified independent electrical testing organization to perform tests described below.
- B. Measure ground resistance without the soil being moistened by any means other than natural precipitation or natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the three-point fall of potential method in accordance with Section 9.03 of IEEE 81. Simple moisture addition is not acceptable.
- C. Ground/resistance maximum values shall be as follows:
 - 1. Equipment rated 500 kVA and less. 10 ohms.
 - 2. Equipment rated 500 kVA to 1000 kVA. 5 ohms.

3. Equipment rated over 1000 kVA. 3 ohms.
 4. Unfenced substations and pad mounted equipment. 5 ohms.
 5. Fence Grounds. 10 ohms.
- D. The grounding tests results shall be submitted to the Engineer for review and approval. Where ground resistances exceed specified values, and if directed, modify the grounding system to reduce resistance values. Where measures are directed that exceed those indicated under the provisions of the Contract, covering change orders will be provided.

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SECTION 16490

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Division 16, Section "General Electrical Requirements"
- C. Division 16, Section "Grounding".
- D. Division 16, Section "Distribution".

1.02 SUMMARY:

- A. This Section includes individually mounted enclosed switches and circuit breakers used for the following:
 - 1. Service disconnecting means.
 - 2. Feeder and branch-circuit protection.
 - 3. Motor and equipment disconnecting means.

1.03 SUBMITTALS:

- A. Product Data: For each type of switch, circuit breaker, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each switch and circuit breaker.
 - 1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Enclosure types and details.
 - b. Current and voltage ratings.
 - c. Short-circuit current rating.

- d. UL listing for series rating of installed devices.
 - e. Features, characteristics, ratings, and factory settings of individual over-current protective devices and auxiliary components.
 - f. Time-current curves, including selectable ranges for each type of circuit breaker.
- 2. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
- C. Field Test Reports: Submit written test reports and include the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- D. Manufacturer's field service report.
- E. Maintenance Data: For enclosed switches and circuit breakers and for components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1, Section "Closeout Procedures," include the following:
 - 1. Routine maintenance requirements for components.
 - 2. Manufacturer's written instructions for testing and adjusting switches and circuit breakers.
 - 3. Time-current curves, including selectable ranges for each type of circuit breaker.

1.04 QUALITY ASSURANCE:

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NEMA AB 1 and NEMA KS 1.
- C. Comply with UL #98, Enclosed Switches and UL #508, Industrial Control Equipment.
- D. Federal Specification W-S-865- Heavy Duty Switches.

- E. Comply with NFPA 70.
- F. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.05 PROJECT CONDITIONS:

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:
 - 1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
 - 2. Altitude: Not exceeding 6600 feet (2000 m).

1.06 COORDINATION:

- A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. Manufacturer: Existing MCC is Westinghouse, provide retro-fit Eaton Cutler-Hammer circuit breaker for installation within existing bucket. Modify MCC bucket in accordance with Eaton Cutler-Hammer recommendations.

2.02 ENCLOSED SWITCHES:

- A. Enclosed, Non-fusible Switch: NEMA KS 1, heavy duty type with lockable handle.
- B. Rating: Voltage and number of poles as required for motor or equipment circuits being disconnected. Switches used for service entrance equipment shall bear a UL label and be rated for service entrance equipment.
- C. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, heavy duty type with clips to accommodate specified fuses, lockable handle with two padlocks, and interlocked with cover in closed position.

- D. Double Throw Safety Switches shall be non-fused double throw with center OFF position, quick-make, quick-break mechanism, visible blades in the OFF position and safety handle. Rating, voltage and number of poles as required for the circuits being disconnected

2.03 ENCLOSED CIRCUIT BREAKERS:

- A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable instantaneous, magnetic trip setting for circuit-breaker frame sizes 150 Amp through 400 Amp.
- B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles. Lugs shall be mechanical style suitable for number, size, trip ratings, and material of conductors.
- C. Application Listing: Appropriate for application: Type SWD for switching fluorescent lighting loads; Type HACK for heating, air-conditioning, and refrigerating equipment.
- D. Electronic Trip Unit Circuit Breakers (Frame sizes 400 Amp and larger): RMS sensing, interchangeable harmonic trip unit, LED trip indicators with the following field-adjustable settings:
 - 1. Long-time pickup levels and adjustments (L).
 - 2. Short-time pickup levels adjustments (S).
 - 3. Instantaneous trip adjustments (I).
 - 4. Ground fault pickup level, time delay, I₂t response and adjustments (G).
 - 5. Remote trip indication and control.
 - 6. Modbus communication Capability; Integral communication module with functions and features compatible with power monitoring, harmonic monitoring, and control system

2.04 SURGE PROTECTION DEVICE (SPD):

- A. Main Circuit Breaker SPD
 - 1. SPD shall be Listed in accordance with UL 1449 Second Edition 2005 and UL 1283, Electromagnetic Interference Filters.

2. Integrated surge protective devices (SPD) shall be Component Recognized in accordance with UL 1449 Second Edition, Revision 2/9/2005 Section 37.3 and 37.4 at the standard's highest short-circuit current rating (SCCR) of 200 kA, including intermediate level of fault current testing that will be effective 2/9/2007.
3. SPD shall be tested with the ANSI/IEEE Category C High exposure waveform (20kV-1.2/50µs, 10kA-8/20µs).
4. SPD shall provide suppression for all modes of protection: L-N, L-G, and N-G in WYE systems.
5. The manufacturer of the SPD shall be the same as the manufacturer of the service entrance and distribution equipment in which the devices are installed and shipped. Also, this distribution equipment shall be fully tested and certified to the following UL standards:
 - a. UL 67 – Panelboards
 - b. UL 845 - Motor Control Centers
 - c. UL 857 – Busway
 - d. UL 891 – Switchboards
 - e. UL 1558 – Low Voltage Switchgear
6. Recommended SPD ratings
 - a. Minimum surge current ratings per phase of equipment shall be as follows:

TABLE 2.4A – MINIMUM SURGE CURRENT RATINGS

EQUIPMENT	SURGE RATING
SWITCHGEAR	200kA
SWITCHBOARDS	160kA
POWER PANELS	160kA
LIGHTING PANELS	160kA
RECEPTACLE PANELS	120kA

- b. UL 1449 clamping voltage must not exceed the following:

TABLE 2.4B – MAXIMUM CLAMPING VOLTAGE LIMITS

VOLTAGE	L-N	L-G	N-G
240/120	800/400V	800/400V	400V
208/120	400V	400V	400V
480/277	800V	800V	800V
600/347	1200V	1200V	1200V

- c. Pulse life test: Capable of protecting against and surviving 5000 ANSI/IEEE Category C High transients without failure or degradation of clamping voltage by more than 10%.
7. SPD shall be designed to withstand a maximum continuous operating voltage (MCOV) of not less than 115% of nominal RMS voltage.
8. SPD shall be constructed of one self-contained suppression module per phase.
9. Visible indication of proper SPD connection and operation shall be provided. The indicator lights shall indicate which phase as well as which module is fully operable. The status of each SPD module shall be monitored on the front cover of the enclosure as well as on the module. A push-to-test button shall be provided to test each phase indicator. Push-to-test button shall activate a state change of dry contacts for testing purposes.
10. SPD shall be equipped with an audible alarm which shall activate when any one of the surge current modules has reached an end-of-life condition. An alarm on/off switch shall be provided to silence the alarm. The switches and alarm shall be located on the front cover of the enclosure.
11. A connector shall be provided along with dry contacts (normally open or normally closed) to allow connection to a remote monitor or other system. The output of the dry contacts shall indicate an end-of-life condition for the complete SPD or module.
12. Terminals shall be provided for necessary power and ground connections.
13. The SPD shall be equipped with the following items:
- a. A transient voltage surge counter shall be located on the diagnostic panel on the front cover of the enclosure. The counter shall be equipped with a manual reset and battery backup to retain memory upon loss of AC power.

- b. A remote monitoring device shall be provided to directly connect to the TVSS with a dry contact connector for simple installation. The device will have indicator lights and an audible alarm to monitor for normal and fault conditions.

- 14. TVSS shall have a warranty for a period of ten (10) years from date of invoice. Warranty shall be the responsibility of the electrical distribution equipment manufacturer and shall be supported by their respective field service division.

2.05 DOUBLE THROW SAFETY SWITCHES:

- A. Unfused, double throw with center OFF position, quick-make, quick-break mechanism, visible blades in the OFF position and safety handle. Rating, voltage and number of poles as required for the circuits being disconnected.

2.06 ENCLOSURES:

- A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.
 - 1. Outdoor Locations: NEMA Type 4.
 - 2. Corrosive Locations: NEMA Type 4X, stainless steel.
 - 3. Wet or Damp Locations: NEMA Type 4.
 - 4. Indoor Dry Locations: NEMA Type 1.
 - 5. Indoor Dusty Locations: NEMA Type 12.
 - 6. Reference Specification 16130 "Raceways, Boxes and Supporting Devices" for approved enclosure types.

2.07 FACTORY FINISHES:

- A. Manufacturer's standard prime-coat finish ready for field painting.
- B. Finish: Manufacturer's standard grey paint applied to factory-assembled and -tested enclosures before shipping.

PART 3 - EXECUTION

3.01 EXAMINATION:

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION:

- A. Mount equipment so that sufficient access and working space is provided for ready and safe operation and maintenance.
- B. Securely fasten equipment to walls or other structural surfaces on which they are mounted. Provide independent galvanized steel supports where no wall or other structural surface exists
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install in conformance with National Electrical Code.

3.03 IDENTIFICATION:

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16.
- B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.
- C. For double throw switches identify source of each service identify source of each service.

3.04 CONNECTIONS:

- A. Install equipment grounding connections for switches and circuit breakers with ground continuity to main electrical ground bus.
- B. Install power wiring. Install wiring between switches and circuit breakers, and control and indication devices.
- C. 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 and UL 486B.

3.05 FIELD QUALITY CONTROL:

- A. Testing: After installing enclosed switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.06 CLEANING:

- A. On completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

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