

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



**PROJECT: NEW HAVEN PUMP STATIONS  
RESILIENCY IMPROVEMENT PROJECT**

**PROJECT NUMBER: SSF 2016-02/FEMA DR4087-CT-74R**

**BID OPENING: 11:00 AM  
Wednesday  
December 18, 2019**



**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**

**TABLE OF CONTENTS**

<u><b>Division</b></u>	<u><b>Section Number</b></u>
<b>0 BIDDING AND CONTRACT REQUIREMENTS</b>	
Advertisement for Bids	00100
Instructions to Bidders	00200
Form of General Bid	00410
Bid Form Attachments	00420
Federal and State Wage Rates	00500
Agreement	00520
Performance Bond	00610
Payment Bond	00615
Standard General Conditions of the Construction Contract	00700
GNHWPCA Special Conditions	00730
Supplementary Conditions	00800
Federal Regulations – Davis Bacon Wage Contract Provisions	00810
Change Orders	00820
State Regulations	00830
Permits	00890
<b>1 GENERAL REQUIREMENTS</b>	
Scope and Sequence of Work	01014
Control of Work and Materials	01110
Special Provisions	01140
Measurement and Payment	01270
Construction Meetings	01311
Submittals	01330
Health & Safety Plan	01380
Structural Tests and Inspections	01450
Dust Control	01562
Environmental Protection	01570
Handling Existing Flows	01575
Cutting, Coring & Patching	01735
Cleaning Up	01740
Equipment Checkout and Testing	01750
Startup and Testing	01752
Operation and Maintenance Manuals	01760
Project As-Built Record Drawings	01765
Project Closeout	01770

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

<u>Division</u>	<u>Section Number</u>
<b>2 SITE WORK</b>	
Ductile Iron Gravity and Force Main Pipe and Fittings For Sewers	02089
Dewatering	02240
Support of Excavation	02252
Earthwork	02300
Erosion and Sedimentation Control	02370
Yard Hydrants	02514
Water Service Connections	02515
Tracer Tape	02518
Valves and Appurtenances	02532
Connections to Existing Structures	02533
Precast Concrete Vaults and Appurtenances	02536
Precast Manholes	02631
Bituminous Concrete Pavement	02746
Porous Flexible Paving	02795
Metal Picket Fence	02830
Loaming and Seeding	02920
<b>3 CONCRETE</b>	
Concrete Formwork	03100
Concrete Reinforcement	03200
Cast-in-Place Concrete	03300
Repair of Existing Concrete Structures	03931
<b>4 MASONRY</b>	
Masonry	04200
<b>5 METALS</b>	
Structural Steel	05120
Cold Formed Metal Framing	05400
Miscellaneous Metals	05500
Metal Grating Stair, Gratings and Railings	05519
<b>6 WOOD &amp; PLASTICS</b>	
Rough Carpentry	06100
Prefabricated Wood Trusses	06112
Finish Carpentry	06200

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

<u>Division</u>	<u>Section Number</u>
<b>7 THERMAL AND MOISTURE PROTECTION</b>	
Building Insulation	07210
Sprayed-on Insulation	07215
Modified Bituminous Sheet Air Barriers	07271
Mineral Fiber Cement Siding	07460
Standing Seam Metal Roof	07620
Sheet Metal Trim	07621
Firestopping	07840
Joint Protection	07920
<b>8 DOORS AND WINDOWS</b>	
Metal Doors and Frames	08100
Flood Doors	08390
Aluminum Windows	08520
Door Hardware	08700
Louvers and Vents	08900
<b>9 FINISHES</b>	
Drywall System	09200
Painting	09900
<b>10 SPECIALTIES</b>	
Deployable Flood Barriers	10700
<b>11 EQUIPMENT</b>	
Equipment - General	11000
Submersible Wastewater Pumping Equipment	11304
<b>13 SPECIAL CONSTRUCTION</b>	
Instrumentation & Control General	13410
Field Instruments and Equipment	13420
Control Panels	13430
<b>15 MECHANICAL</b>	
Valves and Appurtenances	15110
Field Instruments and Equipment	15140
Piping and Equipment Layout For Coordination Drawings	15145

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

**Division**

**16 ELECTRICAL**

**Section  
Number**

Electrical Work General Provisions	16010
Basic Electrical Materials and Methods	16050
Grounding and Bonding	16060
Electrical Identification	16075
Conductors and Cables	16123
Raceways and Boxes	16130
Cabinets and Enclosures	16131
Packaged Engine Generators	16231
Automatic Transfer Switches	16414
Panel Boards	16442
Interior Lighting	16510

**END OF SECTION**

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 0\00000 TOC.docx

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

**Greater New Haven**  
**Water Pollution Control Authority**

**INVITATION**

**for Constructing**

**PROJECT:**                   **New Haven Pump Stations Resiliency Implementation**  
**PROJECT NO.:**           **SSF 2016-002**

Sealed bids will be received at the Office of the Director of Finance and Administration of the Greater New Haven Water Pollution Control Authority (GNHWPCA) located at 260 East Street, New Haven, Connecticut 06511 for **PROJECT: New Haven Pump Stations Resiliency Improvements** until **11:00 a.m. on Wednesday, December 18, 2019** at which time and place said bids will be opened publicly and read aloud.

**A non-mandatory pre-bid meeting will be held at 11:00 a.m. on Wednesday, November 20, 2019 at the Authority's Main Conference Room, 260 East Street, New Haven, CT.**

**All questions from Bidders must be received by the GNHWPCA via email before 4:00 p.m. on Wednesday, December 4, 2019. (send emails to: [engineering@gnhwPCA.com](mailto:engineering@gnhwPCA.com))**

The information for Bidders, Proposal, Form of Contract, and Specifications may be examined at the above address. Anyone submitting a bid for this project must have in their possession a copy of the GNHWPCA's STANDARD SPECIFICATIONS dated September 2017. This document can be obtained upon payment of One Hundred Dollars (\$100.00). The plans and a "bid package" containing the Invitation, Proposal, Special Specifications and Notes can be obtained upon a **non-refundable** payment of One Hundred Dollars (\$100.00).

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 GNHWPCA 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**

SECTION 00200

INSTRUCTIONS TO BIDDERS

1. Receipt and Opening of Bids
2. Location and Work to be Done
3. Deposit on Documents
4. Preparation of Bid
5. Modification of Bids
6. Obligation of Bidder
7. Information not Guaranteed
8. Bid Security
9. Time for Completion
10. Addenda and Interpretations
11. Bid Opening Procedure
12. Comparison of Bids
13. Statutes Regulating Competitive Bidding
14. Right to Reject Bid
15. Ability and Experience of Bidder
16. Conditions of Work
17. Security for Faithful Performance
18. Power of Attorney
19. Laws and Regulations
20. Liquidated Damages for Failure to Enter into Contract
21. Bidder Certification – OSHA Training
22. Prevailing Wage Rates
23. Guarantee
24. Waiver of Local Fees
25. Taxes
26. Safety and Health Regulations
27. American Iron and Steel Requirements of P.L. 113-76
28. Non-Discrimination in Employment
29. Minority and Women Business Enterprise Requirements
30. Non-Collusion
31. Access to the Site
32. “Or Equal” Clause
33. Archaeological Finds
34. Bid Submittal Requirements

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

1. Receipt and Opening of Bids

The Greater New Haven Water Pollution Control Authority (GNHWPCA) will receive sealed Bids for the construction of “New Haven Pump Stations Resiliency Improvements Project.”

Such bids addressed to the GNHWPCA and endorsed “Proposal for New Haven Pump Stations Resiliency Improvements Project” will be received at the GNHWPCA 260 East Street, New Haven, CT 06511, until the date and time noted in Section 00100, ADVERTISEMENT FOR BIDS, at which time and place said bids will be publicly opened and read aloud.

If the building at which bids are to be received is closed for any reason on the date and time that bids are due, receipt of bids by the Owner will be postponed until the next business day at the time originally stated for receipt of bids.

Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified will not be considered. By submission of a bid, the bidder agrees that this bid shall be good and may not be withdrawn for the number of days after the opening of bids, as stipulated in Section 00410, FORM OF GENERAL BID.

2. Location and Work to be Done

The location, general characteristics, and principal details of the Work are indicated on a set of 54 drawings titled “GNHWPCA New Haven Pump Stations Resiliency Improvements Project,” and numbered 1 to 54, inclusive.

Additional drawings showing details in accordance with which the Work is to be done may be furnished by addendum from time to time during the bidding period by the ENGINEER and shall then become a part of the Contract Documents.

The CONTRACTOR shall furnish all superintendence, labor, services, materials, equipment, plant, machinery, apparatus, appliances, tools, supplies, bailing, shoring, removal, and all other things necessary to do all work required for the completion of each item of the Work and as herein specified.

The Work to be done and paid for under any item shall not be limited to the exact extent mentioned or described but shall include all incidental work necessary or customarily done for the completion of that item.

3. Deposit on Documents

A deposit, in the amount and format as specified in Section 00100, ADVERTISEMENT FOR BIDS will be required on each set of Contract Documents taken. Such deposits will



be refunded to all bidders and non-bidders upon the return of said documents in good condition within 30 days after the date of opening of general bids.

4. Preparation of Bid

Each bid must be submitted on the prescribed form in Section 00410, FORM OF GENERAL BID. All blank spaces for bid prices must be filled in, in ink or typewritten, in both words and figures.

General Contractors shall file their bids with a copy of their DAS certificate showing that they are eligible to bid on projects of this category, of this estimated project dollar amount and up to an aggregate limit.

Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, its address, and endorsed with the name of the project as specified in Receipt and Opening of Bids, above.

If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed as specified in Receipt and Opening of Bids, above.

5. Modification of Bids

Any bidder may modify or withdraw its bid by written communication at any time prior to the scheduled closing time for receipt of bids. Any telegraphic communication must be received by the OWNER prior to the closing time, and, provided further, for any telegraphic communication that modifies a bid the OWNER is satisfied that a written confirmation of the modification over the signature of the bidder was mailed prior to the closing time.

The modification communication shall not reveal the bid price but shall provide the addition or subtraction or other modification so that the final prices or terms will not be known by the OWNER until the sealed bid is opened. If written confirmation is not received within two days from the closing time, no consideration will be given to the facsimile transmission.

6. Obligation of Bidder

At the time of the opening of bids each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the Contract Documents (including all addenda). The failure or omission of any bidder to examine any form, instrument, or document shall in no way relieve any bidder from any obligation in respect of its bid.

7. Information not Guaranteed

All information given in the Contract Documents relating to subsurface and other conditions, natural phenomena, existing pipes, and other structures is from the best sources

at present available to the OWNER. All such information is furnished only for the information and convenience of bidders and is not guaranteed.

It is agreed and understood that the OWNER does not warrant or guarantee that the subsurface or other conditions, natural phenomena, existing pipes, or other structures encountered during construction will be the same as those indicated in the Contract Documents.

It is further agreed and understood that no bidder or CONTRACTOR shall use or be entitled to use any of the information made available to it or obtained in any examination made by it in any manner as a basis of or grounds for any claim or demand against the OWNER or the ENGINEER, arising from or by reason of any variance which may exist between the information made available and the actual subsurface or other conditions, natural phenomena, existing pipes or other structures actually encountered during the construction work, except as may otherwise be expressly provided for in the Contract Documents.

8. Bid Security

Each bid must be accompanied by a certified check, a bid bond, cash, a treasurer's or cashier's check, payable to the OWNER, in the amount stated in Section 00100, ADVERTISEMENT FOR BIDS. Such deposits will be returned to all except the three lowest responsible and eligible bidders within five days, Saturdays, Sundays, and legal holidays excluded, after the opening of bids, and the remaining deposits will be returned promptly after the OWNER and the accepted bidder have executed the Contract, or if no notice of intent to award has been presented to any bidder within 90 days, Saturdays, Sundays and legal holidays excluded, after the date of the opening of bids, upon demand of the bidder at any time thereafter.

9. Time for Completion

The successful general bidder must agree to commence work on or before a date to be specified in the written "Notice to Proceed" from the OWNER and to fully complete the project within the time limit stated in Section 00410, FORM OF GENERAL BID.

10. Addenda and Interpretations

No interpretation of the meaning of the plans, specifications or other prebid documents will be made to any bidder orally, and if provided orally, shall not be relied upon by bidders unless confirmed in a written addendum. All information given to bidders other than by means of the plans, specifications, or by addenda, as described below, is given informally and shall not be used as the basis of a claim against the OWNER or the ENGINEER.

Every request for such interpretation should be in writing (typed, not handwritten) addressed to Weston & Sampson Engineers, Inc., 273 Dividend Road, Rocky Hill, Connecticut 06067 Attention: Robert G. Tedeschi, P.E., or sent via email to

TedeschiR@wseinc.com and to be given consideration must be received at least ten (10) working days prior to the date fixed for the opening of bids.

Bidders shall acknowledge receipt of all written addenda in their Form of General Bid. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under its bid as submitted, and each bidder must confirm for itself that it has received all addenda. All addenda so issued shall become part of the Contract Documents. Written addenda may be issued up to 5 business days prior to the bid opening to all bidders who have obtained bid documents.

11. Bid Opening Procedure

The following list of requirements shall be met by each filed bid.

Bids shall be filed at the place and before the time specified in Receipt and Opening of Bids, above.

Properly executed bid security shall be included with the FORM OF GENERAL BID.

The bid and all accompanying documents so required shall be signed by the Bidder or its authorized representative before submission.

All bidders shall include with their bids written acknowledgment of receipt of all addenda. Refer to acknowledgment form provided in Section 00410, FORM OF GENERAL BID.

The total dollar amount of each bid will be read, and the three apparent lowest bids will be selected for further consideration. These three apparent low bids will be read aloud for the benefit of the other bidders and the bid opening procedure will be closed. All those present at the bid opening may examine all bids after the bid opening and after the reading of the three apparent low bids.

Bidders may not withdraw or modify their bids for a period of 90 days, Saturdays, Sundays, and legal holidays excluded, following the opening of the bids.

12. Comparison of Bids

Bids will be compared on the basis of the lump sum prices stated in the bid forms.

In the event that there is a discrepancy in Section 00410, FORM OF GENERAL BID between the lump sum prices written in words and figures, the prices written in words will govern.

The OWNER agrees to examine and consider each FORM OF GENERAL BID submitted in accordance with the terms and conditions set forth herein and as set forth in Section 00410, FORM OF GENERAL BID.

It is the intent of the OWNER to make award to the lowest responsible qualified bidder (reference CGS 4a-59).

13. Statutes Regulating Competitive Bidding

Any bid, which does not comply with the provisions of State of Connecticut General Statutes, need not be accepted, and the OWNER may reject every such bid.

14. Right to Reject Bid

The OWNER may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids, should the OWNER deem it to be in the public interest to do so.

The OWNER may also reject bids which in its sole judgment are either incomplete, conditional, obscure or not responsive or which contain additions not called for, erasures not properly initialed, alterations, or similar irregularities, and may reject bids for any other reason permitted by law, or the OWNER may waive such omissions, conditions or irregularities.

15. Ability and Experience of Bidder

All general contractors shall file with their bids a copy of their DAS certificate of eligibility showing that they are eligible to bid on projects of this category, value, and up to an aggregate limit.

No award will be made to any bidder who cannot satisfy the OWNER that it has sufficient ability and experience in this class of work and sufficient capital and plant to enable it to prosecute and complete the work successfully within the time named. The OWNER's decision or judgment on these matters will be final, conclusive, and binding to the fullest extent permitted by law.

The OWNER may make such investigations as it deems necessary, and the bidder shall furnish to the OWNER, under oath if so required, all such information and data for this purpose as the OWNER may request.

16. Conditions of Work

Each bidder must inform itself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of its obligation to furnish all material and labor necessary to carry out the provisions of its contract. Insofar as possible the CONTRACTOR, in carrying out its work, must employ such methods or means as will not cause any interruption of or interference with the operations of the wastewater treatment system or any other contractors.

17. Security for Faithful Performance

Simultaneously with its delivery of the executed Contract, the CONTRACTOR shall furnish performance and payment bonds, as specified in Sections 00610 and 00615, respectively, as security for faithful performance of this Contract and for the payment of all persons performing labor and materials under this Contract as specified in Section 00700, Standard General Conditions of the Construction Contract included herein, each in the amount of 100 percent of its bid. The surety on such bond or bonds shall be a surety company qualified to do business under the laws of the State of Connecticut and satisfactory to the OWNER. The bonds shall remain in force for one year after final acceptance of the work by the OWNER, unless the OWNER, in writing, releases the CONTRACTOR from the obligation sooner.

18. Power of Attorney

Attorneys-in-fact who sign Contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

19. Laws and Regulations

Applicable provisions of the Connecticut General Statutes and Regulations of Connecticut State Agencies and/or the United States Code and Code of Federal Regulations govern this Contract and any provision in violation of the foregoing shall be deemed null, void and of no effect. Where a conflict between Federal and State Laws and Regulations exists, the more stringent requirement shall apply.

The bidder's attention is directed to the fact that all applicable State laws, municipal ordinances or bylaws, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

Attention is directed to Section 00830 STATE REGULATIONS and to other applicable sections of this specification. In the event of any conflict between provisions of law or regulation quoted or paraphrased in the Contract Documents, the actual provisions of law or regulation shall control.

The contractor who is selected to perform this project must comply with CONN. GEN. STAT. §§ 4a-60, 4a-60a, 4a-60g, and 46a-68b through 46a-68f, inclusive, as amended by June 2015 Special Session Public Act 15-5.

20. Liquidated Damages for Failure to Enter into Contract

The successful bidder, upon its failure or refusal to execute and deliver the Contract, Bonds and Certificates of Insurance required within 10 days after receipt of notice of the acceptance of the bid, shall, except as otherwise provided by applicable law, forfeit to the OWNER, as liquidated damages for such failure or refusal, the security deposited with its bid, provided that the amount forfeited shall not exceed the difference between its bid price

and the bid price of the next lowest responsible and eligible bidder. In case of death, disability, bonafide clerical or mechanical error of a substantial nature, or other similar unforeseen circumstances affecting the bidder, its bid deposit will be returned.

21. Bidder Certification – OSHA Training

All employees who work on this project must have no less than ten (10) hours of OSHA-approved construction safety and health training.

Satisfactory evidence that all persons to be employed on this project have completed ten (10) hours of OSHA-approved construction safety and health training shall be provided with the Agreement.

22. Prevailing Wage Rates

Prevailing Wage Rates as determined by the State of Connecticut Department of Labor, apply to this project. It is the responsibility of the Bidder, before bid opening, to request if necessary, any additional information on Minimum Wage Rates for those trades people who may be employed for the proposed work under this contract and for work classifications not included in the Wage Decision packages.

The Contractor is responsible for requesting up to date wage rates from the Owner prior to the one-year anniversary of the notice to proceed of this contract. The Owner shall obtain updated wage rates from the Department of Labor and provide them to the Contractor upon said request.

Federal Wage Rates as determined by the United States Department of Labor under the Davis-Bacon Act also apply to this project, including reporting requirements and required contract language. See also specific contract provisions to be met in Section 00810, FEDERAL REGULATIONS – DAVIS BACON WAGE CONTRACT PROVISIONS.

23. Guarantee

The Contractor shall guarantee that the Work and Services to be performed under the Contract, and all workmanship, materials and equipment performed, furnished, used or installed in the construction of the same shall be free from defects and flaws, and shall be performed and furnished in strict accordance with the Drawings, Specifications, and other contract documents, that the strength of all parts of all manufactured equipment shall be adequate and as specified and that the performance test requirements of the contract shall be fulfilled. This guarantee shall be for a period of one year from and after the date of substantial completion and acceptance of the Work as stated in the final estimate. If part of the Work is accepted in accordance with that subsection of this AGREEMENT titled “Partial Acceptance”, the guarantee for that part of the Work shall be for a period of one year from the date fixed for such acceptance.

If at any time within the said period of guarantee any part of the Work requires repairing, correction or replacement, the Owner may notify the Contractor in writing to make the

required repairs, correction or replacements. If the Contractor neglects to commence making such repairs, corrections or replacements to the satisfaction of the Owner within seven (7) days from the date of receipt of such notice, or having commenced fails to prosecute such Work with diligence, the Owner may employ other persons to make said repairs, correction or replacements, and charge the costs, including compensation for additional professional services, to the Contractor.

24. Waiver of Local Fees

The OWNER shall waive local permit fees. Bids should reflect the waiver of such fees in the total bid price.

25. Taxes

Bids should not include federal excise or state sales and use taxes, as the OWNER is exempt from payment of any such taxes. The OWNER is also exempt from transportation taxes when goods are consigned to the OWNER. The OWNER will furnish tax exemption certificates upon satisfactory proof of delivery to the OWNER. Shipments shall be consigned to the OWNER in care of the CONTRACTOR.

26. Safety and Health Regulations

The successful bidder shall comply with the Department of Labor Safety and Health Regulations for Construction promulgated under the Occupational Safety and Health Act of 1970 (PC-91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL-91-54).

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 to the requirements of the Connecticut Department of Labor Occupational Safety and Health Administration. Contractors shall be familiar with the requirements of these regulations.

27. American Iron and Steel Requirements of P.L. 113-76

This project is subject to the American Iron and Steel Requirements of P.L. 113-76, the Consolidated Appropriations Act of 2014.

28. Non-Discrimination in Employment

Contracts for work under this proposal shall obligate the Contractor and Subcontractor not to discriminate in employment practices.

29. Minority and Women Business Enterprise Participation

MBE and WBE policies of the State of Connecticut Department of Energy and Environmental Protection are not applicable to this contract.

30. Non-collusion

The individual signing this bid hereby declares that no person or persons other than members of his/her own organization are interested in this Proposal or in the contract proposed to be taken; that it is made without any connection with any other person or persons making a proposal for the same work and is in all respects fair and without collusion or fraud; that no person acting for or employed by the OWNER is directly or indirectly interested therein, or in the supplies or works to which it relates or will receive any part of the profit or any commission therefrom in any manner which is unethical or contrary to the best interests of the OWNER.

An affidavit form is included with this document; bidders are required to complete the form and include with their bid response.

31. Access to the Site

Representatives of the Grant Awarding Agency and of the State of Connecticut shall have access to the work and the project records wherever they are in preparation or progress and the successful Bidder shall provide proper facilities for such access and inspection.

32. "Or Equal" Clause

Whenever the specifications define the material or article required by using the name of the proprietary product or of a manufacturer or vendor rather than by using descriptive detail of substance and function, the words "or equal" are to be understood to follow immediately the name of the maker, vendor, or proprietary product. The words, "or equal" shall be interpreted as including any material or article which, in the opinion of the Engineer, is equal in quality, durability, appearance, strength, and design to the article named and which will perform adequately the functions imposed by the general design.

Whenever in the specifications the names of manufacturers are mentioned as indicating that their products will comply with a particular specification, or when specific trade names or plate numbers or letters are mentioned, it is not intended to exclude products of other manufacturers whose names, trade names or symbols have not been mentioned, provided however, that such products otherwise comply, in the opinion of the Engineer, with the specification. The Engineer's opinion in all cases mentioned in this section shall be final.

33. Archaeological Finds

If artifacts or historical features are identified during the course of the project, the Contractor shall:

- a. Stop work immediately in the area.
- b. Mark the area to avoid further disturbance.
- c. Protect the find by fencing/blocking it off.
- d. Contact the State Historic Preservation Officer, the Owner, and the Engineer.



- e. Work will not be resumed in the area of the find without the approval of the State Historic Preservation Officer.

34. Bid Submittal Requirements

A complete bid shall consist of all the following:

SECTION 00410 – FORM OF GENERAL BID

SECTION 00420 - BID FORM ATTACHMENTS

- Bidder's Qualification Statement
- Non-Collusion Affidavit
- Bid Bond
- Statement of Bidder's Compliance with Executive Order No. 3
- Statement of Bidder's Compliance with Executive Order No. 16
- Statement of Bidder's Compliance with Executive Order No. 17
- State of Connecticut DAS Contractor Prequalification Update (Bid) Statement (and Prequalification Certificate)

**Failure to submit a bid that includes both the Bid Form and all Bid Form attachments listed above may result in bidder's disqualification by the OWNER.**

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWCA\2190282 - New Haven HMGP\4 Working Documents\4.2 Specifications\Division 0\00200 - Instructions to Bidders.docx

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 00410

BID FORM

Proposal of \_\_\_\_\_ (hereinafter called "Bidder")\*

- a corporation, organized and existing under the laws of the State of Connecticut
- a partnership
- a joint venture
- a limited liability company
- an individual doing business as \_\_\_\_\_

\*Insert corporation, partnership, joint venture or individual as applicable.

To the Greater New Haven Water Pollution Control Authority (hereinafter called "Owner").

Gentlemen:

The Bidder, in compliance with your invitation for bids for the New Haven Pump Station Resiliency Improvements Project, having examined the plans and specifications with related documents and the site of the proposed work and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish and superintendence, labor, services, materials, equipment, plant, machinery, apparatus, appliances, tools, supplies, bailing, shoring, removal, and all other things necessary to construct the project in accordance with the Contract Documents, as prepared by Weston & Sampson Engineers, Inc., within the time set forth therein and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

The Bidder hereby agrees to commence work under this Contract on or before a date to be fixed in the written "Notice to Proceed" given by the Owner to the Contractor and to fully complete all work related to the Contract within three hundred sixty five (365) calendar days of the execution of the Contract or the Notice to Proceed, whichever is later. The Bidder further agrees to pay as liquidated damages the sum of \$1,000 for each consecutive calendar day thereafter during which the work has not been fully completed, as provided in the "Liquidated Damages" paragraph of Section 00800, SUPPLEMENTARY CONDITIONS.

Bidder acknowledges receipt of the following addenda:

No.	Dated:
_____	_____
No.	Dated:
_____	_____
No.	Dated:
_____	_____
No.	Dated:
_____	_____

The Bidder agrees to perform the work described in the specifications and shown on the plans for the following lump sum prices:

All entries shall be made clearly in ink or typewritten. Amounts are to be shown in both words and figures. Discrepancies between words and figures will be resolved in favor of words. Discrepancies between the indicated total of lump sum prices multiplied by the estimated quantities and the correct total will be resolved in favor of the correct total. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

Bid price for Items 1A through 4H, inclusive:

\_\_\_\_\_ Dollars  
(Words)

And \_\_\_\_\_ cents \$ \_\_\_\_\_  
(Words) (Numbers)

The submission of the proposed price is as detailed in the following pages (excluding sales and use tax)

Company Name: \_\_\_\_\_

12/18/2019

**BASE PRICE**

Item No.	DESCRIPTION	UNIT PRICE (dollars in words)	UNIT PRICE (\$s)	Quantity	Unit	AMOUNT
<b>FORT HALE PUMP STATION</b>						
1A	Fort Hale PS Improvements		\$	1	LS	\$
1B	Test Pits		\$	50	CY	\$
1C	Allowance for Abatement of Contaminated Material	ten thousand	\$ 10,000.00	1	Allow	\$ 10,000.00
1D	Allowance for Utility Company Work	twenty-five thousand	\$ 25,000.00	\$ 1.00	Allow	\$ 25,000.00
1E	Repair of Deteriorated or Spalled Concrete		\$	200	SF	\$
1F	Fort Hale PS General Conditions		\$	1	LS	\$
<b>EAST SHORE WPAF (ESWPAF)</b>						
2A	Panel Barriers (openings 36" to 48") (Doors #103/105/108/110/111/112/114 /116/119/121/122/123/124/125/126/127)		\$	16	EA	\$
2B	Panel Barriers (openings >48" to 120")(Doors #102/104/115/120)		\$	4	EA	\$
2C	Panel Barriers (openings >120")(Doors #107/109/113)		\$	3	EA	\$
2D	Flood Swing Gate Barriers (#106, 117 and 118)		\$	3	EA	\$
2E	Flood Sliding Gate Barrier (#101)		\$	1	EA	\$
2F	Primary Sludge Room Flood Door Barrier		\$	1	EA	\$
2G	Flood Proof Access Hatch Replacements		\$	10	EA	\$
2H	Flood Proof Window Pane Replacement		\$	2	EA	\$
2I	Floor Drain Covers		\$	6	EA	\$
2J	Flood Walls (Extensions)		\$	170	LF	\$
2K	Flood Walls (Free Standing)		\$	15	LF	\$
2L	Raised HVAC Units		\$	1	LS	\$
2M	Gate Valve at Floor Drain		\$	1	LS	\$
2N	Installation and Modification of Railings		\$	1	LS	\$
2O	Exterior Drain Cover Mats		\$	6	EA	\$
2P	Allowance for Removal/Relocation of Existing Conduit and Equipment	twenty-five thousand	\$ 25,000.00	1	Allow	\$ 25,000.00
2Q	ESWPAF General Conditions		\$	1	LS	\$

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

Company Name: \_\_\_\_\_

12/18/2019

**BASE PRICE**

Item No.	DESCRIPTION	UNIT PRICE (dollars in words)	UNIT PRICE (#s)	Quantity	Unit	AMOUNT
<b>BOULEVARD PUMP STATION</b>						
3A	Panel Barriers (openings 36" to 48") (Doors #201/202/203/204)		\$	4	EA	\$
3B	Panel Barrier (opening >48" to 120") (#205/206)		\$	2	EA	\$
3C	Interior Concrete Flood Walls		\$	85	LF	\$
3D	Exterior Concrete Flood Walls		\$	215	LF	\$
3E	Steel Plate Barrier at Generator Louver		\$	1	LS	\$
3F	Removal and Replacement of Railings		\$	1	LS	\$
3G	Floor Drain Cover		\$	5	EA	\$
3H	Allowance for Removal/Relocation of Existing Conduit and Equipment	twenty-five thousand	\$ 25,000.00	1	Allow	\$ 25,000.00
3I	Boulevard PS General Conditions		\$	1	LS	\$
<b>EAST STREET PUMP STATION</b>						
4A	Panel Barriers (openings 36" to 48") (Doors #306/308/309/310)		\$	4	EA	\$
4B	Panel Barriers (openings >48" to 96") (Doors #301/302/304/305/307)		\$	5	EA	\$
4C	Panel Barriers (openings >96") (Doors #203)		\$	1	EA	\$
4D	Steel Plate Barrier at Generator Louver		\$	1	LS	\$
4E	Steel Panel Barriers at Windows		\$	7	EA	\$
4F	Floor Drain Cover		\$	8	EA	\$
4G	Allowance for Removal/Relocation of Existing Conduit and Equipment	twenty-five thousand	\$ 25,000.00	1	Allow	\$ 25,000.00
4H	East Street PS General Conditions		\$	1	LS	\$
<b>TOTAL</b>						<b>\$</b>

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

The above bid prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to cover the finished work of the several kinds called for.

The Contract will be awarded to the lowest eligible and responsible bidder on the basis of the lowest bid for the base bid for the Project.

The Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The Bidder agrees that this bid shall be good and may not be withdrawn for a period of ninety (90) days, Saturdays, Sundays and legal holidays excluded, after the opening of bids.

Within ten (10) days of receipt of the written notice of acceptance of this bid, the Bidder will execute the formal agreement attached in Section 00520, Agreement.

Bid security is attached in the sum of ten percent (10%) of the total base bid in accordance with the conditions of Section 00200, Instructions to Bidders. The bid security may become the property of the Owner in the event the Contract and bond are not executed within the time set forth above.

The selected Contractor shall furnish a performance bond and a payment bond in an amount at least equal to one hundred percent (100%) of the contract prices in accordance with Section 00610, Performance Bond, Section 00615, Payment Bond, and as stipulated in paragraph 5.01 of Section 00700, Standard General Conditions of the Construction Contract of these specifications.

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

The undersigned hereby certifies that it is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work.

The undersigned certifies under penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this paragraph the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity which sells materials, equipment or supplies used in or for, or engages in the performance of, the same or similar construction, reconstruction, installation, demolition, maintenance or repair work or any part thereof.

The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the State of Connecticut under applicable debarment provisions of the Connecticut General Statutes or any rule or regulations promulgated thereunder.

Respectfully submitted:

Date \_\_\_\_\_

By \_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Name – Typed or Printed)

\_\_\_\_\_  
(Title)

(SEAL - if bid is by a corporation)

\_\_\_\_\_  
(Business Name)

\_\_\_\_\_  
(Federal ID Number)

\_\_\_\_\_  
(Business Address)

\_\_\_\_\_  
(City and State)

\_\_\_\_\_  
(Telephone Number)

\_\_\_\_\_  
(Fax Number)

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 00420

BID FORM ATTACHMENTS

- Bidder's Qualification Statement
- Listing of Proposed Subcontractors
- Non-Collusion Affidavit
- Bid Bond
- Statement of Bidder's Compliance with Executive Order No. 3
- Statement of Bidder's Compliance with Executive Order No. 17
- Statement of Bidder's Compliance with Executive Order No. 16
- State of Connecticut DAS Contractor Prequalification Update (Bid) Statement (and Prequalification Certificate)

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**



**BIDDER'S QUALIFICATION STATEMENT**

TO: Greater New Haven Water Pollution Control Authority  
hereinafter called "Owner"

Pursuant to bidding requirements for the Work titled: New Haven Pump Station Resiliency Improvements Project

The Bidder is qualified to complete the Work as stated below:

**ORGANIZATION**

*If your organization is a corporation, provide the following:*

Date of incorporation: \_\_\_\_\_  
State of incorporation: \_\_\_\_\_  
President's name: \_\_\_\_\_  
Vice-president's name(s): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Secretary's name: \_\_\_\_\_  
Treasurer's name: \_\_\_\_\_

*If your organization is a partnership, answer the following:*

Date of organization: \_\_\_\_\_  
Type of partnership: \_\_\_\_\_  
Name(s) of general partner(s): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

*If your organization is individually owned, answer the following:*

Date of organization: \_\_\_\_\_  
Name of owner: \_\_\_\_\_

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

If the form of your organization is other than those listed above, describe it and name the principles:

---

---

## EXPERIENCE

List the categories of work that your organization normally performs with its own forces.

---

---

Claims and Suits. (If the answer to any of the questions below is yes, please attach details.)

- No  Yes  Has your organization ever failed to complete any work awarded to it?  
No  Yes  Are there any judgements, claims, arbitration proceedings or suits pending or outstanding against your organization or its officers?  
No  Yes  Has your organization filed any lawsuits or requested arbitration with regard to construction contracts within the last five years?  
No  Yes  Within the last five years, has any officer or principal of your organization ever been an officer or principal of another organization when it failed to complete a construction contract?

On a separate sheet, list similar projects your organization has in progress, giving the name of project, owner, engineer, contract amount, percent complete and scheduled completion date. State the total worth of work in progress and under construction.

On a separate sheet, list the major projects your organization has completed in the past five years, giving the name of the project, owner, engineer, contract amount, date of completion and percentage of the cost of the work performed with your own forces. State average annual amount of construction work performed during the past five years.

On a separate sheet, list the construction experience and present commitments of the key individuals of your organization.

---

Signature

Date

---

Printed Name

---

Title

**LISTING OF PROPOSED SUBCONTRACTORS**

Bidder intends to utilize the following subcontractors on this project:

If none, write "none" here: \_\_\_\_\_

*Name, Address and Federal ID Number of Subcontractor*      *Description of Work*      *Est. Value of Work*

1.			\$	
2.			\$	
3.			\$	
4.			\$	
5.			\$	
6.			\$	

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

**NON-COLLUSION AFFIDAVIT**

**GREATER NEW HAVEN WATER POLLUTION CONTROL AUTHORITY:**

This is to certify that in submitting this bid, BIDDER represents that this Bid is not made in the interest of or on behalf of any undisclosed person 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 person, firm, or corporation to refrain from bidding; and BIDDER has not sought by collusion to obtain for himself any advantage over any other Bidder or over OWNER; and the BIDDER or any person in his behalf, has not agreed, connived, or colluded to produce a deceptive show of competition in the matter of the bidding or award of the referenced contract.

**Signature to be by signer of Bid Form.**

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Title

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 201\_\_.

\_\_\_\_\_  
Notary Public

My commission expires on: \_\_\_\_\_

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

**BID BOND**

**BIDDER** (Name and Address):

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**OWNER** (Name and Address):

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**BID**

BID DUE DATE: \_\_\_\_\_

PROJECT (Brief Description Including Location):

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**BOND**

BOND NUMBER: \_\_\_\_\_

DATE (Not later than Bid due date): \_\_\_\_\_

PENAL SUM: \_\_\_\_\_

(Words)

(Figures)

IN WITNESS WHEREOF, Surety and Bidder, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Bid Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

BIDDER

SURETY

\_\_\_\_\_  
Bidder's Name and Corporate Seal

\_\_\_\_\_  
Surety's Name and Corporate Seal

By: \_\_\_\_\_  
Signature and Title

By: \_\_\_\_\_  
Signature and Title  
(Attach Power of Attorney)

Attest: \_\_\_\_\_  
Signature and Title

Attest: \_\_\_\_\_  
Signature and Title

- Note: (1) Above addresses are to be used for giving required notice.  
(2) Any singular reference to Bidder, Surety, OWNER or other party shall be considered plural where applicable.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to pay to OWNER upon default of Bidder the penal sum set forth on the face of this Bond.

2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by OWNER) the executed Agreement required by the Bidding Documents and any performance and payment Bonds required by the Bidding Documents.

3. This obligation shall be null and void if:

3.1. OWNER accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by OWNER) the executed Agreement required by the Bidding Documents and any performance and payment Bonds required by the Bidding Documents, or

3.2. All Bids are rejected by OWNER, or

3.3. OWNER fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default by Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from OWNER, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of and any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by OWNER and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from Bid due date without Surety's written consent.

6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in paragraph 4 above is received by Bidder and Surety and in no case later than one year after Bid due date.

7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power or Attorney evidencing the authority of the officer, agent or representative who executed this Bond on behalf of Surety to execute, seal and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer or proposal as applicable.

**STATEMENT OF BIDDERS COMPLIANCE WITH EXECUTIVE ORDER NO. 3**

This statement must be completed by the Bidder and shall accompany his bid for this project.

IT IS HEREBY CERTIFIED THAT:

NAME OF BIDDER \_\_\_\_\_

BUSINESS ADDRESS \_\_\_\_\_

To the extent required by law, the Bidder has complied on past Contracts and will fully comply on this project with all applicable laws and regulations regarding equal employment opportunities for minorities and women, and

PLEASE CHECK THE APPROPRIATE LINE

Has \_\_\_\_\_ has not \_\_\_\_\_ previously performed work under the conditions of the Governor's Executive Order No. 3 of the State of Connecticut, or any preceding similar Executive Order with regards to Non-Discrimination.

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Date

**IMPORTANT: THIS STATEMENT MUST BE SUBMITTED WITH BID**

Connecticut general statutes require nondiscrimination clauses in state contracts and subcontracts for construction on public buildings, other public works and goods and services. Henceforth all state contracts and subcontracts for construction on public buildings, other public works and goods and services shall contain a provision rendering such contract or subcontract subject to this Order, and that such contract or subcontract may be canceled, terminated or suspended by the labor commissioner for violation of or noncompliance with this Order or state or federal laws concerning nondiscrimination. Each contractor having a contract containing the provisions prescribed in section 4-114a of the 1969 supplement to the general statutes, shall file, and shall cause each of his subcontractors to file, compliance reports with the contracting agency or the labor commissioner.

**STATEMENT OF BIDDERS COMPLIANCE WITH EXECUTIVE ORDER NO. 17**

This statement must be completed by the Bidder and shall accompany his bid for this project.

IT IS HEREBY CERTIFIED THAT:

NAME OF BIDDER \_\_\_\_\_

BUSINESS ADDRESS \_\_\_\_\_

And all proposed subcontractors shall list all employment openings with the Office of the Connecticut State Employment Service in the area where the work is to be performed or where the services are to be rendered and shall comply with the requirements outlined in Executive Order No. 17.

Signature \_\_\_\_\_  
Title \_\_\_\_\_  
Date \_\_\_\_\_

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**



**STATEMENT OF BIDDERS COMPLIANCE WITH EXECUTIVE ORDER NO. 16**

This statement must be completed by the Bidder and shall accompany his bid for this project.

IT IS HEREBY CERTIFIED THAT:

NAME OF BIDDER \_\_\_\_\_

BUSINESS ADDRESS \_\_\_\_\_

Complies with the State of Connecticut Violence in the Workplace Prevention Policy as outlined in Executive Order No. 16.

Signature \_\_\_\_\_  
Title \_\_\_\_\_  
Date \_\_\_\_\_

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

State of Connecticut  
 Department of Administrative Services (DAS) Contractor Prequalification  
**Update (Bid) Statement**  
 (Statement to be included with the bid)

Connecticut General Statute §4a-100 and Connecticut General Statute §4b-91

Each bid submitted for a contract shall include a copy of a prequalification certificate issued by the Commissioner of Administrative Services. The bid shall also be accompanied by an **update bid statement** in such form as the Commissioner of Administrative Services prescribes. The form for such **update bid statement** shall provide space for information regarding all projects completed by the bidder since the date the bidder's prequalification certificate was issued or renewed, all projects the bidder currently has under contract, including the percentage of work on such projects not completed, the names and qualifications of the personnel who will have supervisory responsibility for the performance of the contract, any significant changes in the bidder's financial position or corporate structure since the date the certificate was issued or renewed, any change in the contractor's qualification status, and such other relevant information as the Commissioner of Administrative Services prescribes. Any bid submitted without a copy of the prequalification certificate and an **update bid statement** shall be invalid. Any public agency that accepts a bid submitted without a copy of such prequalification certificate and an **update bid statement**, as required by this section, may become ineligible for the receipt of funds related to such bid.

NOT FOR BIDDING PURPOSES  
 REFERENCE COPY ONLY

<b>Name of Project that company is bidding on:</b>		
<b>Project Number:</b>		
<b>Name of Company:</b>		
<b>FEIN:</b>		
<b>Company Address:</b>		
<b>Prequalification Contact:</b>		<b>Telephone Number:</b>
<b>Date of Prequalification with the DAS:</b>	<b>Single Limit:</b>	<b>Aggregate Work Capacity (AWC):</b>
* This amount equals your company's AWC minus the Total \$ Amount of Work Remaining.		<b>* Remaining Aggregate Work Capacity:</b>

**Please list all of your company's BONDED PROJECTS (BOTH PUBLIC AND PRIVATE) WHICH WERE 100% COMPLETED SINCE THE DATE YOUR PREQUALIFICATION WAS ISSUED OR RENEWED: (Please add additional page(s) if required)**

Name of Project	Owner of Project	Date Project Completed	Total Contract Amount

Please list all of your company's BONDED PROJECTS (BOTH PUBLIC AND PRIVATE) CURRENTLY UNDER CONTRACT:  
 (Please add additional page(s) if required. Please total the Work Remaining column)

Name of Project	Owner of Project	Total Contract Amount	% Complete	Work Remaining (\$)
Total \$ Amount of Work Remaining →				

Please list the names and titles of the personnel who will have supervisory responsibility for the performance of the contract being bid on:  
 (Please add additional page(s) if required)

Individual Name	Title of Individual

NOT FOR BIDDING PURPOSES  
 REFERENCE COPY ONLY

**Have there been any changes in your company's financial condition or business organization, which might affect your company's ability to successfully complete this contract?**

Yes  No

If yes, please explain:

I certify under penalty of law that all of the information contained in this Update (Bid) Statement is true and accurate to the best of my knowledge as of the date below.

\_\_\_\_\_  
 Signature

\_\_\_\_\_  
 Date

It is the responsibility of the Awarding Authority to determine if any of the information provided above will impact the contractor's performance on this project.  
 The DAS' Contractor Prequalification Program can be reached at (860) 713-5280

Section 09500  
State Wage Rates

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

Project: Resiliency Improvements For Waste Water Pumping Stations

**Minimum Rates and Classifications  
for Heavy/Highway Construction**

**Connecticut Department of Labor  
Wage and Workplace Standards Division**

ID#: H 26626

By virtue of the authority vested in the Labor Commissioner under provisions of Section 31-53 of the General Statutes of Connecticut, as amended, the following are declared to be the prevailing rates and welfare payments and will apply only where the contract is advertised for bid within 20 days of the date on which the rates are established. Any contractor or subcontractor not obligated by agreement to pay to the welfare and pension fund shall pay this amount to each employee as part of his/her hourly wages.

Project Number:

Project Town: New Haven

FAP Number:

State Number:

Project: Resiliency Improvements For Waste Water Pumping Stations

**CLASSIFICATION**

	<b>Hourly Rate</b>	<b>Benefits</b>
1) Boilermaker	33.79	34% + 8.96
1a) Bricklayer, Cement Masons, Cement Finishers, Plasterers, Stone Masons	34.72	32.15
2) Carpenters, Piledrivermen	33.53	25.66
2a) Diver Tenders	33.53	25.66

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

**As of:** Wednesday, October 16, 2019

Project: Resiliency Improvements For Waste Water Pumping Stations

3) Divers	41.99	25.66
03a) Millwrights	34.04	26.09
4) Painters: (Bridge Construction) Brush, Roller, Blasting (Sand, Water, etc.), Spray	51.00	21.80
4a) Painters: Brush and Roller	34.62	21.80
4b) Painters: Spray Only	36.62	21.80
4c) Painters: Steel Only	35.62	21.80
4d) Painters: Blast and Spray	37.62	21.80

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

Project: Resiliency Improvements For Waste Water Pumping Stations

4e) Painters: Tanks, Tower and Swing	36.62	21.80
5) Electrician (Trade License required: E-1,2 L-5,6 C-5,6 T-1,2 L-1,2 V-1,2,7,8,9)	38.50	28.61+3% of gross wage
6) Ironworkers: Ornamental, Reinforcing, Structural, and Precast Concrete Erection	36.67	35.77 + a
7) Plumbers (Trade License required: (P-1,2,6,7,8,9 J-1,2,3,4 SP-1,2) and Pipefitters (Including HVAC Work) (Trade License required: 1,2,3,4,5,6,7,8 B-1,2,3,4 D-1,2,3,4 G-1, G-2, G-8, G-9)	43.62	32.06
----LABORERS-----		
8) Group 1: Laborer (Unskilled), Common or General, acetylene burner, concrete specialist	30.75	20.84
9) Group 2: Chain saw operators, fence and guard rail erectors, pneumatic tool operators, powdermen	31.00	20.84

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

Project: Resiliency Improvements For Waste Water Pumping Stations

10) Group 3: Pipelayers	31.25	20.84
11) Group 4: Jackhammer/Pavement breaker (handheld); mason tenders (cement/concrete), catch basin builders, asphalt rakers, air track operators, block paver, curb setter and forklift operators	31.25	20.84
12) Group 5: Toxic waste removal (non-mechanical systems)	32.75	20.84
13) Group 6: Blasters	32.50	20.84
Group 7: Asbestos/lead removal, non-mechanical systems (does not include leaded joint pipe)	31.75	20.84
Group 8: Traffic control signalmen	18.00	20.84
Group 9: Hydraulic Drills	29.30	18.90

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY



Project: Resiliency Improvements For Waste Water Pumping Stations

----LABORERS (TUNNEL CONSTRUCTION, FREE AIR). Shield Drive and Liner Plate Tunnels in Free Air.----

13a) Miners, Motormen, Mucking Machine Operators, Nozzle Men, Grout Men, Shaft & Tunnel Steel & Rodmen, Shield & Erector, Arm Operator, Cable Tenders	32.98	20.84 + a
---	-------	-----------

13b) Brakemen, Trackmen	32.01	20.84 + a
-------------------------	-------	-----------

----CLEANING, CONCRETE AND CAULKING TUNNEL----

14) Concrete Workers, Form Movers, and Shoppers	32.01	20.84 + a
---	-------	-----------

15) Form Erectors	32.34	20.84 + a
-------------------	-------	-----------

----ROCK SHAFT LINING, CONCRETE, LINING OF SAME AND TUNNEL IN FREE AIR:----

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

Project: Resiliency Improvements For Waste Water Pumping Stations

16) Brakemen, Trackmen, Tunnel Laborers, Shaft Laborers	32.01	20.84 + a
17) Laborers Topside, Cage Tenders, Bellman	31.90	20.84 + a
18) Miners	32.98	20.84 + a
----TUNNELS, CAISSON AND CYLINDER WORK IN COMPRESSED AIR: ----		
18a) Blaster	39.47	20.84 + a
19) Brakemen, Trackmen, Groutman, Laborers, Outside Lock Tender, Gauge Tenders	39.27	20.84 + a
20) Change House Attendants, Powder Watchmen, Top on Iron Bolts	37.29	20.84 + a

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

Project: Resiliency Improvements For Waste Water Pumping Stations

21) Mucking Machine Operator	40.06	20.84 + a
------------------------------	-------	-----------

---TRUCK DRIVERS---(\*see note below)

Two axle trucks	29.51	24.52 + a
-----------------	-------	-----------

Three axle trucks; two axle ready mix	29.62	24.52 + a
---------------------------------------	-------	-----------

Three axle ready mix	29.67	24.52 + a
----------------------	-------	-----------

Four axle trucks, heavy duty trailer (up to 40 tons)	29.72	24.52 + a
--	-------	-----------

Four axle ready-mix	29.77	24.52 + a
---------------------	-------	-----------

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

Project: Resiliency Improvements For Waste Water Pumping Stations

Heavy duty trailer (40 tons and over)	29.98	24.52 + a
Specialized earth moving equipment other than conventional type on-the road trucks and semi-trailer (including Euclids)	29.77	24.52 + a
----POWER EQUIPMENT OPERATORS----		
Group 1: Crane handling or erecting structural steel or stone, hoisting engineer (2 drums or over), front end loader (7 cubic yards or over), Work Boat 26 ft. & Over, Tunnel Boring Machines. (Trade License Required)	40.97	24.80 + a
Group 2: Cranes (100 ton rate capacity and over), Excavator over 2 cubic yards; Piledriver (\$3.00 premium when operator controls hammer); Bauer Drill/Caisson. (Trade License Required)	40.64	24.80 + a
Group 3: Excavator/Backhoe under 2 cubic yards; Cranes (under 100 ton rated capacity), Gradall; Master Mechanic; Hoisting Engineer (all types of equipment where a drum and cable are used to hoist or drag material regardless of motive power of operation), Rubber Tire Excavator (Drott-1085 or similar); Grader Operator; Bulldozer Fine Grade (slopes, shaping, laser or GPS, etc.). (Trade License Required)	39.88	24.80 + a
Group 4: Trenching Machines; Lighter Derrick; Concrete Finishing Machine; CMI Machine or Similar; Koehring Loader (Skooper)	39.48	24.80 + a

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

Project: Resiliency Improvements For Waste Water Pumping Stations

Group 5: Specialty Railroad Equipment; Asphalt Paver; Asphalt Spreader; Asphalt Reclaiming Machine; Line Grinder; Concrete Pumps; Drills with Self Contained Power Units; Boring Machine; Post Hole Digger; Auger; Pounder; Well Digger; Milling Machine (over 24" Mandrell) 38.87 24.80 + a

Group 5 continued: Side Boom; Combination Hoe and Loader; Directional Driller. 38.87 24.80 + a

Group 6: Front End Loader (3 up to 7 cubic yards); Bulldozer (rough grade dozer). 38.55 24.80 + a

Group 7: Asphalt Roller; Concrete Saws and Cutters (ride on types); Vermeer Concrete Cutter; Stump Grinder; Scraper; Snooper; Skidder; Milling Machine (24" and Under Mandrel). 38.20 24.80 + a

Group 8: Mechanic, Grease Truck Operator, Hydroblaster, Barrier Mover, Power Stone Spreader; Welder; Work Boat under 26 ft.; Transfer Machine. 37.79 24.80 + a

Group 9: Front End Loader (under 3 cubic yards), Skid Steer Loader regardless of attachments (Bobcat or Similar); Fork Lift, Power Chipper; Landscape Equipment (including hydroseeder). 37.34 24.80 + a

Group 10: Vibratory Hammer, Ice Machine, Diesel and Air Hammer, etc. 35.24 24.80 + a

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

Project: Resiliency Improvements For Waste Water Pumping Stations

Group 11: Conveyor, Earth Roller; Power Pavement Breaker (whiphammer), Robot Demolition Equipment.	35.24	24.80 + a
Group 12: Wellpoint Operator.	35.18	24.80 + a
Group 13: Compressor Battery Operator.	34.58	24.80 + a
Group 14: Elevator Operator; Tow Motor Operator (Solid Tire No Rough Terrain).	33.41	24.80 + a
Group 15: Generator Operator; Compressor Operator; Pump Operator; Welding Machine Operator; Heater Operator.	32.99	24.80 + a
Group 16: Maintenance Engineer/Oiler	32.32	24.80 + a
Group 17: Portable asphalt plant operator; portable crusher plant operator; portable concrete plant operator.	36.76	24.80 + a

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

Project: Resiliency Improvements For Waste Water Pumping Stations

Group 18: Power Safety Boat; Vacuum Truck; Zim Mixer; Sweeper;  
(minimum for any job requiring CDL license). 34.26 24.80 + a

\*\*NOTE: SEE BELOW

----LINE CONSTRUCTION----(Railroad Construction and Maintenance)----

20) Lineman, Cable Splicer, Technician 48.19 6.5% + 22.00

21) Heavy Equipment Operator 42.26 6.5% + 19.88

22) Equipment Operator, Tractor Trailer Driver, Material Men 40.96 6.5% + 19.21

23) Driver Groundmen 26.50 6.5% + 9.00

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

Project: Resiliency Improvements For Waste Water Pumping Stations

23a) Truck Driver 40.96 6.5% + 17.76

---LINE CONSTRUCTION---

24) Driver Groundmen 30.92 6.5% + 9.70

25) Groundmen 22.67 6.5% + 6.20

26) Heavy Equipment Operators 37.10 6.5% + 10.70

27) Linemen, Cable Splicers, Dynamite Men 41.22 6.5% + 12.20

28) Material Men, Tractor Trailer Drivers, Equipment Operators 35.04 6.5% + 10.45

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY



Project: Resiliency Improvements For Waste Water Pumping Stations

01) Asbestos/Toxic Waste Removal Laborers: Asbestos removal and encapsulation (except its removal from mechanical systems which are not to be scrapped), toxic waste removers, blasters. \*\*See Laborers Group 5 and 7\*\*

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

Project: Resiliency Improvements For Waste Water Pumping Stations

*Welders: Rate for craft to which welding is incidental.*

*\*Note: Hazardous waste removal work receives additional \$1.25 per hour for truck drivers.*

*\*\*Note: Hazardous waste premium \$3.00 per hour over classified rate*

***ALL Cranes: When crane operator is operating equipment that requires a fully licensed crane operator to operate he receives an extra \$4.00 premium in addition to the hourly wage rate and benefit contributions:***

- 1) Crane handling or erecting structural steel or stone; hoisting engineer (2 drums or over)***
- 2) Cranes (100 ton rate capacity and over) Bauer Drill/Caisson***
- 3) Cranes (under 100 ton rated capacity)***

*Crane with 150 ft. boom (including jib) - \$1.50 extra*

*Crane with 200 ft. boom (including jib) - \$2.50 extra*

*Crane with 250 ft. boom (including jib) - \$5.00 extra*

*Crane with 300 ft. boom (including jib) - \$7.00 extra*

*Crane with 400 ft. boom (including jib) - \$10.00 extra*

All classifications that indicate a percentage of the fringe benefits must be calculated at the percentage rate times the "base hourly rate".

Apprentices duly registered under the Commissioner of Labor's regulations on "Work Training Standards for Apprenticeship and Training Programs" Section 31-51-d-1 to 12, are allowed to be paid the appropriate percentage of the prevailing journeymen hourly base and the full fringe benefit rate, providing the work site ratio shall not be less than one full-time journeyman instructing and supervising the work of each apprentice in a specific trade.

*~~Connecticut General Statute Section 31-550: Annual Adjustments to wage rates by contractors doing state work~~*

*The Prevailing wage rates applicable to this project are subject to annual adjustments each July 1st for the duration of the project.*

*Each contractor shall pay the annual adjusted prevailing wage rate that is in effect each July 1st, as posted by the Department of Labor.*

*It is the contractor's responsibility to obtain the annual adjusted prevailing wage rate increases directly from the Department of Labor's website.*

*The annual adjustments will be posted on the Department of Labor's Web page: [www.ct.gov/dol](http://www.ct.gov/dol).*

*The Department of Labor will continue to issue the initial prevailing wage rate schedule to the Contracting Agency for the project.*

*All subsequent annual adjustments will be posted on our Web Site for contractor access.*

*Contracting Agencies are under no obligation pursuant to State labor law to pay any increase due to the annual adjustment provision.*

**As of:** Wednesday, October 16, 2019

Project: Resiliency Improvements For Waste Water Pumping Stations

*Effective October 1, 2005 - Public Act 05-50: any person performing the work of any mechanic, laborer, or worker shall be paid prevailing wage*

All Person who perform work ON SITE must be paid prevailing wage for the appropriate mechanic, laborer, or worker classification.

All certified payrolls must list the hours worked and wages paid to All Persons who perform work ON SITE regardless of their ownership i.e.: (Owners, Corporate Officers, LLC Members, Independent Contractors, et. al)

Reporting and payment of wages is required regardless of any contractual relationship alleged to exist between the contractor and such person.

**~~Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clause (29 CFR 5.5 (a) (1) (ii)).**

Please direct any questions which you may have pertaining to classification of work and payment of prevailing wages to the Wage and Workplace Standards Division, telephone (860) 263-6790.

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**



**THIS IS A PUBLIC WORKS PROJECT**

**Covered by the**

**PREVAILING WAGE LAW**

**CT General Statutes Section 31-53**

**If you have QUESTIONS regarding your wages  
CALL (860) 263-6790**

Section 31-55 of the CT State Statutes requires every contractor or subcontractor performing work for the state to post in a prominent place the prevailing wages as determined by the Labor Commissioner.

**Sec. 31-53b. Construction safety and health course. New miner training program. Proof of completion required for mechanics, laborers and workers on public works projects. Enforcement. Regulations. Exceptions.**

(a) Each contract for a public works project entered into on or after July 1, 2009, by the state or any of its agents, or by any political subdivision of the state or any of its agents, described in subsection (g) of section 31-53, shall contain a provision requiring that each contractor furnish proof with the weekly certified payroll form for the first week each employee begins work on such project that any person performing the work of a mechanic, laborer or worker pursuant to the classifications of labor under section 31-53 on such public works project, pursuant to such contract, has completed a course of at least ten hours in duration in construction safety and health approved by the federal Occupational Safety and Health Administration or, has completed a new miner training program approved by the Federal Mine Safety and Health Administration in accordance with 30 CFR 48 or, in the case of telecommunications employees, has completed at least ten hours of training in accordance with 29 CFR 1910.268.

(b) Any person required to complete a course or program under subsection (a) of this section who has not completed the course or program shall be subject to removal from the worksite if the person does not provide documentation of having completed such course or program by the fifteenth day after the date the person is found to be in noncompliance. The Labor Commissioner or said commissioner's designee shall enforce this section.

(c) Not later than January 1, 2009, the Labor Commissioner shall adopt regulations, in accordance with the provisions of Chapter 54, to implement the provisions of subsections (a) and (b) of this section. Such regulations shall require that the ten-hour construction safety and health courses required under subsection (a) of this section be conducted in accordance with federal Occupational Safety and Health Administration Training Institute standards, or in accordance with Federal Mine Safety and Health Administration Standards or in accordance with 29 CFR 1910.268, as appropriate. The Labor Commissioner shall accept as sufficient proof of compliance with the provisions of subsection (a) or (b) of this section a student course completion card issued by the federal Occupational Safety and Health Administration Training Institute, or such other proof of compliance said commissioner deems appropriate, dated no earlier than five years before the commencement date of such public works project.

(d) This section shall not apply to employees of public service companies, as defined in section 16-1, or drivers of commercial motor vehicles driving the vehicle on the public works project and delivering or picking up cargo from public works projects provided they perform no labor relating to the project other than the loading and unloading of their cargo.

(P.A. 06-175, S. 1; P.A. 08-83, S. 1.)

History: P.A. 08-83 amended Subsec. (a) by making provisions applicable to public works project contracts entered into on or after July 1, 2009, replacing provision re total cost of work with reference to Sec. 31-53(g), requiring proof in certified payroll form that new mechanic, laborer or worker has completed a 10-hour or more construction safety course and adding provision re new miner training program, amended Subsec. (b) by substituting "person" for "employee" and adding "or program", amended Subsec. (c) by adding "or in accordance with Federal Mine Safety and Health Administration Standards" and setting new deadline of January 1, 2009, deleted former Subsec. (d) re "public building", added new Subsec. (d) re exemptions for public service company employees and delivery drivers who perform no labor other than delivery and made conforming and technical changes, effective January 1, 2009.

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

# Informational Bulletin

## THE 10-HOUR OSHA CONSTRUCTION SAFETY AND HEALTH COURSE

(applicable to public building contracts entered into *on or after July 1, 2007*, where the total cost of all work to be performed is at least \$100,000)

- (1) This requirement was created by Public Act No. 06-175, which is codified in Section 31-53b of the Connecticut General Statutes (pertaining to the prevailing wage statutes);
- (2) The course is required for public building construction contracts (projects funded in whole or in part by the state or any political subdivision of the state) entered into on or after July 1, 2007;
- (3) It is required of private employees (not state or municipal employees) and apprentices who perform manual labor for a general contractor or subcontractor on a public building project where the total cost of all work to be performed is at least \$100,000;
- (4) The ten-hour construction course pertains to the ten-hour Outreach Course conducted in accordance with federal OSHA Training Institute standards, and, for telecommunications workers, a ten-hour training course conducted in accordance with federal OSHA standard, 29 CFR 1910.268;
- (5) The internet website for the federal OSHA Training Institute is [http://www.osha.gov/iso/otc/training/edcenters/fact\\_sheet.html](http://www.osha.gov/iso/otc/training/edcenters/fact_sheet.html);
- (6) The statutory language leaves it to the contractor and its employees to determine who pays for the cost of the ten-hour Outreach Course;
- (7) Within 30 days of receiving a contract award, a general contractor must furnish proof to the Labor Commissioner that all employees and apprentices performing manual labor on the project will have completed such a course;
- (8) Proof of completion may be demonstrated through either: (a) the presentation of a *bona fide* student course completion card issued by the federal OSHA Training Institute; *or* (2) the presentation of documentation provided to an employee by a trainer certified by the Institute pending the actual issuance of the completion card;
- (9) Any card with an issuance date more than 5 years prior to the commencement date of the construction project shall not constitute proof of compliance;

- (10) Each employer shall affix a copy of the construction safety course completion card to the certified payroll submitted to the contracting agency in accordance with Conn. Gen. Stat. § 31-53(f) on which such employee's name first appears;
- (11) Any employee found to be in non-compliance shall be subject to removal from the worksite if such employee does not provide satisfactory proof of course completion to the Labor Commissioner by the fifteenth day after the date the employee is determined to be in noncompliance;
- (12) Any such employee who is determined to be in noncompliance may continue to work on a public building construction project for a maximum of fourteen consecutive calendar days while bringing his or her status into compliance;
- (13) The Labor Commissioner may make complaint to the prosecuting authorities regarding any employer or agent of the employer, or officer or agent of the corporation who files a false certified payroll with respect to the status of an employee who is performing manual labor on a public building construction project;
- (14) The statute provides the minimum standards required for the completion of a safety course by manual laborers on public construction contracts; any contractor can exceed these minimum requirements; and
- (15) Regulations clarifying the statute are currently in the regulatory process, and shall be posted on the CTDOL website as soon as they are adopted in final form.
- (16) Any questions regarding this statute may be directed to the Wage and Workplace Standards Division of the Connecticut Labor Department via the internet website of <http://www.ctdol.state.ct.us/wgwkstnd/wgmenu.htm>; or by telephone at (860)263-6790.

**THE ABOVE INFORMATION IS PROVIDED EXCLUSIVELY AS AN EDUCATIONAL RESOURCE, AND IS NOT INTENDED AS A SUBSTITUTE FOR LEGAL INTERPRETATIONS WHICH MAY ULTIMATELY ARISE CONCERNING THE CONSTRUCTION OF THE STATUTE OR THE REGULATIONS.**



November 29, 2006

## Notice

### **To All Mason Contractors and Interested Parties Regarding Construction Pursuant to Section 31-53 of the Connecticut General Statutes (Prevailing Wage)**

The Connecticut Labor Department Wage and Workplace Standards Division is empowered to enforce the prevailing wage rates on projects covered by the above referenced statute.

Over the past few years the Division has withheld enforcement of the rate in effect for workers who operate a forklift on a prevailing wage rate project due to a potential jurisdictional dispute.

The rate listed in the schedules and in our Occupational Bulletin (see enclosed) has been as follows:

#### **Forklift Operator:**

- **Laborers (Group 4) Mason Tenders** - operates forklift solely to assist a mason to a maximum height of nine feet only.
- **Power Equipment Operator (Group 9)** - operates forklift to assist any trade and to assist a mason to a height over nine feet.

The U.S. Labor Department conducted a survey of rates in Connecticut but it has not been published and the rate in effect remains as outlined in the above Occupational Bulletin.

***Since this is a classification matter and not one of jurisdiction, effective January 1, 2007 the Connecticut Labor Department will enforce the rate on each schedule in accordance with our statutory authority.***

Your cooperation in filing appropriate and accurate certified payrolls is appreciated.

**STATUTE 31-55a**

**- SPECIAL NOTICE -**

**To: All State and Political Subdivisions, Their Agents, and Contractors**

**Connecticut General Statute 31-55a - Annual adjustments to wage rates by contractors doing state work.**

*Each contractor that is awarded a contract on or after October 1, 2002, for (1) the construction of a state highway or bridge that falls under the provisions of section 31-54 of the general statutes, or (2) the construction, remodeling, refinishing, refurbishing, rehabilitation, alteration or repair of any public works project that falls under the provisions of section 31-53 of the general statutes shall contact the Labor Commissioner on or before July first of each year, for the duration of such contract, to ascertain the prevailing rate of wages on an hourly basis and the amount of payment or contributions paid or payable on behalf of each mechanic, laborer or worker employed upon the work contracted to be done, and shall make any necessary adjustments to such prevailing rate of wages and such payment or contributions paid or payable on behalf of each such employee, effective each July first.*

- The prevailing wage rates applicable to any contract or subcontract awarded on or after October 1, 2002 are subject to annual adjustments each July 1st for the duration of any project which was originally advertised for bids on or after October 1, 2002.
- Each contractor affected by the above requirement shall pay the annual adjusted prevailing wage rate that is in effect each July 1st, as posted by the Department of Labor.
- It is the **contractor's** responsibility to obtain the annual adjusted prevailing wage rate increases directly from the Department of Labor's Web Site. The annual adjustments will be posted on the Department of Labor Web page: [www.ctdol.state.ct.us](http://www.ctdol.state.ct.us). For those without internet access, please contact the division listed below.
- The Department of Labor will continue to issue the initial prevailing wage rate schedule to the Contracting Agency for the project. All subsequent annual adjustments will be posted on our Web Site for contractor access.

**Any questions should be directed to the Contract Compliance Unit, Wage and Workplace Standards Division, Connecticut Department of Labor, 200 Folly Brook Blvd., Wethersfield, CT 06109 at (860)263-6790.**

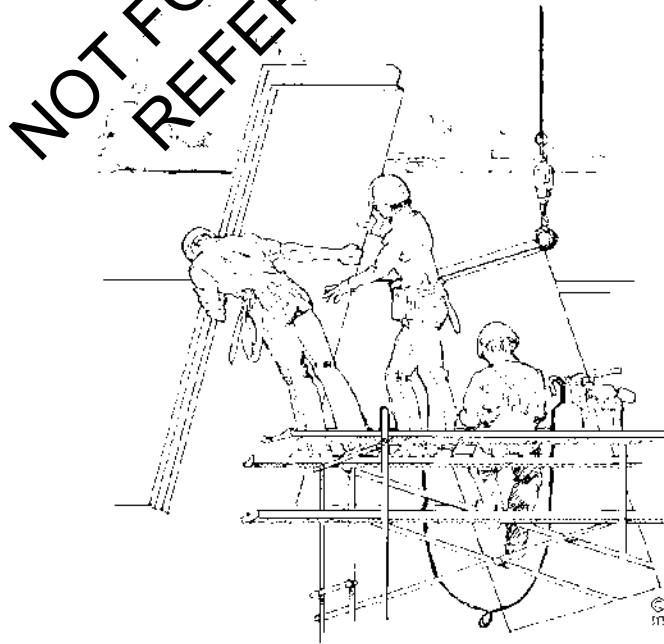
~NOTICE~

TO ALL CONTRACTING AGENCIES

Please be advised that Connecticut General Statutes Section 54-53, requires the contracting agency to certify to the Department of Labor, the total dollar amount of work to be done in connection with such public works project, regardless of whether such project consists of one or more contracts.

Please find the attached "Contracting Agency Certification Form" to be completed and returned to the Department of Labor, Wage and Workplace Standards Division, Public Contract Compliance Unit.

 Inquiries can be directed to (860)261-6543



CONNECTICUT DEPARTMENT OF LABOR  
WAGE AND WORKPLACE STANDARDS DIVISION  
CONTRACT COMPLIANCE UNIT

CONTRACTING AGENCY CERTIFICATION FORM

I, \_\_\_\_\_, acting in my official capacity as \_\_\_\_\_,  
authorized representative title

for \_\_\_\_\_, located at \_\_\_\_\_,  
contracting agency address

do hereby certify that the total dollar amount of work to be done in connection with  
\_\_\_\_\_, located at \_\_\_\_\_,  
project name and number address

shall be \$ \_\_\_\_\_, which includes all work, regardless of whether such project  
consists of one or more contracts.

CONTRACTOR INFORMATION

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Authorized Representative: \_\_\_\_\_

Approximate Starting Date: \_\_\_\_\_

Approximate Completion Date: \_\_\_\_\_

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

Return To: Connecticut Department of Labor  
Wage & Workplace Standards Division  
Contract Compliance Unit  
200 Folly Brook Blvd.  
Wethersfield, CT 06109

Date Issued: \_\_\_\_\_

CONNECTICUT DEPARTMENT OF LABOR  
WAGE AND WORKPLACE STANDARDS DIVISION

**CONTRACTORS WAGE CERTIFICATION FORM**  
**Construction Manager at Risk/General Contractor/Prime Contractor**

I, \_\_\_\_\_ of \_\_\_\_\_  
Officer, Owner, Authorized Rep. Company Name

do hereby certify that the \_\_\_\_\_  
Company Name  
\_\_\_\_\_  
Street  
\_\_\_\_\_  
City

and all of its subcontractors will pay all workers on the  
\_\_\_\_\_  
Project Name and Number  
\_\_\_\_\_  
Street and City

the wages as listed in the schedule of prevailing rates required for such project (a copy of which is attached hereto).

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

\_\_\_\_\_  
Signed

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

\_\_\_\_\_  
Notary Public

Return to:  
Connecticut Department of Labor  
Wage & Workplace Standards Division  
200 Folly Brook Blvd.  
Wethersfield, CT 06109

Rate Schedule Issued (Date): \_\_\_\_\_

[New] In accordance with Section 31-53b(a) of the C.G.S. each contractor shall provide a copy of the OSHA 10 Hour Construction Safety and Health Card for each employee, to be attached to the first certified payroll on the project.

In accordance with Connecticut General Statutes, 31-53 Certified Payrolls with a statement of compliance shall be submitted monthly to the contracting agency.

**PAYROLL CERTIFICATION FOR PUBLIC WORKS PROJECTS**

Connecticut Department of Labor  
Wage and Workplace Standards Division  
200 Folly Brook Blvd.  
Wethersfield, CT 06109

**WEEKLY PAYROLL**

CONTRACTOR NAME AND ADDRESS:											SUBCONTRACTOR NAME & ADDRESS				WORKER'S COMPENSATION INSURANCE CARRIER							
PAYROLL NUMBER	Week-Ending Date		PROJECT NAME & ADDRESS								POLICY #				EFFECTIVE DATE: EXPIRATION DATE:							
PERSON/WORKER, ADDRESS and SECTION	APPR RATE %	MALE/FEMALE AND RACE*	WORK CLASSIFICATION Trade License Type & Number - OSHA 10 Certification Number	DAY AND DATE							Total ST Hours	BASE HOURLY RATE	TYPE OF FRINGE BENEFITS Per Hour 1 through 6 (see back)	GROSS PAY FOR ALL WORK PERFORMED THIS WEEK	TOTAL DEDUCTIONS				GROSS PAY FOR THIS PREVAILING RATE JOB	CHECK # AND NET PAY		
				S	M	T	W	TH	F	S					FICA	FEDERAL WITH-HOLDING	STATE WITH-HOLDING	LIST OTHER				
				HOURS WORKED EACH DAY							Total O/T Hours	CASH										
												1. \$										
												2. \$										
												3. \$										
												4. \$										
												5. \$										
												6. \$										
												1. \$										
												2. \$										
												3. \$										
												4. \$										
												5. \$										
												6. \$										

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

**\*FRINGE BENEFITS EXPLANATION (P):**

Bona fide benefits paid to approved plans, funds or programs, except those required by Federal or State Law (unemployment tax, worker's compensation, income taxes, etc.).

Please specify the type of benefits provided:

- 1) Medical or hospital care \_\_\_\_\_ 4) Disability \_\_\_\_\_
- 2) Pension or retirement \_\_\_\_\_ 5) Vacation, holiday \_\_\_\_\_
- 3) Life Insurance \_\_\_\_\_ 6) Other (please specify) \_\_\_\_\_

**CERTIFIED STATEMENT OF COMPLIANCE**

For the week ending date of \_\_\_\_\_,

I, \_\_\_\_\_ of \_\_\_\_\_, (hereafter known as Employer) in my capacity as \_\_\_\_\_ (title) do hereby certify and state:

**Section A:**

1. All persons employed on said project have been paid the full weekly wages earned by them during the week in accordance with Connecticut General Statutes, section 31-53, as amended. Further, I hereby certify and state the following:

- a) The records submitted are true and accurate;
- b) The rate of wages paid to each mechanic, laborer or workman and the amount of payment or contributions paid or payable on behalf of each such person to any employee welfare fund, as defined in Connecticut General Statutes, section 31-53 (h), are not less than the prevailing rate of wages and the amount of payment or contributions paid or payable on behalf of each such person to any employee welfare fund, as determined by the Labor Commissioner pursuant to subsection Connecticut General Statutes, section 31-53 (d), and said wages and benefits are not less than those which may also be required by contract;
- c) The Employer has complied with all of the provisions in Connecticut General Statutes, section 31-53 (and Section 31-54 if applicable for state highway construction);
- d) Each such person is covered by a worker's compensation insurance policy for the duration of his employment which proof of coverage has been provided to the contracting agency;
- e) The Employer does not receive kickbacks, which means any money, fee, commission, credit, gift, gratuity, thing of value, or compensation of any kind which is provided directly or indirectly, to any prime contractor, prime contractor employee, subcontractor, or subcontractor employee for the purpose of improperly obtaining or rewarding favorable treatment in connection with a prime contract or in connection with a prime contractor in connection with a subcontractor relating to a prime contractor; and
- f) The Employer is aware that filing a certified payroll which he knows to be false is a class D felony for which the employer may be fined up to five thousand dollars, imprisoned for up to five years or both.

2. OSHA~The employer shall affix a copy of the construction safety course, program or training completion document to the certified payroll required to be submitted to the contracting agency for this project on which such persons name first appears.

\_\_\_\_\_  
 (Signature) (Title) Submitted on (Date)

Weekly Payroll Certification For  
Public Works Projects (Continued)

**PAYROLL CERTIFICATION FOR PUBLIC WORKS PROJECTS**

Week-Ending Date: \_\_\_\_\_  
Contractor or Subcontractor Business Name: \_\_\_\_\_

**WEEKLY PAYROLL**

PERSON/WORKER, ADDRESS and SECTION	APPR RATE %	MALE/ FEMALE AND RACE*	WORK CLASSIFICATION	DAY AND DATE							Total ST Hours	BASE HOURLY RATE	TYPE OF FRINGE BENEFITS Per Hour 1 through 6 (see back)	GROSS PAY FOR ALL WORK PERFORMED THIS WEEK	TOTAL DEDUCTIONS				GROSS PAY FOR THIS PREVAILING RATE JOB	CHECK # AND NET PAY						
				S	M	T	W	TH	F	S					FICA	FEDERAL WITH- HOLDING	STATE WITH- HOLDING	OTHER								
Trade License Type & Number - OSHA 10 Certification Number				HOURS WORKED EACH DAY							Total O/T Hours	TOTAL FRINGE BENEFIT PLAN CASH														
												\$	1. \$					\$	2. \$							
												\$	3. \$					\$	4. \$							
												\$	5. \$					\$	6. \$							
												\$	7. \$					\$	8. \$							
												\$	9. \$					\$	10. \$							
												\$	11. \$					\$	12. \$							
												\$	13. \$					\$	14. \$							
												\$	15. \$					\$	16. \$							
												\$	17. \$					\$	18. \$							
												\$	19. \$					\$	20. \$							
												\$	21. \$					\$	22. \$							
												\$	23. \$					\$	24. \$							
												\$	25. \$					\$	26. \$							

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

\*IF REQUIRED



[New] In accordance with Section 31-53b(a) of the C.G.S. each contractor shall provide a copy of the OSHA 10 Hour Construction Safety and Health Card for each employee, to be attached to the first certified payroll on the project.

PAYROLL CERTIFICATION FOR PUBLIC WORKS PROJECTS										WEEKLY PAYROLL										Connecticut Department of Labor Wage and Workplace Standards Division 200 Folly Brook Blvd. Wethersfield, CT 06109							
In accordance with Connecticut General Statutes, 31-53 Certified Payrolls with a statement of compliance shall be submitted monthly to the contracting agency.										CONTRACTOR NAME AND ADDRESS: Landon Corporation, 15 Connecticut Avenue, Northford, CT 06472										SUBCONTRACTOR NAME & ADDRESS: XYZ Corporation 2 Main Street Yantic, CT 06389				WORKER'S COMPENSATION INSURANCE CARRIER: Travelers Insurance Company POLICY # #BAC8888928 EFFECTIVE DATE: 1/1/09 EXPIRATION DATE: 12/31/09			
PAYROLL NUMBER	Week-Ending Date	PROJECT NAME & ADDRESS								Total ST Hours	BASE HOUR RATE	TYPE OF FRINGE BENEFITS per Hour (see back)	GROSS PAY FOR ALL WORK PERFORMED THIS WEEK	TOTAL DEDUCTIONS				GROSS PAY FOR THIS PREVAILING RATE JOB	CHECK # AND NET PAY								
		DAY AND DATE												FEDERAL	STATE	LIST OTHER											
PERSON/WORKER, ADDRESS and SECTION	APPR RATE %	MALE/FEMALE AND RACE*	WORK CLASSIFICATION	S	M	T	W	TH	F	S	Total O-TIME Hours	1. \$	2. \$	3. \$	4. \$	5. \$	6. \$	FICA	WITH-HOLDING	WITH-HOLDING	LIST OTHER	RATE	JOB	NET PAY			
				Trade License Type & Number - OSHA 10 Certification Number								HOURS WORKED EACH DAY															
Robert Craft 81 Maple Street Willimantic, CT 06226		M/C	Electrical Lineman E-1 1234567 Owner OSHA 123456		8	8	8	8	8		8	\$ 8.82	\$ 5.80	\$ 8.82	\$ 2.01	\$	\$	\$				P-xxxx	\$1,582.80	\$1,582.80	#123 \$ xxx.xx		
Ronald Jones 212 Elm Street Norwich, CT 06360	65%	M/B	Electrical Apprentice OSHA 234567		8	8	8	8			40	\$ 19.99	\$	\$ 19.99	\$	\$	\$	xx.xx	xxx.xx	xx.xx	G-xxx	\$1,464.80	\$1,464.80	#124 \$xxx.xx			
Franklin T. Smith 234 Washington Rd. New London, CT 06320 SECTION B		M/H	Project Manager			8					8	\$	\$	\$	\$	\$	\$	xx.xx	xx.xx	xx.xx	M-xx.x	\$1,500.00	\$1,500.00	#125 xxx.xx			
												\$	\$	\$	\$	\$	\$										

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

OSHA 10 ~ATTACH CARD TO 1ST CERTIFIED PAYROLL

**\*FRINGE BENEFITS EXPLANATION (P):**

Bona fide benefits paid to approved plans, funds or programs, except those required by Federal or State Law (unemployment tax, worker's compensation, income taxes, etc.).

Please specify the type of benefits provided:

- 1) Medical or hospital care Blue Cross 4) Disability \_\_\_\_\_
- 2) Pension or retirement \_\_\_\_\_ 5) Vacation, holiday \_\_\_\_\_
- 3) Life Insurance Utopia 6) Other (please specify) \_\_\_\_\_

**CERTIFIED STATEMENT OF COMPLIANCE**

For the week ending date of 9/26/09

I, Robert Craft of XYZ Corporation, (hereafter known as

Employer) in my capacity as Owner (title) do hereby certify and state:

**Section A:**

1. All persons employed on said project have been paid the full weekly wages earned by them during the week in accordance with Connecticut General Statutes, section 31-53, as amended. Further, I hereby certify and state the following:

- a) The records submitted are true and accurate;
- b) The rate of wages paid to each mechanic, laborer or workman and the amount of payment or contributions paid or payable on behalf of each such employee to any employee welfare fund, as defined in Connecticut General Statutes, section 31-53 (h), are not less than the prevailing rate of wages and the amount of payment or contributions paid or payable on behalf of each such employee to any employee welfare fund, as determined by the Labor Commissioner pursuant to subsection Connecticut General Statutes, section 31-53 (d), and said wages and benefits are not less than those which may also be required by contract;
- c) The Employer has complied with all of the provisions in Connecticut General Statutes, section 31-53 (and Section 31-54 if applicable for state highway construction);
- d) Each such employee of the Employer is covered by a worker's compensation insurance policy for the duration of his employment which proof of coverage has been provided to the contracting agency;
- e) The Employer does not receive kickbacks which means any money, fee, commission, credit, gift, gratuity, thing of value, or compensation of any kind which is provided directly or indirectly, to any prime contractor, prime contractor employee, subcontractor, or subcontractor employee for the purpose of improperly obtaining or rewarding favorable treatment in connection with a prime contract or in connection with a prime contractor in connection with a subcontractor relating to a prime contract; and
- f) The Employer is aware that filing a certified payroll which he knows to be false is a class D felony for which the employer may be fined up to five thousand dollars, imprisoned for up to five years or both.

2. OSHA-The employer shall affix a copy of the construction safety course, program or training completion document to the certified payroll required to be submitted to the contracting agency for this project on which such employee's name first appears.

Robert Craft owner 10/2/09  
 (Signature) (Title) Submitted on (Date)

**Section B: Applies to CONNDOT Projects ONLY**

That pursuant to CONNDOT contract requirements for reporting purposes only, all employees listed under Section B who performed work on this project are not covered under the prevailing wage requirements defined in Connecticut General Statutes Section 31-53.

Robert Craft owner 10/2/09  
 (Signature) (Title) Submitted on (Date)

Note: CTDOL will assume all hours worked were performed under Section A unless clearly delineated as Section B WWS-CP1 as such. Should an employee perform work under both Section A and Section B, the hours worked and wages paid must be segregated for reporting purposes.

\*\*\*THIS IS A PUBLIC DOCUMENT\*\*\*  
 \*\*\*DO NOT INCLUDE SOCIAL SECURITY NUMBERS\*\*\*

NOT FOR BIDDING PURPOSES  
 REFERENCE COPY ONLY

## Information Bulletin *Occupational Classifications*

The Connecticut Department of Labor has the responsibility to properly determine "job classification" on prevailing wage projects covered under C.G.S. Section 31-53(d).

**Note: This information is intended to provide a sample of some occupational classifications for guidance purposes only. It is not an all-inclusive list of each occupation's duties. This list is being provided only to highlight some areas where a contractor may be unclear regarding the proper classification. If unsure, the employer should seek guidelines for CTDOL.**

Below are additional clarifications of specific job duties performed for certain classifications:

- **ASBESTOS WORKERS**

Applies all insulating materials, protective coverings, coatings and finishes to all types of mechanical systems.

- **ASBESTOS INSULATOR**

Handle, install apply, fabricate, distribute, prepare, alter, repair, dismantle, heat and frost insulation, including penetration and fire stopping work on all penetration fire stop systems.

- **BOILERMAKERS**

Erects hydro plants, incomplete vessels, steel stacks, storage tanks for water, fuel, etc. Builds incomplete boilers, repairs heat exchanges and steam generators.

- **BRICKLAYERS, CEMENT MASONS, CEMENT FINISHERS, MARBLE MASONS, PLASTERERS, STONE MASONS, PLASTERERS. STONE MASONS, TERRAZZO WORKERS, TILE SETTERS**

Lays building materials such as brick, structural tile and concrete cinder, glass, gypsum, terra cotta block. Cuts, tools and sets marble, sets stone, finishes concrete, applies decorative steel, aluminum and plastic tile, applies cements, sand, pigment and marble chips to floors, stairways, etc.

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

- **CARPENTERS, MILLWRIGHTS. PILEDRIVERMEN. LATHERS. RESILEINT FLOOR LAYERS, DOCK BUILDERS, DIKERS, DIVER TENDERS**

Constructs, erects, installs and repairs structures and fixtures of wood, plywood and wallboard. Installs, assembles, dismantles, moves industrial machinery. Drives piling into ground to provide foundations for structures such as buildings and bridges, retaining walls for earth embankments, such as cofferdams. Fastens wooden, metal or rockboard lath to walls, ceilings and partitions of buildings, acoustical tile layer, concrete form builder. Applies firestopping materials on fire resistive joint systems only. Installation of curtain/window walls only where attached to wood or metal studs. Installation of insulated material of all types whether blown, nailed or attached in other ways to walls, ceilings and floors of buildings. Assembly and installation of modular furniture/furniture systems. Free-standing furniture is not covered. This includes free standing: student chairs, study top desks, book box desks, computer furniture, dictionary stand, atlas stand, wood shelving, two-position information access station, file cabinets, storage cabinets, tables, etc.

- **LABORER, CLEANING**

- The clean up of any construction debris and the general (heavy/light) cleaning, including sweeping, wash down, mopping, wiping of the construction facility and its furniture, washing, polishing, and dusting.

- **DELIVERY PERSONNEL**

- If delivery of supplies/building materials is to one common point and stockpiled there, prevailing wages are not required. If the delivery personnel are involved in the distribution of the material to multiple locations within the construction site then they would have to be paid prevailing wages for the type of work performed: laborer, equipment operator, electrician, ironworker, plumber, etc.

- An example of this would be where delivery of drywall is made to a building and the delivery personnel distribute the drywall from one "stockpile" location to further sub-locations on each floor. Distribution of material around a construction site is the job of a laborer or tradesman, and not a delivery personnel.

- **ELECTRICIANS**

Install, erect, maintenance, alteration or repair of any wire, cable, conduit, etc., which generates, transforms, transmits or uses electrical energy for light, heat, power or other purposes, including the Installation or maintenance of telecommunication, LAN wiring or computer equipment, and low voltage wiring. **\*License required per Connecticut General Statutes: E-1,2 L-5,6 C-5,6 T-1,2 L-1,2 V-1,2,7,8,9.**

- **ELEVATOR CONSTRUCTORS**

Install, erect, maintenance and repair of all types of elevators, escalators, dumb waiters and moving walks. *\*License required by Connecticut General Statutes: R-1,2,5,6.*

- **FORK LIFT OPERATOR**

Laborers Group 4) Mason Tenders - operates forklift solely to assist a mason to a maximum height of nine (9) feet only.

Power Equipment Operator Group 9 - operates forklift to assist any trade, and to assist a mason to a height over nine (9) feet.

- **GLAZIERS**

Glazing wood and metal sash, doors, partitions, and 2 story aluminum storefronts. Installs glass windows, skylights, store fronts and display cases or surfaces such as building fronts, interior walls, ceilings and table tops and metal store fronts. Installation of aluminum window walls and curtain walls is the "joint" work of glaziers and ironworkers, which require equal composite workforce.

- **IRONWORKERS**

Erection, installation and placement of structural steel, precast concrete, miscellaneous iron, ornamental iron, metal curtain wall, rigging and reinforcing steel. Handling, sorting, and installation of reinforcing steel (rebar). Metal bridge rail (traffic), metal bridge handrail, and decorative security fence installation. Installation of aluminum window walls and curtain walls is the "joint" work of glaziers and ironworkers which require equal composite workforce.

- **INSULATOR**

• Installing fire stopping systems/materials for "Penetration Firestop Systems": transit to cables, electrical conduits, insulated pipes, sprinkler pipe penetrations, ductwork behind radiation, electrical cable trays, fire rated pipe penetrations, natural polypropylene, HVAC ducts, plumbing bare metal, telephone and communication wires, and boiler room ceilings.

- **LABORERS**

Acetylene burners, asphalt rakers, chain saw operators, concrete and power buggy operator, concrete saw operator, fence and guard rail erector (except metal bridge rail (traffic), decorative security fence (non-metal).

installation.), hand operated concrete vibrator operator, mason tenders, pipelayers (installation of storm drainage or sewage lines on the street only), pneumatic drill operator, pneumatic gas and electric drill operator, powermen and wagon drill operator, air track operator, block paver, curb setters, blasters, concrete spreaders.

- **PAINTERS**

Maintenance, preparation, cleaning, blasting (water and sand, etc.), painting or application of any protective coatings of every description on all bridges and appurtenances of highways, roadways, and railroads. Painting, decorating, hardwood finishing, paper hanging, sign writing, scenic art work and drywall hhg for any and all types of building and residential work.

- **LEAD PAINT REMOVAL**

- Painter's Rate

1. Removal of lead paint from bridges.
2. Removal of lead paint as preparation of any surface to be repainted.
3. Where removal is on a Demolition project prior to reconstruction.

- Laborer's Rate

1. Removal of lead paint from any surface NOT to be repainted.
2. Where removal is on a *TOTAL* Demolition project only.

- **PLUMBERS AND PIPEFITTERS**

Installation, repair, replacement, alteration or maintenance of all plumbing, heating, cooling and piping. *\*License required per Connecticut General Statutes: P-1,2,6,7,8,9 J-1,2,3,4 SP-1,2 S-1,2,3,4,5,6,7,8/B-1,2,3,4 D-1,2,3,4.*

- **POWER EQUIPMENT OPERATORS**

Operates several types of power construction equipment such as compressors, pumps, hoists, derricks, cranes, shovels, tractors, scrapers or motor graders, etc. Repairs and maintains equipment. *\*License required, crane operators only, per Connecticut General Statutes.*

- **ROOFERS**

Covers roofs with composition shingles or sheets, wood shingles, slate or asphalt and gravel to waterproof roofs, including preparation of surface. (demolition or removal of any type of roofing and or clean-up of any and all areas where a roof is to be relaid.)

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

- **SHEETMETAL WORKERS**

Fabricate, assembles, installs and repairs sheetmetal products and equipment in such areas as ventilation, air-conditioning, warm air heating, restaurant equipment, architectural sheet metal work, sheetmetal roofing, and aluminum gutters. Fabrication, handling, assembling, erecting, altering, repairing, etc. of coated metal material panels and composite metal material panels when used on building exteriors and interiors as soffits, fascia, louvers, partitions, canopies, cornice, column covers, awnings, beam covers, cladding, sun shades, lighting troughs, spires, ornamental roofing, metal ceilings, mansards, copings, ornamental and ventilation hoods, vertical and horizontal siding panels, trim, etc. The sheet metal classification also applies to the vast variety of coated metal material panels and composite metal material panels that have evolved over the years as an alternative to conventional ferrous and non-ferrous metals like steel, iron, tin, copper, brass, bronze, aluminum, etc. Fabrication, handling, assembling, erecting, altering, repairing, etc. of architectural metal roof, standing seam roof, composite metal roof, metal and composite bathroom/toilet partitions, aluminum gutters, metal and composite lockers and shelving, kitchen equipment, and walk-in coolers. To include testing and air –balancing ancillary to installation and construction.

- **SPRINKLER FITTERS**

Installation, alteration, maintenance and repair of fire protection sprinkler systems.

***\*License required per Connecticut General Statutes: F-1,2,3,4.***

- **TILE MARBLE AND TERRAZZO FINISHERS**

Assists and tends the tile setter, marble mason and terrazzo worker in the performance of their duties.

- **TRUCK DRIVERS**

~How to pay truck drivers delivering asphalt is under REVISION~

Truck Drivers are requires to be paid prevailing wage for time spent "working" directly on the site. These drivers remain covered by the prevailing wage for any time spent transporting between the actual construction location and facilities (such as fabrication, plants, mobile factories, batch plant, borrow pits, job headquarters, tool yards, etc.) dedicated exclusively, or nearly so, to performance of the contract or project, which are so located in proximity to the actual construction location that it is reasonable to include them. ***\*License required, drivers only, per Connecticut General Statutes.***

***For example:***

- Material men and deliverymen are not covered under prevailing wage as long as they are not directly involved in the construction process. If, they unload the material, they would then be covered by prevailing wage for the classification they are performing work in: laborer, equipment operator, etc.
- Hauling material off site is not covered provided they are not dumping it at a location outlined above.
- Driving a truck on site and moving equipment or materials on site would be considered covered work, as this is part of the construction process.

➤ *Any questions regarding the proper classification should be directed to:*  
*Public Contract Compliance Unit*  
*Wage and Workplace Standards Division*  
*Connecticut Department of Labor*  
*200 Folly Brook Blvd, Wethersfield, CT 06109*  
*(860) 263-6543.*

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**



**Connecticut Department of Labor  
Wage and Workplace Standards Division  
FOOTNOTES**

⇒ Please Note: If the “Benefits” listed on the schedule for the following occupations includes a letter(s) (+ a or + a+b for instance), refer to the information below.

Benefits to be paid at the appropriate prevailing wage rate for the listed occupation.

If the “Benefits” section for the occupation lists only a dollar amount, disregard the information below.

**Bricklayers, Cement Masons, Cement Finishers, Concrete Finishers, Stone Masons**  
(Building Construction) and  
(Residential- Hartford, Middlesex, New Haven, New London and Tolland Counties)

- a. Paid Holiday: Employees shall receive 4 hours for Christmas Eve holiday provided the employee works the regularly scheduled day before and after the holiday. Employers may schedule work on Christmas Eve and employees shall receive pay for actual hours worked in addition to holiday pay.

**Elevator Constructors, Mechanics**

- a. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day, Christmas Day, plus the Friday after Thanksgiving.
- b. Vacation: Employer contributes 8% of basic hourly rate for 5 years or more of service or 6% of basic hourly rate for 6 months to 5 years of service as vacation pay credit.

**Glaziers**

- a. Paid Holidays: Labor Day and Christmas Day.

**Power Equipment Operators**

(Heavy and Highway Construction & Building Construction)

- a. Paid Holidays: New Year's Day, Good Friday, Memorial day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day, provided the employee works 3 days during the week in which the holiday falls, if scheduled, and if scheduled, the working day before and the working day after the holiday. Holidays falling on Saturday may be observed on Saturday, or if the employer so elects, on the preceding Friday.

**Ironworkers**

- a. Paid Holiday: Labor Day provided employee has been on the payroll for the 5 consecutive work days prior to Labor Day.

**Laborers (Tunnel Construction)**

- a. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day. No employee shall be eligible for holiday pay when he fails, without cause, to work the regular work day preceding the holiday or the regular work day following the holiday.

**Roofers**

- a. Paid Holidays: July 4<sup>th</sup>, Labor Day, and Christmas Day provided the employee is employed 15 days prior to the holiday.

**Sprinkler Fitters**

- a. Paid Holidays: Memorial Day, July 4th, Labor Day, Thanksgiving Day and Christmas Day, provided the employee has been in the employment of a contractor 20 working days prior to any such paid holiday.

**Truck Drivers**

(Heavy and Highway Construction & Building Construction)

- a. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas day, and Good Friday, provided the employee has at least 31 calendar days of service and works the last scheduled day before and the first scheduled day after the holiday, unless excused.

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 00520

AGREEMENT

THIS AGREEMENT, made this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_, by and between \_\_\_\_\_, hereinafter called "OWNER," acting herein through its \_\_\_\_\_, and \_\_\_\_\_ doing business as (a corporation) (a limited liability company) (a partnership) (a joint venture) (an individual)\* located in the (City) (Town)\* of \_\_\_\_\_, County of \_\_\_\_\_, and State of \_\_\_\_\_, hereinafter called "CONTRACTOR."

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned, to be made and performed by the OWNER, the CONTRACTOR hereby agrees with the OWNER to commence and complete the project described as follows:

**GREATER NEW HAVEN WATER POLLUTION CONTROL AUTHORITY  
NEW HAVEN PUMP STATIONS RESILIENCY IMPROVEMENTS PROJECT**

hereinafter called the project, for the sum of \_\_\_\_\_ Dollars and \_\_\_\_\_ cents (\$ \_\_\_\_\_) and all extra work in connection therewith under the terms as stated in the Contract Documents; and at its own proper cost and expense to furnish superintendence, labor, services, materials, equipment, plant, machinery, apparatus, appliances, tools, supplies, bailing, shoring, removal, and all other things necessary to complete the said project in accordance with the conditions and prices stated in Section 00410, FORM OF GENERAL BID, Section 00700, GENERAL CONDITIONS, Section 00800, SUPPLEMENTARY CONDITIONS, Section 00830, STATE REGULATIONS, the plans, which include all maps, plates, drawings, blue prints, and the specifications and all other contract documents therefore as prepared by Weston & Sampson Engineers, Inc., including all bid documents.

The CONTRACTOR hereby agrees to commence work under this contract on or before a date to be fixed in the written Notice to Proceed given by the OWNER to the CONTRACTOR and to fully complete the project within \_\_\_\_\_ consecutive days of the start date fixed in the Notice to Proceed. The CONTRACTOR further agrees to pay as liquidated damages the sum of \$ \_\_\_\_\_ for each consecutive calendar day thereafter during which the work has not been fully completed, as provided in the Liquidated Damages provisions of Section 00800, SUPPLEMENTARY CONDITIONS.

\*Strike out inapplicable terms.

The fair share goals for Minority/Women Business Enterprise participation for this contract are a minimum of three point zero percent (3.0%) Minority Business Enterprise (MBE) participation and five point zero percent (5.0%) Women Business Enterprise (WBE) participation, applicable to the total dollar amount paid for the construction contract. The CONTRACTOR shall take all affirmative steps necessary to achieve this goal, and shall provide reports documenting the portion of contract and subcontract dollars paid to MBEs and WBEs, and its efforts to achieve the goals, with each invoice submitted or at such greater intervals as specified by the Owner. The CONTRACTOR shall require similar reports from its subcontractors.

During the performance of this contract, the contractor agrees as follows:

The CONTRACTOR shall not discriminate against or exclude any person from participation herein on grounds of race, color, religious creed, national origin, sex, sexual orientation, ancestry, or age; and that it shall take affirmative actions to insure that applicants are employed, and that employees are treated during their employment, without regard to race, color, religious creed, national origin, sex, sexual orientation, ancestry, age, or handicapped status.

The CONTRACTOR shall not participate in or cooperate with an international boycott, as defined in Section 999 (b)(3) and (4) of the Internal Revenue Code of 1986, as amended.

Applicable provisions of Connecticut General Statutes and/or the United States Code and Code of Federal Regulations govern this Agreement and any provision in violation of the foregoing shall be deemed null, void and of no effect. Where conflict between Code of Federal Regulations and State laws and Regulations exist, the more stringent requirement shall apply.

The OWNER agrees to pay the CONTRACTOR in current funds for the performance of the Agreement, subject to additions and deductions, as provided in Section 00700, GENERAL CONDITIONS, and to make payments on account thereof as provided in Section 00700, GENERAL CONDITIONS and Section 00800, SUPPLEMENTARY CONDITIONS.

The Agreed upon DIRECT LABOR MARKUP (percentage) for Change Orders on this project shall be fifteen (15) percent.

The Contractor agrees that it will fully comply with Subpart C of 2 CFR Part 180 and 2 CFR Part 1532, entitled Responsibilities of Participants Regarding Transactions (Doing Business with Other Persons). The Contractor shall not award any subcontracts or purchase any materials from suppliers that appear on the Excluded Parties List System. The Contractor shall include this requirement in each subcontract and require it to be included in all subcontracts regardless of tier. The Contractor shall maintain reasonable records to demonstrate compliance with these requirements.

The Contractor acknowledges to and for the benefit of the Owner (“Purchaser”) and the State of Connecticut (the “State”) that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water Fund that have statutory requirements commonly known as “American Iron and Steel;” that requires all of the iron and steel products used in the project to be produced in the United States (“American Iron and Steel Requirement”) including iron and steel products provided by the Contactor pursuant to this Agreement. The

Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Purchaser or the State. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser). While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

Executive Orders: The Contract is subject to the provisions of Executive Order No. Three of Governor Thomas J. Meskill, promulgated June 16, 1971, concerning labor employment practices, Executive Order No. Seventeen of Governor Thomas J. Meskill, promulgated February 15, 1973, concerning the listing of employment openings and Executive Order No. Sixteen of Governor John G. Rowland promulgated August 4, 1999, concerning violence in the workplace, all of which are incorporated into and are made a part of the Contract as if they had been fully set forth in it.

IN WITNESS WHEREOF, the parties to these presents have executed this Agreement in six (6) counterparts, each of which shall be deemed an original, in the year and day first above mentioned.

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

AGREED:

\_\_\_\_\_, Connecticut  
(Owner)

By \_\_\_\_\_

\_\_\_\_\_  
(Name)

\_\_\_\_\_  
(Title)

\_\_\_\_\_  
(Contractor)

By \_\_\_\_\_

\_\_\_\_\_  
(Name)

\_\_\_\_\_  
(Title)

\_\_\_\_\_  
(Address)

\_\_\_\_\_  
(City and State)

Approved as to Form:

By \_\_\_\_\_  
(Owner, Counsel)

\_\_\_\_\_  
(Name)

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

Certificate of Owner's Attorney Regarding Contract Execution

I, the undersigned, \_\_\_\_\_, the duly authorized and acting legal representative of the Owner do hereby certify as follows:

I have examined the attached contracts and surety bonds and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements has been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with terms, conditions, and provisions thereof.

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Date)

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

CERTIFICATE OF VOTE  
(to be filed if Contractor is a Corporation)

I, \_\_\_\_\_, hereby certify that I am the duly qualified and acting Secretary of  
(Secretary of Corporation)  
\_\_\_\_\_ and I further certify that a meeting of the Directors of said company,  
(Name of Corporation)  
duly called and held on \_\_\_\_\_, at which all members were present and voting, the  
(Date of Meeting)  
following vote was unanimously passed:

VOTED: To authorize and empower

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

Anyone acting singly, to execute Forms of General Bid, Contracts or Bonds on behalf of the Corporation.

I further certify that the above vote is still in effect and has not been changed or modified in any respect.

By: \_\_\_\_\_  
(Secretary of Corporation)

A True Copy:

Attest: \_\_\_\_\_  
(Notary Public)

My Commission Expires: \_\_\_\_\_  
(Date)



END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2  
Specifications\Division 0\00520 - Agreement.docx

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

**PERFORMANCE BOND**

CONTRACTOR *(name and address):*

SURETY *(name and address of principal place of business):*

OWNER *(name and address):*

**CONSTRUCTION CONTRACT**

Effective Date of the Agreement:

Amount:

Description *(name and location):*

**BOND**

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract):*

Amount:

Modifications to this Bond Form:  None  See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

**CONTRACTOR AS PRINCIPAL**

**SURETY**

\_\_\_\_\_  
Contractor's Name and Corporate Seal

\_\_\_\_\_  
Surety's Name and Corporate Seal *(seal)*

By: \_\_\_\_\_  
Signature

By: \_\_\_\_\_  
Signature *(attach power of attorney)*

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

Attest: \_\_\_\_\_  
Signature

Attest: \_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

**Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.**

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

---

EJCDC® C-610, Performance Bond

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies,  
and American Society of Civil Engineers. All rights reserved. 2 of 3

---

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

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

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

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

3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

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

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

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

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

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

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be

secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

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

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

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

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

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

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

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

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

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

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

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

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

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

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

14. Definitions

14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages

to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

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

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

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

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

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

16. Modifications to this Bond are as follows:

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

**PAYMENT BOND**

CONTRACTOR *(name and address):*

SURETY *(name and address of principal place of business):*

OWNER *(name and address):*

**CONSTRUCTION CONTRACT**

Effective Date of the Agreement:

Amount:

Description *(name and location):*

**BOND**

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract):*

Amount:

Modifications to this Bond Form:  None  See Paragraph 18

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

**CONTRACTOR AS PRINCIPAL**

**SURETY**

\_\_\_\_\_  
 Contractor's Name and Corporate Seal *(seal)*

\_\_\_\_\_  
 Surety's Name and Corporate Seal *(seal)*

By: \_\_\_\_\_  
 Signature

By: \_\_\_\_\_  
 Signature *(attach power of attorney)*

\_\_\_\_\_  
 Print Name

\_\_\_\_\_  
 Print Name

\_\_\_\_\_  
 Title

\_\_\_\_\_  
 Title

Attest: \_\_\_\_\_  
 Signature

Attest: \_\_\_\_\_  
 Signature

\_\_\_\_\_  
 Title

\_\_\_\_\_  
 Title

**Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.**

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.
2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
5. The Surety's obligations to a Claimant under this Bond shall arise after the following:
  - 5.1 Claimants who do not have a direct contract with the Contractor,
    - 5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
    - 5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).
  - 5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to

satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.

7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
  - 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
  - 7.2 Pay or arrange for payment of any undisputed amounts.
  - 7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.
8. The Surety's total obligation shall not exceed the amount of the bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.
9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.
11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in

the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

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

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

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

#### 16. Definitions

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

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

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

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

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

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

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

18. Modifications to this Bond are as follows:



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.

## STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by



Issued and Published Jointly by

AMERICAN COUNCIL OF ENGINEERING COMPANIES



These General Conditions have been prepared for use with the Agreement Between Owner and Contractor for Construction Contract (EJCDC® C-520, Stipulated Sum, or C-525, Cost-Plus, 2013 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other.

To prepare supplementary conditions that are coordinated with the General Conditions, use EJCDC's Guide to the Preparation of Supplementary Conditions (EJCDC® C-800, 2013 Edition). The full EJCDC Construction series of documents is discussed in the Commentary on the 2013 EJCDC Construction Documents (EJCDC® C-001, 2013 Edition).

Copyright © 2013:

National Society of Professional Engineers  
1420 King Street, Alexandria, VA 22314-2594  
(703) 684-2882  
[www.nspe.org](http://www.nspe.org)

American Council of Engineering Companies  
1015 15th Street N.W., Washington, DC 20005  
(202) 347-7474  
[www.acec.org](http://www.acec.org)

American Society of Civil Engineers  
1801 Alexander Bell Drive, Reston, VA 20191-4400  
(800) 548-2723  
[www.asce.org](http://www.asce.org)

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

The copyright for this document is owned jointly by the three sponsoring organizations listed above. The National Society of Professional Engineers is the Copyright Administrator for the EJCDC documents; please direct all inquiries regarding EJCDC copyrights to NSPE.

NOTE: EJCDC publications may be purchased at [www.ejcdc.org](http://www.ejcdc.org), or from any of the sponsoring organizations above.

**STANDARD GENERAL CONDITIONS OF THE  
CONSTRUCTION CONTRACT**

**TABLE OF CONTENTS**

	<b>Page</b>
Article 1 – Definitions and Terminology .....	8
1.01    Defined Terms .....	8
1.02    Terminology .....	12
Article 2 – Preliminary Matters .....	13
2.01    Delivery of Bonds and Evidence of Insurance .....	13
2.02    Copies of Documents .....	13
2.03    Before Starting Construction .....	13
2.04    Preconstruction Conference; Designation of Authorized Representatives .....	14
2.05    Initial Acceptance of Schedules .....	14
2.06    Electronic Transmittals .....	14
Article 3 – Documents: Intent, Requirements, Reuse .....	15
3.01    Intent .....	15
3.02    Reference Standards .....	15
3.03    Reporting and Resolving Discrepancies .....	15
3.04    Requirements of the Contract Documents .....	16
3.05    Reuse of Documents .....	17
Article 4 – Commencement and Progress of the Work .....	17
4.01    Commencement of Contract Times; Notice to Proceed .....	17
4.02    Starting the Work .....	17
4.03    Reference Points .....	17
4.04    Progress Schedule .....	17
4.05    Delays in Contractor’s Progress .....	18
Article 5 – Availability of Lands; Subsurface and Physical Conditions; Hazardous Environmental Conditions .....	19
5.01    Availability of Lands .....	19
5.02    Use of Site and Other Areas .....	19
5.03    Subsurface and Physical Conditions .....	20
5.04    Differing Subsurface or Physical Conditions .....	21
5.05    Underground Facilities .....	22
5.06    Hazardous Environmental Conditions at Site .....	24

Article 6 – Bonds and Insurance .....	26
6.01 Performance, Payment, and Other Bonds .....	26
6.02 Insurance—General Provisions .....	26
6.03 Contractor’s Insurance .....	27
6.04 Owner’s Liability Insurance .....	30
6.05 Property Insurance .....	30
6.06 Waiver of Rights .....	32
6.07 Receipt and Application of Property Insurance Proceeds .....	33
Article 7 – Contractor’s Responsibilities .....	33
7.01 Supervision and Superintendence .....	33
7.02 Labor; Working Hours .....	33
7.03 Services, Materials, and Equipment .....	33
7.04 “Or Equals” .....	34
7.05 Substitutes .....	35
7.06 Concerning Subcontractors, Suppliers, and Other .....	36
7.07 Patent Fees and Royalties .....	38
7.08 Permits .....	38
7.09 Taxes .....	39
7.10 Laws and Regulations .....	39
7.11 Record Documents .....	39
7.12 Safety and Protection .....	39
7.13 Safety Representative .....	40
7.14 Hazard Communication Programs .....	41
7.15 Emergencies .....	41
7.16 Shop Drawings, Samples, and Other Submittals .....	41
7.17 Contractor’s General Warranty and Guarantee .....	43
7.18 Indemnification .....	44
7.19 Delegation of Professional Design Services .....	44
Article 8 – Other Work at the Site .....	45
8.01 Other Work .....	45
8.02 Coordination .....	46
8.03 Legal Relationships .....	46
Article 9 – Owner’s Responsibilities .....	47
9.01 Communications to Contractor .....	47

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

9.02	Replacement of Engineer .....	47
9.03	Furnish Data .....	47
9.04	Pay When Due.....	47
9.05	Lands and Easements; Reports, Tests, and Drawings.....	47
9.06	Insurance.....	47
9.07	Change Orders.....	47
9.08	Inspections, Tests, and Approvals.....	48
9.09	Limitations on Owner’s Responsibilities .....	48
9.10	Undisclosed Hazardous Environmental Condition.....	48
9.11	Evidence of Financial Arrangements.....	48
9.12	Safety Programs .....	48
Article 10	– Engineer’s Status During Construction.....	48
10.01	Owner’s Representative.....	48
10.02	Visits to Site.....	48
10.03	Project Representative.....	49
10.04	Rejecting Defective Work.....	49
10.05	Shop Drawings, Change Orders and Payments.....	49
10.06	Determinations for Unit Price Work.....	49
10.07	Decisions on Requirements of Contract Documents and Acceptability of Work .....	49
10.08	Limitations on Engineer’s Authority and Responsibilities.....	49
10.09	Compliance with Safety Program .....	50
Article 11	– Amending the Contract Documents; Changes in the Work .....	50
11.01	Amending and Supplementing Contract Documents .....	50
11.02	Owner Authorized Changes in the Work .....	51
11.03	Unauthorized Changes in the Work.....	51
11.04	Change of Contract Price .....	51
11.05	Change of Contract Times.....	52
11.06	Change Proposals .....	52
11.07	Execution of Change Orders.....	53
11.08	Notification to Surety.....	54
Article 12	– Claims.....	54
12.01	Claims .....	54
Article 13	– Cost of the Work; Allowances; Unit Price Work.....	55
13.01	Cost of the Work .....	55

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

13.02	Allowances .....	57
13.03	Unit Price Work .....	58
Article 14 – Tests and Inspections; Correction, Removal or Acceptance of Defective Work.....		59
14.01	Access to Work.....	59
14.02	Tests, Inspections, and Approvals.....	59
14.03	Defective Work.....	60
14.04	Acceptance of Defective Work.....	60
14.05	Uncovering Work .....	60
14.06	Owner May Stop the Work .....	61
14.07	Owner May Correct Defective Work.....	61
Article 15 – Payments to Contractor; Set-Offs; Completion; Correction Period.....		62
15.01	Progress Payments.....	62
15.02	Contractor’s Warranty of Title .....	65
15.03	Substantial Completion.....	65
15.04	Partial Use or Occupancy .....	66
15.05	Final Inspection .....	66
15.06	Final Payment.....	66
15.07	Waiver of Claims .....	68
15.08	Correction Period .....	68
Article 16 – Suspension of Work and Termination.....		69
16.01	Owner May Suspend Work.....	69
16.02	Owner May Terminate for Cause.....	69
16.03	Owner May Terminate for Convenience .....	70
16.04	Contractor May Stop Work or Terminate .....	70
Article 17 – Final Resolution of Disputes .....		71
17.01	Methods and Procedures.....	71
Article 18 – Miscellaneous .....		71
18.01	Giving Notice .....	71
18.02	Computation of Times.....	71
18.03	Cumulative Remedies .....	71
18.04	Limitation of Damages .....	72
18.05	No Waiver .....	72
18.06	Survival of Obligations .....	72
18.07	Controlling Law .....	72

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

## ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

### 1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. 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. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
  3. *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.
  4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
  5. *Bidder*—An individual or entity that submits a Bid to Owner.
  6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
  7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
  8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
  9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
  10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision



regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. (“CERCLA”); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5501 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. (“RCRA”); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 13.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *Engineer*—The individual or entity named as such in the Agreement.
21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.
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.
24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.
26. *Notice of Award*—The written notice by Owner to a Bidder of Owner’s acceptance of the Bid.
27. *Notice to Proceed*—A written notice 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.
28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor’s plan to accomplish the Work within the Contract Times.
30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
31. *Project Manual*—The written documents prepared for or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.
32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or “RPR” includes any assistants or field staff of Resident Project Representative.
33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals and the performance of related construction activities.
35. *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.
36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
37. *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, and such other lands furnished by Owner which are designated for the use of Contractor.

38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
39. *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.
40. *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.
41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.
42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
43. *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 by Contractor or a Subcontractor.
44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities), or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.
45. *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 but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
46. *Unit Price Work*—Work to be paid for on the basis of unit prices.
47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 *Terminology*

- A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent 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 information in the Contract Documents and with the design concept of the 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 Article 10 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 15.03 or 15.04).
- 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. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
- F. Unless stated otherwise in the Contract Documents, words or phrases that 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. *Bonds*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.
- C. *Evidence of Owner’s Insurance*: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

### 2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

### 2.03 *Before Starting Construction*

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), 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;
  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.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *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 2.03.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 provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.
- B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items

resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

### ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

#### 3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- 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.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

#### 3.02 *Reference Standards*

- A. Standards Specifications, Codes, Laws and Regulations
  - 1. Reference in the Contract Documents to standard specifications, manuals, reference standards, 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, reference standard, 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, reference standard, 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 part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, 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 part of the Contract Documents prepared by or for Engineer.

#### 3.03 *Reporting and Resolving Discrepancies*

- A. *Reporting Discrepancies:*
  - 1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer

any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then 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 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
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 had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
  - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); 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 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to



Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers 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 its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
  2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions 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.

**ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK**

4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Contract, whichever date is earlier.

4.02 *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 such date.

4.03 *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.

4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 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 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
  2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.
- B. 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 pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

#### 4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
  2. abnormal weather conditions;
  3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and
  4. acts of war or terrorism.
- D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.
- E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

- F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.
- G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

**ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS**

5.01 *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.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

- A. *Limitation on Use of Site and Other Areas:*
  - 1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
  - 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all 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 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 directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent 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.
- 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 and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading of 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 structures or land to stresses or pressures that will endanger them.

### 5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
  - 1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;
  - 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and
  - 3. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, 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. 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.

5.04 *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:
1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
  2. is of such a nature as to require a change in the Drawings or Specifications; or
  3. differs materially from that shown or indicated in the Contract Documents; or
  4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Possible Price and Times Adjustments:*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, 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 fall within any one or more of the categories described in Paragraph 5.04.A;
    - 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 Paragraph 13.03; and,

- c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
  - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
  - b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
  - c. Contractor failed to give the written notice as required by Paragraph 5.04.A.
3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

#### 5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent 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. Unless it is otherwise expressly provided in the Supplementary Conditions:
  1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and
  2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
    - a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
    - b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
    - c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
    - d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not

shown or indicated with reasonable accuracy, then 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 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

- C. *Engineer's Review:* Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Possible Price and Times Adjustments:*
1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
    - a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
    - 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 Paragraph 13.03;
    - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and
    - d. Contractor gave the notice required in Paragraph 5.05.B.
  2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
  3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

5.06 *Hazardous Environmental Conditions at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
  2. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors 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. 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.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous



Environmental Condition, and impose a set-off against payments to account for the associated costs.

- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. 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, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.
- H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the work performed by Owner's own forces or others in accordance with Article 8.
- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, 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 a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.H shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, 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 failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

## ARTICLE 6 – BONDS AND INSURANCE

### 6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, 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. 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 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.
- B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.
- C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.
- D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then 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 bond and surety requirements above.
- E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.
- F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

### 6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is maintaining the

policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

- D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, 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.
- G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.
- H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.
- I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.
- J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

### 6.03 Contractor's Insurance

- A. *Workers' Compensation:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:
  - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.
  - 2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).

3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).
  4. Foreign voluntary worker compensation (if applicable).
- B. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:
1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.
  2. claims for damages insured by reasonably available personal injury liability coverage.
  3. 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.
- C. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:
1. Products and completed operations coverage:
    - a. Such insurance shall be maintained for three years after final payment.
    - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
  2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
  3. Broad form property damage coverage.
  4. Severability of interest.
  5. Underground, explosion and collapse coverage.
  6. Personal injury coverage.
  7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.
  8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.
- D. *Automobile liability:* Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.
- E. *Umbrella or excess liability:* Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to

industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.

- F. *Contractor's pollution liability insurance:* Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.
- G. *Additional insureds:* The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, 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 (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.
- H. *Contractor's professional liability insurance:* If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.
- I. *General provisions:* The policies of insurance required by this Paragraph 6.03 shall:
1. include at least the specific coverages provided in this Article.
  2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.
  3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.
  4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.
  5. be appropriate for the Work being performed and provide protection from claims that 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.

- J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

#### 6.04 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.
- B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

#### 6.05 *Property Insurance*

- A. *Builder's Risk:* Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
  - 1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."
  - 2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.
  - 3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.

4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).
  5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
  6. extend to cover damage or loss to insured property while in transit.
  7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
  8. allow for the waiver of the insurer's subrogation rights, as set forth below.
  9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.
  10. not include a co-insurance clause.
  11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.
  12. include performance/hot testing and start-up.
  13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.
- B. *Notice of Cancellation or Change:* All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.
- C. *Deductibles:* The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.
- D. *Partial Occupancy or Use by Owner:* If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
- E. *Additional Insurance:* If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.
- F. *Insurance of Other Property:* If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an

employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

6.06 *Waiver of Rights*

- A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, 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 insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, 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 Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, 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 or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:
1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
  2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.
- D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, 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 builder's risk insurance and any other property insurance applicable to the Work.



6.07 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.
- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. 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 Change Order, if needed.

**ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES**

7.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- 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 except under extraordinary circumstances.

7.02 *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, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.03 *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, whether or not such items are specifically called for in the Contract Documents.

- B. All materials and equipment incorporated into the Work 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.

7.04 "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 Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item 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 is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.
  - 1. If Engineer in its sole discretion determines that 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, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:
    - a. in the exercise of reasonable judgment 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
      - 4) it is not objectionable to Owner.
    - 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.
- B. *Contractor's Expense:* Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is

complete and Engineer determines that the proposed item is an “or-equal”, which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

- D. *Effect of Engineer’s Determination:* Neither approval nor denial of an “or-equal” request shall result in any change in Contract Price. The Engineer’s denial of an “or-equal” request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.
- E. *Treatment as a Substitution Request:* If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an “or-equal” item, Contractor may request that Engineer consider the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 *Substitutes*

- A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.
  - 1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.
  - 2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
  - 3. 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:
    - a. shall certify that the proposed substitute item will:
      - 1) perform adequately the functions and achieve the results called for by the general design,
      - 2) be similar in substance to that specified, and
      - 3) be suited to the same use as that specified.
    - b. will state:
      - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,
      - 2) whether 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

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

- 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
  - c. will identify:
    - 1) all variations of the proposed substitute item from that specified, and
    - 2) available engineering, sales, maintenance, repair, and replacement services.
  - d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable 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.
- E. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination:* If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

#### 7.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.
- B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other

individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.

- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.
- E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, supplier, or other individual or entity.
- F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. 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 the right of Owner to the completion of the Work in accordance with the Contract Documents.
- H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be fully responsible to Owner and Engineer 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.
- J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.
- K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.
- L. 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.
- M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to

the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.

- N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.
- O. 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 create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

#### 7.07 *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 by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors 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 specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, 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.

#### 7.08 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all 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 the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

7.09 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.10 *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 or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer and the officers, directors, members, 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 such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 *Record Documents*

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

7.12 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.

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, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- 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 Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.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 at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- F. Contractor's duties and responsibilities for safety and protection 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 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
- G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

#### 7.13 *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.



7.14 *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.

7.15 *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 determines 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.

7.16 *Shop Drawings, Samples, and Other Submittals*

A. *Shop Drawing and Sample Submittal Requirements:*

1. Before submitting a Shop Drawing or Sample, Contractor shall have:
  - a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
  - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
  - c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
  - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
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 of that submittal, and that Contractor approves the 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 set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

- a. Contractor shall submit the number of copies required in the Specifications.
- 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 7.16.D.

2. *Samples:*
  - a. Contractor shall submit the number of Samples required in the Specifications.
  - b. Contractor shall 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 7.16.D.
3. 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. *Other Submittals:* Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.
- 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 information given in 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 or to safety precautions or programs incident thereto.
  3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
  4. Engineer's review and approval of a Shop Drawing or Sample 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 7.16.A.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 will document any such approved variation from the requirements of the Contract Documents in a Field Order.
  5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.
  6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
  7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, 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 to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
  1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
  2. normal wear and tear under normal usage.
- 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 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;
  6. the issuance of a notice of acceptability by Engineer;
  7. any inspection, test, or approval by others; or
  8. any correction of defective Work by Owner.

- D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

#### 7.18 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, 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, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by 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 officers, directors, members, partners, employees, agents, consultants, or subcontractors 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 7.18.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 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, 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.

#### 7.19 *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 Laws and Regulations.
- 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, 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, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this paragraph, 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 7.16.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

## ARTICLE 8 – OTHER WORK AT THE SITE

### 8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. 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 such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.
- D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, 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.

## 8.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
  - 1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
  - 2. an itemization of the specific matters to be covered by such authority and responsibility; and
  - 3. the extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

## 8.03 *Legal Relationships*

- A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner or any utility owner causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.
- C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.

- D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all 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 damage, delay, disruption, or interference.

## ARTICLE 9 – OWNER'S RESPONSIBILITIES

### 9.01 *Communications to Contractor*

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

### 9.02 *Replacement of Engineer*

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

### 9.03 *Furnish Data*

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

### 9.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

### 9.05 *Lands and Easements; Reports, Tests, and Drawings*

- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

### 9.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

### 9.07 *Change Orders*

- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *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.

9.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

**ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION**

10.01 *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.

10.02 *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 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 generally 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.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not



supervise, direct, control, or have authority over or 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.

10.03 *Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

10.04 *Rejecting Defective Work*

- A. Engineer has the authority to reject Work in accordance with Article 14.

10.05 *Shop Drawings, Change Orders and Payments*

- A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.
- B. 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, are set forth in Paragraph 7.19.
- C. Engineer's authority as to Change Orders is set forth in Article 11.
- D. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.06 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

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

- A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.08 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
- B. Engineer will not supervise, direct, control, or have authority over or 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. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

#### 10.09 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

### ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

#### 11.01 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
  - 1. *Change Orders:*
    - a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
    - b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.
  - 2. *Work Change Directives:* A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any

Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. *Field Orders*: Engineer may authorize minor changes in the Work if the changes 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. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

#### 11.02 *Owner-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. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

#### 11.03 *Unauthorized Changes in the Work*

- A. 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, except in the case of an emergency as provided in Paragraph 7.1B or in the case of uncovering Work as provided in Paragraph 14.05.

#### 11.04 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.
- B. 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, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or
  2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or
  3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).

- C. *Contractor's Fee*: When applicable, 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 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;
    - b. for costs incurred under Paragraph 13.01.B.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 Paragraphs 11.01.C.2.a and 11.01.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;
    - d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
    - 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 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.
- B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 *Change Proposals*

- A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures:* Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.
  2. *Engineer's Action:* Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.
  3. *Binding Decision:* Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- B. *Resolution of Certain Change Proposals:* If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

#### 11.07 Execution of Change Orders

- A. Owner and Contractor shall execute appropriate Change Orders covering:
1. 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;
  2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
  3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and
  4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.
- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

## 11.08 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety 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), 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.

## ARTICLE 12 – CLAIMS

### 12.01 *Claims*

- A. *Claims Process:* The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:
  - 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
  - 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and
  - 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.
- B. *Submittal of Claim:* The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.
- C. *Review and Resolution:* The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation:*
  - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.
  - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.
  - 3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

**ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK**

**13.01 Cost of the Work**

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
  1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
  2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:
  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 on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on 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, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

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 13.01.
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, as imposed by Laws and Regulations.
  - e. Deposits lost for 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. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes other than 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.



Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *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 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here 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 Paragraph 13.01.B.

D. *Contractor's Fee:* When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other 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 11.04.C.

E. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, 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.

#### 13.02 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*: Contractor agrees that:
  - 1. 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
  - 2. 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*: 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.

13.03 *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 Agreement.
- 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. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. 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 Owner and Contractor, subject to the provisions of the following paragraph.
- E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:
  - 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;
  - 2. there is no corresponding adjustment with respect to any other item of Work; and
  - 3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

## ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

### 14.01 Access to Work

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

### 14.02 Tests, Inspections, and Approvals

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.
- 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, obtaining, and paying for all inspections and tests required:
  - 1. by the Contract Documents unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
  - 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
  - 3. by manufacturers of equipment furnished under the Contract Documents;
  - 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
  - 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. 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, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to

cover the same and Engineer had not acted with reasonable promptness in response to such notice.

#### 14.03 *Defective Work*

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

#### 14.04 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

#### 14.05 *Uncovering Work*

- A. Engineer has the authority to require special inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then 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, and provide all necessary labor, material, and equipment.
1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages 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 pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
  2. 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, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *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 fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, 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, or employee or agent of any of them.

14.07 *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, 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, then 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 14.07, 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, 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 incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. 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 14.07.

**ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD**

15.01 *Progress Payments*

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 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 during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments:*
  - 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out 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 Contract Documents. 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, a warehouse bond, 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 legitimate obligations associated with prior Applications for Payment.
  - 3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.
- C. *Review of Applications:*
  - 1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, 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 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 generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and 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; or
    - b. 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. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
    - a. to supervise, direct, or control the Work or
    - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
    - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
    - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or
    - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
  5. 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 15.01.C.2.
  6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
    - a. the Work is defective, requiring correction or replacement;
    - b. the Contract Price has been reduced by Change Orders;
    - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
    - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

- e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due:*

- 1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner:*

- 1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
  - a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
  - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
  - c. Contractor has failed to provide and maintain required bonds or insurance;
  - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
  - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
  - f. the Work is defective requiring correction or replacement;
  - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
  - h. the Contract Price has been reduced by Change Orders;
  - i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
  - j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
  - k. Liens have been filed 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;
  - l. there are other items entitling Owner to a set off against the amount recommended.
- 2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, 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, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

#### 15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

#### 15.03 *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 and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- 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 preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

#### 15.04 *Partial Use or Occupancy*

- 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. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.
  - 2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work 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 therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of 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 6.05 regarding builder's risk or other property insurance.

#### 15.05 *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, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

#### 15.06 *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, annotated record

documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:
  - a. all documentation called for in the Contract Documents;
  - b. consent of the surety, if any, to final payment;
  - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
  - d. a list of all disputes that Contractor believes are unsettled; and
  - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, 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, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

**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 have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. 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 15.07. 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. *Completion of Work:*** The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.

**D. *Payment Becomes Due:*** Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation, including

but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

#### 15.07 *Waiver of Claims*

- A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

#### 15.08 *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 Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
  - 1. correct the defective repairs to the Site or such other adjacent areas;
  - 2. correct such defective Work;
  - 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 to 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. 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 repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, 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.

- E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

## ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

### 16.01 *Owner May Suspend Work*

- A. 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 written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

### 16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and 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);
  - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
  - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
  - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:
  - 1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and
  - 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, 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 complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.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 the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and

damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- F. 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, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

#### 16.03 *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. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

#### 16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven 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 16.03.
- 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 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for

expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

## ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

### 17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this Article:
1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
  2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this Article, Owner or Contractor may:
1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or
  2. agree with the other party to submit the dispute to another dispute resolution process; or
  3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

## ARTICLE 18 – MISCELLANEOUS

### 18.01 *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, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or
  2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

### 18.02 *Computation of Times*

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

### 18.03 *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. 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.

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

- A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

18.07 *Controlling Law*

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

18.08 *Headings*

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

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY



**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

- 1.1. 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.
- 2.2. Authorities having jurisdiction include but are not limited to City of New Haven, United Illuminating, 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.

3.0 Maintenance Bond

- 3.1. Contractor shall furnish a maintenance bond, in an amount at least equal to twenty-five (25%) percent of the Contract Price, in a form acceptable to the Owner insuring the Project for a period of two (2) years from the date of final acceptance.
- 3.2. Final payment shall be made only after the Contractor's having posted, and the Owner's acceptance of, a satisfactory maintenance bond. Nothing herein shall relieve the Contractor of payment provisions contained in the Contract Documents.

SECTION 00800

SUPPLEMENTARY CONDITIONS

TABLE OF CONTENTS

<u>Article Number</u>	<u>Title</u>
1	DEFINITIONS AND TERMINOLOGY
2	PRELIMINARY MATTERS
3	DOCUMENTS: INTENT, REQUIREMENTS, REUSE
4	COMMENCEMENT AND PROGRESS OF THE WORK
5	AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS
6	BONDS AND INSURANCE
7	CONTRACTOR'S RESPONSIBILITIES
8	OTHER WORK AT THE SITE
9	OWNER'S RESPONSIBILITIES
10	ENGINEER'S STATUS DURING CONSTRUCTION
11	AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK
12	CLAIMS
13	COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK
14	TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK
15	PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD
16	SUSPENSION OF WORK AND TERMINATION
17	FINAL RESOLUTION OF DISPUTES
18	MISCELLANEOUS

SUPPLEMENTARY CONDITIONS

AMENDMENTS TO GENERAL CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (EJCDC C-700, 2013 edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

ARTICLE 1. DEFINITIONS AND TERMINOLOGY

Delete the words "The individual or entity named as such in the Agreement" in 1.01.A.20 of the General Conditions, "Engineer", and insert the following in their place:

"The individual or entity duly appointed by the Owner to undertake the duties and powers herein assigned to the Engineer, acting either directly or through duly appointed representatives."

ARTICLE 2. PRELIMINARY MATTERS

SC-2.02

Delete paragraph 2.02A of the General Conditions in its entirety and insert the following in its place:

"A. Owner shall furnish to Contractor four (4) paper copies of the Contract Documents."

SC-2.03

"Delete paragraph 2.03 A.3 of the General Conditions and replace with the following:

3. A preliminary Schedule of Values for each lump sum item listed in the Bid, which includes quantities and prices of items which when added together equal the Lump Sum Bid Price and subdivides the Lump Sum Bid Item 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. At a minimum the following Items shall be subdivided from the work at the Fort Hale Pumping Station.

Temporary Bypass Pumping
Survey/layout
Precast Concrete Valve Vault
Bypass Connection
Demolition of Existing Piping and Equipment
Control Building
Structure Support
Metal Stairs and Platform
50 KVA Generator
Rigging - Crane

HVAC
Electrical
Instrumentation
Water Service
Site work - Site Restoration
Porous Pavement
Concrete Walk
Erosion Control
Fencing
Gate
Valve Vault and Wet Well Mechanical
6" Line Stop and Concrete Stop Collar.
4' Diameter Manholes
8" PVC Gravity Sewer
Submersible Pumps
Flow Meter
Lining of existing Wet Well

”

SC-2.05

“Delete paragraph 2.05 A.3 of the General Conditions and replace with the following:

3. Contractor’s Schedule of Values for lump sum items will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Lump Sum Price to the component parts of the Work associated with the lump sum item.”

ARTICLE 3. DOCUMENTS, INTENT, REQUIREMENTS, REUSE

SC-3.01

Add the following sentence at the end of Paragraph 3.01A of the General Conditions:

“...by all. Each and every provision of law and clause required by law to be inserted in these Contract Documents shall be deemed to be inserted herein, and they shall be read and enforced as though it were included herein, and if through mistake or otherwise, any such provision is not inserted, or if not correctly inserted, then upon the application of either party, the Contract Documents shall forthwith be physically amended to make such insertion.”

SC-3.03

Delete the last phrase of paragraph 3.03 A.3 of the General Conditions starting with “had”, and substitute the following:

“knew or reasonably should have known thereof.”

## ARTICLE 4. COMMENCEMENT AND PROGRESS OF THE WORK

### SC-4.01

Add a new paragraph immediately after paragraph 4.01A of the General Conditions which is to read as follows:

- “B. Notwithstanding the time limitations provided in paragraph 4.01A, the OWNER may desire to commence the Contract Times later than the ninetieth day after the bid opening. The OWNER and CONTRACTOR, upon mutual agreement, may extend the commencement of the Contract Times to any date that they elect. OWNER must obtain CONTRACTOR’s approval for extending the time beyond the dates/times stated in the Contract Documents.”

### SC-4.03

Add a new paragraph immediately after paragraph 4.03A of the General Conditions which is to read as follows:

- "B. Engineer may check the lines, elevations and reference marks set by Contractor, and Contractor shall correct any errors disclosed by such check. Such a check shall not be considered as approval of Contractor's work and shall not relieve Contractor of the responsibility for construction of the entire Work in accordance with the Contract Documents. Contractor shall furnish personnel to assist Engineer in checking lines and grades."

### SC-4.04

Add the following paragraph after paragraph 4.04B of the General Conditions:

- "C. The Contractor's resident superintendent shall attend monthly progress meetings at the site of the work with the Engineer and others as appropriate to review schedule status and such other pertinent subjects as may be listed on the agenda by the Engineer."

### SC-4.05

Add the following new paragraphs after paragraph 4.05G of the General Conditions:

“4.06 Liquidated Damages:

- A. If the Contractor shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part consideration for the awarding of this Contract, to pay to the Owner the amount specified in the Contract, not as a penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the Contract shall be in default after the time stipulated in the Contract for completing the work. Such damages may be retained from time to time by the Owner from progress payments or any amounts owing to the Contractor, or otherwise collected.

- B. The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be retained from time to time by the Owner from current periodical estimates.
- C. It is further agreed that time is of the essence of each and every portion of this Contract and of the specifications wherein as definite and certain length of times if fixed for the performance of any act whatsoever; and where under the Contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall be of the essence of this Contract. Provided that the Contractor shall not be charged with liquidated damages of any excess cost when the Owner determines that the Contractor is without fault and the Contractor's reasons for the time extension are acceptable to the Owner; Provided, further, that the Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due:
- 1) to any preference, priority or allocation order duly issued by the Government;
  - 2) to unforeseeable cause beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God, or of the public enemy, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and severe weather; and
  - 3) to any delays of subcontractors or suppliers occasioned by any of the causes specified in subsections C (1) and C (2) above;
- D. Provided, further, that the Contractor shall, within thirty (30) days from the beginning of such delay, unless the Owner shall grant a further period of time prior to the date of final settlement of the Contract, notify the Owner, in writing, of the causes of the delay, who shall ascertain the facts and extent of the delay and notify the Contractor within a reasonable time of its decision in the matter.

## ARTICLE 5. AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

### SC-5.03

Delete the term "Supplementary Conditions" of paragraph 5.03A of the General Conditions and replace it with "Contract Documents".

Delete the term "Supplementary Conditions" of paragraph 5.03B line 2 of the General Conditions and replace it with "Contract Documents".

### SC-5.05

Delete the following words from lines 3 and 4 of paragraph 5.05 E.1 of the General Conditions:

“...or was not shown or indicated with reasonable accuracy”

SC-5.06

Delete the term Supplementary Conditions in paragraph 5.06A of the General Conditions and replace it with “Contract Documents”.

Add the following to the first sentence of paragraph 5.06C:

“or unless Contractor caused or contributed to such Hazardous Environmental Condition.”

ARTICLE 6. BONDS AND INSURANCE

NOTICE TO CONTRACTOR:

1. Proof of Insurance coverage shall be furnished to the Owner in accordance with the schedule for submittal of Bonds and Agreements.
2. Additionally, refer to Article 2. PRELIMINARY MATTERS Paragraph SC-2.01 B of the General Conditions.

SC-6.01

Insert these sentences following SC-6.01A of the General Conditions: The Surety Company providing the bonds shall have a rating of A or better within the Best Key Rating Guide and be licensed by the Connecticut Insurance Department. The CONTRACTOR shall pay the premiums for such Bonds.

SC-6.02

Add “...prior to the start of this Project.” to the end of the first sentence of paragraph 6.02C

Delete paragraph 6.02D of the General Conditions in its entirety if Owner is not providing insurance policies, coverages or endorsements for the Work.

SC-6.03

Add the following to paragraph 6.03C:

“9. Independent Contractors Coverage.”

The limits of liability for the insurance required by paragraph 6.03 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by law:

6.03A Workers' Compensation.

	(1) Worker's Compensation per	Statutory Requirements
--	-------------------------------	------------------------

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

(2) Coverage B - Employer's Liability \$100,000/\$500,000/\$100,000

6.03B and 6.03C Commercial General Liability Limits shall include coverage for Independent Contractors (also known as Owners and Contractors Protective Liability), explosion, collapse and underground hazard coverage (XCU), broad form property damage, pollution, blanket contractual liability and products/completed operations. The general aggregate limits shall be endorsed so that they respond on a per project and per location basis.

Limits:

\$1,000,000 each occurrence

\$2,000,000 general aggregate

\$2,000,000 products/completed operations aggregate

6.03D Automobile Liability for owned, hired and non-owned vehicles

\$1,000,000 Bodily Injury and Property Damage combined single limit

6.03E Umbrella or Excess Liability

Combined single limit of not less than \$5,000,000 per occurrence and in the aggregate

6.03F Contractor's Pollution Liability

Provide pollution liability covering losses resulting in third party bodily injury, property damage, defense and clean costs in the amount of \$1,000,000 each incident and \$5,000,000 in the aggregate as a result of pollution conditions arising from contracting operations performed by or on behalf of the contractor. Such insurance can be provided on a project or blanket basis. If written on a claims made basis, such insurance shall and must be renewed after completion of the project for a period of no less than three years.

6.03H Contractor's Professional Liability

\$1,000,000 per claim and \$1,000,000 in the aggregate

Delete paragraph 6.03.I.3 of the General Conditions in its entirety and insert the following in its place:

“3. contain a provision that notice of cancellation of insurance be delivered in accordance with policy provisions. In addition, the Contractor and/or its insurance broker/agent shall immediately notify the Owner and Engineer should any insurance coverage be cancelled. The Contractor shall immediately stop work on the Project and shall not resume work until the Contractor provides evidence, to the Owner and Engineer, in the form of an acceptable insurance certificate, of new insurance coverage that replaces all cancelled coverage that is required for the Project.”

Add the following paragraphs to SC-6.03I of the General Conditions:



- “6. If the aggregate limits of liability indicated in Contractor's insurance provided in accordance with paragraph 6.03 are not sufficient to cover all claims for damages arising from its operations under this Contract and from any other work performed by it or if the commercial general liability insurance policy of insurance does not provide that the general aggregate limits apply on a per project and per location basis, Contractor shall have the policy amended so that the aggregate limits of liability required by this Contract will be available to cover all claims for damages due to operations under this Contract.
7. Include by endorsement that the insurer shall waive all rights of subrogation in favor of the Owner, Engineer and any other party named in the written contract against whom the insurer must agree to waive rights of subrogation.”

SC-6.04

Delete paragraph 6.04 of the General Conditions in its entirety.

SC-6.06

Delete paragraph 6.06 of the General Conditions in its entirety. SC-6.08

Add the following paragraph 6.08 after paragraph 6.07 of the General Conditions:

- "A. If Owner has any objection to the coverage afforded by or other provisions of the insurance required to be purchased and maintained by Contractor in accordance with this Article 6 on the basis of its not complying with the Contract Documents, Owner will notify Contractor in writing thereof within thirty days of the date of delivery of such certificates to Owner in accordance with paragraph 6.02C. Contractor will provide such additional information in respect of insurance provided by him as Owner may reasonably request."

## ARTICLE 7. CONTRACTOR'S RESPONSIBILITIES

SC-7.01

Delete paragraph 7.01B of the General Conditions in its entirety and replace with the following:

- "B. At the site of the Work the Contractor shall employ a full-time construction superintendent or foreman who shall have full authority to act for the Contractor. It is understood that such representative shall be acceptable to the Engineer and shall be one who will be continued in the capacity for the particular job involved unless the representative ceases to be on the Contractor's payroll. If at any time during the Work the representative is deemed by the Engineer to be no longer acceptable, the representative shall be promptly replaced by the Contractor. All communications to the superintendent or foreman shall be as binding as if given to the Contractor."

SC-7.07

Delete the second sentence in paragraph 7.07A of the General Conditions.

SC-7.12

In line 2 of paragraph 7.12C of the General Conditions change “Supplementary Conditions” to “Contract Documents”.

SC-7.13

Delete the text in parentheses at the end of the third sentence of paragraph 7.13B of the General Conditions.

SC-7.16

In paragraph 7.16D.1 of the General Conditions, delete the word “timely” from the first line.

SC-7.18

Change the phrase “negligent act or omission” to “negligent or wrongful act or omission” in line 11 of paragraph 7.18A of the General Conditions.

Add the following to the end of paragraph 7.18A of the General Conditions:

“The Contractor hereby acknowledges its obligation under the foregoing paragraph to indemnify the Engineer and Owner against judgments suffered because of the contractor's work and to assume the cost of defending the Engineer and Owner against claims as described in the foregoing paragraph.”

Delete paragraph 7.18C of the General Conditions in its entirety.

ARTICLE 9. OWNER'S RESPONSIBILITIES

SC-9.02

Delete the phrase “provided Contractor makes no reasonable objection to the replacement engineer” in paragraph 9.02A of the General Conditions.

SC-9.06

Delete paragraph 9.06A of the General Conditions in its entirety.

SC-9.09

Insert the following after the first sentence of paragraph 9.09A of the General Conditions:

“However, the Owner shall have the right to direct the Contractor to perform the Work according to any sequence schedule set forth in the Contract Documents or established pursuant thereto.”

## ARTICLE 10. ENGINEER'S STATUS DURING CONSTRUCTION

### SC-10.01

Add a new paragraph 10.01B after paragraph 10.01A of the General Conditions, which is to read as follows:

"B. Nothing contained in the Contract Documents shall be construed to create a contractual relationship of any kind (1) between the Engineer and Contractor, (2) between the Owner and a Subcontractor or Subcontractors, or (3) between any person or entities other than the Owner and Contractor. The Engineer shall, however, be entitled to performance and enforcement of obligations under the Contract Documents intended to facilitate performance of the Engineer's duties."

### SC-10.02

Insert the following at the end of paragraph 10.02B of the General Conditions:

"However, the Engineer shall have the right to direct the Contractor to perform the Work according to any sequence schedule set forth in the Contract Documents or established pursuant thereto."

### SC-10.03

Delete the last sentence of paragraph 10.03.

### SC-10.08

Insert the following after the first sentence of paragraph 10.08B of the General Conditions:

"However, the Engineer shall have the right to direct the Contractor to perform the Work according to any sequence schedule set forth in the Contract Documents or established pursuant thereto."

## ARTICLE 13. COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

Delete Article 13 of the General Conditions in its entirety and replace with the following:

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

- (1) If the total extended bid price [Estimated Quantity times the Bid Unit Price] of a particular item of Unit Price Work amounts to 5 percent or more of the Original Contract Price and the variation in the quantity of the particular item of Unit Price Work performed by Contractor differs by more than 15 percent from the estimated quantity of such item indicated in the Agreement; and
- (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, Contractor may make a claim for an adjustment in the Contract Price in accordance with Article 12 if the parties are unable to agree as to the effect of any such variations in the quantity of Unit Price Work performed. If Owner believes that the quantity variation entitles Owner to an adjustment in the unit price, Owner shall be entitled to an adjustment in the unit price in an amount determined by the Engineer. Engineer shall not be liable in connection with any determination relating to adjustments which is rendered in good faith."

ARTICLE 14. TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

SC-14.03

Delete the word "Prompt" at the beginning of paragraph 14.03C of the General Conditions.

SC-14.07

Revise paragraph 14.07A of the General Conditions as follows:

- A. Delete the word "seven" and replace it with the word "ten" so that it reads "after ten days' written notice to Contractor."

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

ARTICLE 15. PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

SC-15.01

Delete paragraph 15.01B.3 of the General Conditions and insert the following in its place:

- "3. Retainage with respect to progress payments will be five percent or, if stipulated, the maximum allowed by law."

Delete the word "immediate" from subparagraph 15.01E.2 of the General Conditions.

Delete subparagraph 15.01E.3 of the General Conditions in its entirety.

SC-15.02

Delete paragraph 15.02A in its entirety and insert the following in its place:

- "A. Contractor warrants and guarantees that title to all work, material and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than at the time of Application for Payment free and clear of all liens. Contractor shall provide written transfer of title and a certified paid invoice provided by the supplier."

SC-15.03

Delete the third sentence of paragraph 15.03C of the General conditions and replace it with the following:

"Owner shall review the preliminary certificate and make written objection to Engineer as to any provisions of the certificate or attached punch list."

In the same paragraph, delete the phrase "within 14 days after submission of the preliminary certificate to Owner" in the fourth sentence; delete the phrase "within said 14 days" in the fifth sentence.

SC-15.06

Delete from paragraph 15.06B.1 of the General Conditions the phrase "within 10 days after receipt of the final Application for Payment," in the first sentence.

SC-15.08

Delete paragraph 15.08A of the General Conditions and insert the following in its place:

- "A. If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or 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, Contractor shall promptly, without cost to Owner and in

accordance with Owner's written instructions: (i) correct such defective work, or, if it has been rejected by Owner, remove it from the site and replace it with work that is not defective, and (ii) satisfactorily correct or remove and replace any damage to other work or the work of others therefrom. If Contractor does not begin the repairs within ten (10) days of receipt of written notification and promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk, loss or damage, Owner may have the defective work corrected or the rejected work removed and replaced, and all claims, costs, losses and damages caused by or resulting from such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor."

## ARTICLE 16. SUSPENSION OF WORK AND TERMINATION

### SC-16.02

Add a new paragraph immediately after paragraph 16.02 A.4 of the General Conditions which is to read as follows:

"5. If the Work to be done under this Contract shall be abandoned, or if this Contract or any part thereof shall be sublet, without the previous written consent of Owner, or if the contract or any claim thereunder shall be assigned by Contractor other wise than as herein specified."

## ARTICLE 18. MISCELLANEOUS

### SC-18.09, 18.10, 18.11, 18.12, 18.13

Add the following new paragraphs after paragraph 18.08 of the General Conditions:

"18.09 Assignment:

A. The Contractor shall not assign the whole or any part of this Contract or any moneys due or to become due hereunder until thirty (30) days prior notice in writing has been given to the Owner of the intention to assign, which notice shall state the identity and address of the prospective assignee. No assignment shall be made without the Owner's prior written consent. Such consent shall not be unreasonably withheld. In case the Contractor assigns all or any part of the moneys due or to become due under this Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any moneys due or to become due to the Contractor shall be subject to prior claims of all persons, firms and corporations of services rendered or materials supplied for the performance of the work called for in this Contract.

### 18.10 Liability

It is understood and agreed that members of the Owner or any agent or employees of the Owner signing this Agreement shall not be personally liable hereunder for any action incurred in connection with this Agreement.

### 18.11 State Statutes and Regulations

See Section 00830 of these Specifications for further modifications of the General Conditions due to state statutes and regulations.

### 18.12 Severability

If any provision of this Agreement shall be invalid or unenforceable to any extent or in any application, then the remainder of this Agreement and of such terms and conditions, except to such extent or in such application, shall not be affected thereby, and each and every term and condition of this Agreement shall be valid and enforced to the fullest extent and in the broadest application permitted by law."

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 0\00800 - Supplemental Conditions.docx

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

SECTION 00810

FEDERAL REGULATIONS

DAVIS BACON WAGES CONTRACT PROVISIONS

Any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the FY 2010 appropriation, the following clauses:

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

Subrecipients may obtain wage determinations from the U.S. Department of Labor's web site, [www.dol.gov](http://www.dol.gov).

(ii)(A) The subrecipient(s), on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:



(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the subrecipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the subrecipient (s) to the State award official. The State award official will transmit the request, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the subrecipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The subrecipient(s), shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written

notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

- (1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;
- (2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;
- (3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.
- (C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.
- (D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 251 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees--

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than

the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may be appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Subrecipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

#### **4. Contract Provision for Contracts in Excess of \$100,000.**

(a) Contract Work Hours and Safety Standards Act. The subrecipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (a)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard

workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The subrecipient, upon written request of the EPA Award Official or an authorized representative of the Department of Labor, shall withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (a)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (a)(1) through (4) of this section.

(b) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Subrecipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Subrecipient shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 00820

CHANGE ORDERS

Policy:

This section supplements Article 11, Amending the Contract Documents; Changes in Work, in the General Conditions and Supplementary Conditions.

All executed change orders submitted to the Engineer for review and processing must be prepared in accordance with the change order format (see Appendix A) with the appropriate number of copies, calculation sheet(s) (Example found in Appendix B) and all other supporting documentation necessary for evaluation. Failure to comply with these instructions will result in delays in processing the change order.

In order to avoid possible delays with approval of change orders at the beginning of the project and as circumstances warrant, the Contractor shall submit a list of construction equipment, identifying major pieces of equipment to be utilized on the project. The list shall include the Contractor's designation, if any, the manufacturer, model, year of manufacture, serial number, size and horsepower of equipment. The Contractor shall also provide for approval a proposed bluebook equipment rental rate development that separately lists for each piece of equipment the monthly rental rate, area adjustment factor, depreciation factor, estimated operating cost per hour and total hourly rate. In the event the Contractor fails or is unable to provide appropriate rate information the Engineer may develop equipment rental rates for use on change orders.

Payment of Change Orders:

Payment of all change orders shall be in accordance with the relevant provisions of Connecticut legal requirements as amended from time to time.

Change order requests shall be made in accordance with one of the following methods in accordance with the procedures and requirements set forth in the Regulations of Connecticut State Agencies Section 22a-482-4 (k) and Article 11 of Section 00700, GENERAL CONDITIONS:

- (A) Unit prices.
  - (ii) New items. Unit prices of new items shall be negotiated.
- (B) A lump sum to be negotiated.
- (C) Cost reimbursement. The actual cost for labor, direct overhead, materials, supplies, equipment, and other services necessary to complete the work plus an amount to be agreed upon to cover the cost of general overhead and profit to be negotiated.

The maximum allowable overhead and profit markup on labor and materials costs for work completed by the Contractor shall be 15%. The maximum allowable markup on costs incurred by Contractor for work completed by Subcontractor shall be 5%.

*This change order will be prepared in such manner as to clearly separate Eligible and Ineligible Costs. The Contractor shall furnish itemized statements of the cost of the work ordered and shall give the Engineer access to all accounts, bills and vouchers relating thereto; and unless the Contractor shall furnish such itemized statements, and access to all accounts, bills and vouchers, he shall not be entitled to payment for any items of extra work for which such information is sought by the Engineer.*

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**



APPENDIX A  
CHANGE ORDER

Sheet \_\_ of

Date \_\_\_\_\_

Project No. \_\_\_\_\_

Contract No. \_\_\_\_\_

Change Order No. \_\_\_\_\_

Owner's Name: \_\_\_\_\_

Owner's Address: \_\_\_\_\_

Contractor's Name: \_\_\_\_\_

Contractor's Address: \_\_\_\_\_

Item 1:

Description of Change: \_\_\_\_\_

Reason for Change: \_\_\_\_\_

Backup Information: \_\_\_\_\_

Cost: \$ \_\_\_\_\_

Item 2

Description of Change: \_\_\_\_\_

Reason for Change: \_\_\_\_\_

Backup Information: \_\_\_\_\_

Cost: \$ \_\_\_\_\_

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

Change Order (Continued)

Sheet \_\_\_ of

Date \_\_\_\_\_

Project No. \_\_\_\_\_

Contract No. \_\_\_\_\_

Change Order No. \_\_\_\_\_

Contract Amount (As Bid) \$ \_\_\_\_\_

Amount of Previous Change Orders \$ \_\_\_\_\_

Net Change in Contract Price (this Change Order) \$ \_\_\_\_\_

Total Adjusted Contract Price (including this Change Order) \$ \_\_\_\_\_

This Change Order extends the time to complete the work by \_\_\_\_\_ calendar days.

The extended completion date is \_\_\_\_\_.

This Change Order checked by: \_\_\_\_\_  
Resident Representative Date

This Change Order is requested by: \_\_\_\_\_

This Change Order is recommended by: \_\_\_\_\_

Consultant Engineer P.E. # Date

The undersigned agree to the terms of the Change Order.

Contractor Date

Owner Date

Do not write below this space: this space reserved for STATE AGENCY APPROVAL

Appendix B  
Example Calculation Sheet

1.	Labor			
	Foreman	10 hours @	\$45.50/hour	\$292.50
	Operator	10 hours @	38.24/hour	382.40
	Laborers	24 hours @	29.25/hour	<u>702.00</u>
				\$1,376.90
2.	Fringe Benefits (Direct Labor Cost)			
	Foreman	10 hours @	\$24.50/hour	\$245.00
	Operator	10 hours @	24.05/hour	240.50
	Laborers	24 hours @	19.50/hour	<u>468.00</u>
				\$953.50
3.	Materials & Freight			
	150 l.f. of 12" pipe @ \$2.00/l.f.			300.00
	15 v.f. precast SMH			1,700.00
	Freight (slip# ___ enclosed)			<u>25.00</u>
				\$2,025.00
4.	Equipment			
	1 Backhoe	10 hours @	\$ 80.00/hour	\$ 800.00
	1 Truck-crane	10 hours @	100.00/hour	<u>1000.00</u>
				\$1800.00
	<b>TOTAL (items 1 through 4):</b>			<b>\$6,155.40</b>
5.	(15%) markup for Overhead, Profit			
	(15%) of \$6,155.40			\$ 923.31
6.	(5 %) markup on subcontractor's cost for general contractor (if subcontractor is involved)			
	Subcontractor invoice (to be attached)			\$4,407.00
	(5 %) of \$4,407 (from subcontractor's invoice)			\$ 220.35
7.	Credits (deductables)			-\$323.00
	<b>TOTAL COST:</b>			<b>\$11,383.06</b>

**Reminder:** Provide support documentation as necessary i.e. vouchers, correspondence, calculation, photographs, reports.

END OF SECTION

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 00830

STATE REGULATIONS

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

STATE OF CONNECTICUT

BY HIS EXCELLENCY

THOMAS J. MESKILL

GOVERNOR

EXECUTIVE ORDER NO. THREE

WHEREAS, sections 4-61d(b) and 4-114a of the 1969 supplement to the general statutes require nondiscrimination clauses in state contracts and subcontracts for construction on public buildings, other public works and goods and services, and

WHEREAS, section 4-61e(c) of the 1969 supplement to the general statutes requires the labor department to encourage and enforce compliance with this policy by both employers and labor unions, and to promote equal employment opportunities, and

WHEREAS, the government of this state recognizes the duty and desirability of its leadership in providing equal employment opportunity, by implementing these laws,

NOW, THEREFORE, I, THOMAS J. MESKILL, Governor of the State of Connecticut, acting by virtue of the authority vested in me under section twelve of article fourth of the constitution of the state, as supplemented by section 3-1 of the general statutes, do hereby ORDER and DIRECT, as follows, by this Executive Order:

The labor commissioner shall be responsible for the administration of this Order and shall adopt such regulations as he deems necessary and appropriate to achieve the purposes of this Order. Upon the promulgation of this Order, the commissioner of finance and control shall issue a directive forthwith to all state agencies, that henceforth all state contracts and subcontracts for construction on public buildings, other public works and goods and services shall contain a provision rendering such contract or subcontract subject to this Order, and that such contract or subcontract may be cancelled, terminated or suspended by the labor commissioner for violation of or noncompliance with this Order or state or federal laws concerning nondiscrimination, notwithstanding that the labor commissioner is not a party to such contract or subcontract.

II

Each contractor having a contract containing the provisions prescribed in section 4-114a of the 1969 supplement to the general statutes, shall file, and shall cause each of his subcontractors to file, compliance reports with the contracting agency or the labor commissioner, as may be directed such reports shall be filed within such times and shall contain such information as to employment policies and statistics of the contractor and each subcontractor, and shall be in such form as the labor commissioner may prescribe. Bidders or prospective contractors or subcontractors may be required to state whether they have participated in any previous contract subject to the provisions of this Order or any preceding similar Order, and in that

event to submit on behalf of themselves and their proposed subcontractors compliance reports prior to or as an initial part of their bid or negotiation of a contract.

### III

Whenever the contractor or subcontractor has a collective bargaining agreement or other contract or understanding with a labor organization or employment agency as defined in section 31-122 of the general statutes, the compliance report shall identify the said organization or agency and the contracting agency or the labor commissioner may require a compliance report to be filed with the contracting agency or the labor commissioner, as may be directed, by such organization or agency, signed by an authorized officer or agent of such organization or agency, with supporting information, to the effect that the signer's practices and policies, including but not limited to matters concerning personnel, training, apprenticeship, membership, grievance and representation, and upgrading, do not discriminate on grounds of race, color, religious creed, age, sex or national origin, or ancestry of any individual, and that the signer will either affirmatively cooperate in the implementation of the policy and provisions of this Order or that it consents and agrees that recruitment, employment and the terms and conditions of employment under the proposed contract shall be in accordance with the purposes and provisions of the Order.

### IV

The labor commissioner may by regulation exempt certain classes of contracts, subcontracts or purchase orders from the implementation of this Order, for standard commercial supplies or raw materials, for less than specified amounts of money or numbers of workers or for subcontractors below a specified tier. The labor commissioner may also provide by regulation for the exemption of facilities of a contractor which are in all respects separate and distinct from activities of the contractor related to the performance of the state contract, provided only that such exemption will not interfere with or impede the implementation of this Order, and provided further, that in the absence of such an exemption, all facilities shall be covered by the provisions of this Order.

### V

Each contracting agency shall be primarily responsible for obtaining compliance with the regulations of the labor commissioner with respect to contracts entered into by such agency or its contractors. All contracting agencies shall comply with the regulations of the labor commissioner in discharging their primary responsibility for securing compliance with the provisions of contracts and otherwise with the terms of this Order and of the regulations of the labor commissioner issued pursuant to this Order. They are directed to cooperate with the labor commissioner and to furnish the labor commissioner such information and assistance as he may require in the performance of his functions under this Order. They are further directed to appoint or designate from among the personnel of each agency, compliance officers, whose duty shall be to seek compliance with the objectives of this Order by conference, conciliation, mediation, or persuasion.

### VI

The labor commissioner may investigate the employment practices and procedures of any state contractor or subcontractor and the practices and policies of any labor organization or employment agency hereinabove described, relating to employment under the state contract, as concerns nondiscrimination by such

organization or agency as hereinabove described, or the labor commissioner may initiate such investigation by the appropriate contract agency, to determine whether or not the contractual provisions hereinabove specified or statutes of the state respecting them have been violated. Such investigation shall be conducted in accordance with the procedures established by the labor commissioner and the investigating agency shall report to the labor commissioner any action taken or recommended.

VII

The labor commissioner shall receive and investigate or cause to be investigated complaints by employees or prospective employees of a state contractor or subcontractor or members or applicants for membership or apprenticeship or training in a labor organization or employment agency hereinabove described, which allege discrimination contrary to the contractual provisions specified hereinabove or state statutes requiring nondiscrimination in employment opportunity. If this investigation is conducted for the labor commissioner by a contracting agency, that agency shall report to the labor commissioner what action has been taken or is recommended with regard to such complaints

VIII

The labor commissioner shall use his best efforts, directly and through contracting agencies, other interested federal, state and local agencies, contractors and all other available instrumentalities, including the commission on human rights and opportunities, the executive committee on human rights and opportunities, and the apprenticeship council under its mandate to provide advice and counsel to the labor commissioner in providing equal employment opportunities to all apprentices and to provide training, employment and upgrading opportunities for disadvantaged workers, in accordance with section 31-51(d) of the 1969 supplement to the general statutes, to cause any labor organization or any employment agency whose members are engaged in work under government contracts or referring workers or providing or supervising apprenticeship or training for or in the course of work under a state contract or subcontract to cooperate in the implementation of the purposes of this Order. The labor commissioner shall in appropriate cases notify the commission on human rights and opportunities or other appropriate state or federal agencies whenever it has reason to believe that the practices of any such organization or agency violate equal employment opportunity requirements of state or federal law.

IX

The labor commissioner or any agency officer or employee in the executive branch designated by regulation of the labor commissioner may hold such hearings, public or private, as the labor commissioner may deem advisable for compliance, enforcement or educational purposes under this Order.

X

- a) The labor commissioner may hold or cause to be held hearings, prior to imposing ordering or recommending the imposition of penalties and sanctions under this Order. No order for disbarment of any contractor from further state contracts shall be made without affording the contractor an opportunity for a hearing. In accordance with such regulations as the labor commissioner may adopt, the commissioner or the appropriate contracting agency may:

- 1. Publish or cause to be published the names of contractors or labor



organizations or employment agencies as hereinabove described which it has concluded have complied or failed to comply with the provisions of this Order or the regulations of the labor commissioner in implementing this Order.

2. Recommend to the commission on human rights and opportunities that in cases in which there is substantial or material violation or threat thereof of the contractual provision or related state statutes concerned herein, appropriate proceedings be brought to enforce them, including proceedings by the commission on its own motion under chapter 563 of the general statutes and the enjoining, within the limitations of applicable law, of organizations, individuals or groups who prevent directly or indirectly or seek to prevent directly or indirectly compliance with the provisions of this Order.
3. Recommend that criminal proceedings be brought under chapter 939 of the general statutes.
4. Cancel, terminate, suspend or cause to be cancelled, terminated, or suspended in accordance with law any contract or any portion or portions thereof for failure of the contractor or subcontractor to comply with the nondiscrimination provisions of the contract. Contracts may be cancelled, terminated, suspended absolutely or their continuance conditioned upon a program for fixture compliance approved by the contracting agency.
5. Provide that any contracting agency shall refrain from entering into any further contracts or extensions or modifications of existing contracts with any contractor until he has satisfied the labor commissioner that he has established and will carry out personnel and employment policies compliant with this Order.
6. Under regulations prescribed by the labor commissioner each contracting agency shall make reasonable efforts within a reasonable period of time to secure compliance with the contract provisions of this Order by methods of conference conciliation, mediation or persuasion, before other proceedings shall be instituted under this Order or before a state contract shall be cancelled or terminated in whole or in part for failure of the contractor or subcontractor to comply with the contract provisions of state statute and this Order.

- b) Any contracting agency taking any action authorized by this Order, whether on its own motion or as directed by the labor commissioner or pursuant to his regulations shall promptly notify him of such action. Whenever the labor commissioner makes a determination under this Order, he shall promptly notify the appropriate contracting agency and other interested federal, state and local agencies of the action recommended. The state and local agency or agencies shall take such action and shall report the results thereof to the labor commissioner within such time as he shall specify.

XI

If the labor commissioner shall so direct, contracting agencies shall not enter into contracts with any bidder or prospective contractor unless he has satisfactorily complied with the provisions of this Order, or submits a program, for compliance acceptable to the labor commissioner, or if the labor commissioner so authorizes, to the contracting agency.

XII

Whenever a contracting agency cancels or terminates a contract, or a contractor has been disbarred from, further government contracts because of noncompliance with the contract provisions with regard to nondiscrimination, the labor commissioner or the contracting agency shall rescind such disbarment, upon the satisfaction of the labor commissioner that the contractor has purged himself of such noncompliance and will thenceforth carry out personnel and employment policies of nondiscrimination in compliance with the provision of this order.

XIII

The labor commissioner may delegate to any officer, agency or employee in the executive branch any function or duty of the labor commissioner under this Order except authority to promulgate regulations of a general nature.

XIV

This Executive Order supplements the Executive Order issued on September 28, 1967. All regulations, orders, instructions, designations and other directives issued heretofore in these premises, including those issued by the heads of various departments or agencies under or pursuant to prior order or statute, shall remain in full force and effect, unless and until revoked or superseded by appropriate authority, to the extent that they are not inconsistent with this Order.

This Order shall become effective thirty days after the date of this Order.

Dated at Hartford, Connecticut, this 16<sup>th</sup> day of June, 1971.

Thomas J. Meskill, GOVERNOR

Filed this \_\_\_\_ day of June, 1971.

SECRETARY OF THE STATE (DEPUTY)

STATE OF CONNECTICUT

BY HIS EXCELLENCY

THOMAS J. MESKILL

GOVERNOR

EXECUTIVE ORDER NO. SEVENTEEN

WHEREAS, Section 31-237 of the General Statutes of Connecticut as amended requires the maintaining of the established free services of the Connecticut State Employment Service to both employers and prospective employees and

WHEREAS, Section 31-5 of the General Statutes of Connecticut requires that no compensation or fee shall be charged or received directly or indirectly for the services of the Connecticut State Employment Service and

WHEREAS, large numbers of our citizens who have served in the Armed Forces of our nation are returning to civilian life in our state and seeking employment in civilian occupations and

WHEREAS, we owe a duty as well as gratitude to these returning veterans including the duty to find suitable employment for them and

WHEREAS, many of our handicapped citizens are fully capable of employment and are entitled to be placed in suitable employment and

WHEREAS, many of the citizens of our state who are unemployed are unaware of the job openings and employment opportunities which do in fact exist in our state and

WHEREAS, notwithstanding the free services of the Connecticut State Employment Service, many of our Connecticut employers do not use its free services or do not avail themselves fully of all of the services offered,

NOW, THEREFORE, I THOMAS J. MESKILL, Governor of the State of Connecticut, acting by virtue of the authority vested in me under the fourth article of the Constitution of the State and in accordance with Section 3-1 of the General Statutes, do hereby ORDER and DIRECT, as follows, by this Executive Order:

I

The Labor Commissioner shall be responsible for the administration of this Order and shall do all acts necessary and appropriate to achieve its purpose. Upon promulgation of this Order, the Commissioner of Finance and Control shall issue a directive forthwith to all state agencies, that henceforth all state contracts and subcontracts for construction on public buildings, other public works and goods and services shall contain a provision rendering such contract or subcontract subject to this Order, and that such contract or subcontract may be cancelled, terminated or suspended by the Labor Commissioner for violation of or

noncompliance with this Order, notwithstanding that the Labor Commissioner is not a party to such contract or subcontract.

II

Every contractor and subcontractor having a contract with the State or any of its agencies, boards, commissions, or departments, every individual partnership, corporation, or business entity having business with the state or who or which seeks to do business with the state, and every bidder or prospective bidder who submits a bid or replies to an invitation to bid on any state contract shall list all employment openings with the office of the Connecticut State Employment Service in the area where the work is to be performed or where the services are to be rendered.

III

All state contracts shall contain a clause which shall be a condition of the contract that the contractor and any subcontractor holding a contract directly under the contractor shall list all employment openings with the Connecticut State Employment Service. The Labor Commissioner may allow exceptions to listings of employment openings which the contractor proposes to fill from within its organizations from employees on the rolls of the contractor on the date of publication of the invitation to bid or the date on which the public announcement was published or promulgated advising of the program concerned.

IV

Each contracting agency of the state shall be primarily responsible for obtaining compliance with this Executive Order. Each contracting agency shall appoint or designate from among its personnel one or more persons who shall be responsible for compliance with the objectives of the Order.

V

The Labor Commissioner shall be and is hereby empowered to inspect the books, records, payroll and personnel data of each individual or business entity subject to this Executive Order and may hold hearings or conferences, formal or informal, in pursuance of the duties and responsibilities hereunto delegated to the Labor Commissioner.

VI

The Labor Commissioner or any agency officer or employee in the executive branch designated by regulation of the Labor Commissioner may hold such hearings, public or private, as the Labor Commissioner may deem advisable for compliance, enforcement or educational purposes under this Order.

VII

- a) The Labor Commissioner may hold or cause to be held hearings, prior to imposing, ordering, or recommending the imposition of penalties and sanctions under this Order. In accordance herewith, the Commissioner or the appropriate contracting agency may suspend, cancel, terminate, or cause to be suspended, cancelled, or terminated in accordance with law any contract or any portion or portions thereof for failure of the contractor or subcontractor to comply with the listing provisions

of the contract. Contracts may be cancelled, terminated, suspended absolutely or their continuance conditioned upon a program for future compliance approved by the contracting agency.

- b) Any contracting agency taking any action authorized by this Order, whether on its own motion or as directed by the Labor Commissioner, shall promptly notify him of such action. Whenever the Labor Commissioner makes a determination under this Order, he shall promptly notify the appropriate contracting agency of the action recommended. The agency shall report the results to the Labor Commissioner promptly.

## VIII

If the Labor Commissioner shall so direct, contracting agencies shall not enter into contracts with any bidder or prospective contractor unless he has satisfactorily complied with the provisions of this Order.

This Order shall become effective sixty days after the date of this Order

Dated at Hartford, Connecticut, this 15<sup>th</sup> day of February, 1973.

Thomas J. Meskill, GOVERNOR

Filed this 15th day of February, 1973.

SECRETARY OF THE STATE (DEPUTY)

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

# The Executive Office of Governor John G. Rowland

State of Connecticut

By His Excellency

John G. Rowland

Governor

## Executive Order No. Sixteen

WHEREAS, the State of Connecticut recognizes that workplace violence is a growing problem that must be addressed; and

WHEREAS, the State is committed to providing its employees a reasonably safe and healthy working environment, free from intimidation, harassment, threats, and /or violent acts; and

WHEREAS, violence or the threat of violence by or against any employee of the State of Connecticut or member of the public in the workplace is unacceptable and will subject the perpetrator to serious disciplinary action up to and including discharge and criminal penalties.

NOW, THEREFORE, I, John G. Rowland, Governor of the State of Connecticut, acting by virtue of the authority vested in me by the Constitution and by the statutes of this state, do hereby ORDER and DIRECT:

1. That all state agency personnel, contractors, subcontractors, and vendors comply with the following **Violence in the Workplace Prevention Policy**:

The State of Connecticut adopts a statewide zero tolerance policy for workplace violence.

Therefore, except as may be required as a condition of employment<sup>3/4</sup>

- o No employee shall bring into any state worksite any weapon or dangerous instrument as defined herein.
- o No employee shall use, attempt to use, or threaten to use any such weapon or dangerous instrument in a state worksite.
- o No employee shall cause or threaten to cause death or physical injury to any individual in a state worksite.

Weapon means any firearm, including a BB gun, whether loaded or unloaded, any knife (excluding a small pen or pocket knife), including a switchblade or other knife having an automatic spring release device, a stiletto, any police baton or nightstick or any martial arts weapon or electronic defense weapon.

Dangerous instrument means any instrument, article, or substance that, under the circumstances, is capable of causing death or serious physical injury.

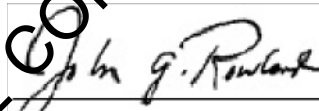
Violation of the above reasonable work rules shall subject the employee to disciplinary action up to and including discharge.

2. That each agency must prominently post this policy and that all managers and supervisors

must clearly communicate this policy to all state employees

3. That all managers and supervisors are expected to enforce this policy fairly and uniformly.
4. That any employee who feels subjected to or witnesses violent, threatening, harassing, or intimidating behavior in the workplace immediately report the incident or statement to their supervisor, manager, or human resources office.
5. That any employee who believes that there is a serious threat to their safety or the safety of others that requires immediate attention notify proper law enforcement authorities and his or her manager or supervisor
6. That any manager or supervisor receiving such a report shall immediately contact their human resources office to evaluate, investigate and take appropriate action.
7. That all parties must cooperate fully when questioned regarding violations of this policy.
8. That all parties be advised that any weapon or dangerous instrument at the worksite will be confiscated and that there is no reasonable expectation of privacy with respect to such items in the workplace.
9. That this order applies to all state employees in the executive branch.
10. That each agency will monitor the effective implementation of this policy.
11. That this order shall take effect immediately.

Dated in Hartford, Connecticut, this fourth day of August, 1999.

  
 \_\_\_\_\_  
 JOHN G. ROWLAND, Governor

Filed this 4th day of August, 1999.



\_\_\_\_\_  
 SUSAN BYSIEWICZ, Secretary of the State

Content Last Modified on 4/12/2004 2:34:16 PM

SECTION 00890

PERMITS

PART 1 – GENERAL

1.01 DESCRIPTION:

This Section provides specific information and defines specific requirements of the Contractor regarding the preparation and acquisition of permits required to perform the work of this project.

1.02 RELATED WORK:

- A. Section 01110, CONTROL OF WORK AND MATERIALS
- B. Section 01562, DUST CONTROL
- C. Section 01570, ENVIRONMENTAL PROTECTION
- D. Section 02240, DEWATERING
- E. Section 02300, EARTHWORK

1.03 GENERAL REQUIREMENTS:

- A. The Owner has obtained or will obtain and pay for the permits listed below, which are required for this project. The Contractor shall assist in obtaining certain permits, as indicated. The Contractor shall obtain and pay for all other permits required, as defined under the Permits subsection of Section 00700, GENERAL CONDITIONS.

Permits by Owner

Status

City Plan

Application only (No Permit Required)

- B. The Contractor shall obtain and pay for the following permits, as well as any other construction-related permits, which may be required in order to complete the work of the project. All permits shall be obtained in accordance with the requirements defined under the Permits subsection of Section 00700, GENERAL CONDITIONS.

Permits by Contractor

Status

Building Permit

\*



\*Contractor shall prepare permit application and obtain the permit after contract is awarded, bearing all expenses for preparation. Owner will pay for and/or waive the permit application fee, if applicable.

PART 2 - PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 PERFORM WORK IN ACCORDANCE WITH REQUIREMENTS:

- A. The Contractor shall perform the work in accordance with the Contract Documents.
- B. Prior to commencing any construction activities, the Contractor shall demonstrate to the Owner and the Engineer, through on-site inspection and submitting copies of permits or approvals, that it is in full compliance with the terms and conditions of all permits specified herein. The Contractor shall maintain full compliance with all permits throughout the performance of the work, and upon request, grant access to permitting authorities to inspect the site for the purpose of verifying such compliance.

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190232 New Haven HMGP\4 Working Documents\4.2  
Specifications\Division 0\00890 - Permits.docx

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 01014

SCOPE AND SEQUENCE OF WORK

PART 1 – GENERAL

1.01 WORK INCLUDED:

- A. Construction of pumping station resiliency improvements as shown on the contract documents. Work will include but is not limited to dry flood proofing at the Boulevard and East Street pumping stations and the East Shore Wastewater Treatment Plant, as well as elevation of the Fort Hale wastewater pumping station.

1.02 RELATED WORK:

- A. SECTION 01110 – CONTROL OF WORK AND MATERIALS

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 GENERAL:

- A. The Contractor shall be responsible for scheduling its activities and the activities of any subcontractors involved, to meet the completion date, or milestones, established for the Contract. Scheduling of the work shall be coordinated with the Owner and Engineer.
- B. The Construction Sequence Requirements shall be used by the Contractor to form a complete schedule for the project, which shall be coordinated with the Owner and Engineer. Prior to performing any work at the site, the Contractor shall submit a detailed plan to the Engineer for review. The plan shall describe the proposed sequence, methods, and timing of the work.

3.02 CONSTRUCTION SEQUENCING REQUIREMENTS:

- A. The Contractor shall provide a written plan of tasks and schedule of construction sequencing, and shall meet with the Engineer, the Owner, and the Owner's Maintenance Contractor to review and coordinate the scheduled details and obtain approval of said schedule prior to the demolition, changing or deactivation of any treatment system. The construction sequencing schedule shall include a written description of temporary measures that will be taken to maintain operations and shall

be updated on a monthly basis, or whenever project operations require a modification to the proposed sequencing.

- B. No tankage or equipment shall be modified or taken off line without written authorization from the Engineer and prior coordination with operations staff.
- C. All existing processes must remain operational and able to perform their intended use at all times, unless temporary systems are provided by the Contractor to ensure permit compliance.
- D. All work requiring a unit to be off line must be completed as a continuous effort to minimize the down time of the unit. The continuous effort provision will be required to the maximum practical extent to any work reducing process tankage, piping and/or equipment key to treatment process performance.
- E. The Contractor shall coordinate the installation of the new electric systems, conduit and wiring, and related electrical improvements to maintain continuous power for system operation and shall coordinate tie-in of each of the new facilities as they are completed and require power.
- F. Instrumentation, control and monitoring equipment must be maintained as required by the NPDES permit and DEEP.

### 3.03 ACCESS REQUIREMENTS:

The Contractor shall continually maintain access to all existing and operational areas to allow the Owner's Maintenance Operations Staff to continue critical operations. In the event that temporary access provisions are needed to provide safe access to the process areas, the Contractor shall be responsible for making such provisions.

### 3.04 CONTRACTOR'S CONSTRUCTION SCHEDULE AND EQUIPMENT STARTUP COORDINATION

The Contractor shall prepare and submit a detailed sequence of construction and operation, which shall provide for the construction and start-up of the new facilities in the most orderly and efficient manner possible while providing the least amount of impact to the Owners Operations personnel and the overall operations of the treatment system. The detailed sequence of construction shall be submitted within 60 calendar days following the Notice to Proceed. Prior to the startup or partial startup of any equipment or system the Contractor shall submit in writing to both the Operator and the Engineer a detailed proposed plan of startup for the said equipment or system for review and comment. The plan shall include detailed instructions for startup, diagrams, flow maintenance & bypassing, potential trouble shooting issues and what is to be done if something goes wrong. No system or equipment shall be brought online without the review and comment of the startup plan by the Engineer. Should the Contractor elect to provide a project

technical startup coordinator the qualifications of the coordinator shall be reviewed by the Engineer.

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 1\01014 - Scope and sequence of Work.docx

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 01110

CONTROL OF WORK AND MATERIALS

PART 1 – GENERAL

Not Used.

PART 2 – PRODUCTS

Not Used

PART 3 - EXECUTION

3.01 HAULING, HANDLING AND STORAGE OF MATERIALS:

- A. The Contractor shall, at its own expense, handle and haul all materials furnished by it and shall remove any of its surplus materials at the completion of the Work.
- B. The Contractor shall provide suitable and adequate storage for equipment and materials furnished by it that are liable to injury and shall be responsible for any loss of or damage to any equipment or materials by theft, breakage or otherwise.
- C. All excavated materials and equipment to be incorporated in the Work shall be placed so as not to injure any part of the Work or existing facilities and so that free access can be had at all times to all parts of the Work and to all public utility installations in the vicinity of the Work. Materials and equipment shall be kept neatly piled and compactly stored in such location as will cause a minimum of inconvenience to public travel and adjoining owners, tenants and occupants.
- D. The Contractor shall be responsible for all damages to the Work under construction during its progress and until final completion and acceptance even though partial payments have been made under the Contract.

3.02 OPEN EXCAVATIONS:

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons, and damage to property. The Contractor shall, at its own expense, provide suitable and safe means for completely covering all open excavations and for accommodating travel when Work is not in progress.
- B. Bridges provided for access to private property during construction shall be removed when no longer required.

- C. The length of open trench will be controlled by the particular surrounding conditions but shall always be confined to the limits prescribed by the Engineer.
- D. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, then special construction procedures shall be taken, such as limiting the length of trench and prohibiting stocking excavated material in the street.
- E. All street excavations shall be completely closed at the end of each Work day. Backfilling or use of steel plates of adequate strength to carry traffic shall be used.

3.03 MAINTENANCE OF TRAFFIC:

- A. Unless permission to close the street is received in writing from the proper authority, all excavated materials and equipment shall be placed so that vehicular and pedestrian traffic may be safely maintained at all times.
- B. Should the Chief of Police deem it necessary, uniformed officers will be assigned to direct traffic. The Contractor shall make all arrangements in obtaining uniformed officers required.
- C. The Contractor shall at its own expense, as directed by the Police Traffic Control/Safety Officer, provide and erect acceptable barricades, barrier fences, traffic signs, and all other traffic devices not specifically covered in a bid item, to protect the Work from traffic, pedestrians, and animals. It shall provide sufficient temporary lighting such as lanterns/flashers (electric battery operated) or other approved illuminated traffic signs and devices to afford adequate protection to the traveling public, at no additional cost to the Owner.
- D. The Contractor shall furnish all construction signs that are deemed necessary by and in accordance with Part VI of the Manual on Uniform Traffic Control Devices as published by the U.S. Department of Transportation. In addition, the Contractor may be required to furnish up to 128 square feet of additional special construction warning signs. Size and exact wording of signs shall be determined by the Engineer during construction.
- E. The intent of policing is to ensure public safety by direction of traffic. Police officers are not to serve as watchmen to protect the Contractor's equipment and materials.
- F. Nothing contained herein shall be construed as relieving the Contractor of any of its responsibilities for protection of persons and property under the terms of the Contract.

3.04 CARE AND PROTECTION OF PROPERTY:

The Contractor shall be responsible for the preservation of all public and private property, and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the Work on the part of the

Contractor, such property shall be promptly restored by the Contractor, at its expense, to a condition similar or equal to that existing before the damage was done, to the satisfaction of the Engineer.

3.05 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES:

- A. All existing buildings, utilities, pipes, poles, wires fences, curbing, property line markers and other structures which the Engineer decides must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from damage by the Contractor. Should such property be damaged, it shall be restored by the Contractor, at no additional cost to the Owner.
- B. The Contractor shall determine the location of all underground structures and utilities (including existing water services, drain lines, electrical lines, and sewers). Services to buildings shall be maintained, and all costs or charges resulting from damage thereto shall be paid by Contractor.
- C. When fences interfere with the Contractor's operations, it shall remove and (unless otherwise specified) promptly restore them.
- D. On paved surfaces the Contractor shall not use to operate tractors, bulldozers, or other power-operated equipment with treads or wheels which are shaped so as to cut or otherwise damage such surfaces.
- E. All property damaged by the Contractor's operations shall be restored to a condition at least equal to that in which it was found immediately before Work was begun. Suitable materials and methods shall be used for such restoration.
- F. Restoration of existing property and structures shall be carried out as promptly as practicable and shall not be left until the end of the construction period.

3.06 MAINTENANCE OF FLOW:

- A. The Contractor shall at its own cost, provide for the flow of sewers and drains interrupted during the progress of the Work, and shall immediately cart away and dispose of all offensive matter. The entire procedure of maintaining existing flow shall be fully discussed with the Engineer well in advance of the interruption of any flow.
- B. All existing drainage facilities including, but not limited to; brooks, streams, canals, channels, ditches, culverts, catch basins and drainage piping shall be adequately safeguarded so as not to impede drainage or to cause siltation of downstream areas in any manner whatsoever. If the Contractor damages or impairs any of the aforesaid drainage facilities, it shall repair the same within the same day.
- C. At the conclusion of the Work, the Contractor shall remove all silt in drainage structures caused by its operations as described in Section 01740, CLEANING UP.

3.07 REJECTED MATERIALS AND DEFECTIVE WORK:

- A. Materials furnished by the Contractor and condemned by the Engineer as unsuitable or not in conformity with the specifications shall forthwith be removed from the Work by the Contractor, and shall not be made use of elsewhere in the Work.
- B. Any errors, defects or omissions in the execution of the Work or in the materials furnished by the Contractor, even though they may have been passed or overlooked or have appeared after the completion of the Work, discovered at any time before the final payment is made hereunder, shall be forthwith rectified and made good by and at the expense of the Contractor and in a manner satisfactory to the Engineer.
- C. The Contractor shall reimburse the Owner for any expense, losses or damages incurred in consequence of any defect, error, omission or act of the Contractor or its employees, as determined by the Engineer, occurring previous to the final payment.

3.08 SANITARY REGULATIONS:

Sanitary conveniences for the use of all persons employed on the Work, properly screened from public observation, shall be provided in sufficient numbers in such manner and at such locations as may be approved. The contents shall be removed and disposed of in a satisfactory manner as the occasion requires. The Contractor shall rigorously prohibit the committing of nuisances within on or about the Work. Any employees found violating these provisions shall be discharged and not again employed on the Work without the written consent of the Engineer. The sanitary conveniences specified above shall be the obligation and responsibility of the Contractor.

3.09 SAFETY AND HEALTH REGULATIONS:

This project is subject to the Safety and Health regulations of the U.S. Department of Labor set forth in 29 CFR, Part 1926, and to the Connecticut Department of Labor Division of Occupational Safety and Health (CONN-OSHA). Contractors shall be familiar with the requirements of these regulations.

3.10 SITE INVESTIGATION:

The Contractor acknowledges that it has satisfied itself as to the conditions existing at the site of the Work, the type of equipment required to perform this Work, the quality and quantity of the materials furnished insofar as this information is reasonably ascertainable from an inspection of the site, as well as from information presented by the drawings and specifications made a part of this contract. Any failure of the Contractor to acquaint itself with available information will not relieve it from the responsibility for estimating properly the difficulty or cost of successfully performing the Work. The Owner assumes no responsibility for any conclusion or interpretation made by the Contractor on the basis of the information made available by the Owner.



3.11 HANGERS, PADS, AND SUPPORTS:

- A. Unless otherwise indicated, hangers and supports shall be by the trade providing the supported item.
- B. Except where detailed or specified, design of hangers and supports shall be the responsibility of the Contractor. All parts of such hangers or supports shall be designed in accordance with accepted engineering practice, using a factor of safety of at least 2½.
- C. When proprietary hangers, etc., are supplied, satisfactory evidence of the strength of such items shall be furnished.
- D. Hangers for items hung from steel and concrete shall be centered on the vertical center of gravity of the beam.
- E. Locations and sizes of openings, sleeves, concrete pads, steel frames, and other equipment supports are indicated on the drawings for bidding purposes only. Final sizes and locations of such items shall be obtained from the shop drawings.

3.12 SLEEVES, HOLES, HANGERS, INSERTS, ETC.:

- A. Except where holes and openings are dimensioned, and hangers, inserts, and supports are fully called for on the architectural and structural drawings (or reference is made thereon to drawings containing such information) to accommodate mechanical or electrical items, they shall be by the mechanical or electrical trade concerned.
- B. Sleeves, inserts, anchors, etc., supplied under the mechanical and electrical contracts in sufficient time to so permit, shall be set in concrete, masonry, etc., or fastened to steel deck, etc., by the respective architectural or structural trade. Where not supplied in sufficient time, installation of such items shall be the responsibility of the mechanical or electrical trade involved.
- C. Nothing shall be suspended from the steel roof deck and no fastenings made to it, except with the prior permission of the Engineer. Request for permission shall be accompanied by full details of the hanger or fastener, including the weight of the item to be suspended.
- D. Nailers and other wood members attached to steel or masonry, for which fasteners are not indicated on the design drawings or in the specification, shall be fastened with the equivalent of ½-inch diameter bolts at 3 feet o.c.
- E. Openings for mechanical and electrical items in finished areas of the building shall be closed off with near escutcheon plates or similar closures. These closures shall be by the mechanical or electrical trade involved.

3.13 ROOF PROTECTION:

Where Work must be performed over completed roofing, the roofing shall be protected by 2 layers of ½-inch thick plywood, laid with joints in the second layer offset 1/2 sheet width and length from joints in the first layer. No material shall be stored or Work performed on areas of roof which are not so protected.

3.14 WEATHER PROTECTION:

The Contractor shall install weather protection and shall furnish adequate heat in the area so protected during the months of November through March.

3.15 ELECTRIC SERVICE:

- A. The Contractor shall make all necessary applications and arrangements and pay for all fees and charges for electrical energy for power and light necessary for the proper completion of this contract during its entire progress. The Contractor shall provide and pay for all temporary wiring, switches, connections, and meters.
- B. There shall be sufficient electric lighting so that all Work may be done in a Workmanlike manner where there is not sufficient daylight.

3.16 HAZARDOUS WASTE:

Should the Contractor, while performing Work under this contract, uncover hazardous materials, as defined in Connecticut Remediation Standard Regulations, it shall immediately notify the Engineer. The Contractor is not, and has no authority to act as, a handler, generator, operator or disposer of hazardous or toxic substances found or identified at the site, and the Owner shall undertake all such functions.

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

END OF SECTION

SECTION 01140

SPECIAL PROVISIONS

PART 1 - GENERAL

Not used

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

3.01 WATER FOR CONSTRUCTION PURPOSES:

- A. In locations where water is in sufficient supply, the Contractor may be allowed to use water without charge for construction purposes. The express approval of the Owner shall be obtained before water is used. Waste of water by the Contractor shall be sufficient cause for withdrawing the privilege of unrestricted use.
- B. If no water is available, the Contractor shall supply water at no additional cost to the Owner.

3.02 PIPE LOCATION:

Pipe shall be located substantially as indicated on drawings. The Owner reserves the right, acting through the Engineer, to make such modifications as may be deemed desirable to avoid interference with existing structures or for other reasons.

3.03 DIMENSIONS OF EXISTING STRUCTURES:

Where the dimensions and locations of existing structures are of critical importance in the installation or connections of new work, the Contractor shall verify such dimensions and locations in the field before the fabrication of any material or equipment that is dependent on the correctness of such information.

3.04 OCCUPYING PRIVATE PROPERTY:

The Contractor shall not enter upon nor occupy with men, equipment or materials any property outside of the public highways or Owner's easements, except with the written consent of the property owner or property owner's agent.

3.05 EXISTING UTILITY LOCATIONS – CONTRACTOR'S RESPONSIBILITY:

- A. The location of existing underground services and utilities shown on the drawings is based on available records. It is not warranted that all existing utilities and services are shown, or that shown locations are correct. The Contractor shall be responsible for

having the utility companies locate their respective utilities on the ground prior to excavating.

- B. To satisfy the requirements of Connecticut law, the Contractor shall, at least 72 hours, exclusive of Saturdays, Sundays and holidays, prior to excavation in the proximity of telephone, gas, cable television and electric utilities, notify the utilities concerned by calling "CALL BEFORE YOU DIG" at telephone number: 1-800-922-4455.
- C. The Contractor shall coordinate all work involving utilities and shall satisfy requirements as to the existing conditions of the areas in which it is to perform its work. It shall conduct and arrange its work so as not to impede or interfere with the work of other contractors working in the same or adjacent areas.

3.06 COORDINATION OF WORK:

The General Contractor shall be responsible for coordinating its own work as well as that of any subcontractors. He shall be responsible for notification of the Engineer when each phase of work is expected to begin and the approximate completion date.

3.07 TIME FOR COMPLETION OF CONTRACT:

The time for completion of this contract is stipulated in the Form of General Bid. The Bidder shall base its bid on completing the proposed work by the completion date stipulated in Section 00410, Form of General Bid.

3.08 MAINTENANCE OF TRENCH SURFACE:

After backfilling and compacting the trench, the Contractor shall be responsible for keeping the ground surface dry and passable at all times until the surface has been restored to original conditions.

3.09 DESIGN OF EQUIPMENT:

Attention is directed to the fact that the layout of certain equipment is based on that of one manufacturer. If other equipment is submitted for approval, the Contractor shall prepare and submit for approval at its expense, detailed structural, mechanical and electrical drawings, equipment lists, maintenance requirements, and any other data required by the Engineer, showing all necessary changes and embodying all special features of the equipment he proposes to furnish. Such changes, if approved, shall be made at the expense of the Contractor.

3.10 SERVICES OF MANUFACTURER'S REPRESENTATIVE:

- A. The Contractor shall arrange for a qualified service representative, at a time suitable to the Engineer, from the company manufacturing or supplying certain equipment as indicated on the detailed specifications, to perform the duties described herein.

- B. After installation of the listed equipment has been completed and the equipment is presumably ready for operation, but before others operate it the representative shall inspect, operate, test, and adjust the equipment. The inspection shall include, but shall not be limited to, the following points as applicable:
1. Soundness (without cracks or otherwise damaged parts); completeness in all details, as specified; correctness in setting, alignment, and relative arrangement of various parts; adequacy and correctness of packing, sealing and lubricants.
  2. The operation, testing, and adjustment shall be as required to prove that the equipment is left in proper condition for satisfactory operation under the conditions specified. Where called for in the specifications, vibration readings shall be made and the equipment balanced accordingly.
  3. On completion of its work, the Contractor shall submit in triplicate to the Engineer the manufacturer's or supplier representative's complete signed report of the results of its inspection, operation, adjustments, and test. The report shall include detailed descriptions of the points inspected, tests and adjustments made, quantitative results obtained if such are specified, and suggestions for precautions to be taken to ensure proper maintenance. The report shall also include a certificate that the equipment conforms to the requirements of the contract and is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void.
  4. After the Engineer has reviewed the reports from the manufacturer's representative, the Contractor shall make arrangements to have the manufacturer's representative present when the field acceptance tests are made.

### 3.11 COMPLIANCE WITH PERMITS:

- A. The Contractor shall perform all work in conformance with requirements of the Permits, which appear in Section 00890 – PERMITS.

### 3.12 CUTTING, FITTING AND PATCHING:

- A. The Contractor shall do all cutting, fitting, or patching of its work that may be required to make its several parts come together properly and fit it to receive or be received by work of other Contractors, as shown upon or reasonably implied by the drawings and the specifications for the completed structure, including all existing work.
- B. The Contractor shall not endanger any work by cutting, digging, or otherwise and shall not cut or alter the work of any other Contractor, save with the consent of the Engineer.
- C. All holes or openings required to be made in new or existing work, particularly at pipe, conduit, or other penetrations not covered by escutcheons or plates shall be neatly patched. All such holes shall be made completely watertight as approved by the Engineer.

- D. Size and locations of holes required in steel, concrete, or other structural or finish materials for piping, wiring, ducts, etc., which have not been located and detailed on the drawings shall be approved by the Engineer prior to layout and cutting thereof. All holes shall be suitably reinforced as required by the Engineer.
- E. Workmanship and materials of patching and repair work shall match the adjacent similar work and shall conform to the applicable sections of the specification. Patches and joints with existing work shall provide, as applicable in each case, visual, structural, and waterproofing continuity.

3.15 CONNECTIONS TO EXISTING WATER SYSTEMS:

- A. The Owner will, upon 24-hour notice from the Contractor, assist the Contractor by locating and opening or closing any and all valves required for draining or admitting water to the various sections of the water main as required to perform the proposed work. No damages shall be claimed by the Contractor for delays in dewatering pipelines nor shall any damages be claimed because of water leaking through closed valves after dewatering is completed.
- B. Connections to the existing distribution system shall be made with the mains under pressure unless the lines can be temporarily taken out of service as approved by the Owner.
- C. The Contractor will be required to make test excavations to ascertain that the proposed position of the connections will be clear of joints, fittings, or other obstructions.
- D. If any failure occurs in connection to existing mains, service shall be restored in the shortest possible time, the Contractor working around the clock, if necessary. He shall cooperate with the Owner in supplying emergency water if required to maintain facility operations.

3.14 PROTECTION OF AQUIFER:

The Contractor shall take extra precautions to ensure that no pollutants enter the groundwater table from the construction area. The Contractor shall not store fuels or other hazardous materials or potential contaminants on the construction site. In the event of a spill, the Contractor shall immediately notify the Engineer.

3.15 CONTRACTOR'S REPRESENTATIVE:

The Contractor shall designate a representative who will be available to respond to emergency calls by the Owner at any time day and night and on weekends and holidays should such a situation arise.

3.16 VISUAL RECORDING:

Before beginning construction, the Contractor shall make a color DVD recording along the entire work length. One complete recording, for the entire project length, shall be

furnished to the Engineer prior to the start of the work. The visual recording shall be identified by street name, as applicable, and station.

3.17 OPERATOR TRAINING:

A trained representative of the manufacturer of all equipment shall instruct the plant operating personnel on the operation and maintenance of the equipment. The Owner reserves the right to videotape all training sessions.

3.18 HOURS OF CONSTRUCTION ACTIVITY:

- A. The Contractor shall conduct all construction activity between **7:00 a.m. and 5:00 p.m.**, Monday through Friday. No construction work shall be allowed on Saturdays, Sundays or Holidays without written authorization from the Owner.
- B. The Owner will provide personnel for assistance in locating and operating valves at no cost to the Contractor during the Owner's normal working hours (**Monday through Friday 7:00 a.m. to 3:00 p.m.**). When this assistance is required by the Contractor outside of the Owner's normal working hours the cost will be incurred by the Contractor at the prevailing overtime rate of pay for the personnel providing the assistance. The Owner will bill the Contractor directly.

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPCA\210002 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 1\01140 - Spec. Prov.docx

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 01270

MEASUREMENT AND PAYMENT

PART 1 - DESCRIPTION

1.01 GENERAL:

- A. The following subsections describe the measurement of and payment for the work to be done under the items listed in Section 00410, FORM OF GENERAL BID.
- B. All work performed as described in these contract documents will be paid for under one or more of the items listed in the FORM OF GENERAL BID. All other activities required in connection with performance of the work, including all work required under Division 1, GENERAL REQUIREMENTS, whether described in the contract documents or mandated by applicable codes, permits and laws, will not be separately paid for unless specifically provided for in the form of general bid, but will be considered incidental to performance of the overall project.
- C. Each unit or lump-sum price stated in the FORM OF GENERAL BID shall constitute full compensation as herein specified for each item of work completed in accordance with the drawings and specifications, including cleanup.
- D. The payment items listed herein and in the FORM OF GENERAL BID are intended to provide full payment for the work shown on the drawings and specified herein. Any work called for or implied in the documents but not listed as a payment item shall be considered incidental to the overall project.
- E. Unless otherwise noted, each item shall be furnished and installed in accordance with the technical section, whether a specific applicable payment item exists or not.
- F. Unless otherwise noted, all earthwork shall be included under any item requiring excavation. The prices for those items that involve excavation shall include compensation for disposal of surplus excavated material, and installation of all necessary sheeting and bracing.
- G. In all items involving excavation, the price shall be based on doing the entire excavation in earth. Where rock is excavated, the price therefor shall be in addition to the cost of excavating earth and no deduction shall be made in the amount for earth excavation.
- H. If changes are made to the design that was shown on the Drawings and Specifications in the original contract and should such changes increase or decrease the quantity of work to be performed, an adjustment will be made therefore based on the Unit Quantities' described herein. No work shall be performed in excess of the Unit Quantities provided in the FORM OF GENERAL BID without written approval. Upon completion of the project remaining and/or unused Unit Quantities shall not be billed and shall be returned/credited to the Owner.



1.02 ITEM 1: FORT HALE WASTEWATER PUMPING STATION:

A. FORT HALE PS IMPROVEMENTS (ITEM 1A)

1. The lump sum price shall constitute full compensation for furnishing all labor, materials, tools, and all equipment required, as well as coordination between disciplines, to construct the Fort Hale Wastewater Pumping Station Upgrade and related facilities in their entirety as shown on the Drawings and called for in the Contract Documents, complete, in place and accepted by the Owner.
2. Prior to construction, the Contractor shall review the Contract Documents and coordinate all equipment between the different construction disciplines for location, size, serviceability, support systems, connections (piping, electrical, instrumentation, HVAC, plumbing), incidentals and any and all other components required for a complete and functional system. If one system is shown on one set of discipline drawings / specifications but the same system is missing or incomplete on another set of discipline drawings/specifications the Contractor, at no additional cost to the Owner, shall provide all necessary equipment, materials, labor, support systems, connections (piping, electrical, instrumentation, HVAC, plumbing), coordination, incidentals and any and all other components required for furnishing and installing the system complete as well as providing a complete and functional system.
3. The Contract Documents are provided to allow each of the Contractors to scope and bid the project. The actual construction installation requirements can vary from vendor to vendor and are provided after submittal and incorporation of equipment shop/coordination drawings by the Contractors. The installation and integration requirements for all process equipment, components and controls are subject to modifications based on the actual equipment submittals of the equipment to be furnished. Coordination is required between all equipment vendors as well as between the Contractor and the Sub-Contractors. Coordination between all equipment vendors and Contractors shall be required and provided at no additional cost to the Owner on an as-needed / required basis such that a complete and functional system is provided.
4. Payment for Fort Hale Pumping Station Improvements shall include by-pass pumping, including all related operational and maintenance costs, for the duration necessary to complete the work, metal and concrete support structures, control building, metal platform and stairs, pumps, piping, valves, wet well coating, electrical, instrumentation and HVAC equipment, precast valve vault, concrete, furnishing, installing and testing pump station equipment, including electrical and alarm (telemetry) equipment; commissioning, paving, loaming and seeding, landscaping, fencing and all other items required to provide a completed pumping station as shown on the drawing and specified herein.
5. Payment for the work under this item shall also include full compensation for all labor, equipment, materials and incidentals as required for the construction of all site work and structural work as shown on the contract drawings, including but not limited

to, clearing and grubbing, removal of top soil, test pits; erosion and sedimentation control installation, monitoring, maintaining, inspections, and removal; utility relocation and installation, all earth excavation, backfill, compaction and compaction testing, removal, transportation and disposal of all excavated materials; connection to existing structures, connections to existing utilities, site improvements, site restoration including but not limited to, bituminous concrete pavement, concrete sidewalks, fencing and gates, porous flexible paving, stone surfaces, project close out documents including but not limited to record drawings, operation and maintenance manuals, start-up services, training, and all related and incidental work as shown in the Contact Documents, complete and accepted by the Owner.

B. TEST PITS (ITEM 1B):

1. Test pits as ordered by the Engineer and not incidental to construction shall be measured per cubic yard excavated and backfilled under the Item "Test Pits."
2. Test pits shall be paid at the contract unit price under the item "Test Pits." The unit price under this item shall constitute full compensation for all excavation, backfill, pavement repair, surface restoration, or other work incidental to excavation or restoration of test pits.

C. ALLOWANCE FOR ABATEMENT OF CONTAMINATED MATERIAL (ITEM 1C):

1. The allowance under this item shall be utilized as payment for the abatement, handling, removal, transportation, documentation, sampling, and proper disposal of any contaminated materials encountered by the Contractor during construction activities. Only contaminated materials that are removed from the site and disposed of at a licensed disposal site shall be measured for payment. Work under this allowance item shall be negotiated between the Contractor and the Owner based on the actual field conditions and the materials encountered. Work under this item shall include adjustments for and direct labor costs only with a maximum profit of 5%. Indirect costs and overhead shall not be paid for separately and shall be considered included in the lump sum fees under Bid Item #1A.
2. Payment will also be made based on invoices submitted by testing and disposal facilities. No Mark-up will be allowed. The Contractor shall review said invoices for accuracy and forward copies of same to the Engineer and include the cost in his Application for Payment. Actual payment shall be made by the Contractor and the Contractor shall be reimbursed by the Owner through the monthly applications for payment.

D. ALLOWANCE FOR UTILITY COMPANY WORK (ITEM 1D):

1. The allowance under this item shall be utilized as payment for charges incurred by the various utility companies impacted by the proposed project. Work under this allowance item shall be negotiated between the Contractor and the Owner based on the actual field conditions and the modifications required. Work under this item shall

include adjustments for and direct labor costs only with a maximum profit of 5%. Indirect costs and overhead shall not be paid for separately and shall be considered included in the lump sum fees under Bid Item #1A.

2. Additional items, which are acceptable for payment under this item, consist of Utility Service Entrance fees and any modifications to the Utility Service Entrance received in writing from the Utility Service Company on Utility Service Company letterhead and signed by an authorized representative of the Utility Service Company.
3. Payment under this allowance shall constitute full compensation for furnishing all labor, materials, tools and equipment, incidentals and constructing the modifications, complete as negotiated between the Contractor and Owner.

E. REPAIR OF DETERIORATED OR SPALLED CONCRETE (ITEM 1E):

1. Repair of deteriorated or spalled concrete, as required by the Engineer, shall be measured in place per square foot of surface area repaired. Quantities shall be rounded up to the nearest whole number value.
2. Payment for repair of deteriorated or spalled concrete, as required by the Engineer, shall include full compensation for all labor, equipment, materials and incidentals as required for the repair of deteriorated or spalled concrete as specified in the Contract Documents meeting the approval of the Engineer. Work under this item also providing and placing materials for structural repairs including setup and breakdown of any and all scaffolding and support systems and incidentals as required.

1.03 ITEM 2: ESWPAF - OPERATIONS BUILDING:

A. PANEL BARRIERS (ITEMS 2A, 2B & 2C)

1. Each panel barrier designed to span an existing or proposed rough opening width as designated (opening 36" to 48"), (openings >48" to 120") or (openings >120") shall be paid for under this subdivided items shall be measured per each barrier furnished and installed per manufacturer's requirements and as required in the contract documents.
2. Payment shall constitute full compensation for all work associated with the furnishing and installing panel barriers as shown on the plans, and as described in these specifications. This includes all design work, submittals, labor and materials, and all other incidental items.

B. FLOOD SWING GATE BARRIER (ITEM 2D):

1. Each flood swing gate barrier designed to span the proposed rough opening width shall be paid for under this item shall be measured per each barrier furnished and installed per manufacturer's requirements and as required in the contract documents.
2. Payment shall constitute full compensation for all work associated with the furnishing and installing the swing gate barrier as shown on the plans, and as described in these specifications. This includes all design work, submittals, labor and materials, and all other incidental items

C. FLOOD SLIDING GATE BARRIER (ITEM 2E):

1. Each flood sliding gate barrier designed to span the proposed rough opening width shall be paid for under this item shall be measured per each barrier furnished and installed per manufacturer's requirements and as required in the contract documents.
2. Payment shall constitute full compensation for all work associated with the furnishing and installing the slide gate barrier as shown on the plans, and as described in these specifications. This includes all design work, submittals, labor and materials, and all other incidental items

D. PRIMARY SLUDGE ROOM FLOOD DOOR BARRIER (ITEM 2F):

1. Each flood submarine door barrier designed to span the proposed rough opening width shall be paid for under this item shall be measured per each barrier furnished and installed per manufacturer's requirements and as required in the contract documents.
2. Payment shall constitute full compensation for all work associated with the furnishing and installing the submarine door, concrete barrier infill and sealing of existing pipe penetrations and miscellaneous openings as shown on the plans, and as described in these specifications. This includes all design work, submittals, labor and materials, and all other incidental items

E. FLOOD PROOF ACCESS HATCH REPLACEMENT (ITEM 2G):

1. Each access hatch replacement and fixed solid metal panel designed to span the proposed rough opening width shall be paid for under this item shall be measured per each, furnished and installed per manufacturer's requirements and as required in the contract documents.
2. Payment shall constitute full compensation for all work associated with the furnishing and installing the access hatch replacement as shown on the plans, and as described in these specifications. This includes all design work, submittals, labor and materials, and all other incidental items

F. FLOOD PROOF WINDOW PANE REPLACEMENT (ITEM 2H):

1. Each window pane replacement, designed to span the proposed rough opening width, shall be paid for under this item and shall be measured per each, furnished and installed per manufacturer's requirements and as required in the contract documents.
2. Payment shall constitute full compensation for all the work associated with the furnishing and installing the window pane replacement as shown on the plans, and as described in these specifications. This includes all design work, submittals, labor and materials, and all other incidental items.

G. FLOOR DRAIN COVERS (ITEM 2I):

1. Each floor drain cover shall be paid for under this item and shall be measured per each cover furnished and installed as required in the contract documents.
2. Payment shall constitute full compensation for all work associated with furnishing and installing the floor drain covers and associated hardware as shown on the plans, and as described in these specifications. This includes all design work, submittals, labor and materials, and all other incidental items.

H. FLOOD WALL (EXTENSION) (ITEM 2J):

1. Flood Wall (Extension) shall consist of either concrete or CMU wall installed on an existing foundation, as shown on the contract drawings or as required by the Engineer. The length of wall to be paid for under this item shall be measured by the linear foot along the centerline of the completed wall, including connections to existing walls and foundation.
2. Payment under this item shall constitute full compensation for constructing the wall, complete in place, as indicated on the drawings and as specified, including furnishing and installing concrete, reinforcing, precast cap, drilling and grouting, brick work and all work incidental thereto and not specifically included for payment under other items.

I. FLOOD WALL (FREE STANDING) (ITEM 2K):

1. Flood Wall Free Standing shall consist of a either concrete or CMU wall installed with new foundation, as shown on the contract drawings or as required by the Engineer. The length of wall to be paid for under this item shall be measured by the linear foot along the centerline of the completed wall, including demo of existing walls and connections to existing foundation.
2. Payment under this item shall constitute full compensation for constructing the wall, complete in place, as indicated on the drawings and as specified, including furnishing and installing concrete, reinforcing, precast cap, excavation, gravel, backfill, brick work and all work incidental thereto and not specifically included for payment under

other items.

J. RAISE HVAC UNITS (ITEM 2L):

1. Raise HVAC units shall include relocation of existing duct work, conduit and electrical components above specified flood elevation, as shown on the contract drawings or as required by the Engineer. Raising existing HVAC units shall be paid for under this Lump Sum item.
2. Payment under this lump sum item shall constitute full compensation for raising the HVAC units, complete in place, as indicated on the drawings and as specified, including equipment pad modifications, relocation of existing duct work, conduit and electrical components, mounting of existing units, patching of existing walls, unit testing and all work incidental thereto and not specifically included for payment under other items.

K. GATE VALVE AT FLOOR DRAIN (ITEM 2M):

1. Gate valve at floor drain shall consist of removing and replacing existing gate valve from within the existing pit, as shown on the contract drawings. Gate valve at floor drain shall be paid for under this Lump Sum item.
2. Payment under this lump sum item shall constitute full compensation for removal and replacement of gate valve at the location shown on the Contract Drawings, complete in place, as indicated on the contract drawings and as specified, including all labor and material, tools, and equipment required to remove and replace existing gate valve, install new gate valve and make modifications to existing opening as shown on the drawing and all work incidental thereto and not specifically included for payment under other items.

L. INSTALLATION AND MODIFICATIONS OF RAILINGS (ITEMS 2N):

1. Installation and modification of railings consist of removing and replacing existing railings on concrete landing adjacent to Barrier #117 and removal and modification as required to existing railings at the main entrance adjacent Barrier 101, as shown on the contract drawings. Installation and modification to be paid for under this Lump Sum item.
2. Payment under this lump sum item shall constitute full compensation for installation and modification of railings, complete in place, as indicated on the drawings and as specified, including all labor and material, tools and equipment required to remove, modify, install new railings and supports and all work incidental thereto and not specifically included for payment under other items.

M. EXTERIOR DRAIN COVER MATS (ITEM 2O):

1. Exterior drain cover mats shall be measured for payment per each mat furnished and installed as required in the contract documents.
2. Payment shall constitute full compensation for all work associated with furnishing and installing the exterior drain cover mat and associated hardware as shown on the plans, and as specified herein. This includes all design work, submittals, labor and materials, and all other incidental items

1.04 BOULEVARD PUMPING STATION (ITEM 3):

A. PANEL BARRIERS (ITEMS 3A & 3B)

3. Each panel barrier designed to span an existing or proposed rough opening width as designated (opening 36" to 48") or (openings >48" to 20") shall be paid for under this subdivided items shall be measured per each barrier furnished and installed per manufacturer's requirements and as required in the contract documents.
4. Payment shall constitute full compensation for all work associated with the furnishing and installing panel barriers as shown on the plans, and as described in these specifications. This includes all design work, submittals, labor and materials, and all other incidental items.

B. INTERIOR CONCRETE FLOOD WALL (ITEM 3C):

1. Interior concrete flood wall shall consist of concrete wall installed on interior masonry, as shown on the contract drawings or as required by the Engineer. The length of wall to be paid for under this item shall be measured by the linear foot along the centerline of the completed wall, including connections to existing foundation.
2. Payment under this item shall constitute full compensation for constructing the wall, complete in place, as indicated on the drawings and as specified, including furnishing and installing concrete, reinforcing, drilling and grouting and all work incidental thereto and not specifically included for payment under other items.

C. EXTERIOR CONCRETE FLOOD WALL (ITEM 3D):

1. Exterior concrete flood wall shall consist of concrete wall installed on the exterior masonry wall as shown on the contract drawings or as required by the Engineer. The length of wall to be paid for under this item shall be measured by the linear foot along the centerline of the completed wall, including connections to existing foundation.
2. Payment under this item shall constitute full compensation for constructing the wall, complete in place, as indicated on the drawings and as specified, including furnishing and installing concrete, concrete form liners, reinforcing, drilling and grouting and all work incidental thereto and not specifically included for payment under other

items.

D. STEEL PLATE BARRIER AT GENERATOR LOUVER (ITEM 3E):

1. Steel plate barrier at generator louver shall consist of installing a steel plate to protect the existing generator louver and adjacent equipment from flood waters, as shown on the contract drawings. Steel plate barrier at generator louver shall be paid for under this lump sum item.
2. Payment under this item shall constitute full compensation for steel plate barrier at generator louver, complete in place, as indicated on the drawings and as specified, including all labor and material required to install steel plate, supports, hardware, plug, and all work incidental thereto and not specifically included for payment under other items.

E. REMOVAL AND REPLACEMENT OF RAILINGS (ITEM 3F)

1. Removing and replacing of railings consists of installing new replacement removable railing system to match existing system and that will not conflict with proposed deployable barriers at stairs and loading areas, as shown on the contract drawings. Removing and replacing railings to be paid for under this lump sum item.
2. Payment under this item shall constitute full compensation for removal and replacement of railings, complete in place, as indicated on the drawings and as specified, including all labor and material required to remove and install new railings and all work incidental thereto and not specifically included for payment under other items.

F. FLOOR DRAIN COVERS (ITEM 3G):

1. Each floor drain cover shall be paid for under this item shall be measured per each cover furnished and installed as required in the contract documents.
2. Payment shall constitute full compensation for all work associated with furnishing and installing the floor drain covers and associated hardware as shown on the plans, and as described in these specifications. This includes all design work, submittals, labor and materials, and all other incidental items

1.05 EAST STREET PUMPING STATION (ITEM 4):

A. PANEL BARRIERS (ITEMS 4A, 4B & 4C)

1. Each panel barrier designed to span an existing or proposed rough opening width as designated (opening 36" to 48"), (openings >48" to 96") or (openings >96") shall be paid for under this subdivided items shall be measured per each barrier furnished and installed per manufacturer's requirements and as required in the contract documents.



2. Payment shall constitute full compensation for all work associated with the furnishing and installing panel barriers as shown on the plans, and as described in these specifications. This includes all design work, submittals, labor and materials, and all other incidental items.

B. STEEL PLATE BARRIER AT GENERATOR LOUVER (ITEM 4D):

1. Steel plate barrier at generator louver shall consist of installing a steel plate to protect the existing generator louver and adjacent equipment from flood waters, as shown on the contract drawings. Steel plate barrier at generator louver to be paid for under this lump sum item.
2. Payment shall constitute full compensation for steel plate barrier at generator louver, complete in place, as indicated on the drawings and as specified, including all labor and material required to install steel plate, supports, hardware, plug and all work incidental thereto and not specifically included for payment under other items.

C. STEEL PLATE BARRIER AT WINDOW (ITEM 4E):

1. Steel plate barrier at window shall consist of installing a steel plate to protect the existing window from flood waters, as shown on the contract drawings. Steel plate barrier at window to be paid for under this Lump Sum Item.
2. Payment shall constitute full compensation for steel plate barrier at window, complete in place, as indicated on the drawings and as specified, including all labor and material required to install steel plate, supports, hardware and all work incidental thereto and not specifically included for payment under other items.

D. FLOOR DRAIN COVERS (ITEM 4F):

1. Each floor drain cover shall be paid for under this item shall be measured per each cover furnished and installed as required in the contract documents.
2. Payment shall constitute full compensation for all work associated with furnishing and installing the floor drain covers and associated hardware as shown on the plans, and as described in these specifications. This includes all design work, submittals, labor and materials, and all other incidental items

1.06 ALLOWANCE FOR REMOVAL / RELOCATION OF EXISTING CONDUIT AND EQUIPMENT (ITEMS 2P, 3H, 4G):

- A. The allowance under this item shall be utilized as payment for work to remove or relocate existing electrical or instrumentation conduit, boxes or equipment impacted by the proposed project. Work under this allowance item shall be negotiated between the Contractor and the Owner based on the actual field conditions and the modifications required. Work under this item shall include adjustments for and direct labor costs only with a maximum profit of 5%. Indirect costs and overhead shall not be paid for

separately.

- B. Payment under this allowance shall constitute full compensation for furnishing all labor, materials, tools and equipment, incidentals and constructing the modifications, complete as negotiated between the Contractor and Owner.

1.07 ITEMS 1F, 2Q, 3I, 4H: GENERAL CONDITIONS:

- A. The lump sum for this item shall constitute full compensation to the Contractor for the general conditions, mobilization, demobilization, bonds and insurance, and all other work not specifically called out in other method and measurement items necessary to make the Contract operational, exclusive of the cost of materials but including furnishing and maintaining the Contractors temporary construction facilities if necessary. The total for all GENERAL CONDITIONS items shall not exceed five percent (5%) of the total of bid.

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 1\01270\01270 - M&P.docx

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 01311

CONSTRUCTION MEETINGS

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. This Section specifies requirements for project meetings including but not limited to Pre-Construction Conference and Progress Meetings.
- B. It shall be the responsibility of the Contractor to coordinate work between all subcontractors, sections, and trades required for the proper completion of the Work.

1.02 PRE-CONSTRUCTION CONFERENCE:

- A. After the bids have been opened but prior to the start of the construction there will be a pre-construction conference to discuss the phasing and scheduling of the Project. The specific time and place of the conference shall be arranged by the Engineer after the Contract has been awarded.
- B. This pre-construction conference is intended to establish lines of communication between the parties involved, review responsibilities and personnel assignments, establish project schedules, discuss proposed performance methods, and coordinate Work to be performed by subcontractors.
- C. Authorized representatives of the Owner, Engineer and their consultants, the Contractor, its Superintendent and Site Foreman, and all others invited by the Contractor, shall attend the pre-construction conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.
- D. Discuss items of significance at the pre-construction conference that could affect progress including at least the following:
  - 1. Preparation of Asset Maintenance and Management Forms
  - 2. Tentative construction schedule
  - 3. Critical Work sequencing
  - 4. Designation of responsible personnel
  - 5. Procedures for processing field decisions and Change Orders
  - 6. Procedures for processing Applications for Payment

7. Review of Davis Bacon and other federal requirements
8. Distribution of Contract Documents
9. Submittal of Shop Drawings, Product Data and Samples
10. Preparation of record documents
11. Use of the premises
12. Office, work and storage, and laydown areas
13. Equipment deliveries
14. Construction safety procedures
15. Environmental health and safety procedures
16. First aid
17. Security
18. Housekeeping
19. Working hours
20. Traffic Control
21. Emergency Vehicle Access to and around work site
22. Environmental protection measures for construction site

1.03 PROGRESS MEETINGS:

A. During the course of the Project, the Contractor shall attend weekly progress meetings as scheduled by the Owner. The Owner, based on work progress and activities, may adjust the progress meetings to biweekly or other. The attendance of subcontractors may be required during the progress of the Work. The Contractor's delegate to the meeting shall be prepared and authorized to discuss the following items:

1. Progress of Work/Critical Work Sequencing in relation to Contract Schedule.
2. Proposed Work activities for forthcoming period.
3. Resources committed to Contract.
4. Coordination of Work with others.
5. Status of procurement of equipment and materials.
6. Status of Submittals.
7. Outstanding actions, decisions, or approvals that affect Work activities.
8. Site access and/or security issues

9. Hazards and risks
10. Housekeeping
11. Quality issues
12. Potential Claims
13. Change Orders
14. Costs, budget, and payment requests

B. The Contractor shall revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized and the revised schedule shall be submitted to the Engineer and Owner.

PART 2 - PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

END OF SECTION

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 1\01311 - Construction Meetings.docx

09/30/2011

01311-4

SECTION 01330

SUBMITTALS

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. The Contractor shall provide the Engineer with submittals as required by the contract documents.

1.02 RELATED WORK:

- A. Divisions 1 – 16 of these specifications that require submittals.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 GENERAL:

- A. As required by the General Conditions, Contractor shall submit a schedule of shop and working drawing submittals.
- B. The Contractor shall submit the shop and working drawing submittals either electronically or hard copy.

3.02 ELECTRONIC SUBMITTALS:

- A. In accordance with the accepted schedule, the Contractor shall submit promptly to the Engineer by email (buccis@wseinc.com) or on Compact Disc (mail to Weston & Sampson Engineers, attention: S. Bucci), one electronic copy in Portable Document Format (PDF) of shop or working drawings required as noted in the specifications, of equipment, structural details and materials fabricated especially for this Contract.
- B. Each electronic copy of the shop or working drawing shall be accompanied by the Engineer's standard shop drawing transmittal form, included as Exhibit 1 of this section (use only for electronic submittals), on which is a list of the drawings, descriptions and numbers and the names of the Owner, Project, Contractor and building, equipment or structure.
- C. The Contractor shall receive a shop drawing memorandum with the Engineer's approval or comments via email.

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

3.03 HARD COPY SUBMITTALS:

- A. In accordance with the accepted schedule, the Contractor shall submit promptly to the Engineer, by mail (to Weston & Sampson Engineers, attention: Sarah Bucci), six (6) copies each of shop or working drawings required as noted in the specifications, of equipment, structural details and materials fabricated especially for this Contract.
- B. Each shipment of drawings shall be accompanied by the Engineer's (if applicable) standard shop drawing transmittal form on which is a list of the drawings, descriptions and numbers and the names of the Owner, Project, Contractor and building, equipment or structure.

3.04 SHOP AND WORKING DRAWINGS:

- A. Shop and working drawings shall show the principal dimensions, weight, structural and operating features, space required, clearances, type and brand of finish of shop coat, grease fittings, etc., depending on the subject of the drawings. When it is customary to do so, when the dimensions are of particular importance, or when so specified, the drawings shall be certified by the manufacturer or fabricator as correct for this Contract.
- B. All shop and working drawings shall be submitted to the Engineer by and/or through the Contractor, who shall be responsible for obtaining shop and working drawings from his subcontractors and returning reviewed drawings to them. All shop and working drawings shall be prepared on standard size, 24-inch by 36-inch sheets, except those, which are made by changing existing standard shop or working drawings. All drawings shall be clearly marked with the names of the Owner, Project, Contractor and building, equipment or structure to which the drawing applies, and shall be suitably numbered. Each shipment of drawings shall be accompanied by the Engineer's (if applicable) standard shop drawing transmittal form on which is a list of the drawings, descriptions and numbers and the names mentioned above.
- C. Only drawings that have been prepared, checked and corrected by the fabricator should be submitted to the Contractor by his subcontractors and vendors. Prior to submitting drawings to the Engineer, the Contractor shall check thoroughly all such drawings to satisfy himself that the subject matter thereof conforms to the Contract Documents in all respects. Shop drawings shall be reviewed and marked with the date, checker's name and indication of the Contractor's approval, and only then shall be submitted to the Engineer. Shop drawings unsatisfactory to the Contractor shall be returned directly to their source for correction, without submittal to the Engineer. Shop drawings submitted to the Engineer without the Contractor's approval stamp and signature will be rejected. Any deviation from the Contract Documents indicated on the shop drawings must be identified on the drawings and in a separate submittal to the Engineer, as required under subsection 6.17 Shop Drawings and Samples; D. Submittal Procedures, Paragraph 3 of the 1996 General Conditions.



- D. The Contractor shall be responsible for the prompt submittal and resubmittal, as necessary, of all shop and working drawings so that there will be no delay in the work due to the absence of such drawings.
- E. The Engineer will review the shop and working drawings as to their general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Corrections of comments made on the drawings during the review do not relieve the Contractor from compliance with requirements of the Contract Documents. The Contractor is responsible for: confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner. The review of the shop drawings is general and shall not relieve the Contractor of the responsibility for details of design, dimensions, code compliance, etc., necessary for interfacing with other components, proper fitting and construction of the work required by the Contract and for achieving the specified performance. The Engineer will review submittals two times: once upon original submission and a second time if the Engineer requires a revision or corrections. The Contractor shall reimburse the Owner amounts charged to the Owner by the Engineer for performing any review of a submittal for the third time or greater.
- F. With few exceptions, shop drawings will be reviewed and returned to the Contractor within 30 days of submittal.
- G. No material or equipment shall be purchased or fabricated especially for this Contract nor shall the Contractor proceed with any portion of the work, the design and details of which are dependent upon the design and details of equipment or other features for which review is required, until the required shop and working drawings have been submitted and reviewed by the Engineer as to their general conformance and compliance with the project and its Contract Documents. All materials and work involved in the construction shall then be as represented by said drawings.
- H. Electronic copies of the shop and working drawings and/or catalog cuts will be returned to the Contractor. The Contractor shall furnish printed copies of such drawings or catalog cuts when so requested.

### 3.05 SAMPLES:

- A. Samples specified in individual Sections include, but are not necessarily limited to, physical examples of the work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols, and units of work to be used by the Engineer or Owner for independent inspection and testing, as applicable to the work.

- B. The number of samples submitted shall be as specified. Submittal and processing of samples shall follow the procedures outlined for shop and working drawings unless the specifications call for a field submittal or mock-up.
- C. Acceptance of samples will be acknowledged via a copy of the transmittal noting status. When samples are not acceptable, prompt resubmittal will be required.

3.06 OPERATING AND MAINTENANCE MANUALS AND SPARE PARTS LISTS:

- A. Submit operation and maintenance manuals and spare parts lists in accordance with Section 01760.

3.07 WARRANTIES, GUARANTEES, AND BOND:

- A. Submit separate binder containing all facility warranties compiled.
- B. Submit (1) electronic file of draft and final forms.

3.08 ASSET AND MAINTENANCE SUMMARY FORMS:

- A. Submit separate binder containing all compiled Asset Summary Forms and Maintenance Summary Forms. Refer to Section 01760 for additional information.
- B. Submit (1) electronic file of draft and final forms.

END OF SECTION

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

EXHIBIT 1 TO SECTION 01330 SUBMITTALS

SHOP DRAWING TRANSMITTAL FORM

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

# Shop Drawing Transmittal



## Instructions for Preparing Transmittal

No action will be taken on any item unless accompanied by this form. Type or print all entries.

TRANSMITTAL NOS. To be consecutive (1, 2, 3, etc.).

Each resubmittal of same item shall use same number with suffix letter (A, B, etc.).

SPEC. SECT. NO: Only one spec. section no. to each transmittal.

DESCRIPTION: Complete identification of document or group of documents.

SOURCE: Originator of document(s) being submitted.

DRAWING NO: Identification of document(s).

NO. OF COPIES: Usually 6 or as directed/specified.

CONTRACT DRAWING REFERENCE: Contract drawing number(s) showing details of document(s) being submitted.

SPECIAL INSTRUCTIONS: Special cases and emergencies, changes in distribution and special handling requests, etc. should be entered here.

SIGNATURE OF CONTRACTOR: Signature of individual who reviews and approves material prior to submittal to engineer.

Contractor to retain one copy.

### THIS SECTION TO BE COMPLETED BY CONTRACTOR

TRANSM. NO.	SPEC. SECT. NO.	DATE	CONTRACTOR'S JOB NO.	WESTON & SAMPSON JOB NO.
-------------	-----------------	------	----------------------	--------------------------

PROJECT NAME & CONTRACT NO. LOCATION

Attention:  
Weston & Sampson  
273 Dividend Road  
Rocky Hill, CT 06067

TRANSMITTED VIA:

ITEM NO.	DESCRIPTION	SOURCE	DRAWING NO. CATALOG NO. OR FIGURE, ETC.	NO. OF COPIES	CONTRACT DRAW REF.	By Weston & Sampson ACTION CODE	REVIEWED BY
1							
2							
3							
4							

THIS CERTIFIES THAT ALL ITEMS SUBMITTED HERewith HAVE BEEN CHECKED BY THE CONTRACTOR, ARE IN CONFORMANCE WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS, EXCEPT AS NOTED, AND ARE APPROVED BY THE CONTRACTOR FOR THIS PROJECT.

SPECIAL INSTRUCTIONS:

(FOR CONTRACTOR)  
SIGNATURE & TITLE:

### THIS SECTION TO BE COMPLETED BY WESTON & SAMPSON

#### ACTION CODE

- 1 - NO EXCEPTIONS TAKEN
  - 2 - MAKE CORRECTIONS NOTED
  - 3 - AMEND AND RESUBMIT
  - 4 - REJECTED - SEE REMARKS
  - 5 - ACKNOWLEDGEMENT
- a. INSTALLATION SHALL PROCEED ONLY WHEN ACTION CODE IS 1 OR 2
  - b. ACTION CODED 3 SHALL BE RESUBMITTED WITHIN TIME LIMIT SET IN CONTRACT.
  - c. REVIEW DOES NOT RELIEVE CONTRACTOR FROM RESPONSIBILITY OF COMPLIANCE WITH ALL REQUIREMENTS OF THE CONTRACT DOCUMENTS.

FIELD OFFICE

REC'D BY

DATE



BY \_\_\_\_\_ / / DATE

SECTION 01380

HEALTH AND SAFETY PLAN

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. Prior to the start of work on the site, Contractor shall prepare and submit a site-specific health and safety plan that includes consideration of all known and potential hazards at the site. Work may not proceed at the project site until the Contractor's health and safety plan has been received and reviewed by the Engineer.

1.02 REFERENCES:

- A. OSHA 29 CFR 1910.120

1.03 RELATED WORK:

- A. Section 02252 SUPPORT OF EXCAVATION

PART 2 – PRODUCTS

2.01 HEALTH AND SAFETY PLAN:

- A. The health and safety plan shall include, but not necessarily be limited to the following:
  1. Identification of Contractor's Site Safety Officer.
  2. Identification of Hazards and Risks Associated with Project.
  3. Contractor's Standard Operating Procedures, Including Personnel Training and Field Orientation.
  4. Respiratory Protection Training Requirements.
  5. Levels of Protection and Selection of Equipment Procedures.
  6. Type of Medical Surveillance Program.
  7. Personal Hygiene Requirements and Guidelines.
  8. Zone Delineation of the Project Site.
  9. Site Security and Entry Control Procedures.

10. Field Monitoring of Site Contaminants.
11. Contingency and Emergency Procedures.
12. Listing of Emergency Contacts.

### PART 3 - EXECUTION

#### 3.01 PERSONAL PROTECTIVE EQUIPMENT:

- A. The personal protective equipment required to provide the appropriate level of dermal and respiratory protection shall be determined based on the results of continuous air monitoring performed by the Contractor and the standards set forth in the Contractor's health and safety plan. The Engineer may conduct duplicate air monitoring for quality control purposes. Modified Level D protection shall be the minimum requirement for all on-site personnel.

END OF SECTION

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 01450

STRUCTURAL TESTS AND SPECIAL INSPECTIONS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS:

- A. The Connecticut State Building Code, under which this project is designed and will be built, requires the Structural Engineer of Record (SER) to provide a program of structural tests and inspections for this project. The SER is the structural engineer who is in responsible charge of the preparation of the structural drawings and structural specifications for this project and whose professional engineering seal appears on said structural drawings.
- B. The SER has prepared a document entitled Statement of Special Inspections, which has been or will be submitted to the building official who has jurisdiction over this project, with the application for a building permit.
- C. The program of structural tests and special inspections shall not relieve the Contractor or its subcontractors of their responsibilities and obligations for quality control of the Work, their other obligations for supervising the Work for any design work which is included in their scope of services, and for full compliance with the requirements of the Contract Documents. Furthermore, the detection of, or failure to detect, deficiencies or defects in the Work during the testing and inspection conducted pursuant to the program shall not relieve the Contractor or its subcontractors of their responsibility to correct all deficiencies or defects, whether detected or undetected, in all parts of the Work, and to otherwise comply with all requirements of the Contract Documents.
- D. The program of structural tests and special inspections does not apply to the Contractor's equipment, temporary structures used by the Contractor to construct the project, the Contractor's means, methods, procedures, and job site safety.

1.02 CONTRACTOR RESPONSIBILITIES:

- A. The Contractor shall provide free and safe access to the Work for the SER and all other individuals who are observing the Work or performing structural tests or inspections. The Contractor shall provide all ladders, scaffolding, staging, and up-to-date safety equipment, all in good and safe working order, and qualified personnel to handle and erect them, as may be required for safe access.
- B. The Contractor shall give reasonable notice to the Owner and the Engineer of when the various parts of the Work will be ready for testing and/or inspection. The Contractor shall notify the Owner and the Engineer a minimum of 48 hours before such tests and/or inspections are to take place.



1.03 PROGRAM OF STRUCTURAL TESTS AND SPECIAL INSPECTIONS:

The following is a summary of Work subject to Tests and Inspections under the Program.

- |                           |                     |
|---------------------------|---------------------|
| 1. Soils and Foundations  | 4. Structural Steel |
| 2. Cast-In-Place Concrete |                     |
| 3. Masonry                |                     |

<u>Abbreviation</u>	<u>Agent</u>
SER	Structural Engineer of Record
ITA	Independent Testing Agency Hired and Paid for by Contractor

**A. Soils and Foundations**

Item	Agent	Scope
1. Shallow Foundations	SER	Inspect soils below footings for adequate bearing capacity and consistency with geotechnical report.
	SER	Inspect removal of unsuitable material and preparation of subgrade prior to placement of controlled fill.
2. Controlled Structural Fill	ITA	Perform sieve tests (ASTM D422 & D1140) and modified Proctor tests (ASTM D1557) of each source of fill material.
	SER	Inspect placement, lift thickness and compaction of controlled fill.
	ITA	Test density of each lift of fill by nuclear methods (ASTM D2922)
	SER	Verify extent and slope of fill placement.

**B. Cast-In-Place Concrete Construction**

Item	Agent	Scope
1. Mix Design	ITA	Review concrete batch tickets and verify compliance with approved mix design. Verify that water added at the site does not exceed that allowed by the mix design.
2. Reinforcement Installation	ITA	Inspect size, spacing, cover, positioning and grade of reinforcing steel. Verify that reinforcing bars are free from oil or other deleterious materials. Inspect bar laps and mechanical splices. Verify that bars are adequately tied and supported on chairs or bolsters.
3. Anchor Rods	ITA	Inspect size, positioning and embedment of anchor rods. Inspect concrete placement and consolidation around anchors.

Item	Agent	Scope
4. Concrete Placement	ITA	Inspect placement of concrete. Verify that concrete conveyance and depositing avoids segregation or contamination. Verify that concrete is properly consolidated.
5. Sampling and Testing of Concrete	ITA	Test concrete compressive strength (ASTM C31 & C39), slump (ASTM C143), air-content (ASTM C231 or C173) and temperature (ASTM C1064).
6. Curing and Protection	ITA	Inspect curing, cold weather protection and hot weather protection procedures.

### C. Masonry Construction

Item	Agent	Scope
1. Mixing of Mortar and Grout	ITA	Inspect proportioning, mixing and retempering of mortar and grout.
2. Materials	SER	Review material certifications for conformance to specifications.
3. Installation of Masonry	ITA	Inspect size, layout, bonding and placement of masonry units.
4. Mortar Joints	ITA	Inspect construction of mortar joints including tooling and filling of head joints.
5. Reinforcement Installation	ITA	Inspect placement, positioning and lapping of reinforcing steel.
	ITA	Inspect welding of reinforcing steel.
6. Grouting Operations	ITA	Inspect placement and consolidation of grout. Inspect masonry clean-outs for high-lift grouting.
7. Weather Protection	ITA	Inspect cold weather protection and hot weather protection procedures. Verify that wall cavities are protected against precipitation.
8. Evaluation of Masonry Strength	ITA	Test compressive strength of mortar and grout cube samples (ASTM C780). Test compressive strength of masonry prisms (ASTM C1314).
9. Anchors and Ties	ITA	Inspect size, location, spacing and embedment of dowels, anchors and ties.

## D. Structural Steel

Item	Agent	Scope
1. Fabricator Certification Quality Control	ITA	Review shop fabrication and quality control procedures.
2. Material Certification	ITA	Review certified mill test reports and identification markings on wide-flange shapes, high-strength bolts, nuts and welding electrodes
3. Bolting	ITA	Inspect installation and tightening of high-strength bolts. Verify that splines have separated from tension control bolts. Verify proper tightening sequence. Continuous inspection of bolts in slip-critical connections.
4. Welding	ITA	Visually inspect all welds. Inspect pre-heat, post-heat and surface preparation between passes. Verify size and length of fillet welds.
	ITA	Ultrasonic testing of all full-penetration welds.
5. Structural Details	ITA	Inspect steel frame for compliance with structural drawings including bracing, member configuration and connection details.

### PART 2 - PRODUCTS

NOT USED.

### PART 3 - EXECUTION

NOT USED.

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 1\01450 - Structural Tests and Special Inspections.docx

SECTION 01562

DUST CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION:

This section of the specification covers the control of dust via calcium chloride and water.

PART 2 - PRODUCTS

2.01 CALCIUM CHLORIDE:

- A. Calcium chloride shall conform to the requirements of AASHTO-M 144, Type I or Type II and Specification for Calcium Chloride, ASTM D98. The calcium chloride shall be packaged in moisture proof bags or in airtight drums with the manufacturer, name of product, net weight, and percentage of calcium chloride guaranteed by the manufacturer legibly marked on each container.
- B. Calcium chloride failing to meet the requirements of the aforementioned specifications or that which has become caked or sticky in shipment, may be rejected by the Engineer.

2.02 WATER:

- A. Water shall not be brackish and shall be free from oil, acid, and injurious alkali or vegetable matter.

PART 3 - EXECUTION

3.01 APPLICATION:

- A. Calcium chloride shall be applied when ordered by the Engineer and only in areas which will not be adversely affected by the application. See Section 01570, ENVIRONMENTAL PROTECTION.
- B. Calcium chloride shall be uniformly applied at the rate of 1-1/2 pounds per square yard or at any other rate as required by the Engineer. Application shall be by means of a mechanical spreader, or other approved methods. The number and frequency of applications shall be determined by the Engineer.
- C. Water may be sprinkler applied with equipment including a tank with gauge-equipped pressure pump and a nozzle-equipped spray bar.

- D. Water shall be dispersed through the nozzle under a minimum pressure of 20 pounds per square inch, gauge pressure.

END OF SECTION

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

SECTION 01570

ENVIRONMENTAL PROTECTION

PART 1 – GENERAL

1.01 DESCRIPTION:

- A. The work covered by this section of the specifications consists of furnishing all labor, materials, tools and equipment and performing all work required for the prevention of environmental pollution during and as a result of construction operations under this contract.
- B. The requirements set forth in this section of the specifications apply to construction adjacent to drainage structures and all unpaved areas, unless otherwise specifically stated.
- C. Prior to commencement of work, the Contractor shall meet with representatives of the Engineer to develop mutual understandings relative to compliance of the environmental protection program.

1.02 RELATED WORK:

- A. Section 00890, PERMITS
- B. Section 01330, SUBMITTALS
- C. Section 01562, DUST CONTROL
- D. Section 02246, DEWATERING
- E. Section 01252, SUPPORT OF EXCAVATION
- F. Section 02300, EARTHWORK

1.03 SUBMITTALS:

- A. The Contractor shall submit for approval six (6) sets of details and literature fully describing environmental protection methods to be employed in carrying out construction activities within 100 feet of drainage structures.

PART 2 - PRODUCTS

2.01 SILT FENCE:

- A. The silt fence shall consist of a 3-foot wide continuous length sediment control fabric, stitched to a mesh backing, and stapled to preweathered oak posts installed as shown

on the drawings. The oak posts shall be 1-1/4-inches by 1-1/4-inches (Minimum Dimension) by 48-inches and shall be tapered. The bottom edge of the silt fence shall be buried as shown on the drawings.

- B. The silt fence shall be DOT Silt Fence PPDM3611, as manufactured by U.S. Silt & Site Supply/Getesco, Concord, NH, FX11 by Carthage Mills, Cincinnati, OH, or equal.
- C. Silt fence properties:

<u>Physical Properties</u>	<u>Test Method</u>	<u>Minimum Value</u>
Grab Strength, lbs.	ASTM-D-4632	124
Grab Elongation, %	ASTM-D-4632	15
Mullen burst, psi	ASTM-D-3786	300
Puncture, lbs.	ASTM-D-4833	65
Trapezoidal Tear, lbs.	ASTM-D-4833	65
UV Resistance <sup>2</sup> , % <sup>3</sup>	ASTM-D-4355	80@500 hrs.
AOS, US Sieve No.	ASTM-D-4751	30
Flow Rate, gal/min/sq ft	ASTM-D-4491	10
Permittivity, (1/sec) gal/min/sq ft	ASTM-D-4491	0.05 sec <sup>-1</sup>

2.02 STRAW BALES:

- A. Straw bales shall consist of certified seed free stems of agricultural grain and cereal crops and shall be free of grasses and legumes. Standard bales shall be 14-inches high, 18- inches wide and 36- to 40-inches long tied with polypropylene twine and weigh within 5 percent of 7 lbs. per cubic ft.

2.03 CATCH BASIN PROTECTION:

- A. To trap sediment and to prevent sediment from clogging drainage systems, catch basin protection in the form of a siltation sack (Siltsack as manufactured by ACF Environmental, Inc., Terrafix Geosynthetics, Inc., or equal) shall be provided as approved by the Engineer.

PART 3- EXECUTION

3.01 NOTIFICATION AND STOPPAGE OF WORK:

- A. The Engineer will notify the Contractor in writing of any non-compliance with the provisions of the specifications. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails to act promptly, the Owner may order stoppage of all or part of the work through the Engineer until satisfactory corrective action has been taken. No claim for an extension of time or for excess costs or damage incurred by the

Contractor as a result of time lost due to any stop work orders shall be made unless it was later determined that the Contractor was in compliance.

### 3.02 AREA OF CONSTRUCTION ACTIVITY:

- A. Insofar as possible, the Contractor shall confine his construction activities to those areas defined by the plans and specifications. All land resources within the project boundaries and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition after completion of construction at least equal to that which existed prior to work under this contract.

### 3.03 PROTECTION OF WATER RESOURCES:

- A. The Contractor shall not pollute drainage systems, streams, lakes or reservoirs with fuels, oils, bitumens, calcium chloride, acids or other harmful materials. It is the Contractor's responsibility to comply with all applicable Federal, State, County and Municipal laws regarding pollution of watercourses.
- B. Special measures should be taken to insure against spillage of any pollutants into drainage systems.

### 3.04 PROTECTING AND MINIMIZING EXPOSED AREAS:

- A. The Contractor shall limit the area of land which is exposed and free from vegetation during construction. In areas where the period of exposure will be greater than two (2) months, temporary vegetation, mulching or other protective measures shall be provided as specified.
- B. The Contractor shall take account of the conditions of the soil where temporary cover crop will be used to insure that materials used for temporary vegetation are adaptive to the sediment control. Materials to be used for temporary vegetation shall be approved by the Engineer.

### 3.05 LOCATION OF STORAGE AREAS:

- A. The location of the Contractor's storage areas for equipment and/or materials shall be upon cleared portions of the job site or areas to be cleared as a part of this project, and shall require written approval of the Engineer. Plans showing storage facilities for equipment and materials shall be submitted for approval of the Engineer.
- B. No excavated materials or materials used in backfill operations shall be deposited within a minimum distance of one hundred (100) feet of any watercourse or any drainage facility. Adequate measures for erosion and sediment control such as the placement of baled straw or silt fence around the downgradient perimeter of stockpiles shall be employed to protect any downgradient areas from siltation.



- C. There shall be no storage of equipment or materials in areas designated as wetlands or on drainage structures.
- D. The Engineer may designate a particular area or areas where the Contractor may store materials used in his operations.
- E. Storage areas in cross-country locations shall be restored to pre-construction conditions in accordance with the requirements of Section 02920, LOAMING AND SEEDING.

3.06 DISCHARGE OF DEWATERING OPERATIONS:

- A. Any water that is pumped and discharged from the trench and/or excavation as part of the Contractor's water handling shall be filtered by an approved method prior to its discharge into a receiving water or drainage system.
- B. Under no circumstances shall the Contractor discharge water to the areas designated as wetlands.
- C. The pumped water shall be filtered through a sediment filter bag, filter fabric and baled straw, or a vegetative filter strip to trap sediment occurring as a result of the construction operations.

3.07 DUST CONTROL:

- A. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping of paved areas as necessary, and sprinkling of unvegetated and disturbed areas as needed to minimize creation and dispersion of dust. If the Engineer decides it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread the material, as required. Calcium chloride shall be as specified under Section 01562, DUST CONTROL.
- B. Calcium Chloride shall not be used for dust control within a drainage basin or in the vicinity of any source of potable water.

3.08 SEPARATION AND REPLACEMENT OF TOPSOIL:

- A. Topsoil shall be carefully removed from unpaved areas where excavations are to be made, and separately stored to be used again as required. The topsoil shall be stored in an area acceptable to the Engineer and adequate measures shall be employed to prevent erosion of said material.

3.09 BALED STRAW:

- A. To trap sediment and to prevent sediment from clogging drainage systems, baled straw shall be used where shown on the drawings. Care shall be taken to keep the bales from

breaking apart. The bales should be securely staked to prevent overturning, flotation, or displacement. All deposited sediment shall be removed periodically.

### 3. 10 ERECTION AND MAINTENANCE OF SILT FENCE:

- A. Where indicated on the drawings or where required by the Engineer, the Contractor shall erect and maintain a temporary silt fence. The silt fence shall be used specifically to contain sediment from runoff water and to minimize environmental damage caused by construction.

### 3.11 SURFACE RESTORATION:

- A. Loaming and seeding detailed in Section 02920 immediately following the completion of construction activities and site work. A one-year guarantee of maintenance will be required on the seeding to ensure that they establish in the area.

### 3.12 CATCH BASIN PROTECTION:

- A. Catch basin protection shall be used for every catch basin, shown on the plans or as required by the Engineer, to trap sediment and prevent it from clogging drainage systems and entering wetlands. Siltation sacks shall be securely installed under the catch basin grate. Care shall be taken to keep the siltation sacks from breaking apart or clogging. All deposited sediment shall be removed periodically and at times prior to predicted precipitation to allow free drainage flow. Prior to working in areas where catch basins are to be protected, each catch basin sump shall be cleaned of all debris and protected. The contractor shall properly dispose of all debris at no additional cost to the Owner.

END OF SECTION

SECTION 01575

HANDLING EXISTING FLOWS

PART 1 - GENERAL

1.01 WORK INCLUDED:

This Section covers all materials, equipment, and labor required to handle existing sanitary and combined sewage flows and installation and maintenance of all temporary connections, plugs, and by-pass pumping. Upon completion of the new work, all temporary plugs and connections shall be removed.

1.02 RELATED WORK:

Section 01330, SUBMITTALS

1.03 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Submit complete, checked shop drawings, showing equipment, method of by-passing, and the method of transferring flows from the existing system to the new system. Prior to starting work, the Contractor shall submit flow calculations for each pipeline to be bypassed that show pump capacity to be provided. Comply with requirements of Section 01330.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION

3.01 MAINTAINING EXISTING FLOWS:

- A. The Contractor shall maintain all flows in the existing system until construction of the pumping station is complete and ready for safe operation.
- B. The Contractor shall protect against surcharging of the existing system upstream of the work area by installing adequate temporary by-pass pumping to handle dry weather and wet weather flows. The bypass system shall have a sufficient capacity to handle full pipe capacity for the pumping station to be bypassed (400 GPM) and shall provide and maintain sufficient flow at all times to prevent any backwater flooding due to obstructions caused by the construction.
- C. The Contractor shall repair any damage that occurs to existing pipes and structures to the satisfaction of the Engineer. Work performed under this section shall be considered incidental and shall not be measured separately for payment.

- D. Existing pipes to be abandoned shall be filled with cement grout. Plugs shall be installed at locations shown on the drawings.
- E. The temporary bypass pumping system shall include floats (or other acceptable level sensing devices) that will transmit a high-water condition to an on-site autodialer that shall send an alarm condition to the Contractor's Superintendent. The autodialer shall also alert a designated "on-call" employee of the Contractor, should the Superintendent fail to acknowledge the call.

END OF SECTION

\\Wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\2 Specifications\Division 1\01575 - Handling Existing Flows.docx

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

SECTION 01735

CUTTING, CORING AND PATCHING

PART 1 - GENERAL

1.01 WORK INCLUDED:

This Section covers the cutting, coring, rough and finish patching of holes and openings in existing structures.

1.02 RELATED WORK:

A. SECTION 03300 CAST-IN-PLACE CONCRETE

PART 2 - PRODUCTS

2.01 SEALING MATERIALS:

- A. Mechanical seals shall be modular, adjustable, bonded, mechanical type consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve. The seal shall be rated by the manufacturer for 40 feet of head or 20 psig. Mechanical seals shall be Link-Seal, manufactured by Thunderline Corp., Wayne, MI., or approved equal.
- B. Sealant shall be a two part foamed silicone elastomer as manufactured by Dow Corning Co., product No. 3-6548 silicone R.T.V.; 3M brand fire barrier products caulk C.P. 25 and 3M brand putty 303; Flame-Safe fire stop systems Fig. No. FS-500 by Thomas & Betts Corporation, or approved equal. Packing shall be a fire retardant pliable material, Fig. 310 by Sealrite Co.; White Oakum W.S.-600 by American Manufacturing Co., or approved equal. Sealant bead configuration, depth and width shall be in accordance with manufacturer's recommendations.

2.02 MISCELLANEOUS MATERIALS:

- A. Bonding compound shall be Sikadur Hi-Mod epoxy by Sika Corporation, or equivalent by Euclid Chemical Corporation, Master Builders Company, or approved equal.
- B. Non-shrink grout shall be Masterflow 713 by Master Builders Company; Euco N-S by Euclid Chemical Co.; Five Star Grout by U.S. Grout Corp. or approved equal.
- C. Materials for finish patching shall be equal to those of adjacent construction.

## PART 3 - EXECUTION

### 3.01 GENERAL:

- A. The Contractor shall leave all chases or openings for the installation of his own or any other contractor's or subcontractor's work, or shall cut the same in existing work, and shall see that all sleeves or forms are at the work and properly set in ample time to prevent delays. He shall see that all such chases, openings, and sleeves are located accurately and are of proper size and shape and shall consult with the Engineer and the contractors and subcontractors concerned in reference to this work.
- B. In case of his failure to leave or cut all such openings or have all such sleeves provided and set in proper time, Contractor shall cut them or set them afterwards at his own expense, but in so doing he shall confine the cutting to the smallest extent possible consistent with the work to be done. In no case shall piers or structural members be cut without the written consent of the Engineer.
- C. The Contractor shall not cut or alter the work of any subcontractor or any other contractor, nor permit any of his subcontractors to cut or alter the work of any other contractor or subcontractor, except with the written consent of the contractor or subcontractor whose work is to be cut or altered or with the written consent of the Engineer. All cutting and patching or repairing made necessary by the negligence, carelessness, or incompetence of the Contractor or any of his subcontractors shall be done by or at the expense of the Contractor and shall be the responsibility of the Contractor.
- D. All cutting and coring shall be performed in such a manner as to limit the extent of patching.
- E. All holes cut through concrete and masonry walls, slabs or arches shall be core drilled unless otherwise approved. No structural members shall be cut without the approval of the Engineer and all such cutting shall be done in a manner required by him. No holes may be drilled in beams or other structural members without obtaining prior approval. All work shall be performed by mechanics skilled in this type of work.

### 3.02 CORING:

- A. Coring shall be performed with an approved non-impact rotary tool with diamond core drills. Size of holes shall be suitable for pipe, conduit, sleeves, equipment or mechanical seals to be installed.
- B. If holes are cored through floor slabs they shall be drilled from below.
- C. All equipment shall conform to OSHA standards and specifications pertaining to plugs, noise and fume pollution, wiring and maintenance.
- D. Provide protection for existing equipment, utilities and critical areas against water or other damage caused by drilling operation.

- E. Slurry or tailings resulting from coring operations shall be vacuumed or otherwise removed from the area following drilling.

### 3.03 CUTTING:

- A. Cutting shall be performed with a concrete saw and diamond saw blades of proper size and application.
- B. Provide for control of slurry generated by sawing operation on both sides of wall or slab.
- C. When cutting a reinforced concrete wall, the cutting shall be done so as not to damage bond between the concrete and reinforcing steel left in the structure. Cut shall be made so that steel neither protrudes nor is recessed from the face of the cut.
- D. Adequate bracing of area to be cut shall be installed prior to start of cutting. Check area during sawing operations for partial cracking and provide additional bracing as required to prevent a partial release of cut area during sawing operations.
- E. Provide equipment of adequate size to remove cut panels.
- F. For cutting a trench in a floor slab, a full-depth cut shall be made using a concrete saw for the desired width of the trench. A partial-depth cut shall be made to expose the reinforcing bars. The width of the partial cut shall be to the required lap length of the reinforcing bars. Care shall be taken not to cut exposed reinforcing bars but if any are cut, dowel holes shall be drilled and dowels epoxied in. Reinforcing of the same size, as the existing shall be tied to the existing exposed reinforcing and/or dowels with the proper lap length.

### 3.04 PATCHING:

Rough patching shall be such as to bring the cut or cored area flush with existing construction unless otherwise shown. Finish patching shall match existing surfaces as approved.

Trenches in floor slabs shall be repaired as described in 3.03F above and concrete meeting the requirements of Section 03300 CAST-IN-PLACE CONCRETE shall be poured and cured.

END OF SECTION

THIS SPACE INTENTIONALLY LEFT BLANK

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY



SECTION 01740

CLEANING UP

PART 1 - GENERAL

1.01 DESCRIPTION:

The Contractor must employ at all times during the progress of its work adequate cleanup measures and safety precautions to prevent injuries to persons or damage to property. The Contractor shall immediately, upon request by the Engineer provide adequate material, equipment and labor to cleanup and make safe any and all areas deemed necessary by the Engineer.

1.02 RELATED WORK:

- A. Section 00700 GENERAL CONDITIONS
- B. Section 01110 CONTROL OF WORK AND MATERIALS
- C. Section 01140 SPECIAL PROVISIONS
- D. Section 01570 ENVIRONMENTAL PROTECTION

PART 2 - PRODUCTS

Not applicable

PART 3 - EXECUTION

2.01 DAILY CLEANUP:

- A. The Contractor shall clean up, at least daily, all refuse, rubbish, scrap and surplus material, debris and unneeded construction equipment resulting from the construction operations and sweep the area. The site of the work and the adjacent areas affected thereby shall at all times present a neat, orderly and workmanlike appearance.
- B. Upon written notification by the Engineer, the Contractor shall within 24 hours clean up those areas, which in the Engineer's opinion are in violation of this section and the above referenced sections of the specifications.
- C. If in the opinion of the Engineer, the referenced areas are not satisfactorily cleaned up, all other work on the project shall stop until the cleanup is satisfactory.

2.02 MATERIAL OR DEBRIS IN DRAINAGE FACILITIES:

- A. Where material or debris has washed or flowed into or has been placed in existing watercourses, ditches, gutters, drains, pipes, structures, such material or debris shall be entirely removed and satisfactorily disposed of during progress of the work, and the ditches, channels, drains, pipes, structures, and work shall, upon completion of the work, be left in a clean and neat condition.

2.03 REMOVAL OF TEMPORARY BUILDINGS, STRUCTURES AND EQUIPMENT:

- A. On or before completion of the work, the Contractor shall, unless otherwise specifically required or permitted in writing, tear down and remove all temporary buildings and structures it built; shall remove all temporary works, tools and machinery or other construction equipment it furnished; shall remove all rubbish from any grounds which it has occupied; shall remove silt fences and hay bales used for trapping sediment; and shall leave the roads and all parts of the property and adjacent property affected by its operations in a neat and satisfactory condition.

2.04 RESTORATION OF DAMAGED PROPERTY:

- A. The Contractor shall restore or replace, when and as required, any property damaged by its work, equipment or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. For this end the Contractor shall do as required all necessary highway or driveway, walk and landscaping work. Materials, equipment, and methods for such restoration shall be as approved by the Engineer.

2.05 FINAL CLEANUP:

- A. Before acceptance by the Owner, the Contractor shall perform a final cleanup to bring the construction site to its original or specified condition. This cleanup shall include removing all trash and debris off of the premises. Before acceptance, the Engineer shall approve the condition of the site.
- B. Before acceptance by the Owner, the Contractor shall perform a final cleanup to bring the building to a "like new" condition. This cleanup shall include removing all trash and debris from the premises; sweeping and mopping of all floors; washing of all walls, windows and doors; cleaning and polishing of all finish metal surfaces; cleaning of all equipment, utilizing proper solvents for removal of oil and grease; cleaning of dirt and debris out of all mechanical and electrical cabinets; and all other related work required to render the building suitable for use. Before acceptance, the Engineer shall approve the condition of the building.

END OF SECTION

SECTION 01750

EQUIPMENT CHECKOUT AND TESTING

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. The physical checkout and testing requirements in this Section are in addition to those requirements defined in the technical specifications.

1.02 RELATED WORK:

- A. Section 01752, STARTUP AND TESTING
- B. Division 5 through Division 16.

1.03 DEFINITIONS:

- A. Shop Testing is defined as testing that is performed by the manufacturer either at the place of manufacture, or the place of assembly, for the purpose of proving that the equipment meets the requirements of the technical specification(s).
- B. Physical Checkout is defined as the process whereby the Contractor physically inspects products after they have been installed in the work, and certifies that the products have been properly and completely installed, and are ready for field testing.
- C. Field Testing is defined as testing that is performed on products by the Contractor with the assistance of the manufacturer's representative, after the performance of physical checkout, for the purpose of proving that the tested products meet the specifications. While field testing can be described as "shop testing in the field", it may be required whether or not shop testing was performed on the product.
- D. System Testing is defined as testing performed on a "system" normally comprised of two or more pieces of equipment, after physical checkout and field testing have been completed, for the purpose of proving that the system meets specifications. System testing is described in Section 01752, STARTUP AND TESTING.
- E. Manufacturer's representative, sometimes referred to as the Factory-Trained Service Technician, is defined as a person provided by the manufacturer, who is qualified by training and experience to provide technical and process related advice, and/or assistance, relating to the installation or utilization of the products provided by the manufacturer. Minimum training and experience shall include not less than three (3) years' participation in similar work, including no less than three similar projects during this three-year period.

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

1.04 SHOP TESTING:

A. When required by the specifications, shop testing shall be performed prior to delivery of the equipment or material. If shop testing is not required by the technical specifications, provide shop testing as detailed in Paragraph 1.06. Provide a minimum of fifteen (15) days written notice, indicating the time and place of testing. Submit the following to the Engineer for approval not less than fifteen days prior to this notice.

1. Description of the test - Outline how the tests will conform to the requirements of the specifications.
2. Testing devices that will be used in the tests - description must state how the devices will perform or what they will measure, and the device accuracy. Submit sample measurement results and catalog cuts.
3. Schedule for testing - schedule shall include frequency of measurements, personnel present, and contingency plans for equipment and/or test failure.
4. Test forms - submit samples of all forms used to record and report on shop test data. Forms shall include description of test, test date, equipment used, equipment tested, personnel present, equipment tag ID numbers, and measurements made. Forms shall have a place for signature by the chief testing person, and an officer of the manufacturer certifying that the tests results shown are true, accurate, have met the required criteria, and that the equipment will operate as indicated.

B. Submit the following to the Engineer within one week after completion of the tests:

1. Completed test forms for each device tested.
2. Completed certification.
3. A written summary of testing, reporting results.
4. A schedule for retesting, if necessary. Perform any retesting required to fulfill the specification test requirements at no additional cost to the Owner. Additional travel required by the Engineer and the Owner personnel to witness retesting shall be paid by the Contractor, at no additional cost to the Owner.

1.05 PHYSICAL CHECKOUT:

A. Physical checkout shall include the following, where applicable:

1. Verify exterior areas for backfill, grading, surfacing, drainage, landscaping, roadways, fencing, and gates.
2. Verify buildings for structure, masonry, architectural, mechanical systems, electrical/lighting, communications, and HVAC.

3. Verify concrete structures for structural integrity, finish tolerance, durability, appearance, embedded and inserted items, painting and surface applications.
4. Verify steel structures for member alignment, connection bolts torque, connection welds integrity, painting, fire proofing and surface applications.
5. Verify mechanical systems and items for setting, alignment and securing, check and adjust packing and seals, lubrication, drying out, drive connection and alignment including rotation and belt/chain tension, painting or surface applications, and tagging for project system.
6. Verify piping systems for material, size, components, direction, alignment of joints and bolts/welding, packing and seals, screens and filters and strainers, leak and pressure hydro tests, painting and color coding, hangers and anchors and expansion provision and supports, clean out of foreign matter and tagging for project system.
7. Verify electrical and control/instrumentation systems for conduit and tray installation, wire/cable material and size, circuit continuity and identification, voltage testing, ground continuity and testing, terminal installation and identification, jar switches and circuit breakers and transformers tested, substation operation tested, and tagging for project system.
8. Verify communication system including telephone, fire/smoke alarm, security, paging, closed circuit TV similar to electrical above.
9. Verify computer systems by station, function, network interface.
10. Each piece of equipment and system must be certified by the manufacturer's representative as described in subsection 1.07.

1.06 MINIMUM SHOP AND FIELD TESTING REQUIREMENTS:

If the technical specifications do not define shop and field testing requirements, the following requirements shall be acceptable.

- A. Measurement of wearing ring clearances for all pumps requiring assembly, so equipped:
  1. Take a minimum of two (2) readings, 90 degrees apart.
  2. All measured clearances shall be within supplier's specifications for new Installations. Replace and recheck rings found to be out-of-round or out-of-specified tolerance.
- B. Measurement of impeller bore for all pumps requiring assembly:
  1. Take a minimum of two (2) readings, 90 degrees apart.

2. All measured clearances shall be within supplier's specifications for new installations. Replace and recheck impellers found to be out of round or out of specified tolerance.

C. Measurement of shaft run out for all rotating equipment requiring assembly:

1. Remove bearings from the shaft. Support shaft on pedestal rollers or in a lathe.
2. Check each shoulder on the shaft.
3. Take a minimum of two readings for each shoulder, 90 degrees apart.
4. All measured clearances shall be within supplier's specifications for new installations. Replace and recheck shafts found to be out of round or out of specified tolerance.

D. Vibration Measurements

1. Provide vibrational signature testing and documentation for each piece of direct drive or close coupled rotating equipment with a motor HP of 50 or above and a rated operating speed in excess of 999 RPM.
2. Unless specified otherwise, the current edition of the Hydraulic Institute Standard, "Acceptable Field Vibration Limits" shall be the standard for vibrational testing.
3. Take all specified vibrational readings in three directions; vertical, horizontal, and axial.
4. Provide vibrational measurements in the following engineering units:
  - a. Displacement in thousandths of an inch (mils), peak to peak.
  - b. Velocity in inches per second (ips), peak to peak.
  - c. Acceleration in feet per second, zero to peak.
  - d. Spike energy in g-SE.
5. The vibrational reading shall be less than the allowable maximum for the device rotating frequency and within the operating band specified by the supplier.
6. Amplitude Allowable Maximums:

<u>RPM</u>	<u>Amplitude Inches Peak to Peak</u>
3,000 and above	0.001
1,500 - 2,999	0.002
1,000 - 1,499	0.0025
999 and below	0.003

7. Utilize a Bently Nevada Dual Path Monitor, or equal for all vibrational measurements.

E. Belt Drives

All belts shall be in accordance with supplier's recommendations.

F. Gear Drives and Reducers

1. Check gears for lash at no less than three points around the gear.
2. Rotate a full 360 degrees while checking alignment.

G. Coupling/Shaft Alignment

1. Perform all final alignments and checks with a dial indicator or a laser device. Feeler gauges and straight edges are not acceptable.
2. Eliminate soft foot conditions prior to aligning.
3. When checking for final soft foot any displacement readings in excess of 0.002-in. must be corrected.
4. When checking for pipe strain, any displacement in excess of 0.002-in. requires piping realignment.
5. Alignments will not be regarded as final until the grout is set and all piping has been attached. Demonstrate that alignment is not changed by attachment of piping.
6. Shim the driving element; never the driven element.
7. Take bracket sag corrections into account when using a dial indicator. Bracket sag shall be determined on rigid pipe.
8. Mount a dial indicator to the driven element so that it can be rotated. Rotate both elements while aligning.
9. When aligning three coupled elements, align gear reduction elements with the driven element first, then align the driver to the gear reduction elements.
10. Check all four alignments: i.e. angular alignment in the vertical and horizontal planes, and parallel alignment in vertical and horizontal planes.
11. The minimum acceptable alignment accuracy for flexible couplings is +/- 0.005-in., or the supplier's specifications, whichever is more stringent.

12. The dial indicator must be perpendicular to the alignment surface.
13. Number hold down nuts prior to tightening. Loosen in reverse order. Tighten in ascending order.
14. Use only clean, deburred shims. Clean the machine base and remove rust or burrs prior to alignment.

#### H. Measurement of Noise (dB)

1. Eliminate noise sources generated by adjacent construction activity prior to testing.
2. Establish a background noise level prior to testing.
3. Perform noise level testing on each installation device as required by the technical specifications.
4. The maximum acceptable noise level exposure is 85 dBA over eight hours continuous for office, shop, and other areas where the Owner's personnel will be performing their assigned duties.

#### I. Hydrostatic Testing

1. AWWA C600 standards are the minimum acceptable standards for all hydrostatic testing.
2. Visually inspect all welds prior to testing, for cracks, undercut on surfaces greater than 1/32-in deep, lack of fusion on surface, reinforcement greater than Table 127.2.2 located in ANSI B31.1, Power Piping, and incomplete penetration (when accessible). Repair or rework as required by the Engineer.
3. At no time during hydrostatic testing shall any part of the piping system be subjected to a stress greater than 90% of its yield strength at test temperature.
4. After at least 10 minutes of full hydrostatic test procedures, make an examination for leakage of all joints, connections, and all regions of high stress, such as around openings and thickness transition sections.
5. Unless otherwise specified, the minimum required hydrostatic test pressure shall be 1.5 times the design pressure as specified and as indicated.
6. Unless otherwise specified, the minimum pressure holding time shall be 10 minutes plus the time required to inspect for leakage.
7. Maximum pressure shall not exceed the maximum rated pressure for any component in the system being tested.



J. Electrical Equipment

1. The testing standards for electrical components are those contained in Division 16 and in the pertinent technical specification(s).

1.07 SERVICES OF THE MANUFACTURER'S REPRESENTATIVE:

- A. Services of manufacturer's representatives shall be provided for equipment and systems specified in Divisions 11 through 16.
- B. Contractor shall coordinate services of the various representatives to avoid overlap, thereby ensuring all work may be observed by the Engineer, and the Owner's operating personnel may receive all required training.
- C. Contractor shall notify the Engineer in writing not less than ten working days prior to the visit of each manufacturer's representative.
- D. Manufacturer's representative shall provide services specified in Divisions 11 through 16. As a minimum, the services shall include the following:
  1. When each piece of equipment or system has been installed, including connection of permanent power and control, the equipment or system shall be started up and fully inspected, aligned and adjusted, including provision of lubrication and all pre-operative maintenance.
  2. Each piece of equipment or system shall be complete in all respects. Omission of any required items shall be corrected. Lack of discussion in the specifications of components which are necessary to equipment operation will not be accepted as the basis for an extra charge.
  3. At the time of the inspection the representative shall provide a minimum of two additional hours to train the Owner's operations personnel in the operation and maintenance of the equipment or system.
  4. Upon completion of this work the manufacturer's representative shall forward a copy of the report of his inspection to the Engineer via the Contractor. The report shall be on a form suitable to the Engineer and shall detail the work completed, deficiencies noted and/or corrected, any special instructions, and the names of Owner's personnel who received training. It shall also certify that the installation of the equipment or system is complete, ready for permanent operation, and free from any defects that would void the warranty.
  5. Satisfactory certification of all individual equipment and systems must be received by the Engineer prior to the authorization to proceed with the overall start-up operation.

6. The manufacturer's representative shall return at a later date to supervise field tests, assist in start-up and perform any additional training required. Reports of these visits, specifically detailing the results of all field tests, shall be forwarded to the Engineer within 7 days of completion of the services.
7. At the conclusion of checkout and testing, all information recorded during the test, including start-up and manufacturer's sign-off sheets, shall be forwarded to the Owner.

1.08 CORRECTIONS TO THE WORK:

Correct any items of work failing to meet the specifications at no additional cost to the Owner. Correct the nonconforming items by re-work, modification, or replacement, at the option of the Engineer. Provide all required labor, materials, and retesting as specified herein, to verify that the equipment or system conforms to the specifications.

1.09 SAFETY:

Conduct all test procedures in compliance with all applicable safety standards and regulations.

PART 2 – PRODUCTS – Not Used

PART 3 - EXECUTION – Not Used

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPC\12190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 1\01750 - Equip. Checkout and Testing.docx

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 01752

STARTUP AND TESTING

PART 1 - GENERAL

1.01 WORK INCLUDED:

This Section includes the startup and testing services required for the pump station(s) during system startup.

1.02 SYSTEM DESCRIPTION:

- A. The Contractor shall perform a 40-hour system startup test to the satisfaction of the Engineer and Owner. Startup and testing shall not be initiated until all required certifications and other required documentation has been submitted, as described herein.
- B. The purpose of the startup test is to provide a final operational checkout of all equipment prior to beneficial use by the Owner.
- C. As most components of each pump station are interrelated, Substantial Completion of the project shall not be certified until successful completion of startup.

1.03 RELATED WORK:

- A. Section 01750, EQUIPMENT CHECKOUT AND TESTING
- B. Divisions 11 through 16

1.04 SEQUENCING:

Testing, operator training and other like services to be provided under the technical sections of the specifications are not to be performed during startup without written authorization from the Engineer.

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF THE GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Three copies of the following shall be forwarded to the Engineer for review two (2) weeks prior to commencement of startup:
  - 1. Certification by a representative of the manufacturer that each piece of equipment has been installed properly and is ready for operation.

2. Certification by a representative of the equipment manufacturer that all equipment requiring calibration has been properly calibrated.
  3. A schedule of the testing, including staffing, and specific testing and operation of individual equipment items.
- B. At the conclusion of the test, all information recorded during the test shall be forwarded to the Engineer.
- C. This test is not to be utilized as a general debugging of the system. All equipment shall be started, tested and calibrated prior to this test. This includes automatic and manual operation as well as instrumentation interfacing.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Prior to commencement of testing, the Engineer shall be given three (3) days' written notice.
- B. The Contractor shall complete final debugging prior to startup.
- C. The 40-hour test shall be performed.

3.02 TEST PROCEDURES:

- A. It is the general responsibility of the Contractor to insure that all equipment is completely operational throughout the test; provide the Engineer with proper technical assistance as required to completely test all equipment and alarms.
- B. It is the general responsibility of the Engineer and Owner during the test period to supervise the testing of all equipment, associated alarms and devices; to vary the operation of the equipment as necessary, and to pump as required.

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 1\01752 - Startup and Testing.docx

## SECTION 01760

### OPERATION AND MAINTENANCE MANUALS

#### PART 1 - GENERAL

##### 1.01 SCOPE OF WORK:

- A. This section includes procedural requirements for compiling and submitting operation and maintenance data required to complete the project.

##### 1.02 RELATED WORK:

- A. General Requirements in their entirety (Section 00700 through Section 01770)
- B. Individual Technical Specification Sections Specific for Operation and Maintenance Data.
- C. Section 01330, SUBMITTALS
- D. Section 01770, PROJECT CLOSEOUT

##### 1.03 FORMAT:

- A. Prepare data in form of an instructional manual.
- B. Binders: Commercial quality, 8 1/2 x 11 inch three-ring binders with hardback, washable, plastic covers, two inch maximum ring size. When multiple binders are used, correlate data into related, consistent groupings. Provide a table of contents in each binder.
- C. Cover: Identify each binder cover and spine with typed or printed title OPERATION AND MAINTENANCE INSTRUCTION; list title of Project facility; identify subject matter of contents.
- D. Arrange contents by systems under section numbers and sequence of Table of Contents.
- E. Provide tabbed flyleaf for each separate product and system, with typed description of product and major component parts of equipment.
- F. Text: Manufacturer's printed data, or typewritten data - on 20-pound paper.
- G. Drawings: Provide with reinforced punched, binder tab. Bind in with text; fold larger drawings to size of text pages.
- H. Submit certification that the data and drawings provided pertain exactly to the model, size, and series product and equipment installed in the work.
- I. All documents will be electronically scannable.

- J. All products, systems, and drawings must be cross-referenced with tag ID numbers.
- K. The manual for each piece of equipment shall be a separate document with the following specific requirement:

1. Contents:

Table of Contents and Index

Brief description of each system and components

Starting and stopping procedures

Special operating instructions

Recommended inspection and maintenance procedures and schedule (i.e. weekly, monthly, yearly, etc.)

Manufacturer's printed operating and maintenance instructions, parts list, illustrations, and diagrams

One copy of each wiring diagram

One copy of each approved shop drawing and each Contractor's coordination and layout drawing

List of spare parts, manufacturer's price, and recommended quantity

Name, address, and telephone number of local service representatives.

Completed GNHWPCA Asset Summary and Maintenance Summary Forms

All Manufacturers Warranties

2. Material

Loose leaf on 60-pound, punched paper

Holes reinforced with plastic cloth or metal

Page size, 8 ½ x 11 inches

Diagrams, illustrations and attached foldouts as required, of original quality, reproduced by dry copy method

Covers: oil, moisture and wear resistant 9 x 12 size

#### 1.04 QUALITY ASSURANCE:

- A. Prepare instructions and data by personnel experienced in maintenance and operations of described products.

#### 1.05 CONTENTS, EACH VOLUME (BINDER):

- A. Table of Contents: Provide title of Contract, schedule of products and systems, indexed to content of the volume. A listing of all relevant tag ID numbers for each volume shall be placed immediately after the Table of Contents.
- B. For each product or systems: List names, addresses, and telephone numbers of subcontractors and suppliers, including local source of suppliers and replacement parts.
- C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- E. Text: As required to supplement product data, provide logical sequence of instructions for each procedure incorporating manufacturer's instructions.
- F. Warranties, Guarantees, and Bonds: Bind copy of each
- G. See O&M Manual Review Checklist at end of this specification section.

#### 1.06 MANUAL FOR MATERIALS AND FINISHES:

- A. Building Products, Applied Materials, and Finishes: Include product data with catalog number, size composition, and color and texture designations. Provide information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional Requirements: As specified in individual product specification sections.

## 1.07 MANUAL FOR EQUIPMENT AND SYSTEMS:

- A. Each Item of Equipment and Each System: Include description of unit or system and component parts. Identify function, normal operating characteristics and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- B. Data submitted on all equipment shall include complete maintenance instructions (including preventive and corrective maintenance) and parts lists in sufficient detail to facilitate ordering replacements.
- C. All products, systems, equipment, electrical wiring, interconnection diagrams, instrumentation wiring, personnel protection systems wiring, presented in this manual will have tag numbers corresponding to contract drawings and specifications. In the event, numbers do not exist; the Engineer will specify a series of numbers.
- D. Panelboard Circuit Directories: Provide electrical service characteristics, controls and communications.
- E. Include color-coded wiring diagrams as installed.
- F. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequence. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter and any special operating instructions.
- G. Provide servicing and lubrication schedule, and list of lubricants required. Cross-reference lubricants to products offered by at least three major lubricant suppliers.
- H. Include manufacturer's printed operation and maintenance instructions.
- I. Include sequence of operation by controls manufacturer.
- J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- K. Provide control diagrams by controls manufacturer as installed.
- L. Provide Contractor's coordination drawings, with color-coded piping diagrams as installed.
- M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.



- O. Include test and balancing reports, calibration data, alignment records, and other information.
- P. Additional Requirements: as specified in individual product specification sections.
- Q. Provide a listing in table of Contents for design data with tabbed flysheet and space for insertion of data.
- R. Incorporation of all Physical Checkout information obtained through the field-testing and correction phases of the Work. Input must be specific to the actions and information obtained during those phases.

#### 1.08 SUBMITTALS:

- A. The Contractor shall submit to the Engineer, prior to substantial completion of the project, four (4) printed and bound copies each of Operation and Maintenance Manual required as noted in the technical specifications sections for this Contract. Also submit (1) Electronic file of draft and final O&M Manuals.
- B. The Contractor shall be responsible for the prompt submittal and resubmittal, as necessary, of all manuals so that there will be no delay in the startup operation of the facility due to the absence of such manuals.
- C. Manuals shall show the principal dimensions, weight, structural and operating features, space required, clearances, type and/or brand of finish or shop coat, grease fittings, etc., depending on the subject of the drawings.
- D. All manuals shall be submitted to the Engineer by and/or through the Contractor, who shall be responsible for obtaining manuals from his subcontractors and returning reviewed manuals to them. A shop drawing transmittal form with a description of the manual shall accompany each shipment of manuals.
- E. The Engineer will review the manuals as to their general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Corrections of comments made in the manuals during the review does not relieve the Contractor from compliance with requirements of the Contract Documents.
- E. O&M Manuals will be reviewed and returned to the Contractor within 30 days of submittal.
- F. Where reference is made in technical specification sections to operating and maintenance manuals and/or spare parts lists, the Contractor shall submit four copies to the Engineer for review in accordance with the following instructions:

1. Four (4) complete sets of operation and maintenance instructions covering all equipment furnished under Sections 11, 13, 14, 15 and 16 requiring operation and maintenance manuals shall be delivered directly to the Owner.
  2. Submission and approval of each set of manuals is considered an integral part of furnishing and installing respective equipment or systems.
  3. Submit four (4) copies of first draft volumes as required herein. This first draft shall contain all currently available product data. One copy will be returned with comments.
  4. Submit four copies of completed second draft volumes in final form 90 days prior to startup and after Physical checkout to include the additional requirements set forth in paragraph 1.07.R of Section 01760 OPERATION AND MAINTENANCE MANUALS.
  5. Submit four copies of the Final Operation and Maintenance Manuals as required in Section 01770 PROJECT CLOSEOUT.
- G. If the submittal is complete and does not require any changes, an acknowledgement (copy of transmittal) will be returned noting status. If the submittal is incomplete or does require changes, corrections, additions, etc., one copy of the submittal will be returned with a copy of transmittal noting status.
- H. For systems requiring field adjustment and balancing, such as heating and ventilating, the Contractor shall submit separate test results and adjustment data on completion of the work to be incorporated into the system manual.
- I. The information included in the manual shall be as described in the individual specification sections, but as a minimum shall contain clear and concise instructions for operating, adjusting, lubricating and maintaining the equipment, an exploded assembly drawing, identifying each part by number and a listing of all parts of the equipment, with part numbers and descriptions required for ordering spare parts. Spare parts lists shall include recommended quantity and price.

#### 1.09 ASSET AND MAINTENANCE SUMMARY FORMS:

- A. The Contractor shall submit to the Engineer, prior to substantial completion of the project, printed and bound copies of each GNHWPCA Asset Summary Form and Maintenance Summary Form for all equipment provided. Asset Summary and Maintenance Forms are attach along with sample completed forms.
- B. Also submit (1) Electronic file of draft and final forms.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

**OPERATION AND MAINTENANCE MANUAL  
REVIEW CHECKLIST**

- 1. Name, address, telephone/fax number of the manufacturer
- 2. Name, address, contact name, telephone/fax of local representative
- 3. Name, address, telephone/fax number of the contractor
- 4. Exploded view/general arrangement of materials of construction
- 5. Description of operation/operating principal
- 6. Project specific Operating parameters
- 7. Wiring Diagrams, to include Interconnection Diagrams
- 8. Troubleshooting checklist
- 9. Recommended spare parts list with prices, and ordering instructions
- 10. Model number and the serial number of the model provided
- 11. Performance curves or tabulated data
- 12. Routine Maintenance instructions/service instructions with recommended Intervals
- 13. Assembly and disassembly instructions
- 14. Recommended lubricates and lubrication schedule
- 15. Approved copies of Shop Drawings are to be included in the manual
- 16. Startup/break-in and adjustment instructions
- 17. Warranty information
- 18. GHNWPCA Asset Summary Forms
- 19. GNHWPCA Maintenance Summary Forms

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

Reviewed By: \_\_\_\_\_  
Weston & Sampson Engineers

Date: \_\_\_\_\_

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 1\01760 - O&M Manuals.docx

END OF SECTION

# ASSET SUMMARY FORM

**Owner Name:** GNHWPCA **Project Number/Name:** \_\_\_\_\_

**General:**

Description: \_\_\_\_\_ Tag #: \_\_\_\_\_

Type: \_\_\_\_\_

Area: \_\_\_\_\_

Building/Room: \_\_\_\_\_

Vendor: \_\_\_\_\_ Website: \_\_\_\_\_

Manufacturer: \_\_\_\_\_ Website: \_\_\_\_\_

Model #: \_\_\_\_\_ Serial #: \_\_\_\_\_ Mfg Job #: \_\_\_\_\_

if serial # is unavailable

Install Date: \_\_\_\_\_ Purchase Date: \_\_\_\_\_

Start-up Date: \_\_\_\_\_ Warranty End Date: \_\_\_\_\_

**Specification(s):**

Pump Size/Size	Pump Flow	Pump Head	Pump Media

HP	Frame	RPM	Voltage

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

**Component(s):**

Component(s):		Specifications (if applicable)			
ID	Component Name - Mfg.	HP	Frame	RPM	Voltage
1					
2					
3					
4					
5					

## ASSET SUMMARY FORM cont.

**Attachment(s):**

ID	Attachment Name
1	
2	
3	

**Existing Asset(s):**

If replacing existing asset, record the tag and description of each existing asset:

Tag	Description

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

**Contact Information:**

General Contr.: \_\_\_\_\_

Email: \_\_\_\_\_

Phone: \_\_\_\_\_

Design Engineer: \_\_\_\_\_

Email: \_\_\_\_\_

Phone: \_\_\_\_\_

Sub-Contractor: \_\_\_\_\_

Email: \_\_\_\_\_

Phone: \_\_\_\_\_

**For Owner Use Only:**

Representative: \_\_\_\_\_

CMMS Upload Date: \_\_\_\_\_

CMMS Asset ID: \_\_\_\_\_

## MAINTENANCE SUMMARY FORM

Manufacturer's Local Rep: \_\_\_\_\_

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone: \_\_\_\_\_

Weight of Individual Components (Over 100 Pounds): \_\_\_\_\_

**Maintenance Requirements:**

Maintenance Task	Frequency	Lubricants
List each maintenance operation required and refer to specific information in the manufacturer's standard maintenance manual, if applicable. (Reference to manufacturer's catalog or sales literature is not acceptable.)	List required frequency of each maintenance operation	Refer by symbol to lubricant required.

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

MAINTENANCE SUMMARY FORM cont.

**Lubricant List:**

Reference Symbol	Shell	Exxon Mobile	Chevron Texaco	BP Amoco	Or Equal
List symbols used in No. 7 above.	List equivalent lubricants, as distributed by each manufacturer for the specific use recommended.				

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

**Recommended Spare Parts for Owners Inventory:**

Part No.	Description	Unit	Qty	Unit Cost	Stored Location

Note: Identify parts provided by this Contract with two asterisks.  
**Stored Location is recorded by Owner**



# ASSET SUMMARY FORM - EXAMPLE 1 - ATTACHMENT A

**Owner Name:** GNHWPCA **Project Number/Name:** CWF2010-01

**General:**

Description: Return Activiated Sludge Pump 6 Tag #: P-32-1-06

Type: Centrifugal Pump Horizontal

Area: North Basement

Building/Room: Facility 52 Activated Sludge Pump Station

Vendor: Rodnev Co. Website: [www.rodnevco.com/](http://www.rodnevco.com/)

Manufacturer: GNH Pumps Website: [www.gnhpumps.com/](http://www.gnhpumps.com/)

Model #: K250-400/G-3-F Serial #: 315707 Mfg Job #: \_\_\_\_\_

if serial # is unavailable

Install Date: 1/1/2016 Purchase Date: 12/1/2014

Start-up Date: 3/5/2016 Warranty End Date: 3/5/2017

**Specification(s):**

Pump Size/Size	Pump Flow	Pump Head	Pump Media
10" X 10"	3475 gpm	40	RAS

HP	Frame	RPM	Voltage
50		1180	460

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

**Component(s):**

Component(s):		Specifications (if applicable)			
ID	Component Name	HP	Frame	RPM	Voltage
1	Horizontal Motor - WEG	50	365T	1180	460
2	Coupling Drive				
3	Check Valve - Surge Buster				
4	Discharge Plug Valve - Milliken				
5	Suction Plug Valve - Milliken				

## ASSET SUMMARY FORM cont.

**Attachment(s):**

ID	Attachment Name
1	RAS Pump O&M Manual
2	Electronic Photo - Pump 6
3	Start up/COPI

**Existing Asset(s):**

If replacing existing asset, record the tag and description of each existing asset:

Tag	Description
Ex29765	Auma Centrifugal Pump Horizontal

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

**Contact Information:**

General Contr.: \_\_\_\_\_

Email: \_\_\_\_\_

Phone: \_\_\_\_\_

Design Engineer: \_\_\_\_\_

Email: \_\_\_\_\_

Phone: \_\_\_\_\_

Sub-Contractor: \_\_\_\_\_

Email: \_\_\_\_\_

Phone: \_\_\_\_\_

**For Owner Use Only:**

Representative: \_\_\_\_\_

CMMS Upload Date: \_\_\_\_\_

CMMS Asset ID: \_\_\_\_\_

## ASSET SUMMARY FORM - EXAMPLE 2 - ATTACHMENT B

**Owner Name:** GNHWPCA **Project Number/Name:** CWF2010-01

**General:**

Description: Air Flow Control Valve Tag #: FCV-21-4 - 1

Type: Flow Control Valve

Area: BRB Basin 1 - Zone 3

Building/Room: Facility 50 - BRB Basins

Vendor: Rodnev Co. Website: [www.rodnevco.com/](http://www.rodnevco.com/)

Manufacturer: GNH Autovalve Website: [www.gnhvalve.com/](http://www.gnhvalve.com/)

Model #: Series 400 Serial #: AH145900 Mfg Job #: \_\_\_\_\_  
if serial # is unavailable

Install Date: 7/27/2015 Purchase Date: 5/27/2015

Start-up Date: 7/27/2015 Warranty End Date: 7/27/2016

**Specification(s):**

Pump Size/Size	Pump Flow	Pump Head	Pump Media
6"			

Frame	RPM	Voltage

**Component(s):**

Component(s):		Specifications (if applicable)			
ID	Component Name	HP	Frame	RPM	Voltage
1	Electric Valve Actuator - GNH				460
2					
3					
4					
5					

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

## ASSET SUMMARY FORM cont.

**Attachment(s):**

ID	Attachment Name
1	Valve O&M Manual
2	Electronic Photo - ABZ Valve
3	Start up/COPI

**Existing Asset(s):**

If replacing existing asset, record the tag and description of each existing asset:

Tag	Description

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

**Contact Information:**

General Contr.: \_\_\_\_\_

Email: \_\_\_\_\_

Phone: \_\_\_\_\_

Design Engineer: \_\_\_\_\_

Email: \_\_\_\_\_

Phone: \_\_\_\_\_

Sub-Contractor: \_\_\_\_\_

Email: \_\_\_\_\_

Phone: \_\_\_\_\_

**For Owner Use Only:**

Representative: \_\_\_\_\_

CMMS Upload Date: \_\_\_\_\_

CMMS Asset ID: \_\_\_\_\_

# MAINTENANCE SUMMARY FORM - Example 1 - ATTACHMENT A

Manufacturer's Local Rep: Rodnev Co.

Name: John Daley

Address: 345 Main St. New Haven, CT 06511

Telephone: 203-555-5555

Weight of Individual Components (Over 100 Pounds): 2850 lbs

**Maintenance Requirements:**

Maintenance Task	Frequency	Lubricants
List each maintenance operation required and refer to specific information in the manufacturer's standard maintenance manual, if applicable. (Reference to manufacturer's catalog or sales literature is not acceptable.)	List required frequency of each maintenance operation	Refer by symbol to lubricant required.
Inspect Coupling Rubber inserts for wear	1/yr	NA
Grease Motor Bearings	1-2 years or 15,000 hrs	mobil polyrex em
Change seal oil	1-2 years or 10,000 hrs	Vegetable oil or any SAE 30 non detergent oil

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

## MAINTENANCE SUMMARY FORM cont.

### Lubricant List:

Reference Symbol	Shell	Exxon Mobile	Chevron Texaco	BP Amoco	Or Equal
List symbols used in No. 7 above.	List equivalent lubricants, as distributed by each manufacturer for the specific use recommended.				
Bearing Grease		Mobile Polyrex EM			
Seal Oil					Vegetable

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

### Recommended Spare Parts for Owners Inventory:

Part No.	Description	Unit	Qty	Unit Cost	Stored Location
**433.01	Inner Seal		2		
433.02	Outer Seal		2		
502	Case Wear Ring		2		
932,01-4	Circlip	4	2		
421.01,421.02	Lip Seals	2	2		
411	Oring Kit		4		
Note: Identify parts provided by this Contract with two asterisks. <b>Stored Location is recorded by Owner</b>					

# MAINTENANCE SUMMARY FORM - Example 2 - ATTACHMENT B

Manufacturer's Local Rep: Rodnev Co.

Name: John Daley

Address: 345 Main St. New Haven, CT 06511

Telephone: 203-555-5555

Weight of Individual Components (Over 100 Pounds): N/A

**Maintenance Requirements:**

Maintenance Task	Frequency	Lubricants
List each maintenance operation required and refer to specific information in the manufacturer's standard maintenance manual, if applicable. (Reference to manufacturer's catalog or sales literature is not acceptable.)	List required frequency of each maintenance operation	Refer by symbol to lubricant required.
Verify position feed back to actual valve position	1/yr	NA

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY



# MAINTENANCE SUMMARY FORM cont.

### Lubricant List:

Reference Symbol	Shell	Exxon Mobile	Chevron Texaco	BP Amoco	Or Equal
List symbols used in No. 7 above.	List equivalent lubricants, as distributed by each manufacturer for the specific use recommended.				

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

### Recommended Spare Parts (or Owners Inventory):

Part No.	Description	Unit	Qty	Stored Location

Note: Identify parts provided by this Contract with two asterisks.  
**Stored Location is recorded by Owner**

ASSET SUMMARY FORM

Owner Name: \_\_\_\_\_

Project Number/Name: \_\_\_\_\_

General Contractor: \_\_\_\_\_

Email: \_\_\_\_\_

Phone: \_\_\_\_\_

Design Engineer: \_\_\_\_\_

Email: \_\_\_\_\_

Phone: \_\_\_\_\_

Sub-Contractor: \_\_\_\_\_

Email: \_\_\_\_\_

Phone: \_\_\_\_\_

Tag #	Description	Type	Area	Building/Room	Vendor

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

For Owner Use Only:

Representative: \_\_\_\_\_

ASSET SUMMARY FORM

Owner Name: \_\_\_\_\_

Project Number/Name: \_\_\_\_\_

General Contractor: \_\_\_\_\_

Email: \_\_\_\_\_

Phone: \_\_\_\_\_

Design Engineer: \_\_\_\_\_

Email: \_\_\_\_\_

Phone: \_\_\_\_\_

Sub-Contractor: \_\_\_\_\_

Email: \_\_\_\_\_

Phone: \_\_\_\_\_

Website	Manufacturer	Website	Model #	Serial #	Mfg Job #

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

CMMS Upload Date: \_\_\_\_\_

ASSET SUMMARY FORM

Owner Name: \_\_\_\_\_

Project Number/Name: \_\_\_\_\_

General Contractor: \_\_\_\_\_

Email: \_\_\_\_\_

Phone: \_\_\_\_\_

Design Engineer: \_\_\_\_\_

Email: \_\_\_\_\_

Phone: \_\_\_\_\_

Sub-Contractor: \_\_\_\_\_

Email: \_\_\_\_\_

Phone: \_\_\_\_\_

Install Date	Start-up Date	Purchase Date	Pump Size	Pump Flow	Pump Head	Pump Media	HP	Frame	RPM	Voltage

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

ASSET SUMMARY FORM

Owner Name: \_\_\_\_\_

Project Number/Name: \_\_\_\_\_

General Contractor: \_\_\_\_\_

Email: \_\_\_\_\_

Phone: \_\_\_\_\_

Design Engineer: \_\_\_\_\_

Email: \_\_\_\_\_

Phone: \_\_\_\_\_

Sub-Contractor: \_\_\_\_\_

Email: \_\_\_\_\_

Phone: \_\_\_\_\_

Component(s)	HP	Frame	RPM	Voltage	Existing Asset(s)	Attachment(s)

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 01765

PROJECT AS-BUILT RECORD DRAWINGS

PART 1 - GENERAL

1.01 WORK INCLUDED:

This Section covers the Contractors As-Built Record drawings for the project. The As-Built Record drawings for the project shall include, but are not limited to:

- A. The Contractors construction coordination drawings for all the project disciplines. The Contractors construction coordination drawings for the project disciplines shall be submitted to the Engineer prior to Construction of the said discipline. The Contractors construction coordination drawings for the project disciplines shall include but are not limited to the following:

1. Civil,
2. Structural,
3. Electrical,
4. Mechanical,
5. Plumbing,
6. Process,
7. Instrumentation

- B. Draft Record Documents Review

Upon completion of the project construction the Contractor shall submit a complete copy of 24- by 36-inch Record Drawings to the Owner and the Engineer for review. The Owner and the Engineer shall jointly review the Record Drawings and provide comments to the Contractor. The Contractor shall modify the Record Drawings as necessary based on the comments provided by the Owner and the Engineer.

- C. Final Record Documents

Upon incorporation and acceptance of the Draft Record Drawings comments from the Owner and the Engineer, the Contractor shall submit the Final Record Drawings and documentation. The Contractor shall submit two sets of 24- by 36-inch Record Drawings to the Owner and an additional two sets of 24- by 36-inch Record Drawings to the Engineer for their records. The Contractor shall also submit to the Engineer a minimum 20 gigabyte flash drive with the electronic Record Drawing files. The electronic Record Drawing files shall be obtained from the Owner (the Engineer shall provide on behalf of the Owner if the Engineer was the project designer) and developed in AutoCAD (latest revision) and the submittal shall include the Final AutoCAD DWG file documents, drawing line types, blocks, etc. The actual version of AutoCAD shall be coordinated with the Engineer.

1.02 RELATED WORK:

- A. General Requirements in their entirety.
- B. Division 2 through Division 16.

1.03 AS-BUILT DOCUMENTS:

- A. Contractor shall maintain on site, separate from the documents used for construction, one complete set of the documents listed below, and as construction progresses, shall legibly record on these documents all changes made during construction.
  - 1. Contract Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other Modifications to the Contract.
  - 5. Reviewed shop drawings, product data, and samples.
  - 6. Written interpretations and clarifications.
  - 7. Field Orders.
  - 8. Field test reports properly verified.
- B. The completed set of documents shall include but are not limited to:
  - 1. Significant deviations of any nature made during construction.
- C. The completed set of as-built documents shall be submitted to the Engineer with the final Application for Payment.

PART 2 - MATERIALS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01770

PROJECT CLOSEOUT

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. This Section covers administrative and procedural requirements for closing out the project, including, but not limited to:

1. Project as-built documents
2. Checkout and Certification
3. Startup and Testing
4. Final Cleaning
5. Substantial Completion
6. Closeout Procedures
7. Final Completion
8. Correction/Warranty Period

B. Closeout checklist to be completed by the Engineer.

1.02 RELATED WORK:

- A. General Requirements in their entirety.
- B. Section 01740, CLEANING UP
- C. Section 01750, EQUIPMENT CHECKOUT AND TESTING
- D. Section 01752, STARTUP AND TESTING
- E. Section 01760, OPERATION AND MAINTENANCE MANUALS
- F. Division 2 through Division 16.

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY



1.03 AS-BUILT DOCUMENTS:

- A. Contractor shall maintain on site, separate from the documents used for construction, one set of the documents listed below, and as construction progresses, shall legibly record on these documents all changes made during construction.
1. Contract Drawings.
  2. Specifications.
  3. Addenda.
  4. Change Orders and other Modifications to the Contract.
  5. Reviewed shop drawings, product data, and samples.
  6. Written interpretations and clarifications.
  7. Field Orders.
  8. Field test reports properly verified.
- B. The completed set of as-built documents shall be submitted to the Engineer with the final Application for Payment.

1.04 CHECKOUT AND CERTIFICATIONS:

- A. Prior to checkout and certification the following tasks shall be completed:
1. Construction shall be complete. For this purpose, completion of construction is defined as follows:
    - a. The Contractor has completed construction and erection of the work in conformance with the Contract Drawings and Specifications.
    - b. The Contractor has installed and adjusted operating equipment, systems, or facilities, as applicable, as defined by the manufacturers' erection, installation, operation and maintenance instructions.
  2. All shop drawings shall have final approval.
  3. All shop tests shall be complete and approved test results submitted to the Engineer.
- B. Refer to Section 01750 for requirements regarding equipment checkout and certification.

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

1.05 START-UP AND TESTING:

A. Prior to start-up the following tasks shall be complete:

1. All checkout and certifications shall be satisfactorily completed,
2. All operations and maintenance manuals shall be approved,
3. All preliminary training by the manufacturer's representative shall be completed,
4. An approved start-up procedure shall be in place.

B. Refer to Section 01752 for start-up and testing requirements.

1.06 FINAL CLEANING:

A. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.

1. Clean the site, including landscape development areas of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to smooth, even textured surfaces.
2. Remove waste and surplus materials, rubbish, fencing equipment, temporary utilities and construction facilities from the site, unless otherwise required by the Engineer.
3. Comply with requirements of Section 01740 CLEANING UP.

1.07 SUBSTANTIAL COMPLETION:

A. Substantial Completion is officially defined in the General and Supplementary Conditions. The date of substantial completion will be certified by the Engineer. This date will not be certified until the following requirements have been satisfied by the Contractor:

1. All Contract requirements are coordinated into a fully operational system. All individual units of equipment and treatment are fully operative and performing at specified efficiencies. Where efficiencies are not specified, performance shall meet acceptable standards for the particular unit.
2. All field tests have been satisfactorily completed and reports forwarded to the Engineer.
3. All final training has been completed by the manufacturers' representatives.

4. All spare parts and lubricants have been satisfactorily delivered to the Owner. Spare parts are for the exclusive use of the Owner when the facility has been turned over. Contractor is responsible for all maintenance and repair materials required until the facility is accepted by the Owner.

1.08 CLOSEOUT PROCEDURES:

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and is complete in accordance with Contract Documents and ready for Engineer's and Owner's inspection.
- B. Accompany Engineer and Owner on inspection to verify conformance with the Contract Documents. Prepare a punch list of work items that have been determined by inspection to not conform to Contract Documents. Punch list items shall include work items that are missing, incomplete, damaged, incorrect items, or improperly installed or constructed. The Contractor shall correct the punch list deficiencies by re-work, modifications, or replacement, as appropriate, until the items conform to the Contract Documents. The initial punch list shall be produced by the Contractor, with copies to the Engineer and Owner. When the Contractor has reduced the number of deficient items to a reasonable level, the Engineer will develop a definitive punch list for the use of the Contractor.
- C. Provide submittals to Engineer that are required by governing or other authorities.
- D. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due. The Contractor shall submit the following documents with or prior to Final Application for Payment: Set of as-built documents, Contract Completion and Acceptance Certificate, Consent of Surety to Final Payment, Release and Waiver of Liens and Claims, Affidavit of Payment of Debts and Claims, and remaining releases, waivers, warranties/guarantees, and all other data required by the Contract Documents.

1.09 FINAL COMPLETION:

- A. Prior to final completion, the following tasks shall be completed:
  1. All items in the punch list shall be completed.
  2. All Contract closeout documentation shall be submitted to and accepted by the Engineer.

1.10 CORRECTION/WARRANTY PERIOD:

- A. During the correction period, the Contractor shall correct all deficiencies in equipment and materials.
- B. During the warranty period, the Contractor shall perform all corrective work on warranty deficiencies.

- C. Corrective work will be identified by the Engineer or Owner, as appropriate. The Contractor will be notified of the item(s) requiring corrective work.
- D. The Contractor shall begin work on all corrective work within ten days of being notified of the deficiency by the Engineer and shall then work continuously until the deficiency is corrected. Upon completion of the corrective work, the Contractor shall submit a letter report to the Engineer describing the deficiency and the corrective action that was taken.
- E. The Contractor shall coordinate all corrective work with the Engineer and/or the Owner.

1.11 COMPLETION CHECKLIST:

- A. The Project Completion Checklist, which follows shall be completed as the project nears completion. When the project has been fully completed, Final Payment can be approved.

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 1\01770 - Project Closeout.docx

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

**PROJECT COMPLETION CHECKLIST**

Owner \_\_\_\_\_ Job No. \_\_\_\_\_

Project \_\_\_\_\_

As part of the project closeout, all items listed below must be checked off as being complete or otherwise accounted for. The person verifying completion of the item shall list the completion date and his/her initials.

<b>Project Closeout Checklist</b>		
	Date Completion Verified	Verified by
<b>AS-BUILT DOCUMENTS HANDED OVER</b>		
1. Contract Drawings		
2. Specifications		
3. Addenda		
4. Change Orders/Contract Modifications		
5. Reviewed Shop Drawings, Product Data and Samples		
6. Written Interpretations/Clarifications		
7. Field Orders		
8. Field Test Reports		
<b>EQUIPMENT CHECKOUT AND CERTIFICATIONS</b>		
1. Construction Complete per Drawings/Specifications		
2. Equipment Installed and Adjusted		
3. All Shop Drawings have Final Approval		
4. All Shop Tests Complete and Results Submitted		

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

<b>Project Closeout Checklist</b>		
	Date Completion Verified	Verified By
<b>START-UP AND TESTING</b>		
1. All Checkout and Certifications Complete		
2. All O&M Manuals Approved		
3. All Preliminary Training by Manufacturers Rep. Completed		
<b>FINAL CLEANING</b>		
1. All Construction Facilities Removed		
2. All Construction Debris Removed		
3. All Areas Swept/Cleared		
<b>SUBSTANTIAL COMPLETION</b>		
1. All Items Coordinated Into a Fully Operational System		
2. All Equipment Units Operational at Specified Efficiencies		
3. All Field Tests Completed and Reports Submitted		
4. All Final Training by Manufacturer's Rep. Completed		
5. All Spare Parts and Lubricants Provided		
<b>CLOSEOUT PROCEDURES</b>		
1. Written Certification Submitted that Work is Ready for Owner & Engineer Inspection		
2. Inspection by Owner, Engineer, Contractor completed		
3. Punch List of Nonconforming Items Prepared		
4. Documents Required by Governing or Other Authorities Submitted (List Them)		
5. Final Application for Payment Received		
6. Contact Completion and Acceptance Certificate Submittal		
7. Consent of Surety to Final Payment Submittal		
8. Release and Waiver of Liens and Claims Submitted		
9. Affidavit of Payment of Debts and Claims Submitted		

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

**Project Closeout Checklist**

	Date Completion Verified	Verified By			
10. Warranties/Guarantees Submitted					
11. Other Required Releases and Waivers Submitted (List Them)					
12. Permits Submitted (List Them)					
13. Weekly Payrolls Submitted as Required by Law					
<b>FINAL COMPLETION</b>					
1. All Items in Punch List Completed					
2. All Other Required Documentation Submitted (List It)					
<b>CORRECTION/WARRANTY PERIOD</b>					
1. Correction Period Start Date: _____ End Date: _____					
2. Specific Warranties Provided					
<table border="0" style="width: 100%;"> <tr> <td style="width: 30%;"><u>Item</u></td> <td style="width: 30%;"><u>Warranty Duration</u></td> <td></td> </tr> </table>	<u>Item</u>	<u>Warranty Duration</u>			
<u>Item</u>	<u>Warranty Duration</u>				

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

Full name of persons signing their initials on this checklist:

---

---

---

---

---

---

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**



NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 1\01770 - Project Closeout.docx

SECTION 02089

DUCTILE IRON GRAVITY AND FORCE MAIN PIPE  
AND FITTINGS FOR SEWERS

PART 1 - GENERAL

1.01 WORK INCLUDED:

This Section covers the furnishing, handling, hauling, laying, jointing, and testing of ductile iron pipe used for gravity sewer and force main construction, including fittings and appurtenant work as indicated on the drawings and as specified.

1.02 RELATED WORK:

- A. Section 02252, SUPPORT OF EXCAVATION
- B. Section 02300, EARTHWORK
- C. Section 02532, VALVES AND APPURTENANCES FOR WASTEWATER WORK
- D. Section 02631, PRECAST MANHOLES AND CATCH BASINS

1.03 QUALITY ASSURANCE

- A. All pipe and fittings shall be inspected and tested at the foundry as required by the standard specifications to which the material is manufactured. The Contractor shall furnish in duplicate to the Engineer sworn certificates of such tests.
- B. In addition, the Owner reserves the right to have any or all pipe, fittings and special castings inspected and tested by an independent service at either the manufacturer's plant or elsewhere. Such inspection and/or tests shall be at the Owner's expense.

1.04 REFERENCES:

- A. The following standards form a part of these specifications as referenced:

American Water Works Association

AWWA	C104	Cement-Mortar Lining for Ductile- Iron Pipe and Fittings for Water Flexible Elastomeric Seals
AWWA	C110	Ductile-Iron and Gray-Iron Fittings, 3 inches through 48 inches, for Water and Other Liquids
AWWA	C111	Rubber Gasket Joints for Ductile- Iron and Gray-Iron Pressure Pipe and Fittings

AWWA	C150	Thickness Design of Ductile-Iron Pipe
AWWA	C116	Protective Fusion Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings
AWWA	C151	Ductile-Iron Pipe, Centrifugally Cast for Water or Other Liquids
AWWA	C153	Ductile-Iron Compact Fittings, 3 inches through 64 inches for Water Service.
AWWA	C600	Installation of Ductile-Iron Water Mains

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01330 SUBMITTALS, SUBMIT THE FOLLOWING:

- A. Manufacturer's literature of the materials of this section.
- B. Shop drawings consisting of manufacturer's scale drawings, cuts or catalogs including descriptive literature and complete characteristics and specifications, and code requirements. Shop drawings shall be submitted for the ductile iron pipe, type of joint, fittings, couplings, filling rings, and lining and coating in accordance with specifications.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. The Contractor shall use push-on joint type ductile iron pipe unless otherwise indicated on the plans or specified herein.
- B. All ductile iron pipe shall be designed in accordance with AWWA C150 and shall be manufactured in accordance with AWWA C151.
- C. Unless otherwise indicated or specified, ductile iron pipe shall be Thickness Class 52.
- D. All pipe delivered to the job site shall be accompanied by independent testing laboratory reports certifying that the pipe and fittings conform to the above-mentioned specifications. In addition, the pipe shall be subject to thorough inspection and tests, the right being reserved for the Engineer to apply such of the tests specified, as he may from time to time deem necessary.
- E. All cutting of pipe shall be done with a machine suitable for cutting DI pipe. Cut ends shall be beveled when recommended by the pipe manufacturer.

2.02 FITTINGS:

- A. Fittings shall conform to the requirements of AWWA C110 or C153 as appropriate and shall be of a pressure classification at least equal to that of the pipe with which they are used.

- B. The Contractor shall use ductile iron fittings. Cast-iron, Class 250 fittings may be substituted, upon approval of the Engineer, for ductile iron fittings.
- C. Unless otherwise indicated, fittings shall have all bell mechanical joint ends.

2.03 GASKETS, GLANDS, NUTS AND BOLTS:

- A. Gaskets, glands, nuts, bolts and accessories shall conform to AWWA C111 or C153 as appropriate.
- B. Gaskets shall be of plain tipped rubber, suitable for exposure to the liquid within the pipe.
- C. Glands shall be ductile or cast iron.
- D. Bolts and nuts shall be high strength alloy.

2.04 LINING AND COATING:

- A. The inside of pipe and fittings shall be given a cement lining and asphaltic seal coat in accordance with AWWA C104. The thickness of the lining shall be double that specified in AWWA C104.
- B. The outside of pipe and fittings shall be coated with the standard asphaltic coating specified under the appropriate AWWA Standard Specification for pipe and fittings.
- C. Machined surfaces shall be cleaned and coated with a suitable rust preventative coating at the shop immediately after being machined.

2.05 FLEXIBLE COUPLINGS:

- A. All sleeve-type couplings and accessories shall be of a pressure rating at least equal to that of the pipeline in which they are to be installed.
- B. Couplings shall be cast or ductile iron and shall be provided with gaskets of a composition suitable for exposure to the liquid within the pipe.
- C. Couplings for buried pipe shall be Dresser 153; Smith-Blair Type 441 or 443; Romac Style 501; Ford Style FC1 or FC2; or approved equal.

PART 3 - EXECUTION

3.01 INSPECTION BEFORE INSTALLATION:

Pipes and fittings shall be subjected to a careful inspection just before being laid or installed.

3.02 HANDLING AND CUTTING:

- A. Any pipe or fitting which has a damaged lining, scratched or marred machine surface and/or abrasion of the pipe coating or lining shall be rejected and removed from the job-site.
- B. Any fitting showing a crack and any fitting or pipe which has received a severe blow that may have caused incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.
- C. In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portions, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used will be perfectly sound. The cut shall be made in the sound barrel at a point at least 12-inches from the visible limits of the crack.
- D. Except as otherwise approved, all cutting shall be done with a machine suitable for cutting ductile iron pipe. Hydraulic squeeze cutters are not acceptable for cutting ductile iron pipe. Travel type cutters or rotary type abrasive saws may be used. All cut ends shall be examined for possible cracks caused by cutting.
- E. Lined and coated pipe and fittings shall be assembled and installed with approved packing or gaskets of the type recommended by the pipe manufacturer for the particular lining used.

### 3.03 INSTALLATION:

- A. Each pipe length shall be inspected before being laid to verify that it is not cracked. Pipe shall be laid to conform to the lines and grades indicated on the drawings or given by the Engineer. Each pipe shall be so laid as to form a close joint with the next adjoining pipe and bring the inverts continuously to the required grade.
- B. The pipe shall be supported by compacted crushed stone. Crushed stone shall be as specified under Section 02500, EARTHWORK.
- C. The pipe shall not be driven down to grade by striking it with a shovel handle, timber, rammer, or other unyielding object. When each pipe has been properly bedded, enough of the backfill material shall be placed and compacted between the pipe and the sides of the trench to hold the pipe in correct alignment.
- D. Before a joint is made, the pipe shall be checked to assure that a close joint with the next adjoining pipe has been maintained and that inverts are matched and conform to the required line and grade.
- E. For pipe placed on crushed stone, immediately after the joint is made, the jointing area shall be filled with suitable materials so placed and compacted that the ends of either pipe will not settle under backfill load.
- F. No pipe or fitting shall be permanently supported on saddles, blocking, or stones.

- G. Branches and fittings shall be laid by the Contractor as indicated on the drawings, and/or as required by the Engineer. Open ends of pipe and branches shall be closed with DI caps secured in place with premolded gasket joints or as required by the Engineer.
- H. All pipe joints shall be made as nearly watertight as practicable. There shall be no visible leakage at the joints and there shall be no sand, silt, clay, or soil of any description entering the pipeline at the joints. Where there is evidence of water or soil entering the pipeline, connecting pipes, or structures, the defects shall be repaired to the satisfaction of the Engineer.
- I. The Contractor shall build a tight bulkhead in the pipeline where new work enters an existing sewer. This bulkhead shall remain in place until its removal is authorized by the Engineer.
- J. Care shall be taken to prevent earth, water, and other materials from entering the pipe, and when pipe-laying operations are suspended, the Contractor shall maintain a suitable stopper in the end of the pipe and at openings for manholes.
- K. As soon as possible after the pipe and manholes are completed on any street, the Contractor shall flush out the new pipeline using a rubber ball ahead of the water, and none of the flushing water or debris shall be permitted to enter any existing sewer.

#### 3.04 PUSH ON JOINTS:

- A. Joining of push-on joint pipe shall conform to AWWA C600.
- B. If effective sealing of the joint is not attained, the joint shall be disassembled, thoroughly cleaned, a new gasket inserted and joint reassembled.

#### 3.05 MECHANICAL JOINTS:

- A. Assembling of fittings with mechanical joint ends shall conform to AWWA C600.
- A. If effective sealing of the joint is not attained at the maximum torque indicated in the above standard, the joint shall be disassembled and thoroughly cleaned, then reassembled. Bolts shall not be overstressed to tighten a leaking joint.

#### 3.06 SLEEVE-TYPE COUPLINGS:

- A. Pipe ends shall be cleaned thoroughly prior to installation. After the bolts have been inserted and all nuts have been made up finger tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint, preferable by use of a torque wrench of the appropriate size and torque for the bolts. The correct torque as indicated by a torque wrench shall not exceed 90 foot-lb.

#### 3.07 QUALITY ASSURANCE

- A. LEAKAGE TESTING FOR GRAVITY PIPE:

1. On completion of a section of sewer, including building connections installed to the property line, the Contractor shall install suitable bulkheads as required, dewater and test the sewer for leakage.
2. Unless otherwise approved, the section shall be tested using low-pressure air test procedures. If circumstances permit, the Engineer may allow testing by infiltration or exfiltration in lieu of air testing.
3. The air test procedures shall conform to the Uni-Bell Recommended Practice for Low Pressure Air Testing of Installed Sewer Pipe, UNI-B-6. The starting air pressure for the test shall be 4 psig (greater than the average groundwater back pressure of any groundwater above the pipe, but not greater than 9.0 psig). The minimum duration permitted for the prescribed low-pressure air exfiltration pressure drop between two consecutive manholes shall not be less than provided in Table I or Table II of UNI-B-6. The two tables are reproduced on the following pages.
4. Using the air pressure test, if there has been no leakage (zero psig drop) after one hour of testing, the section undergoing test shall have passed.
5. If either infiltration or exfiltration testing is permitted by the Engineer, the test shall be conducted for at least 24 hours. The amount of infiltration or exfiltration shall not exceed 100 gallons per inch-diameter per mile of sewer per 24 hours.
6. The infiltration test measures leakage into a section of sewer and may be used only where the groundwater level is one foot or more above the crown of the section of sewer pipe at its upper end and at least one foot above the top of building connections and chimneys. For making the infiltration tests, underdrains, if used, shall be plugged and other groundwater drainage shall be stopped to permit the groundwater to return to its normal level insofar as practicable. Allowances shall be made for water, which may enter the sewer through pipe connections and inlets during the infiltration test.
7. Where the groundwater level is less than 1 foot above the top of the pipe at its upper end, the exfiltration test may be used. The sewers shall be subjected to an internal pressure by plugging the pipe at the lower end and then filling the pipelines and manholes with clean water to a height of 2 feet above the highest point in the system to be tested, including main pipeline, service connections and chimneys. When slopes between manholes are steep, the Contractor shall insure that this test can be accomplished without danger of forcing stoppers from wye or tee branches.
8. The rate of exfiltration from the sewers shall be determined by measuring the amount of water required to maintain the water level at the elevation established at the beginning of the test.
9. The Contractor shall construct such weirs or other means of measurements as may be required, shall furnish water and shall do all necessary pumping to enable the test to be properly made.

10. The Contractor shall be responsible for the satisfactory watertightness of the entire section of sewer. Should the sections under test fail to meet the requirements, the Contractor shall do all work of locating and repairing leaks and retesting as the Engineer may require without additional compensation. A plan of the method of repairing any leaks that are found shall be submitted to the Engineer for review.

TABLE 1

SPECIFICATION TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP  
FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q=0.0015

Pipe Diameter (in)	Minimum Time (min:sec)	Length for Min. Time (ft)	Length for Longer Length (sec)	Specification time for length (L) shown (min:sec)								
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft	
4	3:46	597	.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46	
6	5:40	398	.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24	
8	7:34	298	1.52 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24	
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48	
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38	
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	31:09	35:36	
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41	
21	19:50	114	10.670 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31	
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33	
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48	
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15	
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53	
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46	

NOT FOR BIDDING PURPOSES  
 REFERENCE COPY ONLY



TABLE 2

SPECIFICATION TIME REQUIRED FOR A 0.5 PSIG PRESSURE DROP  
FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q=0.0015

Pipe Diameter (in)	Minimum Time (min:sec)	Length for Min. Time (ft)	Length for Longer Length (sec)	Specification time for length (L) shown (min:sec)							
				<u>100 ft</u>	<u>150 ft</u>	<u>200 ft</u>	<u>250 ft</u>	<u>300 ft</u>	<u>350 ft</u>	<u>400 ft</u>	<u>450 ft</u>
4	1:53	597	.190 L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6	2:50	398	.427 L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12
8	3:47	298	.760 L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	239	1.187 L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12	5:40	199	1.709 L	5:40	5:40	5:42	7:03	8:33	9:58	11:24	12:50
15	7:05	159	2.671 L	7:05	7:05	8:34	11:08	13:21	15:35	17:48	20:02
18	8:30	133	3.846 L	8:30	9:37	12:49	16:01	19:14	26:26	25:38	28:51
21	9:55	114	5.235 L	9:55	13:13	17:27	21:49	26:11	30:32	34:54	39:16
24	11:20	99	6.837 L	11:20	17:57	22:48	28:30	34:11	39:53	45:35	51:17
27	12:45	88	8.653 L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	46:54
30	14:10	80	10.683 L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07
33	15:35	72	13.026 L	21:33	32:19	43:56	53:25	64:28	75:24	86:10	96:57
36	17:00	66	15.384 L	25:39	38:28	51:17	64:06	76:55	89:44	102:34	115:23

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

B. LEAKAGE TESTING FOR FORCEMAINS:

1. Prior to the pressure and leakage tests, the piping shall be thoroughly flushed clean of all dirt, dust, oil, grease and other foreign material. This work shall be done with care to avoid damage to linings and coatings.
2. The installed pipe shall be pressure tested and leakage tested in accordance with AWWA Standard C600.
3. Unless otherwise approved, all pipelines shall be given a combined pressure and leakage tests between line valves. The Contractor shall furnish and install suitable temporary testing plugs or caps; all necessary pressure pumps, pipe connections, meters, gates, and other necessary equipment; and all labor required. The Owner or Engineer shall have the privilege of using their own gages.

4. Subject to approval and provided that the tests are made within a reasonable time considering the progress of the project as a whole, and the need to put the section into service, the Contractor may make the tests when he desires.
5. Unless it has already been done, the section of pipe to be tested shall be filled with water of approved quality, and all air shall be expelled from the pipe. The Contractor shall follow established procedures for filling the pipe and expelling trapped air to avoid exposing the piping system to water-hammer. If blowoffs are not available at high points for releasing air, the Contractor shall excavate as required and install the necessary taps. If the Contractor changes the grade of pipe installation, he will be responsible for locating the taps at the correct location in the system for testing. Taps shall be installed at the beginning and end of each run. After completion of the test, if so required by the Engineer, he shall remove corporations used for testing; plug the holes and backfill as necessary.
6. The section under test shall be maintained full of water for a period of 24 hours prior to the combined pressure and leakage test being applied.
7. The pressure shall consist of first raising the water pressure (based on the elevation of the lowest point of the section under test corrected to the gage location) to a pressure in pounds per square inch numerically equal to the pressure rating of the pipe (150 psi, unless otherwise noted). If the Contractor cannot achieve the specified pressure and maintain it for a period of one hour, the section shall be considered as having failed to pass the pressure test.
8. If the pressure test fails, the Contractor shall make a leakage test by metering the flow of water into the pipe while maintaining in the section being tested a pressure equal to the pressure rating of the pipe. If the average leakage during a two-hour period exceeds a rate of 11.6 gallons per inch of diameter per 24 hours per mile of pipeline, the section shall be considered as having failed the leakage test. For example, if 1,000 feet of 12-inch pipe is to be tested, the allowable leakage is 2.2 gallons over a 2-hour period, calculated as follows:
 
$$L = \frac{(11.6 \text{ gal}) \times (12") \times (2 \text{ hr.}) \times (1000')}{(1") \times (24 \text{ hr.}) \times (5280')} = 2.2 \text{ gal}$$
9. If the section fails to pass the pressure and leakage test, the Contractor shall do everything necessary to locate, uncover, and repair or replace the defective pipe, fitting, or joint, all at his own expense and without extension of time for completion of the work. Additional tests and repairs shall be made until the section passes the specified test.

END OF SECTION

\\Wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 2\02089-DI Gravity and Force Main Pipe.docx

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

## SECTION 02240

### DEWATERING

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

This section specifies designing, furnishing, installing, maintaining, operating and removing temporary dewatering systems as required to lower and control water levels and hydrostatic pressures during construction; disposing of pumped water; constructing, maintaining, observing and, except where indicated or required to remain in place, removing of equipment and instrumentation for control of the system.

##### 1.02 RELATED WORK:

- A. Section 01570, ENVIRONMENTAL PROTECTION
- B. Section 02252, SUPPORT OF EXCAVATION
- C. Section 02300, EARTHWORK

##### 1.03 SYSTEM DESCRIPTION:

- A. Dewatering includes lowering the water table and intercepting seepage which would otherwise emerge from the slopes or bottom of the excavation; increasing the stability of excavated slopes; preventing loss of material from beneath the slopes or bottom of the excavation; reducing lateral loads on sheeting and bracing; improving the excavation and hauling characteristics of sandy soil; preventing rupture or heaving of the bottom of any excavation; and disposing of pumped water.

##### 1.04 QUALITY ASSURANCE:

- A. The Contractor is responsible for the adequacy of the dewatering systems.
- B. The dewatering systems shall be capable of effectively reducing the hydrostatic pressure and lowering the groundwater levels to a minimum of 2 feet below excavation bottom, unless otherwise required by the Engineer, so that all excavation bottoms are firm and dry.
- C. The dewatering system shall be capable of maintaining a dry and stable subgrade until the structures, pipes and appurtenances to be built therein have been completed to the extent that they will not be floated or otherwise damaged.
- D. The dewatering system and excavation support (see Section 02252, SUPPORT OF EXCAVATION) shall be designed so that lowering of the groundwater level outside the excavation does not adversely affect adjacent structures, utilities or wells.

1.05 SUBMITTALS:

- A. In accordance with Section 01330, Contractor shall submit a plan indicating how it intends to control the discharge from any dewatering operations on the project, whether it is discharge of groundwater from excavations or stormwater runoff during the life of the project.

PART 2 - PRODUCTS: NOT APPLICABLE

PART 3 - EXECUTION

3.01 DEWATERING OPERATIONS:

- A. All water pumped or drained from the work shall be disposed of in a manner that will not result in undue interference with other work or damage to adjacent properties, pavements and other surfaces, buildings, structures and utilities. Suitable temporary pipes, flumes or channels shall be provided for water that may flow along or across the site of the work. All disposal of pumped water shall conform to the provisions of Section 01570 ENVIRONMENTAL PROTECTION and Section 00890 PERMITS.
- B. Dewatering facilities shall be located where they will not interfere with utilities and construction work to be done by others.
- C. Dewatering procedures to be used shall be as described below:
  - 1. Crushed stone shall encapsulate the suction end of the pump to aid in minimizing the amount of silt discharged.
  - 2. For dewatering operations with relatively minor flows, pump discharges shall be directed into hay bale sedimentation traps lined with filter fabric. Water is to be filtered through the hay bales and filter fabric prior to being allowed to seep out into its natural watercourse.
  - 3. For dewatering operations with larger flows, pump discharges shall be into a steel dewatering basin. Steel baffle plates shall be used to slow water velocities to increase the contact time and allow adequate settlement of sediment prior to discharge into waterways.
  - 4. Where indicated on the contract drawings or in conditions of excess silt suspended in the discharge water, silt control bags shall be utilized in catch basins.
- D. The Contractor shall be responsible for repair of any damage caused by his dewatering operations, at no cost to the Owner.

END OF SECTION

SECTION 02252

SUPPORT OF EXCAVATION

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This section of the specification covers wood sheeting and bracing for support of excavations. The requirements of this section shall also apply, as appropriate, to other methods of excavation support and underpinning which the Contractor elects to use to complete the work.
- B. The Contractor shall furnish and place timber sheeting of the kinds and dimensions required, complying with these specifications, where indicated on the drawings or required by the Engineer.

1.02 RELATED WORK:

- A. Section 02240, DEWATERING.
- B. Section 02300, EARTHWORK.

1.03 QUALITY ASSURANCE:

- A. This project is subject to the Safety and Health regulations of the U.S. Department of Labor set forth in 29 CFR, Part 1926. Contractors shall be familiar with Connecticut requirements and regulations.
- B. The excavation support system shall be of sufficient strength and be provided with adequate bracing to support all loads to which it will be subjected. The excavation support system shall be designed to prevent any movement of earth that would diminish the width of the excavation or damage or endanger adjacent structures.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Timber sheeting shall be sound spruce, pine, or hemlock, planed on one side and either tongue and grooved or splined. Timber sheeting shall not be less than nominal 2-inches thick.
- B. Timber and steel used for bracing shall be of such size and strength as required in the excavation support design. Timber or steel used for bracing shall be new or undamaged used material which does not contain splices, cutouts, patches, or other alterations which would impair its integrity or strength.

## PART 3 - EXECUTION

### 3.01 INSTALLATION:

- A. Work shall not be started until all materials and equipment necessary for their construction are either on the site of the work or satisfactorily available for immediate use as required.
- B. The sheeting shall be securely and satisfactorily braced to withstand all pressures to which it may be subjected and be sufficiently tight to minimize lowering of the groundwater level outside the excavation, as required in Section 02240, DEWATERING.
- C. The sheeting shall be driven by approved means to the design elevation. No sheeting may be left so as to create a possible hazard to safety of the public or a hindrance to traffic of any kind.
- D. If boulders or very dense soils are encountered, making it impractical to drive a section to the desired depth, the section shall, as required, be cut off.
- E. The sheeting shall be left in place where indicated on the drawings or required by the Engineer in writing. At all other locations, the sheeting may be left in place or salvaged at the option of the Contractor. Steel or wood sheeting permanently left in place shall be cut off at a depth of not less than two feet below finish grade unless otherwise required.
- F. All cut-off will become the property of the Contractor and shall be removed by him from the site.
- G. Responsibility for the satisfactory construction and maintenance of the excavation support system, complete in place, shall rest with the Contractor. Any work done, including incidental construction, which is not acceptable for the intended purpose shall be either repaired or removed and reconstructed by the Contractor at his expense.
- H. The Contractor shall be solely responsible for repairing all damage associated with installation, performance, and removal of the excavation support system.

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 2\02252 - Support of Excavation.docx

SECTION 02300

EARTHWORK

PART 1 - GENERAL

1.01 WORK INCLUDED:

The Contractor shall make excavations of normal depth in earth for trenches and structures, shall backfill and compact such excavations to the extent necessary, shall furnish the necessary material and construct embankments and fills, and shall make miscellaneous earth excavations and do miscellaneous grading.

1.02 RELATED WORK:

- A. Section 00890, PERMITS
- B. Section 01110, CONTROL OF WORK AND MATERIALS
- C. Section 01570, ENVIRONMENTAL PROTECTION
- D. Section 02240, DEWATERING
- E. Section 02252, SUPPORT OF EXCAVATION
- F. Section 02746, BITUMINOUS CONCRETE PAVEMENT
- G. Section 02920, LOAMING AND SEEDING

1.03 REFERENCES

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

- American Society for Testing and Materials (ASTM)
- |      |       |  |
|------|-------|--|
| ASTM | C131  | Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.                    |
| ASTM | C136  | Method for Sieve Analysis of Fine and Coarse Aggregates.   |
| ASTM | C330  | Specification for Lightweight Aggregate for Structural Concrete.   |
| ASTM | D1556 | Test Method for Density of Soil in Place by the Sand Cone Method.  |
| ASTM | D1557 | Test Methods for Moisture-density Relations of Soils and Soil Aggregate Mixtures Using Ten-pound (10 Lb.) Hammer and Eighteen-inch (18") Drop. |



ASTM D2922 Test Methods for Density of Soil and Soil-aggregate in Place by Nuclear Methods (Shallow Depth).

Connecticut Department of Transportation Standard Specification for Highways and Bridges (Form 817).

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Samples of all materials proposed for the project shall be submitted to the Engineer for review. Size of the samples shall be as approved by the Engineer.

1.05 PROTECTION OF EXISTING PROPERTY:

- A. The work shall be executed in such manner as to prevent any damage to facilities at the site and adjacent property and existing improvements, such as but not limited to streets, curbs, paving, service utility lines, structures, monuments, bench marks, observation wells, and other public or private property. Protect existing improvements from damage caused by settlement, lateral movements, undermining, washout and other hazards created by earthwork operations.
- B. In case of any damage or injury caused in the performance of the work, the Contractor shall, at its own expense, make good such damage or injury to the satisfaction of, and without cost to, the Owner. Existing roads, sidewalks, and curbs damaged during the project work shall be repaired or replaced to at least the condition that existed at the start of operations. The Contractor shall replace, at his own cost, existing benchmarks, observation wells, monuments, and other reference points which are disturbed or destroyed.
- C. Buried drainage structures and pipes, observation wells and piezometers, including those which project less than eighteen inches (18") above grade, which are subject to damage from construction equipment shall be clearly marked to indicate the hazard. Markers shall indicate limits of danger areas, by means which will be clearly visible to operators of trucks and other construction equipment, and shall be maintained at all times until completion of project.

1.06 DRAINAGE:

- A. The Contractor shall provide, at its own expense, adequate drainage facilities to complete all work items in an acceptable manner. Drainage shall be done in a manner so that runoff will not adversely affect construction procedures nor cause excessive disturbance of underlying natural ground or abutting properties.

1.07 FROST PROTECTION AND SNOW REMOVAL:

- A. The Contractor shall, at its own expense, keep earthwork operations clear and free of accumulations of snow as required to carry out the work.

- B. The Contractor shall protect the subgrade beneath new structures and pipes from frost penetration when freezing temperatures are expected.

PART 2 - PRODUCTS

2.01 MATERIAL:

A. GRAVEL BORROW:

Gravel Borrow shall satisfy the requirements listed in CONN DOT Article M. 02.01-2, Grading A.

B. SAND BORROW:

Sand borrow shall satisfy the requirements listed for fine aggregate in CONN DOT Article M.03.01-2.

C. CRUSHED STONE:

Crushed stone shall satisfy the requirements listed in CONN DOT Article M.02.06, Grading "C".

D. PEASTONE:

Peastone shall be smooth, hard, naturally occurring, rounded stone meeting the following gradation requirements:

Passing 5/8 inch square sieve opening	-	100%
Passing No. 8 sieve opening	-	0%

E. BACKFILL MATERIALS:

1. Class B Backfill:

Class B backfill shall be granular, well graded friable soil; free of rubbish, ice, snow, tree stumps, roots, clay and organic matter; with 30 percent or less passing the No. 200 sieve; no stone greater than two-third (2/3) loose lift thickness, or six inches, whichever is smaller.

2. Select Backfill:

Select backfill shall be granular, well graded friable soil, free of rubbish, ice, snow, tree stumps, roots, clay and organic matter, and other deleterious or organic material; graded within the following limits:

<u>Sieve Size</u>	<u>Percent Finer by Weight</u>
3"	100
No. 10	30-95
No. 40	10-70
No. 200	0-10

F. PROCESSED GRAVEL:

1. Processed gravel shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings and deleterious materials. The coarse aggregate shall have a percentage of wear, by the Los Angeles Abrasion Test, of not more than 50.
2. The gradation shall meet the following requirements:

<u>Sieve Designation</u>	<u>Percentage Passing</u>
3 in.	100
1 1/2 in.	70-100
3/4 in.	50-85
No. 4	30-60
No. 200	0-10

3. The approved source of bank-run gravel material shall be processed by mechanical means. The equipment for producing crushed gravel shall be of adequate size with sufficient adjustments to produce the desired materials. The processed material shall be stockpiled in such a manner to minimize segregation of particle sizes. All processed gravel shall come from approved stockpiles.

PART 3 - EXECUTION

3.01 DISTURBANCE OF EXCAVATED AND FILLED AREAS DURING CONSTRUCTION:

- A. Contractor shall take the necessary steps to avoid disturbance of subgrade during excavation and filling operations, including restricting the use of certain types of construction equipment and their movement over sensitive or unstable materials, dewatering and other acceptable control measures.
- B. All excavated or filled areas disturbed during construction, all loose or saturated soil, and other areas that will not meet compaction requirements as specified herein shall be removed and replaced with a minimum 12-inch layer of compacted crushed stone wrapped all around in non-woven filter fabric. Costs of removal and replacement shall be borne by the Contractor.

- C. The Contractor shall place a minimum of 12-inch layer of special bedding materials and crushed stone wrapped in filter fabric over the natural underlying soil to stabilize areas which may become disturbed as a result of rain, surface water runoff or groundwater seepage pressures, all at no additional cost to the Owner. The Contractor also has the option of drying materials in-place and compacting to specified densities.

3.02 EXCAVATION:

A. GENERAL:

1. The Contractor shall perform all work of any nature and description required to accomplish the work as shown on the Drawings and as specified.
2. Excavations, unless otherwise required by the Engineer, shall be carried only to the depths and limits shown on the Drawings. If unauthorized excavation is carried out below required subgrade and/or beyond minimum lateral limits shown on Drawings, it shall be backfilled with gravel borrow and compacted at the Contractor's expense as specified below, except as otherwise indicated. Excavations shall be kept in dry and good conditions at all times, and all voids shall be filled to the satisfaction of the Engineer.
3. In all excavation areas, the Contractor shall strip the surficial topsoil layer and underlying subsoil layer separate from underlying soils. In paved areas, the Contractor shall first cut pavement as specified in paragraph 3.02 B.1 of this specification, strip pavement and pavement subbase separately from underlying soils. All excavated materials shall be stockpiled separately from each other within the limits of work.
4. The Contractor shall follow a construction procedure, which permits visual identification of stable natural ground. Where groundwater is encountered, the size of the open excavation shall be limited to that which can be handled by the Contractor's chosen method of dewatering and which will allow visual observation of the bottom and backfill in the dry.
5. The Contractor shall excavate unsuitable materials to stable natural ground where encountered at proposed excavation subgrade, as required by the Engineer. Unsuitable material includes topsoil, loam, peat, other organic materials, snow, ice, and trash. Unless specified elsewhere or otherwise required by the Engineer, areas where unsuitable materials have been excavated to stable ground shall be backfilled with compacted special bedding materials or crushed stone wrapped all around in non-woven filter fabric.

B. TRENCHES:

1. Prior to excavation, trenches in pavement shall have the traveled way surface cut in a straight line by a concrete saw or equivalent method, to the full depth of pavement. Excavation shall only be between these cuts. Excavation support shall

be provided as required to avoid undermining of pavement. Cutting operations shall not be done by ripping equipment.

2. The Contractor shall satisfy all dewatering requirements specified in Section 02240 DEWATERING, before performing trench excavations.
3. Trenches shall be excavated to such depths as will permit the pipe to be laid at the elevations, slopes, and depths of cover indicated on the Drawings. Trench widths shall be as shown on the Drawings or as specified.
4. Where pipe is to be laid in bedding material, the trench may be excavated by machinery to, or just below, the designated subgrade provided that the material remaining in the bottom of the trench is not disturbed.
5. If pipe is to be laid in embankments or other recently filled areas, the fill material shall first be placed to a height of at least 12-inches above the top of the pipe before excavation.
6. Pipe trenches shall be made as narrow as practicable and shall not be widened by scraping or loosening materials from the sides. Every effort shall be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed.
7. If, in the opinion of the Engineer, the subgrade, during trench excavation, has been disturbed as a result of rain, surface water runoff or groundwater seepage pressures, the Contractor shall remove such disturbed subgrade to a minimum of 12 inches and replace with crushed stone wrapped in filter fabric. Cost of removal and replacement shall be borne by the Contractor.

C. BUILDING AND FOUNDATION EXCAVATION:

1. Excavations shall not be wider than required to set, brace, and remove forms for concrete, or perform other necessary work.
2. After the excavation has been made, and before forms are set for footings, mats, slabs, or other structures, and before reinforcing is placed, all loose or disturbed material shall be removed from the subgrade. The bearing surface shall then be compacted to meet the requirements of this specification.
3. If, in the opinion of the Engineer, the existing material at subgrade elevation is unsuitable for structural support, the Contractor shall excavate and dispose of the unsuitable material to the required width and depth as required by the Engineer. If, in the opinion of the Engineer, filter fabric is required; the Contractor shall place filter fabric, approved by the Engineer, as per manufacturer's recommendations. Crushed stone shall then be placed in lifts and compacted to required densities. Backfill shall be placed to the bottom of the proposed excavation.

3.03 BACKFILL PLACEMENT AND COMPACTION:

A. GENERAL:

1. Prior to backfilling, the Contractor shall compact the exposed natural subgrade to the densities as specified herein.
2. After approval of subgrade by the Engineer, the Contractor shall backfill areas to required contours and elevations with specified materials.
3. The Contractor shall place and compact materials to the specified density in continuous horizontal layers, not to exceed nine (9) inches in uncompacted lifts. The degree of compaction shall be based on maximum dry density as determined by ASTM Test D1557, Method C. The minimum degree of compaction for fill placed shall be as follows:

<u>Location</u>	<u>Percent of Maximum Density</u>
Below pipe centerline	95
Above pipe centerline	92
Below pavement (upper 3 ft.)	95
Embankments	95
Below pipe in embankments	95
Adjacent to structures	92
Below structures	95

4. The Engineer reserves the right to test backfill for conformance to the specifications and Contractor shall assist as required to obtain the information. Compaction testing will be performed by the Engineer or by an inspection laboratory designated by the Engineer, engaged and paid for by the Owner. If test results indicate work does not conform to specification requirements, the Contractor shall remove or correct the defective Work by recompacting where appropriate or replacing as necessary and approved by the Engineer, to bring the work into compliance, at no additional cost to the Owner. All backfilled materials under structures and buildings shall be field tested for compliance with the requirements of this specification.
5. Where horizontal layers meet a rising slope, the Contractor shall key each layer by benching into the slope.
6. If the material removed from the excavation is suitable for backfill with the exception that it contains stones larger than permitted, the Contractor has the option to remove the oversized stones and use the material for backfill or to provide replacement backfill at no additional cost to the Owner.

7. The Contractor shall remove loam and topsoil, loose vegetation, stumps, large roots, etc., from areas upon which embankments will be built or areas where material will be placed for grading. The subgrade shall be shaped as indicated on the Drawings and shall be prepared by forking, furrowing, or plowing so that the first layer of the fill material placed on the subgrade will be well bonded to the subgrade.
8. Where called for on the Drawings, Lightweight Fill shall be placed and compacted as recommended by the manufacturer. The exact number of passes shall be approved by the Engineer to insure stability of the layer. As soon as the compaction of each layer has been completed, the next layer shall then be placed. The Contractor shall take all necessary precautions during construction activities in operations on or adjacent to the Lightweight Fill to insure that the material is not over-compacted. Construction equipment, other than for compaction, shall not operate on the exposed Lightweight Fill. The top surface of the Lightweight Fill lying directly below the gravel course shall be checked by additional rolling of the Lightweight Fill to prevent infiltration of fines.

B. TRENCHES:

1. Bedding as detailed and specified shall be furnished and installed beneath the pipeline prior to placement of the pipeline. A minimum bedding thickness shall be maintained between the pipe and undisturbed material, as shown on the Drawings.
2. As soon as practicable after pipes have been laid, backfilling shall be started.
3. Unless otherwise indicated on the Drawings, select backfill shall be placed by hand shovel in 6-inch thick lifts up to a minimum level of 12-inches above the top of pipe. This area of backfill is considered the zone around the pipe and shall be thoroughly compacted before the remainder of the trench is backfilled. Compaction of each lift in the zone around the pipe shall be done by use of power-driven tampers weighing at least 20 pounds or by vibratory compactors. Care shall be taken that material close to the bank, as well as in all other portions of the trench, is thoroughly compacted to densities required.
4. Class B backfill shall be placed from the top of the select backfill to the specified material at grade (loam, pavement subbase, etc.). Fill compaction shall meet the density requirements of this specification.
5. If the materials above the trench bottom are unsuitable for backfill, the Contractor shall furnish and place backfill materials meeting the requirements for trench backfill, as shown on the drawings or specified herein.
6. Should the Engineer order crushed stone for utility supports or for other purposes, the Contractor shall furnish and install the crushed stone as required.

7. In shoulders of streets and roads, the top 12-inch layer of trench backfill shall consist of crushed or uncrushed gravel, satisfying the requirements listed in CONN DOT standard specification M02.04.
8. Subbase shall consist of bank or crushed gravel meeting the requirements of CONN DOT standard specification M.02.02.

C. BACKFILLING UNDER BUILDINGS AND FOUNDATIONS:

Material to be used as structural fill under structures shall be special bedding material or gravel borrow, as shown on the Drawings or as required by the Engineer. Where gravel borrow fill is required to support proposed footings, walls, slabs, and other structures, the material shall be placed in a manner accepted by the Engineer. Compaction of each lift shall meet the density requirements of this specification.

D. BACKFILLING ADJACENT TO STRUCTURES:

1. The Contractor shall not place backfill against or on structures until they have attained sufficient strength to support the loads to which they will be subjected. Excavated material approved by the Engineer may be used in backfilling around structures. Backfill material shall be thoroughly compacted to meet the requirements of this specification.
2. Contractor shall use extra care when compacting adjacent to pipes and drainage structures. Backfill and compaction shall proceed along sides of drainage structures so that the difference in top of fill level on any side of the structure shall not exceed two feet (2') at any stage of construction.
3. Where backfill is to be placed on only one side of a structural wall, only hand-operated roller or plate compactors shall be used within a lateral distance of five feet (5') of the wall for walls less than fifteen feet (15') high and within ten feet (10') of the wall for walls more than fifteen feet (15') high.

3.04 DISPOSAL OF SURPLUS MATERIALS:

- A. No excavated material shall be removed from the site of the work or disposed of by the Contractor unless approved by the Engineer.
- B. Surplus excavated materials, which are acceptable to the Engineer, shall be used to backfill normal excavations in rock or to replace other materials unacceptable for use as backfill. Upon written approval of the Engineer, surplus excavated materials shall be neatly deposited and graded so as to make or widen fills, flatten side slopes, or fill depressions; or shall be neatly deposited for other purposes as indicated by the Owner, within its jurisdictional limits; all at no additional cost to the Owner.
- C. Surplus excavated material not needed as specified above shall be hauled away and disposed of by the Contractor at no additional cost to the Owner, at appropriate locations,



and in accordance with arrangements made by him. Disposal of all rubble shall be in accordance with all applicable local, state and federal regulations.

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 2\02300 - Earthwork.docx

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 02370

EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 SCOPE OF WORK:

- A. Furnish all labor, materials, tools and equipment, and perform all operations necessary for erosion and sedimentation control work indicated on contract drawings and as specified herein.

1.02 RELATED WORK:

- A. Section 01562, DUST CONTROL.
- B. Section 01570, ENVIRONMENTAL PROTECTION.
- C. Section 02920, LOAMING AND SEEDING.

1.03 PROJECT CONDITIONS:

- A. Earthmoving activities in the project area shall be conducted in such a manner as to prevent accelerated erosion and the resulting sedimentation.
- B. The Contractor shall implement and maintain erosion and sedimentation control measures as shown on the contract drawings or as required by the Owner or Engineer from the start of construction until provisional acceptance of seeded areas, to effectively prevent accelerated erosion and sedimentation.

1.04 SUBMITTALS:

- A. The Contractor shall submit to the Engineer certification that the materials used for silt fence and hay bale construction meet the specifications.

1.05 GENERAL METHODOLOGY:

- A. Erosion and sedimentation control methods shall consider all factors which contribute to erosion and sedimentation including, but not limited to, the following:
  - 1. Topographic features of the Project area.

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

2. Types, depth, slope and areal extent of the soils.
3. Proposed alteration of the area.
4. Amount of run-off from the Project area and the upgradient watershed areas.
5. Staging of earthmoving activities.
6. Temporary control measures and facilities for use during earthmoving.

**PART 2 - PRODUCTS**

**2.01 MATERIALS:**

- A. Straw Bales shall consist of rectangular shaped bales of straw weighing at least 40 pounds per bale. They shall be free of primary noxious weed seeds.
- B. Silt Fence shall be a woven polypropylene and/or polyester material, which meets or exceeds the minimum average roll values requirements tabulated below:

Fabric Property	Test Method	Fabric Requirement
Tensile strength, lbs	ASTM D-4632 Grab	100 minimum
Elongation at 50% minimum tensile strength	ASTM D-4632 Grab	50% maximum
Permittivity, sec <sup>-1</sup>	ASTM D-4491	0.1 minimum
Apparent opening size, mm	ASTM D-4751	0.84 maximum
Ultraviolet degradation at 500 hours	ASTM D-4355	minimum 70% strength retained

- C. Mulch, if used to protect the seed from erosion, shall consist of cured straw free from primary noxious weed seeds, twigs, debris and rough or woody materials. Mulch shall be free from rot or mold and shall be acceptable to

the Engineer or Owner. Alternately, mulch shall be specially processed cellulose homogeneous fiber containing no growth or germination-inhibiting factors. Processed cellulose fiber shall be manufactured in such a manner that after addition and agitation in slurry tanks with water, the fibers in the material become uniformly suspended to form a slurry when sprayed on the ground. The material shall allow homogeneous absorption and percolation of moisture. The manufacturer to show the air-dry weight content shall mark each package of the cellulose fiber. Mulch shall be utilized on all newly graded subgrade and topsoil areas that cannot be seeded within five (5) days.

### PART 3 - EXECUTION

#### 3.01 CONSTRUCTION SEQUENCE:

- A. Construction of erosion control measures as depicted on drawings will be completed prior to any site work.
- B. Sediment barriers shall be used at locations shown on the drawings. Sediment barriers are temporary berms, diversions, or other barriers that are constructed to retain sediment on-site by retarding and filtering stormwater runoff.
- C. All temporary erosion control measures will be maintained throughout the course of site construction activities until provisional acceptance of the site vegetation by the Engineer or Owner, at which time the Contractor shall remove all remaining temporary erosion control structures, and properly dispose of accumulated sediment on-site in areas approved by the Owner.
- D. The Engineer or Owner may order additional erosion and sediment controls be installed. The Contractor shall comply with Engineer or Owner's request and immediately install the required controls.

#### 3.02 CONSTRUCTION METHODS:

- A. Silt fences and/or staked straw bales shall be installed at the site downgradient of work areas as required by Owner or Engineer in the field. The silt fence shall be installed in accordance with manufacturers instructions. Hay bales shall be staked at locations shown on the contract drawings or approved by the Engineer. The base of all hay bales and silt fencing shall be embedded to the depths shown on the contract drawings.
- B. Straw mulch, if used, shall be applied at a rate of 100-lbs/1000 ft<sup>2</sup>.

- C. On slopes, the Contractor shall provide protection against washouts by an approved method. Any washout, which occurs either in the Contractor's work area or in areas topographically below his work, shall be regraded and reseeded at the Contractor's expense until an accepted vegetative stand is established.

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 2\02370 - Erosion and Sedimentation Control.docx

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 02514  
YARD HYDRANTS

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This Section covers the furnishing and installation of yard hydrants and appurtenances as indicated on the drawings and as specified herein.
- B. Pipe and couplings shall be specified under the appropriate pipe sections.

1.02 RELATED WORK:

- A. Section 02300, EARTHWORK

1.03 REFERENCES:

- A. The following standards form a part of this specification:

American Society for Testing and Materials (ASTM)

ASTM	A48	Gray Iron Castings
ASTM	A126	Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM	A536	Ductile Iron Castings
ASTM	B62	Composition Bronze or Ounce Metal Castings
ASTM	D429	Test Method for Rubber Property Adhesion to Rigid Substrate.

American Water Works Association (AWWA)

AWWA	C500	Metal Seated Gate Valves For Water Supply Service
AWWA	C502	Dry-Barrel Fire Hydrants
AWWA	C504	Rubber-Seated Butterfly Valves
AWWA	C509	Resilient-Seated Gate Valves for Water Supply Service
AWWA	C515	Reduced Wall, Resilient-Seated Gate Valves for Water Supply Service

AWWA C550 Protective Interior Coatings for Valves and Hydrants  
Federal Specifications (FS)

FS TT-V-51F Varnish, Asphalt

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF THE GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Shop drawings shall be submitted for the hydrants, valves and appurtenances indicating type of joint, and lining and coating, etc., in accordance with the specifications.
- B. Shop drawings shall consist of manufacturer's scale drawings, cuts or catalogs including descriptive literature and complete characteristics and specifications, and code requirements.
- C. Refer to Paragraph 3.01.A for Affidavit of Compliance required to be submitted.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. Hydrants shall open left.

2.02 VALVE BOXES AND EXTENSIONS

- A. Valve boxes shall be manufactured in North America. The minimum outside diameter of the boxes shall be 5 1/2-inches and the lengths shall be as necessary to suit the ground elevation and the depth of each valve operator, regardless of the depth of cover.
- B. When there is more than 6 feet of cover, valve operators shall have non-rising extension stems which raise the operating nut to a depth of approximately 4 feet below grade. The extension stem shall have a centering support ring at the upper end. The lower socket shall be tapped with a set screw into the valve nut to prevent the extension stem from lifting off the valve nut.
- C. Each valve shall be provided with a box which has a close fitting 7-1/4-inch diameter cover and is substantially dirt-tight. The top of the cover shall be flush with the top of the box rim. The word "WATER" shall be cast in the top of the cover.
- D. Valve boxes shall be of cast iron and of the adjustable sliding, heavy pattern type. They shall be so designed and constructed as to prevent direct transmission of traffic loads to the pipe or valve. The upper or sliding section of the box shall be provided with a flange on the top of the section (not on the bottom) having sufficient bearing area to prevent undue settlement. The lower section of the box shall be designed to enclose the operating nut and stuffing box of the valve and to rest on the backfill. The boxes shall be adjustable

through at least 6 inches vertically without reduction of lap between sections to less than 8-inches.

2.03 YARD HYDRANT:

- A. Yard hydrants shall have 2-1/8-inch minimum valve opening, 3-inches minimum inside diameter barrel, 2-1/2-inches screwed inlet and two 1-1/2-inch hose nozzles.
- B. Yard hydrants shall be designed for 100 psi working pressure and 200 psi test pressure.
- C. All passages through the hydrant shall have easy well- rounded curves.
- D. The hydrants shall be provided with a positive non-corrodible drip, arranged to drain the barrel when the hydrant is shut off.
- E. Hydrants shall be covered with two coats of rust-resisting paint below grade.
- F. One set of outlet nozzle caps shall be provided for each hydrant, tapped and fitted for a 3/4-inch hose connection.
- G. Yard hydrants shall be Mueller Co., Model A-411 Kupferle, or equal.

PART 3 - EXECUTION

3.01 AFFIDAVIT OF COMPLIANCE

- A. The manufacturer shall furnish as part of the shop drawing submittal the Engineer with an affidavit stating that valve(s), hydrants conform to the applicable requirements of the applicable AWWA Standard and the Engineer's specifications, and that all tests specified therein have been performed and all test requirements have been met and the test date.
- B. A copy of the Affidavit of Compliance shall be delivered to the construction site attached to each valve and/or hydrant furnished. The Affidavit shall be attached to the valve or hydrant inside a waterproof pouch.
- C. Any valve or hydrant received without the required affidavit shall be removed from the project and replaced at no expense to the Owner.
- D. All materials shall be certified "NEW". No reconditioned or repaired materials are permitted. Any reconditioned or repaired materials furnished or installed shall be removed and replaced with new materials at no expense to the Owner.

3.02 INSTALLATION:

- A. All valves shall be carefully installed and supported in their respective positions free from distortion and strain. Care shall be taken to prevent damage or injury to the valves and appurtenances during handling and installation.



- B. All material shall be carefully inspected for defects in workmanship and all debris and foreign material cleaned out of valve openings and seats. All mechanisms shall be operated to check for proper functioning, and all nuts and bolts checked for tightness.
- C. Valves and other equipment that do not operate easily or are otherwise defective shall be repaired or replaced at the Contractor's expense.
- D. Hydrants shall be set plumb. Earth fill shall be carefully tamped around the hydrants to a distance of 4 feet on all sides of the hydrant, or to the undisturbed trench face, if less than 4 feet. Hydrants and connecting pipe shall have at least the same depth of cover as the distributing main. Hydrants shall be set upon a layer of stone or a slab of concrete not less than 4-inches thick and 15-inches square. The side of the hydrant opposite the pipe connection shall be firmly wedged against the vertical face of the trench with a concrete thrust block, as indicated on the drawings.
- E. Broken stone shall be placed around the base of the hydrant at the location of the drain hole, and backfill around the hydrant shall be thoroughly compacted to the grade line in a satisfactory manner. Hydrants shall have the interiors cleaned of all foreign matter before installation, and shall be inspected in both the open and closed positions.
- F. The body of the hydrant shall be of sufficient length to allow the hydrant to be set at the proper elevation, as shown on the drawings. Extensions shall be furnished and installed at the Contractor's expense, when required for greater depths.
- G. Valve boxes shall be set plumb, flush with the ground or paved surface, and centered directly over the operating nut of the valves. Earth fill shall be carefully tamped around the valve boxes to a distance of 4 feet on all sides of the boxes or to the undisturbed trench face, if less than 4 feet.
- H. Valves shall be operational and accessible at all times during construction and warranty period. The Contractor shall verify proper operation of all valves in the presence of the Engineer and/or Owner following completion of the project and prior to the acceptance of Substantial Completion.

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 2\02514 - Hydrants and Valves.docx

SECTION 02515

WATER SERVICE CONNECTIONS

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section covers the furnishing and installation of new water service connections and the repair, replacement, and/or transfer of existing water service connections as shown on the drawings, as specified herein, and as required by the Engineer.

Work and materials covered under this Section of the specifications shall be in strict compliance with Connecticut Water Company Standards.

Interruption of and connection to the existing water main system, at the locations indicated on the Contract Drawings, shall be in strict accordance with the Connecticut Water Company's requirements and only with the prior approval of the Connecticut Water Company.

1.02 RELATED WORK:

- A. Section 02746, BITUMINOUS CONCRETE PAVEMENT
- B. Section 02920, LOAMING AND SEEDING

1.03 REFERENCES:

- A. The following standards form a part of this specification:

American Society for Testing and Materials (ASTM)

- |      |       |   |
|------|-------|---|
| ASTM | B88   | Seamless Copper Water Tube                          |
| ASTM | B584  | Copper Alloy Sand Castings for General Applications |
| ASTM | D2737 | Polyethylene (PE) Plastic Tubing                    |

American Water Works Association (AWWA)

- |      |      |  |
|------|------|--|
| AWWA | C800 | Water-Service Line Fittings  |
| AWWA | C651 | Disinfecting Water Mains   |
| AWWA | C901 | Polyethylene Pressure Pipe & Tubing, 1/2-inch through 3-inch for Water Service |

Federal Specifications (FS)

FS            WW-T-799C      Tube, Copper, Seamless

Connecticut Water Company's "Purchasing Standards for Waterworks Material".

1.04      SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF THE GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Six (6) printed sets and electronic versions of manufacturer's literature of the materials of this section for review.

PART 2 - PRODUCTS

2.01      GENERAL

- A. All materials shall be per the Connecticut Water Company's Purchase Standards for Water Works Materials

2.02      SERVICE PIPING:

- A. Piping for buried copper water services shall be continuous Type K annealed seamless copper water tubing conforming to ASTM B88 Standard Specification for Seamless Copper Water Tube or U.S. Federal Specification WW-T-799C for Tube, Copper, Seamless. Tubing shall be 4 inch diameter unless otherwise indicated.
- B. Couplings, if required, for existing to new service pipe connections shall have compression connections on the inlet and compression connections on the outlet. Couplings shall be made of brass as specified in AWWA C800. All brass components that come into contact with potable water shall be made from either CDA/UNS Brass Alloys C89520 or C89833 and shall not contain more than twenty-five hundredths of one percent (0.25% or less) total lead content by weight. The lead leach limit of the coupling shall be 5 parts per billion (ppb). Couplings shall be NSF/ANSI 61 Annex F and Annex G and NSF/ANSI 372 certified by an ANSI accredited organization and shall be stamped or embossed with a mark or name indicating that the product is manufactured from a low-lead alloy, as specified above.

2.03      CORPORATION STOPS:

- A. Corporation stops shall be made of brass as specified in AWWA C800. All brass components that come into contact with potable water shall be made from either CDA/UNS Brass Alloys C89520 or C89833 and shall not contain more than twenty-five hundredths of one percent (0.25% or less) total lead content by weight. The lead leach limit of the corporation stops shall be 5 ppb. Corporation stops shall be NSF/ANSI 61 Annex F and Annex G and NSF/ANSI 372 certified by an ANSI accredited organization and shall be stamped or embossed with a mark or name indicating that the product is manufactured from a low-lead alloy, as specified above.

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

- B. Service clamps shall be installed with all corporation stops 2-inches and larger in size and with all corporation stops installed in PVC pipe. Clamps shall be all bronze, ductile iron or stainless steel, double strap, AWWA taper thread (CC) with O-ring seal.
- C. Corporation stops shall be Mueller H-15008, Ford, or approved equal, bronze-body with a lapped, ground key and manufactured in North America, and shall be in conformance with AWWA Standard C-800, latest edition. The inlet shall have a standard AWWA corporation valve inlet thread and the outlet shall be a compression connection for copper tubing. Corporation stops (1 inch only) may be used with a flared outlet connection when approved by the Connecticut Water Company.

#### 2.04 CURB STOPS:

- A. Curb stops shall be Mueller Mark II Oriseal Valve H-15204, H-15214 when drain is required, or Ford B-44, bronze-body and manufactured in North America, and shall be in conformance with AWWA Standard C-800, latest edition. Both ends of curb stops shall have a compression connection for copper tubing. Compression type connections may be substituted with flared connections when approved by the Connecticut Water Company.

#### 2.05 CURB BOXES:

- A. Curb boxes shall be iron-body with close fitting, dirt tight covers and manufactured in North America. The top of the cover shall be flush with the top of the box rim with the word "WATER" clearly marked. Curb box to be slide type with a 2.5-inch shaft.
- B. All curb boxes shall be manufactured by General Foundries Inc., Ford, or approved equal: Buffalo Style slide type model no. GF 36095, 47in bottom, 25in top with Plug lid (bolted) no. GF 36095 marked "WATER". If enlarged base is required use model no.36500.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

- A. Where new water mains are being installed and existing water services are to be transferred to the new main, the Contractor shall discontinue the existing water services by shutting down the corporation stop at the old water main, unless specifically otherwise required by the Engineer. The Contractor shall take special care to minimize the interruption of existing water service.
- B. The Contractor shall tap a new corporation stop, cut the existing service piping and connect the new service piping to the old service piping using an approved coupling at a point between the main and the existing curb stop and box.
- C. Where transfers are to be made and the existing curb stop and box cannot be utilized or a new curb stop and box is required, the Contractor shall connect the new service piping to

the existing service piping using an approved coupling approximately 12-inches from the curb stop on the building side of the stop.

- D. Where transfers are being made and the existing service is of lead, galvanized steel, or iron, the service shall be replaced to the curb stop and box unless otherwise required. If required, the curb stop and box shall be replaced as specified above.
- E. Curb stops and boxes shall be set plumb, flush with the ground or paved surface, and centered with the box located directly over the stop. The box shall be set on a concrete block or flat stone. Earth fill shall be carefully tamped around the boxes to a distance of 4 feet on all sides of the box or to the undisturbed face of the trench, if less than 4 feet.
- F. Curb stops shall be operational and accessible at all times during construction and warranty period. The Contractor shall verify the proper operation of all curb stops in the presence of the Engineer and/or Owner following completion of the project and prior to the acceptance of substantial completion.
- G. All services shall be installed at **5 feet 0 inches** of cover unless otherwise required by the Engineer.
- H. Service connections shall be tested and disinfected in accordance with AWWA standards.

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP4 Working Documents\4.2 Specifications\Division 2\02515 - Water Service Connections.docx

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 02518

TRACER TAPE

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section covers the furnishing, handling and installation of tracer tape, as called for on the drawings.

1.02 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Manufacturer's literature on the materials, colors and printing specified herein, shall be submitted to the Engineer for review.
- B. Tape samples shall also be submitted to the Engineer for review.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

Tracer tape shall be by Reef Industries, Houston, TX; Empire Level, Mukwonago, WI; Pro-Line Safety Products Co., W. Chicago, IL; or approved equal.

2.02 TRACER TAPE:

- A. Tracer tape shall be at least 3 inches wide.
- B. Tracer tape for non-ferrous pipe or conduit shall be constructed of a metallic core bonded to plastic layers. The metallic tracer tape shall be a minimum 5-mil thick and must be locatable at a depth of 18 inches with ordinary pipe locaters.
- C. Tracer tape for ferrous pipe or conduit shall consist of multiple bonded plastic layers. The non-metallic tracer tape shall elongate at least 500% before breaking.
- D. The tape shall bear the wording: "BURIED DRAIN LINE BELOW" (with "DRAIN" replaced by "WATER", "SEWER", "ELECTRICAL", "GAS", "TELEPHONE", or "CHEMICAL" as appropriate), continuously repeated every 30 inches to identify the pipe.

- E. Tape colors shall be as follows, as recommended by the American Public Works Association (APWA):

Electric	Red
Gas & Oil	Yellow
Communications	Orange
Water	Blue
Sewer & Drain	Green
Chemical	Red (not APWA)

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

- A. Tracer tape shall be installed directly above the pipe or conduit it is to identify, approximately 12 inches below the proposed ground surface.
- B. The Contractor shall follow the manufacturer's recommendations for installation of the tape, as approved by the Engineer.

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPCA\2194262 - New Haven HMGP\4 Working Documents\4.2 Specifications\Division 2\02518 - Tracer Tape.docx

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 02532

VALVES AND APPURTENANCES

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section covers furnishing and installation of all outside valves and appurtenances as indicated on the drawings and as specified herein.

1.02 RELATED WORK:

- A. Section 02089, DUCTILE IRON GRAVITY AND FORCE MAINS PIPE AND FITTINGS FOR SEWERS
- B. Section 02300, EARTHWORK
- C. Section 02631, PRECAST MANHOLES AND CATCHBASINS
- D. Section 03300, CAST-IN-PLACE CONCRETE

1.03 REFERENCES:

The following standards form a part of this specification, as referenced:

- American Society for Testing and Materials (ASTM)
- ASTM D429 Test Methods for Rubber Property - Adhesion to Rigid Substrates
- American Water Works Association (AWWA)
- AWWA C111 Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings
- AWWA C509 Resilient Seated Gate Valves for Water Supply Service
- AWWA C515 Reduced Wall, Resilient-Seated Gate Valves for Water Supply Service
- AWWA C550 Protective Interior Coatings for Valves and Hydrants

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF THE GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Shop drawings shall be submitted for valves and appurtenances, indicating type of joint, and lining and coating, etc., in accordance with the specifications.



- B. Shop drawings shall consist of manufacturer's scale drawings, or catalog cuts, including descriptive literature with complete characteristics and specifications, and code requirements.

## PART 2 - PRODUCTS

### 2.01 RESILIENT SEATED GATE VALVES:

- A. Resilient seated, wedge type gate valves shall be manufactured to meet all applicable requirements of AWWA C509 or C515. Valves 12-inches and smaller shall be bubble-tight at 250 psi water working pressure, tested in both directions.
- B. Valve bodies shall be of cast or ductile iron and shall have non-rising threaded bronze stems acting through a bronze stem nut. Opening nuts shall be 2-inches square and shall open **LEFT**. All buried valves shall have mechanical joint ends in compliance with AWWA C111.
- C. Valve wedges shall be of cast iron with resilient seating surfaces permanently bonded to the wedges in strict accordance with ASTM D429 or attached to the face of the wedges with stainless steel screws. Each valve shall have a smooth, unobstructed water way free from sediment pockets.
- D. Valves shall have low friction, torque-reduction thrust bearings. All O-rings and gaskets shall be removable without taking the valves out of service.
- E. Valve body, bonnet and O-ring plate shall be coated both on interior and exterior with fusion bonded epoxy meeting applicable requirements of AWWA C550.
- F. Resilient seated gate valves shall be as manufactured by Clow Corporation, Oskaloosa, IA; Mueller Co, Chattanooga, TN; Kennedy Valve, Elmira, NY; or be an approved equal.

### 2.01 PLUG VALVES:

- A. Plug valves shall be of the non-lubricated rectangular port; eccentric type with neoprene faced plugs and shall be furnished with flanged joint ends. Flanged valves shall be faced and drilled to ANSI B 16.1 Class 125. Valve bodies and plugs shall be made of ASTM A 126, Class B cast-iron. All exposed nuts, bolts, springs, washers, etc., shall be zinc plated. Resilient plug facings shall be neoprene suitable for use with sewage. Valves shall be furnished with corrosion resistant seats, which comply with AWWA Standard C507 and with AWWA Standard C504. Valve shaft seals shall comply with AWWA Standard C507, and with AWWA C504 and shall be replaceable without valve or gear disassembly.
- B. Valves shall provide drip-tight shutoff up to the full pressure rating.
- C. All valves shall be hydrostatically pressure tested at 175 psi by the manufacturer.

- D. All valves shall be 100% full port design.
- E. All valves shall be provided with gear actuators and shall have non-rising threaded bronze stems acting through a bronze stem nut. Opening nuts shall be 2-inches square and shall open LEFT. All buried valves shall have mechanical joint ends in compliance with AWWA C111.
- F. Where indicated on the Contract Drawings or requested by the Engineer, plug valves shall include a valve stem extension constructed of painted steel. Valve stem extensions shall be of the length required as indicated on the Contract Drawings. Intermediate valve supports and hardware required for mounting of the extension shall be provided by the installing contractor. Valve stem extensions shall be suitable for use with the valve actuators specified herein.
- G. Plug valves shall be as manufactured by DeZurik Water Controls, Sartell, MN; Clow Valve Company, Oskaloosa, IA, Kennedy Valve Company, Lima, OH or approved equal.

#### 2.02 VALVE BOXES:

- A. Each valve shall be provided with a box. Covers shall be close fitting and substantially dirt-tight. The top of the cover shall be flush with the top of the box rim and marked "Sewer".
- B. Valve boxes shall be of cast iron and of the adjustable threaded or sliding, heavy pattern type. They shall be so designed and constructed as to prevent direct transmission of traffic loads to the pipe or valve. The upper section of the box shall be provided with a flange having sufficient bearing area to prevent undue settlement. The lower section and stuffing box shall be designed to enclose the operating nut and stuffing box of the valve and rest on the backfill. The boxes shall be adjustable through at least 6-inches vertically without reduction of lap between sections to less than 4-inches.
- C. The inside diameter of boxes shall be at least 4-1/2-inches and the lengths shall be as necessary to suit the ground elevation and the depth of each valve.

#### 2.03 LINE STOPS:

- A. Line stop fitting body shall consist of a ductile iron or ASTM A-36 steel fusion bonded epoxy coated to 10-12 mils in accordance with AWWA C-213. The fitting shall be full encirclement, pressure retention-type split tee. The outlet of the fitting shall have locking pins built in to retain the completion plug. The contractor shall be responsible for verifying the outside diameter of the pipe where the valve will be inserted.
- B. Before backfilling, all exposed portions of bolts used to hold the two halves of the sleeve together shall be heavily coated with two coats of bituminous paint comparable to Inertol No. 66, Special Heavy. Sleeves shall be furnished with a nitrile gasket that fits 360

degrees around the pipe at each end.

- C. The completion plug shall be machined from a stress relieved carbon steel weldment. It shall contain two (2) circumferential grooves: one to receive the locking devices from line stop flange and second to contain a compressible "O" ring to seal tight under pressure. The line stop fitting shall be closed with a blind flange. Facing and drilling of the blind flange shall be compatible with that of the line stop flange.
- D. The Contractor shall provide the materials, machines, and related equipment necessary to install the line stop into an existing piping system under full operating pressure without interrupting service.
- E. Line stops shall be as manufactured by South Shore Pipeline, Hanover MA, John Hoadley & Sons, Inc. Rockland MA, Hydra-Stop, Inc., Blue Island, IL; IPSCO Paulsboro NJ; or approved equal.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

- A. All material shall be carefully inspected for defects in workmanship and material, and all debris and foreign matter shall be cleaned out of valve openings and seats. Operating mechanisms shall be operated to check for proper functioning, and all nuts and bolts shall be checked for tightness.
- B. Valves and other equipment which do not operate easily or are otherwise defective shall be repaired or replaced at the Contractor's expense.
- C. All valves shall be carefully installed and supported in their respective positions, free from all distortion and strain. Care shall be taken to prevent damage or injury to the valves and appurtenances during handling and installation.
- D. Valve boxes shall be set plumb, flush with the ground or paved surface, and centered directly over the operating nut of the valves. Earth fill shall be carefully tamped around the valve box to a distance of 4 feet on all sides of the box or to undisturbed trench faces if less than 4 feet.
- E. Valves shall be operational and accessible at all times during construction and warranty period. The Contractor shall verify the proper operation of all valves in the presence of the Engineer and/or Owner following completion of the project and prior to the acceptance of Substantial Completion.

END OF SECTION

SECTION 02533

CONNECTIONS TO EXISTING STRUCTURES

PART 1 - GENERAL

1.01 WORK INCLUDED:

The Contractor shall furnish materials, tools, labor and equipment to cut suitable openings into the existing sewer manholes, make connections to existing sewers and all other work necessary to direct the existing sewage flow as indicated on the drawings and as herein specified.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. The Contractor shall provide temporary plugs or provide other suitable means for maintaining the new sewer free of sewage flow until such time as it can be inspected and tested for leakage.
- B. Connections to the new sewer shall be made when required by the Engineer and only after the new pipeline has been inspected and has successfully passed the leakage test.
- C. The Contractor shall modify each existing structure for installation of the necessary piping, but in so doing shall confine the cutting to the smallest amount possible consistent with the work to be done.
- D. All new piping connected to existing structures shall be encased in concrete in a manner satisfactory to the Engineer.
- E. All work shall be done with the proper tools and by careful workmen competent to do work.
- F. The Contractor shall cut, reshape and fill the existing manhole tables and plug existing outlets as indicated on the drawings and as required by the Engineer, to accommodate the new connections. Reshaped manhole invert channels shall be smoothly shaped to permit the flow of sewage. Manhole invert channels shall be reconstructed as specified under Section 02631, PRECAST MANHOLES AND CATCH BASINS.

END OF SECTION

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

SECTION 02536

PRECAST CONCRETE VAULT AND APPURTENANCES

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This section covers precast vaults complete, including, but not limited to, bases, walls, mortar, frames and covers, as shown on the Drawings and as specified herein.
- B. The Contractor shall furnish all labor, materials, tools and equipment necessary to furnish complete factory-built, precast concrete structures. The structures shall be in manageable sections, completely ready for assembly, as indicated on the drawings and as specified herein, and pretested at the factory before shipment to the jobsite.

1.02 REFERENCES:

- A. The following standards form a part of this specification as referenced:

American Society for Testing and Materials (ASTM)

ASTM	A48	Gray Iron Castings
ASTM	A615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM	C32	Sewer and Vault Brick (Made from Clay or Shale)
ASTM	E177	Test Method for Steady - State Heat Flux Measurements and Thermal Transmission Properties by means of the Guarded-Hot-Plates
ASTM	C207	Hydrated Lime for Masonry Purposes
ASTM	C478	Precast Reinforced Concrete Vault Sections
ASTM	C923	Resilient Connectors Between Reinforced Concrete Vault Structures and Pipes
ASTM	C150	Portland Cement
ASTM	C1227	Standard Specifications for Precast Septic Tank - Watertightness. Testing

American Association of State Highway Transportation Officials (AASHTO)

AASHTO M198 Joints for Circular Concrete Sewers and Culvert Pipe Using Flexible Watertight Gaskets

1.03 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01330 SUBMITTALS, SUBMIT THE FOLLOWING:

- A. Manufacturer literature and shop drawings of the materials of this section shall be submitted to the Engineer for review. Shop drawings shall indicate locations and dimensions of proposed penetrations.
- B. Test reports as required shall be submitted to the Engineer.

1.04 QUALITY ASSURANCE:

- A. The precast concrete structure manufacturer shall have a minimum of ten (10) years successful experience in the design and the assembly of factory-built, prefabricated precast structures.
- B. The Engineer shall have the right to inspect or test any materials during fabrication in the factory. At the option of the Engineer, certified tests of materials may be accepted in lieu of field tests.
- C. Precast concrete structures shall be as manufactured by Old Castle Precast, Avon, CT; United Concrete Products, Yaleville, CT; Concrete Systems Inc. Hudson, NH; or approved equal.
- D. A Registered Professional Structural Engineer holding a currently valid license in the State of Connecticut shall prepare the precast concrete structure designs. Structural design calculations for the precast concrete structures shall be prepared and dated, live stamped and signed by a registered professional Engineer, in the State of Connecticut, and shall be submitted for approval prior to fabrication.

1.05 GUARANTEE:

- A. The structure manufacturer shall guarantee all precast concrete structures against defective materials or workmanship for a period of five years after the date of project completion. If any material or workmanship proves to be defective within five (5) years, they shall be replaced or repaired by the precast concrete structure manufacturer at no additional cost to the owner.

1.06 DELIVERY, STORAGE AND HANDLING:

- A. Precast structures will be considered suitable for handling to transport to the Contract site after the concrete has cured to a minimum strength of 80 percent of the design strength.

- B. Ship equipment and material complete, except where partial disassembly is required by transportation regulations or for protection of components.
- C. The package pumping station sections shall be shipped F.O.B. jobsite by the package pumping station manufacturer. The package pumping station manufacturer shall provide all necessary lifting fixtures, hardware and cables for lifting, off-loading and setting the building without incurring damage to the walls or roof.
- D. Delivery of precast structures shall be coordinated with installation or shall be unloaded with proper equipment along the line of Work, outside excavation limits near as practicable to point of final placement. They shall be stored off the ground on wood blocks, pallets or other appropriate means away from brush, poison oak or ivy and in an accessible area for inspection. Excavated or other material shall not be placed over or against the stored precast structures.
- E. Contractor shall receive, off load, store, and safeguard all equipment and materials at the job site.
- F. Precast structures and appurtenances shall be unloaded and handled with crane or equipment of adequate capacity, equipped with appropriate slings, and lifting devices to protect the material from damage.
- G. If damage occurs and is deemed repairable, it shall be repaired as directed by the Engineer in accordance with approved manufacturer's recommendations. If damage is not repairable in the opinion of the Engineer, such items of material will be rejected and shall be removed and replaced at the Contractor's expense.

## PART 2 - PRODUCTS

### 2.01 GENERAL REQUIREMENTS:

- A. Precast sections shall conform in shape, size, dimensions, materials, and other respects to the details indicated on the drawings or as required by the Engineer.
- B. The hatch frame and cover shall be the standard frame and cover as specified. The frame and cover shall be set by the Contractor to conform accurately to the grade of the finished pavement, existing ground surface, or as indicated on the drawings.

### 2.02 PRECAST CONCRETE SECTIONS:

- A. All precast concrete sections shall conform to ASTM C478 with the following exceptions and additional requirements:
  - 1. The wall thickness of precast sections shall be as designated on the drawings, meeting the following minimum requirements:



<u>Section</u>	<u>Minimum Wall Thickness, in.</u>
Roof	8
Walls	6
Floor	6

2. Type II cement shall be used except as otherwise approved.
  3. Sections shall be steam cured and shall not be shipped until at least five days after having been cast.
  4. Minimum compressive strength of concrete shall be 5000 psi at 28 days.
  5. No more than two lift holes may be cast or drilled in each section.
  6. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of the barrel.
  7. Acceptance of the sections will be on the basis of material tests and inspection of the completed product.
  8. Steel reinforcement shall be Grade 60 and conform to ASTM A615 with a minimum of 1-inch cover.
  9. Design loading shall be AASHTO HS-20-44.
  10. The outside surfaces of the vault shall be thoroughly sealed with bituminous coating as herein specified prior to shipping.
- B. Precast sections shall be manufactured to contain wall and roof openings of the minimum size to receive the ends of the pipes and such openings being accurately set to conform to line and grade of the pipelines. Subsequent cutting or tampering in the field, for the purpose of creating new openings or altering existing openings, will not be permitted except as required by the Engineer.
- C. The Engineer reserves the right to reject any precast section and the rejected unit shall be tagged and removed from the job site immediately.
- D. The Engineer may also require the testing of concrete sections as outlined under Physical Requirements in ASTM C478 with the Contractor bearing all testing costs.
- E. All internal and external exposed edges or access points of the precast concrete structures / wetwell and drywell pumping station units shall be provided with a 3/4" chamfer. The 3/4" chamfer shall be integrally cast at the precast concrete manufacturer's facility. Precast concrete structures which are not provided with a 3/4" chamfer shall be rejected, removed from the project area, disposed of by the contractor and replaced at no additional

cost to the Owner. Field applied chamfers such as mechanical grinding shall not be acceptable

2.03 BRICK MATERIALS:

- A. The brick shall be sound, hard, and uniformly burned brick regular and uniform in shape and size, of compact texture, and satisfactory to the Engineer. Brick shall comply with ASTM C32, for Grade SS, hard brick, except that the mean of five tests for absorption shall not exceed 8 percent by weight.
- B. Rejected brick shall be immediately removed from the work and brick satisfactory to the Engineer substituted.

2.04 MORTAR, CEMENT, HYDRATED LIME AND SAND:

- A. The mortar shall be composed of portland cement, hydrated lime, and sand in which the volume of sand shall not exceed three times the sum of the volumes of cement and lime. The proportions of cement and lime shall be as required by the Engineer and may vary from 1:1/4 for dense hard-burned brick to 1:3/4 for softer brick. In general, mortar for Grade SS Brick shall be mixed in the volume proportions of 1:1/2:4-1/2; Portland cement to hydrated lime to sand.
- B. Cement shall be Type II Portland cement as specified for concrete masonry.
- C. Hydrated lime shall be Type S conforming to ASTM C207.
- D. The sand shall comply with the specifications for "Fine Aggregate", for concrete masonry except that all of the sand shall pass a No. 8 sieve.

2.05 JOINTS:

- A. Joint gaskets to be flexible self-sealing butyl rubber joint sealant installed according to manufacturer's recommendations. For cold weather applications, use adhesive with joint sealant as recommended by manufacturer.
- B. Acceptable Materials:
  - 1. Kent-Seal No. 2, Con-Seal, Ram-Nek or equivalent.
- C. Joints between precast sections shall conform to related standards and manufacturer's instructions. Joints shall be water-tight.

2.06 ALUMINUM VAULT LADDERS:

- A. Aluminum ladders shall be fastened to concrete with stainless steel or aluminum toggle or expansion bolts, and fasteners shall be in the locations shown on the shop drawings.
- B. Ladders shall be solid stock and all-welded construction. Rungs shall be 3/4-inch diameter fitted into holes in 1/4-inch by 2-inch rails and welded all around. Tops of ladder rails shall have rounded corners or vinyl coverings to prevent injury. Aluminum ladders shall include brackets, fasteners, bracing and support.

2.07 OPENINGS:

- A. All wall penetrations shall be formed at the manufacturing plant utilizing cast in place 316 stainless steel pipe sleeves with water stops.
- B. Provide openings for all penetrations entering the structure or shown on the Contract Documents. Additional holes which may be required for a complete and functional system shall be provided at no additional cost.
- C. Opening Size: To provide a uniform annular space suitable for Link-Seal modular seals installation between the outside wall of pipe and cast in-place sleeve.
- D. Opening Location: To permit setting of the entering pipes at the correct elevations.
- E. Openings shall have a flexible watertight union between pipe and the structure.
- F. Link-Seal modular seals by GPT, a division of EnPro Industries.

2.08 ALUMINUM FLOOR DOOR:

- A. Access frames and covers shall have a 1/4-inch thick, one-piece, mill finish, extruded aluminum frame, incorporating a continuous concrete anchor and bituminous coating applied to the exterior of the frame. Door panels shall be 1/4-inch thick aluminum diamond plate, reinforced to withstand H-20 load ratings. Doors shall open to 90 degrees and automatically lock with a stainless steel hold open arm with aluminum release handle. Doors shall incorporate enclosed stainless steel compression spring assists and shall close flush with the frame. Lifting handle, hinges, and all fastening hardware shall be stainless steel. Unit shall lock with stainless steel slam locks with removable keys. Hatches shall include a special keyed cylinder lock with access through a weather-tight removable deckplate.
- B. Floor door shall be watertight and a 1-1/2-inch drainage coupling shall be located in the channel frame.
- C. Floor door shall be installed as shown on the drawings. Unit shall be furnished completely fabricated. Hatch cover and frame shall be manufactured by Bilco Co., New

Haven, CT; Incryo/Milnor, Lima, OH; Halliday Products, Orlando, FL; U.S.F. Fabrication, Hialeah, FL; or an approved equal.

- D. The manufacturer shall guarantee against defects in material or workmanship for a period of five (5) years from the date of Owner's acceptance.
- E. 2-inch thick polystyrene insulation shall be firmly adhered to the interior cover.
- F. Fall protection, meeting OSHA requirements, shall be hinged hatch safety net.

2.09 EXPANDABLE DRAIN PLUGS:

- A. Expandable drain plugs shall be manufactured of nylon-6 and rubber and shall seal pipe air-tight up to a pressure of 8 psi. Drain plugs shall be equal to Firm Hand Tile Expandable Stopper as supplied by T.E. Toomy Co., Inc., Wakefield, MA.

2.10 BITUMINOUS DAMPPROOFING:

- A. Liquid Asphalt Damp proofing: Non-fibrated asphalt emulsion primer coat followed by fibrated asphalt emulsion top coat for below grade wall damp proofing.

Primer coat: BASF MasterSeal 610 or equal.

Top coat: BASF MasterSeal 614, or equal.

2.11 INSULATION:

- A. Insulation shall be polystyrene and shall be supplied in boards of full thickness required; multiple layers of thinner boards shall not be acceptable.
- B. Thickness of perimeter insulation shall be 2-inches and shall produce a minimum thermal resistance "R" value of 5.5 h x ft<sup>2</sup> x NF/Btu (1.0 m<sup>2</sup> x K/W) as determined in accordance with ASTM C177, at an average mean temperature of 75°F (24°C).
- C. Adhesive for perimeter insulation shall be compatible with materials for which it will be in contact. Adhesive shall be subject to the approval of the Engineer. Adhesive shall be that recommended by the manufacturer of the insulation.
- D. In addition to adhesive, expansion bolts shall be provided to securely fasten insulation to the ceiling.

2.12 ACCESSORIES:

- A. Gasket materials shall be top grade (100% solids, vulcanized) butyl rubber and shall meet or exceed AASHTO M-198.

- B. Couplings at the vault -pipe interface shall be of the method detailed on the drawings. The seal system shall be rubber (with or without stainless steel straps) meeting the requirements of ASTM C923 and recommended for this type of connection. Only cast-in-place couplings shall be acceptable for new vaults furnished per this specification; couplings for core-drilled or cast-in-place openings will be rejected except for modifications to existing vaults.
- C. Vent shall be 6-inch diameter ductile iron pipe with rainproof metal hood and noncorrosive screen.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

##### A. Precast Sections

1. The precast vault shall be supported on a compacted level foundation of crushed stone, as specified in Section 02300 EARTHWORK, at least 6-inches thick, but to the depth necessary to reach sound undisturbed earth.
2. Precast reinforced concrete sections shall be set so as to be vertical and with sections in true alignment.
3. Butyl rubber joint sealant shall be installed between each concrete section.
4. All holes in sections used for their handling shall be thoroughly plugged with mortar. The mortar shall be one part cement to 1-1/2 parts sand, mixed slightly damp to the touch (just short of "balling"), hammered into the holes until it is dense and an excess of paste appears on the surface, and then finished smooth and flush with the adjoining surfaces.

##### B. Brickwork

1. The brick shall be moistened by suitable means, as required, until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.
2. Each brick shall be laid as headers in a full bed and joint of mortar without requiring subsequent grouting, flushing or filling, and shall be thoroughly bonded as required.

##### C. Castings

1. Frames shall be set with the tops conforming accurately to the grade on the drawings or as required by the Engineer.
2. Frames shall be set as shown on the drawings and in a full bed of mortar so that the space between the top of the concrete section or brick headers and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar

extending to the outer edge of the concrete shall be placed all around the bottom flange. The mortar shall be smoothly finished to be flush with the top of the flange and have a slight slope to shed water away from the frame.

3. Covers shall be left in place in the frames except while work is being performed on them.

D. Accessories

Accessories shall be installed in accordance with manufacturer's instructions.

3.02 CLEANING:

All new vaults shall be thoroughly cleaned of all silt, debris and foreign matter of any kind, prior to final inspection.

END OF SECTION

\\\\Wse03.local\\WSE\\Projects\\CT\\GNHWPCA\\2190262 New Haven HMGP\\4 Working Documents\\4.2 Specifications\\Division 2\\02536 - Precast concrete vaults.docx

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 02631

PRECAST MANHOLES

PART 1 - GENERAL

1.01 WORK INCLUDED:

This Section covers all precast manholes and catch basins complete, including, but not limited to, bases, walls, cones, mortar, inverts, frames and covers.

1.02 RELATED WORK:

- A. Section 02300, EARTHWORK
- B. Section 02745, PAVING

1.03 SYSTEM DESCRIPTION:

- A. Precast sections shall conform in shape, size, dimensions, materials, and other respects to the details indicated on the drawings or as required by the Engineer.
- B. All manholes shall have concrete bases. Concrete bases shall be precast unless otherwise specified. Invert channels shall be formed of brick and mortar upon the base.
- C. Riser and cone sections shall be precast concrete.

1.04 REFERENCES:

- A. The following standards form a part of this specification as referenced:

American Society for Testing and Materials (ASTM)

ASTM A48	Gray Iron Castings
ASTM C32	Sewer and Manhole Brick
ASTM C144	Aggregate for Masonry Mortar
ASTM C207	Hydrated Lime for Masonry Purposes
ASTM C478	Precast Reinforced Concrete Manhole Sections
ASTM C923	Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes

ASTM C1244 Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test.

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M198 Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets

Occupational Safety and Health Administration

OSHA 29 CFR 1910.27 Fall Prevention Protection

1.05 SUBMITTALS:

- A. Manufacturer's literature of the materials of this section
- B. Test reports as required by the Engineer.

PART 2 - PRODUCTS

2.01 PRECAST CONCRETE SECTIONS

- A. All precast concrete sections shall conform to ASTM C478 with the following exceptions and additional requirements:

- 1. The wall thickness of precast sections shall be as designated on the drawings, meeting the following minimum requirements:

<u>Section Diameter (Inches)</u>	<u>Minimum Wall Thickness (Inches)</u>
48	5
60	6
72	7
84	8

- 2. Type II cement shall be used except as otherwise approved.
- 3. Sections shall be steam cured and shall not be shipped until at least five days after having been cast.
- 4. Minimum compressive strength of concrete shall be 4000 psi at 28 days.
- 5. No more than two lift holes may be cast or drilled in each section.



6. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of each precast section.
  7. Acceptance of the sections will be on the basis of material tests and inspection of the completed product.
  8. Circumferential steel reinforcement in walls and bases shall be a minimum of 0.12 sq. in./lin. ft. for 4-foot diameter sections and 0.15 sq. in./lin. ft. for 5- and 6-foot diameter sections. Reinforcing shall extend into tongue and groove.
- B. Conical reducing sections shall have a wall thickness not less than 5-inches at the bottom and wall thickness of 8-inches at the top. Conical sections shall taper from a minimum of 48-inches diameter to 24 or 30-inches diameter at the top, as shown on the drawings.
  - C. Except where insufficient depth of cover dictates the use of a shorter base, bases shall be a minimum of 4 feet in height.
  - D. Slab top sections and flat riser sections (Grade Rings) shall conform to the contract drawings, with particular attention focused upon the reinforcing steel and be designed to meet or exceed an HS-20 Loading requirement.
  - E. The tops of the bases shall be suitably shaped by means of accurate ring forms to receive the riser sections.
  - F. Precast sections shall be manufactured to contain wall openings of the minimum size to receive the ends of the pipe, such openings being accurately set to conform with line and grade of the sewer or drain. Subsequent cutting or tampering in the field, for the purpose of creating new openings or altering existing openings, will not be permitted except as required by the Engineer.
  - G. "Drop-over" manholes shall be placed where indicated on the drawings. The Contractor shall accurately measure the diameter of the existing outlet pipe and inform the manufacturer of its size, so that the "Drop-over" type opening can be cut into the precast manhole base. The bottom shall be cast in place by the Contractor in accordance with Section 03302, FIELD CONCRETE. The invert channel shall be formed of brick and mortar, as specified in this specifications section. The sub-base shall be a compacted, level foundation of crushed stone, at least 6-inches thick, as specified in Section 02300 EARTHWORK, but shall vary to the depth necessary to reach sound undisturbed earth.
  - H. The exterior surfaces of all precast manhole bases, walls, and cones shall be given a minimum of one shop coat of bituminous dampproofing.
  - I. The Engineer reserves the right to reject any unsatisfactory precast section and the rejected unit shall be tagged and removed from the job site immediately.
  - J. The Engineer may also require the testing of concrete sections as outlined under Physical Requirements in ASTM C478 with the Contractor bearing all testing costs.

2.02 BRICK MATERIALS:

- A. Brick shall be sound, hard, and uniformly burned brick, regular and uniform in shape and size, of compact texture, and satisfactory to the Engineer. Bricks shall comply with ASTM C32, for Grade SS, hard brick, except that the mean of five tests for absorption shall not exceed 8 percent by weight.
- B. Rejected brick shall be immediately removed from the work and brick satisfactory to the Engineer substituted.
- C. Mortar shall be composed of Portland cement, hydrated lime, and sand in which the volume of sand shall not exceed three times the sum of the volumes of cement and lime. The proportions of cement and lime shall be as required by the Engineer and may vary from 1:1/4 for dense hard-burned brick to 1:3/4 for softer brick. In general, mortar for Grade SS Brick shall be mixed in the volume proportions of 1:1/2:4-1/2; Portland cement to hydrated lime to sand.
- D. Cement shall be Type II Portland cement as specified for concrete masonry.
- E. Hydrated lime shall be Type S conforming to ASTM C207.
- F. The sand shall comply with ASTM C144 specifications for "Fine Aggregate," except that all of the sand shall pass a No. 8 sieve.

2.03 FRAMES, GRATES, COVERS AND STEPS:

- A. Castings shall be of good quality, strong, tough, even-grained cast iron, smooth, free from scale, lumps, blisters, sand holes, and defects of every nature which would render them unfit for the service for which they are intended. Contact surfaces of covers and frame seats shall be machined to prevent rocking of covers.
- B. All castings shall be thoroughly cleaned and may be subject to a careful hammer inspection at the Engineer's discretion.
- C. Castings shall be ASTM A48 Class 30B or better.
- D. The surface of the manhole covers shall have a diamond pattern with the cast words, as shown on the drawings.
- E. Manhole steps shall conform to ASTM C478 requirements and shall be fabricated of either extruded aluminum or steel reinforced plastic. Steps shall be uniformly spaced at a maximum of 12-inches unless otherwise shown on the drawings.

2.04 SEWER MANHOLE ACCESSORIES:

- A. Gasket materials shall be top grade (100% solids, vulcanized) butyl rubber and shall meet or exceed AASHTO M-198.
- B. Couplings at the manhole-pipe interface shall be made with a rubber seal system (with or without stainless steel straps) meeting the requirements of ASTM C923 and recommended for this type of connection.
- C. Stubs installed as specified and indicated on the drawings shall be short pieces of the same class pipe as that entering the manhole and shall have either stoppers or end caps as shown on the drawings. Stoppers or end caps shall be especially designed for that application.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. PRECAST SECTIONS:

- 1. Precast bases shall be supported on a compacted level foundation of crushed stone, as specified in Section 02300 EARTHWORK, at least 6-inches thick, but shall vary to the depth necessary to reach sound undisturbed earth.
- 2. Precast reinforced concrete sections shall be set vertical and with sections in true alignment.
- 3. Butyl rubber joint sealant shall be installed between each concrete section. Catch basin sections do not require joint sealant if so indicated on the drawings.
- 4. All holes in sections used for handling the sections shall be thoroughly plugged with mortar. Mortar shall be one part cement to 1-1/2 parts sand, mixed slightly damp to the touch (just short of "balling"), hammered into the holes until it is dense and an excess of paste appears on the surface, and then finished smooth and flush with the adjoining surfaces.

B. BRICK WORK:

- 1. Bricks shall be moistened by suitable means, as required, until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.
- 2. Each brick shall be laid as a header in a full bed and joint of mortar without requiring subsequent grouting, flushing or filling, and shall be thoroughly bonded as directed.

**Note to specifier:**

3. The brick inverts shall conform accurately to the size of the adjoining pipes. Side inverts shall be curved and main inverts (where direction changes) shall be laid out in smooth curves of the longest possible radius which is tangent to the centerlines of adjoining pipe.

C. CASTINGS:

1. Cast iron frames, grates and covers shall be as specified. The frames and covers shall be set by the Contractor to conform accurately to the grade of the finished pavement, existing ground surface, or as indicated on the drawings. Frames shall be adjusted to meet the street surface.
2. Cast iron manhole frames and covers not located in paved areas shall be set 6-inches above finished grade, at a height as required by the Engineer, or as indicated on the drawings. The top of the cone shall be built up with a minimum of 1 course and a maximum of 5 courses of brick and mortar used as headers for adjustment to final grade.
3. Frames shall be set concentric with the top of the concrete section and in a full bed of mortar so that the space between the top of the concrete section or brick headers and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the concrete shall be placed all around the bottom flange. The mortar shall be smoothly finished to be flush with the top of the flange and have a slight slope to shed water away from the frame.
4. Covers and/or grates shall be left in place in the frames, for safety reasons, except while work is being performed.

D. ACCESSORIES:

1. Accessories shall be installed in accordance with manufacturer's instructions.
2. Stubs shall be set accurately to the dimensions indicated on the drawings. Stubs shall be sealed with suitable watertight plugs.

E. MANHOLE FALL PREVENTION SYSTEM:

Carrier rail shall extend from the manhole invert shelf to within 18-inches of finish grade. The rail and manhole rung clamp assembly shall be rigidly connected utilizing 3/8-inch stainless steel bolts. Assembly shall be clamped to manhole steps at 2-foot centers or as recommended by the manufacturer.

3.02 LEAKAGE TESTS:

- A. Leakage tests shall be made by the Contractor and observed by the Engineer on each manhole. The test shall be by vacuum or by water exfiltration as described below:

B. VACUUM TEST:

1. The vacuum test shall be conducted in accordance with ASTM C1244. Test results will be judged by the length of time it takes for the applied vacuum to drop from 10 inches of mercury to 9 inches. If the time is less than that listed in Table 1 of ASTM C1244, the manhole will have failed the test. Test times from Table 1 are excerpted below.

TABLE 1

Minimum Test Times for Various Manhole Diameters

Depth (Feet)	Diameter (Inches)		
	48	60	72
	<u>Times (Seconds)</u>		
0-12	30	39	49
12-16	40	52	67
16-20	50	65	81
20-24	59	78	97
26-30	74	98	121

2. If the manhole fails the initial test, the Contractor shall locate the leaks and make proper repairs. Leaks may be filled with a wet slurry of accepted quick setting material. If the manhole should again fail the vacuum test, additional repairs shall be made, and the manhole water tested as specified below.

C. WATER EXFILTRATION TEST:

1. After the manhole has been assembled in place, all lifting holes shall be filled and pointed with an approved non-shrinking mortar. All pipes and other openings into the manhole shall be suitably plugged and the plugs braced to prevent blow out. The test shall be made prior to placing the shelf and invert. If the groundwater table has been allowed to rise above the bottom of the manhole, it shall be lowered for the duration of the test.
2. The manhole shall be filled with water to the top of the cone section. If the excavation has not been backfilled and observation indicates no visible leakage, that is, no water visibly moving down the surface of the manhole, the manhole may be considered to be satisfactorily water-tight. If the test, as described above, is unsatisfactory as determined by the Engineer or if the manhole excavation has been backfilled, the test shall be continued. A period of time may be permitted if the Contractor so wishes, to allow for absorption by the manhole. At the end of this period, the manhole shall be refilled to the top of the cone, if necessary, and a measuring time of at least 8 hours begun. At the end of the test period, the manhole shall be refilled to the top of the cone, measuring the volume of water added. This

amount shall be extrapolated to a 24-hour loss rate and the leakage determined on the basis of depth. The leakage for each manhole shall not exceed one gallon per vertical foot for a 24-hour period. If the manhole fails this requirement, but the leakage does not exceed 3 gallons per vertical foot per day, repairs by approved methods may be made as required by the Engineer to bring the leakage within the allowable rate of one gallon per foot per day. Leakage due to a defective section or joint or exceeding the 3 gallon per vertical foot per day, shall be cause for rejection of the manhole. It shall be the Contractor's responsibility to uncover the rejected manhole as necessary and to disassemble, reconstruct or replace it as required by the Engineer. The manhole shall then be retested and, if satisfactory, interior joints shall be filled and pointed.

3. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorption, etc. It shall be assumed that a loss of water during the test is a result of leaks through joints or through the concrete. Furthermore, the Contractor shall take any steps necessary to assure the Engineer that the water table is below the bottom of the manhole throughout the test.
4. If the groundwater table is above the highest joint in the manhole, and there is no leakage into the manhole, as determined by the Engineer, such a test can serve to evaluate water-tightness of the manhole. However, if the Engineer is not satisfied with the results, the Contractor shall lower the water table and carry out the test as described hereinbefore.

### 3.03 CLEANING:

All new manholes shall be thoroughly cleaned of all silt, debris and foreign matter of any kind, prior to final inspection.

END OF SECTION

SECTION 02746

BITUMINOUS CONCRETE PAVEMENT

PART 1 - GENERAL

1.01 WORK INCLUDED:

The Contractor shall furnish all labor, materials and equipment and shall replace the pavements as indicated on the drawings and as herein specified.

1.02 RELATED WORK:

- A. Section 00890, PERMITS
- B. Section 01562, DUST CONTROL
- C. Section 02300, EARTHWORK
- D. Section 02631, PRECAST MANHOLES AND CATCH BASINS

1.03 SYSTEM DESCRIPTION:

A. GENERAL

The types of pavement systems to be utilized on this project are as follows:

- TYPE 1. PERMANENT TRENCH PAVEMENT
- TYPE 2. BITUMINOUS CONCRETE DRIVEWAY

PAVEMENT SCHEDULE

B. TYPE 1. PERMANENT TRENCH PAVEMENT

Areas shall be paved with permanent trench Class 1 pavement, 2-1/2 inches thick and permanent trench Class 2 pavement, 1-1/2-inches thick. Permanent trench binder course and trench top course pavement shall be installed only with the approval of the Engineer.

C. TYPE 2. BITUMINOUS CONCRETE DRIVEWAY

All areas shall be excavated to a depth required to install the compacted gravel subbase, the Class 1 pavement, and the Class 2 pavement. Areas shall be fine-graded as shown on the drawings prior to installation of the bituminous pavement.

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

1.04 REFERENCES

The following standards form a part of these specifications and indicate the minimum standards required:

American Society for Testing and Materials (ASTM)

ASTM D1557 Test for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 Pound Rammer and 18-Inch Drop

State of Connecticut Department of Transportation (CT DOT)

Form 817 Standard Specifications for Roads, Bridges and Incidental Construction

4.03 Cold-Reclaimed Asphalt Pavement

4.06 Bituminous Concrete (Recycle or Crushed Glass Option)

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Six sets of complete job mix formula shall be submitted to the Engineer at least two weeks before any of the work of this section is to begin.

PART 2 - PRODUCTS

2.01 GRAVEL SUBBASE:

- A. Gravel subbase shall consist of inert material that is hard durable stone and coarse sand, free from loam and clay, surface coatings and deleterious materials.
- B. Gradation requirements for gravel subbase shall be as specified in Form 817 Article M.05.01 Processed Aggregate Base and Pavement Surface Treatment.

2.02 BITUMINOUS CONCRETE PAVEMENT:

- A. Bituminous concrete pavements shall consist of Classes 1 and 2 Bituminous Concrete.
- B. Bituminous concrete mixtures shall be within the composition limits of base courses, binder courses, top courses and surface treatment, in accordance with Form 817 Article M.04.02 Mix Design and Job Mix Formula, with constituents that conform to Table A, below.



TABLE A

PERCENT BY WEIGHT PASSING SIEVE DESIGNATION

Standard Sieves	Class 1	Class 2
2 in	-	-
1 in	100	-
¾ in	90-100	-
½ in	70-100	100
3/8 in	60-82	90-100
¼ in	-	-
No.4	40-65	55-80
No.8	28-50	40-64
No.30	10-32	16-36
No.50	6-26	8-26
No.200	3-8	3-8
PG Binder Content, %	5-6.5	5-8

\* Percentages shown for aggregate sizes are stated as proportional percentages of total aggregate for the mix.

- C. The joint sealant shall be a hot poured rubberized emulsified asphalt sealant, meeting the requirements of Form 817 Article M.04.01 Joint Seal Material.
- D. The tack coat shall be an asphalt emulsion, RS-1, conforming to Form 817 Article M.04.01 Bituminous Concrete Materials.

PART 3 - EXECUTION

3.01 GENERAL:

Paving courses required for the project shall be as shown on the drawings and as specified herein. Pavement thicknesses specified are measured in compacted inches. If a pavement course thickness exceeds 2-1/2 compacted inches, the course shall be installed in multiple lifts with each lift not exceeding 2-1/2 compacted inches in thickness.

3.02 GRAVEL SUBBASE:

- A. The gravel subbase to be placed under pavement shall consist of gravel evenly spread and thoroughly compacted. Depths of the subbase shall be as shown on the drawings.
- B. The gravel shall be spread in layers not more than 4-inches thick, compacted measure. All layers shall be compacted to not less than 95 percent of the maximum dry density of the material as determined by ASTM D1557 Method C at optimum moisture content.

3.03 PERMANENT BITUMINOUS PAVEMENT:

- A. The bituminous paving mixture, equipment, methods of mixing and placing, and the precautions to be observed as to weather, condition of base, etc., shall be in accordance with Form 817 Section 4.06 Bituminous Concrete.
- B. BINDER COURSE (CLASS 1) PAVEMENT:
  - 1. Immediately prior to installing the binder course, the trimmed edges shall be made stable and unyielding, free of loose or broken pieces and all edges shall be thoroughly broomed clean. Contact surfaces of trench sides, curbing, manholes, catch basins, or other appurtenant structures in the pavement shall be painted thoroughly with a uniform coating of asphalt emulsion (tack coat), just before any mixture is placed against them.
  - 2. The binder course shall be repaired as necessary to maintain the surface of the pavement until placement of the permanent overlay. If required, the Contractor shall place a leveling course before placing the permanent overlay.
- C. TOP COURSE (CLASS 2) PAVEMENT (PERMANENT OVERLAY):
  - 1. The top course shall be placed over the trench or full width as shown on the drawings or as specified.
  - 2. Prior to placement of the top course, the entire surface over which the top course is to be placed, including against curbs, gutters and castings, shall be broom cleaned and tack coated.
  - 3. Top course pavement placed over trenches may be feathered to meet existing paved surfaces, if approved by the Engineer.

3.04 PAVEMENT PLACEMENT:

- A. Unless otherwise permitted by the Engineer for particular conditions, only machine methods of placing the pavement shall be used. The equipment for spreading and finishing shall be mechanical, self-powered pavers, capable of spreading and finishing the mixture true to line, grade, width and crown. The mixtures shall be placed and compacted only at such times as to permit proper inspection and checking by the Engineer.
- B. After the paving mixtures have been properly spread, initial and intermediate compaction shall be obtained by the use of steel wheel rollers having a weight of not less than 10 tons. Vibratory roller, if used, shall be of a self-propelled type specifically designed for the compaction of bituminous concrete. It shall be equipped with a spread control device and set to prevent the roller from traveling in excess of 2 1/2 mph (220 fpm) while operating in vibratory mode, and 5 mph (440 fpm) while operating in the static mode.

- C. Final rolling of the top course or surface treatment pavement shall be performed by a steel wheel roller weighing not less than 10 tons at a mix temperature and time sufficient to allow for final smoothing of the surface and thorough compaction.
- D. Immediately after placement of top course or surface treatment pavement, all joints between the existing and new top course or surface treatment pavements shall be sealed with joint sealant.
- E. Where there is no backing for the edges of the curb-to-curb pavement, the Contractor shall provide a gravel transition. The gravel transition shall be installed immediately after the pavement is placed, shall be feathered and extend a minimum of 18-inches, and shall be compacted using the same equipment as for pavement compaction. The gravel shall be uniformly graded material meeting the requirements of Form 817 Article M.02.04 Gravel Shoulders.
- F. When required by the Engineer, the Contractor shall furnish and install additional paving to provide satisfactory transition for driveways and walkways impacted by a new curb-to-curb pavement installation. The transition installation will be considered incidental to the curb-to-curb pavement installation.

3.08 ADDITIONAL PAVING:

- A. If the Engineer determines that the existing bituminous concrete pavement on (local) streets is thicker than the permanent pavement specified herein, the Contractor may be required to install additional Class 1 bituminous concrete to obtain the depth of the existing pavement.
- B. If for the installation of full width paving, the Engineer determines that the existing road surface requires additional leveling pavement, then the Contractor shall install additional Class 2 bituminous concrete to bring the section to proper line and cross section. Additional paving required to restore the proper line and cross section of binder course installed by the Contractor which has become rough and uneven shall be furnished and installed at the expense of the Contractor.

3.09 PARKING LOTS, DRIVEWAYS, AND SIDEWALKS:

- A. Pavement shall consist of a 2-1/2-inch binder course and a 1-1/2-inch top course on a 12-inch gravel sub-base. All thicknesses are compacted thicknesses.
- B. Adjacent concrete work, slate work, sidewalks, structures, etc., shall be protected from stain and damage during the entire operation. Damaged or stained areas shall be replaced or repaired to equal their original condition.
- C. All joints between binder and top course shall be staggered a minimum of 6-inches.

- D. After final rolling, no vehicular traffic of any kind shall be permitted on the pavement until it has cooled and hardened sufficiently to prevent distortion and loss of fines, and in no case in less than 6 hours.
- E. Smoothness of all areas of the finished surface shall not vary more than 1/4-inch when tested with a 10 foot straight-edge, applied both parallel to and at right angles to the centerline of the paved area. At building entrances, curbs, and other locations where an essentially flush transition is required, pavement elevation tolerance shall not exceed plus or minus 1/8-inch. Irregularities exceeding these amounts, or which retain water on the surface, shall be corrected by removing the defective work and replacing or repairing it to the satisfaction of the Engineer.

### 3.10 RAISING AND ADJUSTING CASTINGS:

- A. In areas of permanent top course paving, existing municipally-owned catch basin and manhole castings and valve boxes shall be raised to the proper grade where required by the Engineer.
- B. The method of adjusting these castings shall be as follows: Cut around catch basin or manhole castings a minimum of 8-inches from casting. Excavate and if required rebuild up to 12-inches of masonry below the bottom of the casting. Backfill with suitable material and compact to bottom of casting. Place high, early strength cement or bituminous concrete collar, as required by the Engineer, to approximately 1½-inches below the raised casting grade. Masonry work shall conform to Section 02631, PRECAST MANHOLES AND CATCH BASINS.
- C. In some areas, raising of castings may not be required. Where required by the Engineer, castings not to be raised shall have at least 12-inches of bituminous concrete pavement chipped and removed around the casting. New bituminous concrete pavement shall be placed and compacted around such castings to approximately 1-1/2-inches below the top of the casting. The overlay course shall then be sloped down to the level of the casting.
- E. The method of raising valve boxes shall be as follows: Cut around valve box a minimum of 8-inches from valve box. Excavate as required and raise the valve box. Pour high early strength cement or bituminous concrete collar, as required by the Engineer, to approximately 1-1/2-inches below the top of the valve box.
- E. Castings, which need to be raised or adjusted to complete permanent curb to curb paving, shall be done immediately prior to paving.

END OF SECTION

SECTION 02795

POROUS PAVEMENT SYSTEM (RECYCLED PLASTIC GRASS PAVERS)

PART 1 – GENERAL

1.01 WORK INCLUDED:

Furnish all labor, equipment and materials required to install porous pavement system, as indicated on the drawings.

1.02 RELATED SECTIONS:

- A. Section 02300, EARTHWORK
- B. Section 02920, LOAMING AND SEEDING

1.03 SYSTEM DESCRIPTION:

- A. Provides vehicular and pedestrian load support over grass areas, while protecting grass from harmful effects of traffic.
- B. Provides a permeable load support structure for vehicular or pedestrian traffic with an open aggregate or other suitable infill.

1.04 SUBMITTALS:

- A. Submit under provisions of Section 01330.
- B. Product Data: Submit manufacturer's product data.
- C. Shop Drawings: Submit manufacturer's shop drawings including laying pattern and anchoring.
- D. Samples: Submit manufacturers sample.
- E. Installation Instructions: Manufacturer's printed installation instructions. Include methods for maintaining installed products.

1.05 QUALITY ASSURANCE:

- A. Manufacturer ISO Certification: ISO Certification certifying manufacturer's quality management system is currently registered to ISO 9001:2000 quality standards.
- B. Manufacturer's Field Representative Qualifications: Experienced in the installation of the specified products.

- C. Installer Qualifications: Experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
- D. Installation Meetings: Conduct three (3) meetings to verify project requirements, subbase conditions, and manufacturer's installation instructions. Require attendance of parties directly affecting work of this section, including the contractor, engineer, installer, and manufacturer's representative. Comply with Division 1 requirements.

## PART 2 – PRODUCTS

- A. Manufacturers of the porous pavement system shall be Presto Products Company, Appleton, Wisconsin; Invisible Structures, Inc., Golden, Colorado; or approved equal.
- B. Paving Units shall be made of 100-percent recycled plastic.
- C. Porous pavement system shall have a wall compressive strength of 320 psi minimum.
- D. Loaming and Seeding mixture shall conform to standards of Section 02920, LOAMING AND SEEDING and Section 02300, EARTHWORK.

## PART 3 – EXECUTION

### 3.01 PREPARATION:

- A. Subgrade
  1. Prepare subgrade in accordance with manufacturer's instructions and Section 02300, EARTHWORK.
  2. Excavate area allowing for unit thickness and the engineered base depth (where required).
  3. Provide adequate drainage from excavated area if area has potential to collect water, when working with in-place soils that have poor permeability.
  4. Ensure in-place soil is relatively dry and free from standing water.
  5. Uniformly grade base.
  6. Level and clear base of large objects, such as rocks and pieces of wood.
- B. Base Preparation
  1. Prepare engineered base in accordance with manufacturer's instructions, if engineered base is required.
  2. If required, place a geotextile separation layer between the natural ground and the 'engineered base'.

3. Place engineered base of clear stone or crushed rock, homogenously blended with topsoil.
4. Aggregate portion of base shall conform to Section 02300, EARTHWORK.

3.02 INSTALLATION:

- A. Install and infill paving units in accordance with manufacturer's instructions.
- B. Place units with long direction of unit perpendicular to direction of traffic. Ensure final seam pattern has seams perpendicular to traffic flow straight and seams parallel to traffic flow staggered. Use half units where required for pattern by field cutting a full unit.
- C. Cut units with a hand or power saw to custom fit contours and around obstructions.
- D. Ensure required traffic load transfer and support.
- E. Prevent units from shifting during installation.
- F. Infill units with suitable topsoil immediately after units are installed to minimize potential for joint separation.
- G. Spread topsoil infill uniformly over the units to a level even with the top of the cell wall.
- H. Topsoil and seeding shall be as specified in Section 02920 – LOAMING AND SEEDING.

END OF SECTION

Document2

SECTION 02830

METAL PICKET FENCE

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. The contractor shall provide all labor, materials and accessory items necessary for the installation of the metal fence system defined herein.

1.02 SYSTEM DESCRIPTION:

- A. The manufacturer shall supply a total ornamental fencing system of the design, style, strength and picket spacing defined herein. The system shall include all components; pickets, rails, posts, gates and hardware as required.

1.03 QUALITY ASSURANCE:

- A. The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and the materials and techniques specified.

1.04 REFERENCES:

- A. The following standards form a part of this specification as referenced.

American Society for Testing and Materials (ASTM)

ASTM	B117	Practice for Operating Salt-Spray (Fog) Apparatus.
ASTM	D523	Test Method for Specular Gloss.
ASTM	D714	Test Method for Evaluating Degree of Blistering in Paint.
ASTM	D822	Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
ASTM	A653/	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
ASTM	D1654	Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
ASTM	D2244	Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
ASTM	D2794	Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
ASTM	D3359	Test Method for Measuring Adhesion by Tape Test.
ASTM	F2408	Ornamental Fences Employing Galvanized Steel Tubular Pickets.



1.05 SUBMITTALS:

- A. Six (6) sets of manufacturers literature of the materials specified herein shall be submitted to the Engineer for review.
- B. Six (6) sets of shop drawings of the fence shall be submitted to the Engineer for review. The color shall be determined by Owner.

1.06 PRODUCT HANDLING AND STORAGE

- A. Upon receipt at the job site, all materials shall be checked to ensure that no damages occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage and to protect against damage, weather, vandalism and theft.

PART 2 - PRODUCTS

2.01 SUPPLIER

- A. The ornamental metal fencing system shall conform to Maverick – C (Commercial) Barcelona, 3-Rail style, manufactured by Iron World Fencing, in Laurel, Maryland, Ameristar Montage Commercial Steel Ornamental Fencing Classic, 3-Rail style, manufactured by Ameristar Fence Products, Inc. in Tulsa, Oklahoma, or approved equal.

2.02 MATERIALS

- A. Steel material for fence panels and posts shall conform to the requirements of ASTM A653/A653M, with a minimum yield strength of 45,000 psi (310 MPa) and a minimum zinc (hot-dip galvanized) coating weight of 0.60 oz/ft<sup>2</sup> (184 g/m<sup>2</sup>), Coating Designation G-60.
- B. Material for pickets shall be 3/4" square x 18 Ga. tubing. The rails shall be steel channel, 1.5" x 1.4375" x 14 Ga. Picket holes in the rail shall be spaced 4.675" o.c. Fence posts and gate posts shall meet the minimum size requirements of Table 1.

2.03 FABRICATION

- A. Pickets, rails and posts shall be pre-cut to specified lengths. ForeRunner rails shall be pre-punched to accept pickets. Grommets shall be inserted into the pre-punched holes in the rails and pickets shall be inserted through the grommets so that pre-drilled picket holes align with the internal upper raceway of the ForeRunner rails (Note: This can best be accomplished by using an alignment template). Retaining rods shall be inserted into each ForeRunner rail so that they pass through the pre-drilled holes in each picket, thus completing the panel assembly.
- B. The manufactured framework shall be subjected to the Ameristar thermal stratification coating process (high-temperature, in-line, multi-stage, and multi-layer) including, as a

minimum, a six-stage pretreatment/wash and an electrostatic spray application of a polyester finish. The topcoat shall be a “no-mar” TGIC polyester powder coat finish with a minimum thickness of 2 mils (0.0508mm). The color shall be (Black). The stratification-coated framework shall be capable of meeting the performance requirements for each quality characteristic shown in Table 1.

<b>Table 1 – Coating Performance Requirements</b>		
<u>Quality Characteristics</u>	<u>ASTM Test Method</u>	<u>Performance Requirements</u>
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117 & D1654	Corrosion Resistance over 1000 hours (Scribed per D1654; failure mode is accumulation of 1/8” coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625” ball).
Weathering Resistance	D822, D2244, D523 (60° Method)	Weathering Resistance over 1,000 hours (Failure mode is 50% loss of gloss or color variance of more than 3 delta E color units).

- C. Finish: All fence components shall be subject to a six-stage pretreatment/wash followed by an electrostatic spray application of a "no-mar" TGIC polyester powder coat finish with a minimum thickness of 2-4 mils. The color shall be (Black).
- D. Completed panels shall be capable of supporting a 200 lb. load (applied at midspan) without permanent deformation. Panels without rings shall be biasable to a 12.5% change in grade.
- E. Swing gates shall be fabricated using 1-1/4" x 1-7/16" Forerunner rail, 1.75” sq. x .125” gate ends, and 3/4” sq. x .080 pickets. Gates that exceed 6’ in width will have a 1.75” sq. x .125” intermediate upright. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined by welding. Latches shall be lockable by pad lock supplied by the owner.

2.04 WARRANTY

- A. The ornamental metal fence system shall include a written limited lifetime warranty against defects in materials and workmanship.
- B. The ornamental metal fence system shall include a written limited lifetime warranty on the coating against cracking, chipping, blistering, peeling or corroding. Refer to warranty certificate for complete details and limitations.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. The metal fence system shall be constructed according to the size and locations shown on the Drawings and as specified herein, or as otherwise required by the Engineer.
- B. The metal fence system shall be erected in accordance with the manufacturer's installation guidelines.

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 2\02830 - Metal Picket Fence.docx

END OF SECTION

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

SECTION 02920

LOAMING AND SEEDING

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section covers all labor, materials, and equipment necessary to do all loaming, seeding and related work as indicated on the drawings and as herein specified. All lawns disturbed by the Contractor's operations shall be repaired as herein specified.

1.02 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Submit information detailing the seed mixes, fertilizers, mulch material and origin of loam shall be submitted to the Engineer for review.
- B. Test results shall be submitted to the Engineer for review.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. LOAM:

- 1. Loam shall be a natural, fertile, friable soil, typical of productive soils in the vicinity, obtained from naturally well-drained areas, neither excessively acid nor alkaline, and containing no substances harmful to grass growth. Loam shall not be delivered to the site in frozen or muddy condition and shall be reasonably free of stumps, roots, heavy or stiff clay, stones larger than 1-inch in diameter, lumps, coarse sand, noxious weeds, sticks, brush or other litter.
- 2. The loam shall contain not less than 4 percent nor more than 20 percent organic matter as determined by the loss of weight by ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 230 degrees F.

B. LIME:

Lime shall be standard commercial ground limestone containing at least 50 percent total oxides (calcium oxide and magnesium oxide), and 50 percent of the material must pass through a No. 100 mesh sieve with 98 percent passing a No. 2 mesh sieve.

C. FERTILIZER:

Fertilizer shall be commercial fertilizer, 10-10-10 fertilizer mixture containing at least 40 percent of organic nitrogen. It shall be delivered to the site in the original sealed containers, each showing the manufacturer's guaranteed analysis. Fertilizer shall be stored so that when used it will be dry and free flowing. No fertilizer shall be used which has not been marketed in accordance with State and Federal Laws, relating to fertilizers.

D. MULCH:

1. Materials to be used in mulching shall conform to the following requirements:
2. Straw Mulch - Straw Mulch shall consist of stalks or stems of grain after threshing.
3. Wood Fibre Mulch - Wood Fibre Mulch shall consist of wood fibre produced from clean, whole uncooked wood, formed into resilient bundles having a high degree of internal friction and shall be dry when delivered to the project.

E. SEED:

1. Seed shall be of an approved mixture, the previous year's crop, clean, high in germinating value, a perennial variety, and low in weed seed. Seed shall be obtained from a reliable seed company and shall be accompanied by certificates relative to mixture purity and germinating value.
2. Grass seed for lawn areas shall conform to the following requirements:

	Proportion by Weight	Germination Purity	Purity Minimum
Chewing's Fescue	30%	70%	97%
Kentucky 31 Fescue	30%	90%	98%
Kentucky Blue Grass	20%	80%	85%
Domestic Rye Grass	20%	90%	98%

PART 3 - EXECUTION

3.01 SURFACE PREPARATION:

- A. After approval of rough grading, loam shall be placed on areas affected by the Contractor's operations. Loam shall be at least 6-inches compacted thickness.
- B. Lime shall be applied to bring the pH to 6.5 or, without a soil test, at the rate of 2-3 tons of lime per acre.

- C. Fertilizer shall be applied according to the soil test, or without a soil test, at the rate of 1000 pounds per acre.
- D. Loam shall be worked a minimum of 3-inches deep, thoroughly incorporating the lime and fertilizer into the soil. The loam shall then be raked until the surface is finely pulverized and smooth and compacted with rollers, weighing not over 100 pounds per linear foot of tread, to an even surface conforming to the prescribed lines and grades. Minimum depth shall be 6-inches after completion.

3.02 SEEDING:

- A. Seeding shall be done when weather conditions are approved as suitable, in the periods between April 1 and May 30 or August 15 to October 1, unless otherwise approved.
- B. If there is a delay in seeding, during which weeds grow or soil is washed out, the Contractor shall remove the weeds or replace the soil before sowing the seed, without additional compensation. Immediately before seeding is begun, the soil shall be lightly raked.
- C. Seed shall be sown at the approved rate, on a calm day by machine.
- D. One half the seed shall be sown in one direction and the other half at right angles. Seed shall be raked lightly into the soil to a depth of 1/4-inch and rolled with a roller weighing not more than 100 pounds per linear foot of tread.
- E. The surface shall be kept moist by a fine spray until the grass shows uniform germination over the entire area. Wherever poor germination occurs in areas larger than 3 sq. ft., the Contractor shall reseed, roll, and water as necessary to obtain proper germination.
- F. The Contractor shall water, weed, cut and otherwise maintain and protect seeded areas as necessary to produce a dense, healthy growth of perennial lawn grass.
- G. If there is insufficient time in the planting season to complete the fertilizing and seeding, permanent seeding may be left until the following planting season, at the option of the Contractor or as required by the Engineer. In that event, a temporary cover crop shall be sown. This cover crop shall be cut and watered as necessary until the beginning of the following planting season, at which time it shall be plowed or harrowed into the soil, the area shall be fertilized and the permanent seed crop shall be sown as specified.

3.03 PLACING MULCH:

- A. Straw Mulch shall be loosely spread to a uniform depth over all areas designated on the plans, at the rate of 4-1/2 tons per acre, or as otherwise required.
- B. Straw Mulch may be applied by mechanical apparatus, if in the judgment of the Engineer the apparatus spreads the mulch uniformly and forms a suitable mat to control slope erosion. The apparatus shall be capable of spreading at least 80 percent of the hay or

straw in lengths of 6-inches or more, otherwise it shall be spread by hand without additional compensation.

- C. Wood Fibre Mulch shall be uniformly spread over certain selected seeded areas at the minimum rate of 1,400 pounds per acre unless otherwise required. It shall be placed by spraying from an approved spraying machine having pressure sufficient to cover the entire area in one operation.

#### 3.04 SEEDING AND MULCHING BY SPRAY MACHINE:

- A. The application of lime, fertilizer, grass seed and mulch may be accomplished in one operation by the use of an approved spraying machine. The materials shall be mixed with water in the machine and kept in an agitated state in order that the materials may be uniformly suspended in the water. The spraying equipment shall be so designed that when the solution is sprayed over an area, the resulting deposits of lime, fertilizer, grass seed and mulch shall be equal to the specified quantities.
- B. A certified statement shall be furnished, prior to start of work, to the Engineer by the Contractor as to the number of pounds of limestone, fertilizer, grass seed and mulch per 100 gallons of water.
- C. This statement should also specify the number of square yards of seeding that can be covered with the solution specified above. If the results of the spray operation are unsatisfactory, the Contractor will be required to abandon this method and to apply the lime, fertilizer, grass seed and mulch by other methods.

#### 3.05 INSPECTION AND ACCEPTANCE:

At the beginning of the planting season following that in which the permanent grass crop is sown, the seeded areas will be inspected. Any section not showing dense, vigorous growth at that time shall be promptly reseeded by the Contractor at his own expense. The seeded areas shall be watered, weeded, cut and otherwise maintained by the Contractor until the end of that planting season, when they will be accepted if the sections show dense, vigorous growth.

END OF SECTION

SECTION 03100  
CONCRETE FORMWORK

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section of the specifications covers the furnishing and installation of forms for cast-in-place concrete.

1.02 RELATED WORK:

- A. Section 01450, STRUCTURAL TESTS AND INSPECTIONS
- B. Section 03200, CONCRETE REINFORCEMENT
- C. Section 03300, CAST-IN-PLACE CONCRETE

1.03 REFERENCES:

The following standards form a part of this specification:

American Concrete Institute (ACI)

- ACI 301 Specifications for Structural Concrete
- ACI 347 Recommended Practices for Concrete Formwork

U.S. ARMY CORPS OF ENGINEERS (CE)

- CE 03300 Cast-in-Place Concrete

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Forms for exterior and interior surfaces which will be exposed to view after the work is completed, whether such surfaces are painted or unpainted, shall be new plywood stock, steel, tempered masonite, or other materials which will provide smooth concrete surfaces without subsequent surface plastering. Plastic or plastic-faced forms shall not be used, except with the prior approval of the Engineer.
- B. Form ties shall be cone type or equal, with waterstop, which leaves no metal closer than 2-inches to finished face of concrete.



- C. Form release agent shall be a non-staining, non-yellowing, non-toxic liquid free from kerosene and resins of the type recommended by the manufacturer of the forming system being used such as EZ strip by L&M Construction Chemicals, Omaha, NB and "Magic Kote" by Symons Corp., Des Plaines, IL or approved equal.
- D. Where steel adjacent to vertical faces of forms cannot be otherwise secured, mortar doughnuts shall be used to prevent steel from lying too close to the finish vertical faces of the concrete.

### PART 3 - EXECUTION

#### 3.01 PREPARATION:

Surfaces of forms to be in contact with concrete shall be greased with nonstaining form release compound. Wetting will not be accepted as a substitute. Approval of the Engineer shall be obtained before use of coated materials or liners in lieu of form release compound, except as modified herein.

#### 3.02 CONSTRUCTION:

- A. For concrete surfaces which will be visible after completion of the structure, painted or unpainted, the type and the precise location of form ties, nails joints between form members, and any other features which will leave a visible trace in the finished concrete, will be subject to the approval of the Engineer.
- B. Formwork shall be so constructed, braced, or tied that the formed surfaces of the concrete will be perfectly true, smooth, and to the dimensions shown on the drawings. All forms used for circular sections shall be true arcs as indicated on the drawings. Short chords will not be acceptable. Form line shall present an uninterrupted surface conforming to radii indicated on the drawings.
- C. Forms shall be sufficiently tight to prevent leakage of mortar, and when necessary shall have temporary openings as required for thorough cleaning, and as required for introduction of concrete to avoid excessive free fall. Panels damaged in stripping or otherwise shall not be reused.
- D. Unless otherwise noted on the design drawings, forms shall be filleted and chamfered at all sharp corners, and exposed edges with a 3/4-inch chamfer. Chamfer shall not be used where masonry or other material will subsequently be installed flush with one of the adjacent surfaces of the concrete. Where a wash or slope is indicated on the drawings no additional chamfer is required.

#### 3.03 REMOVAL OF FORMS:

- A. Except as otherwise specifically authorized by the Engineer, forms shall not be removed before the concrete has attained a strength of at least 30 percent of the ultimate strength prescribed by the design and not before reaching the following number of day-degrees [whichever is the longer]:

<u>Location</u>	<u>Day-Degrees</u>
a. Beams and Slabs	500
b. Walls and Vertical Surfaces	200

\* Day-Degree: Total number of days times average daily air temperature at surface of concrete. For example, 5 days at a daily weighted average temperature of 60 deg F equals 300 day-degrees. Temperatures below 50 deg F are not to be considered in determining Day-Degree.

- B. Where beams, girder, columns, walls and similar vertical forms are adequately supported on shores, the side forms may be removed after 24 hours of cumulative curing time provided the side forms support no loads other than the lateral pressure of the plastic concrete. Cumulative curing time represents the sum of time intervals, not necessarily consecutive, during which the temperature of the air surrounding the concrete is above 50 deg F in accordance with American Concrete Institute standards.
- C. Shoring shall not be removed until the concrete has attained at least 70 percent of the specified strength and sufficient strength to support safely its own weight and the construction live loads upon it.
- D. Forms shall be removed in such a manner as not to impair safety and serviceability of the structure. Concrete exposed by form removal shall have sufficient strength not to be damaged by the removal operation.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section of the specification covers the furnishing and installation of reinforcement for cast-in-place concrete.

1.02 RELATED WORK:

- A. Section 01450, STRUCTURAL TESTS AND INSPECTIONS
- B. Section 03100, CONCRETE FORMWORK
- C. Section 03300, CAST-IN-PLACE CONCRETE

1.03 SYSTEM DESCRIPTION:

Materials and construction shall conform to ACI 308 and ACI 350 unless otherwise noted on the design drawings or modified herein.

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. The Contractor shall furnish the Engineer with complete checked, reinforcing steel shop drawings and bar lists. Shop drawing shall include grade of steel used as well as splice lengths.
- B. Mill test reports shall accompany drawings. Fabrication shall not commence until the drawings and mill test reports have been released by the Engineer.
- C. When fiber reinforcement is used, Contractor shall submit manufacturer's data confirming that material meets the specification.

1.05 REFERENCES:

- A. The following standards form a part of these specifications:

American Concrete Institute (ACI)

- |         |  |
|---------|--|
| ACI 318 | Building Code Requirements for Structural Concrete |
| ACI 347 | Recommended Practice for Concrete Formwork         |

ACI 350 Code Requirements for Environmental Engineering Concrete Structures

ACI SP-66 ACI Detailing Manual

American Society for Testing and Materials (ASTM)

ASTM A185 Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement

ASTM A497 Specification for Welded Deformed Steel Wire Fabric for Concrete Reinforcement

ASTM A615 Deformed Billet-Steel Bars for Concrete Reinforcement

ASTM A775 Epoxy-coated Reinforcing Steel Bars

ASTM A884 Epoxy-coated Welded Wire Fabric

American Welding Society (AWS)

AWS 12.1 Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Steel reinforcing bars shall conform to ASTM A615, Grade 60, and A775 if epoxy-coated bars are specified.
- B. Welded steel wire fabric shall conform to ASTM A185 or ASTM A497 and ASTM A884 if epoxy-coated fabric is specified. Gauge and spacing of wires shall be as indicated on the drawings.
- C. Reinforcing steel shall be detailed in accordance with ACI SP-66 modified as applicable to conform to ACI 350.
- D. Reinforcement shall be accurately formed to the dimensions indicated on the drawings. Bars shall be shipped to the site with bars of the same size and shape, fastened in bundles with securely wired-on metal identification tags listing both size and mark.
- E. Any bar showing cracks after bending shall be discarded.
- F. Steel failing to meet the requirements of this specification or the drawings will be rejected and shall be removed from the site immediately.

## 2.02 FIBER REINFORCEMENT:

When called for on the drawings, concrete engineered reinforcing fibers shall be polypropylene, collated, fibrillated fibers from Fibermesh Co., 4019 Industry Drive, Chattanooga, TN; Forta Corporation, One Hundred Forta Drive, Grove City, PA; or approved equal. Only fibers designed and manufactured specifically for use in concrete from virgin polypropylene and so certified by the manufacturer shall be acceptable.

## PART 3 - EXECUTION

### 3.01 STEEL INSTALLATION:

- A. Before being placed in position, reinforcement shall be thoroughly cleaned of loose mill and rust scale, dirt, and other coatings (including ice), that reduce or destroy bond. When there is a delay in depositing concrete after reinforcement is in place, bars shall be reinspected and cleaned as necessary.
- B. After forms have been oiled, but before concrete is placed, all steel shall be securely wired in the exact position called for, and shall be maintained in that position until all concrete is placed and compacted. Chair bars and supports shall be provided in a number and arrangement satisfactory to the Engineer.
- C. Concrete blocks having a minimum bearing area of 2-inches by 2-inches and equal in quality to that specified for the slab, shall be used for supporting reinforcing bars for slabs on grade. Wood blocks, stones, brick chips, etc., shall not be used to support reinforcement.
- D. Metal supports shall be of types that will not penetrate the surface of formwork or slab and which will not show through or stain surfaces that are to be exposed to view, painted or unpainted.
- E. Welding of reinforcing bars will be permitted only where permission of the Engineer has been obtained in advance. Such welding shall be performed only under conditions established by the Engineer, and in accordance with AWS 12.1.
- F. Reinforcement, which is to be exposed for a considerable length of time after having been placed, shall be painted with a heavy coat of cement grout, if required by the Engineer.

### 3.02 FIBER INSTALLATION:

- A. Fibermesh fibers shall be used in concrete as indicated on the drawings or as specified and in strict accordance with the manufacturer's recommendations as to type and amount. The fiber manufacturer or approved distributor shall provide the services of a qualified employee for pre-job meeting and initial job start up.

END OF SECTION

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 WORK INCLUDED:

This Section covers all concrete and all related items necessary to place and finish the concrete work.

1.02 RELATED WORK:

- A. Section 02300, EARTHWORK
- B. Section 03100, CONCRETE FORMWORK
- C. Section 03200, CONCRETE REINFORCEMENT
- D. Items furnished under other Sections and installed under this Section include, but are not limited to:

Items embedded in concrete, including anchors, sleeves, floor drains, castings, frames for hatches, angles, nosings, and other miscellaneous metals.

1.03 REFERENCES:

The following standards form a part of these specifications:

- American Concrete Institute (ACI)
- ACI 301 Structural Concrete for Buildings
- ACI 302 Recommended Practice for Concrete Floor and Slab Construction
- ACI 304 Recommended Practice for Measuring, Mixing, Transporting, and Replacing Concrete
- ACI 305 Recommended Practice for Hot Weather Concreting
- ACI 306 Recommended Practice for Cold Weather Concreting
- ACI 318 Building Code Requirements for Reinforced Concrete
- ACI 347 Recommended Practice for Concrete Formwork

ACI 350 Concrete Sanitary Engineering Structures

American Society for Testing and Materials (ASTM)

ASTM C33 Concrete Aggregates

ASTM C39 Compressive Strength of Cylindrical Concrete Specimens

ASTM C42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

ASTM C87 Effect of Organic Impurities in Fine Aggregate on Strength of Mortar

ASTM C94 Ready-Mixed Concrete

ASTM C143 Standard Method for Slumps of Portland Cement Concrete

ASTM C150 Portland Cement

ASTM C171 Sheet Materials for Curing Concrete

ASTM C231 Air Content of Freshly Mixed Concrete by the Pressure Method

ASTM C260 Air-Entraining Admixtures for Concrete

ASTM C309 Liquid Membrane Forming Compounds for Curing Concrete

ASTM C494 Chemical Admixtures for Concrete

ASTM D1751 Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

ASTM D1752 Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Six sets of shop drawings of the materials specified herein shall be submitted to the Engineer for review.
- B. Six copies of the statement of materials constituting the design of mixes which satisfy the specified strength for each size aggregate as required by ASTM C94 shall be submitted to the Engineer within one week following award of the contract.
- C. Provide one copy of the "Certificate of Delivery" for each load of concrete as it arrives on the site, under the provisions of ASTM C94.



PART 2 - PRODUCTS

2.01 CONCRETE:

- A. Concrete conforming to the requirements listed below shall be used where indicated on the drawings. Unless otherwise indicated, concrete used as fill under foundations, and elsewhere approved by the Engineer, shall be the 4,000 psi mix.

TABLE

Minimum Comp. Strength at 28 days (psi)	Maximum Water/Cement ratio (gallons per bag of cement)*	Cement Factor: 94 lb. Bags per cubic yard minimum**
4000	0.48 (5.6)	6.5
5000	0.40 (4.7)	7.4

\* Based on air-entrained concrete. If non-air-entrained concrete is called for, the listed maximum water/cement ratios may be increased slightly, as approved by the Engineer. The water is the total water in the mix, including free water on the aggregate.

\*\* These are minimum amounts; increase as necessary to meet mix requirements.

- B. Concrete shall conform to ASTM C94. One copy of the Certificate of Delivery required by ASTM C94 shall be delivered to the Engineer immediately upon arrival of each load of concrete at the site. The Contractor shall be responsible for the design of the concrete mixtures.
- C. Standard compression tests of all proposed mixes shall be made by the testing laboratory or other satisfactory evidence shall be presented that the design mixes will attain the minimum strengths listed on the design drawings or called for herein, within the limitations of the ACI Code. No concrete shall be delivered to the job site until the Engineer has approved the design mixes.
- D. All concrete (unless otherwise required) shall contain an air-entraining agent. Air entrained concrete shall have an air content by volume of 3 to 6 percent for 1-1/2-inch aggregate and 4 to 8 percent for 3/4-inch aggregate. The air content shall be the responsibility of the testing laboratory and in accordance with ASTM C231.
- E. All concrete shall contain a mid-range water reducer to minimize cement and water content of the mix, at the specified slump, in accordance with ASTM C494.
- F. Slump for all concrete shall be from 3-inch to 4-inch, except for concrete using a superplasticizer, when the maximum slump shall be 8- inches. Any concrete having a

slump greater than 4-inches (8-inches with superplasticizer) shall be promptly removed from the site.

- G. No calcium chloride or admixtures containing calcium chloride shall be added to the concrete. No admixture other than those specified shall be used in concrete without the specific written permission of the Engineer in each case.
- H. No additional water, except for the amount indicated by the design mix shall be added to the concrete without the prior permission of the Engineer.

#### 2.02 CEMENT:

- A. The cement shall be an approved brand of American manufactured Portland Cement, Type IIA conforming to ASTM C150. The brand name and type of cement proposed for use shall be submitted to the Engineer for approval immediately following award of contract. Only one color of cement, all of the same manufacture, shall be used for the work.
- B. When the use of high-early-strength Portland cement (Type IIIA) is permitted by the Engineer the same strength requirements shall apply, but the indicated strengths shall be attained in 7 days instead of 28 days.

#### 2.03 ADMIXTURES:

- A. Air entraining agent shall be in accordance with ASTM C260.
- B. Water reducing agent shall be a mid-range water reducer meeting ASTM C494, Type A.
- C. Water reducing agent-retarder shall be in accordance with ASTM C494, Type D.
- D. Superplasticizer agent shall be in accordance with ASTM C494, Type F or Type G and contain no more than 0.1% chloride ions. Product may be plant added or field added based on the best application considering distance, temperature and time.

#### 2.04 AGGREGATES:

- A. Except as otherwise noted, aggregate shall conform to the requirements of ASTM C33.
- B. Fine aggregate shall consist of washed inert natural sand conforming to the requirements of ASTM C33.
- C. Coarse aggregate shall consist of well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33.
- D. The following designated sizes of aggregate shall be the maximum employed in concrete.

2-inch for mass concrete

1½-inch for reinforced sections 18-inch and over in thickness  
3/4-inch for reinforced and unreinforced sections less than 18-inch thickness.

2.05 WATER:

Water for concrete shall be potable, free from injurious amounts of oil, acid, alkali, organic matter and other deleterious substances.

2.06 GROUT:

Grout shall be mixed in the proportions of one part Portland Cement to 2 parts sand, by volume. Only sufficient water shall be used to enable grout to barely hold its shape when squeezed into a ball in the hand. Aggregate for grout shall conform to the requirements of the reference specification for concrete. Prior approval of the Engineer shall be obtained for the use of proprietary grouts, and the instructions of the Engineer shall be followed in their use.

2.07 CURING MATERIALS:

- A. Curing compound shall be a curing/hardener compound such as Acurion by AntiHydro, Sikaguard Cure/Hard by Sika, Super Diamond Clear by Euclid or approved equal.
- B. Curing paper shall be a fiber-reinforced laminated Kraft bituminous product conforming to the requirements of ASTM C177.

2.08 JOINT FILLER:

- 1. Preformed joint filler strip shall conform to ASTM D1751 or D1752, having a thickness as indicated on the drawings.
- 2. Fillers shall be provided in pieces of the full thickness required. Use of multiple layers of thin pieces to make-up the full thickness will not be permitted.

2.09 JOINT SEALANT:

Joint sealant for construction and control joints shall be a two-part polysulfide base sealant conforming to Thiokol's Building Trade Performance Specification, Class A (self-leveling), Type II (hardness: 35-45 Shore A).

PART 3 - EXECUTION

3.01 GENERAL:

Under no circumstances shall concrete that has set or partially set before placing be used; and no retempering of concrete or grout will be permitted.

3.02 PREPARATION:

- A. Before placing concrete, forms and the space to be occupied by the concrete shall be thoroughly cleaned, and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint or other material which would tend to reduce the bond.
- B. Unless otherwise indicated, a moisture barrier shall be used under all slabs placed on the ground in accordance with ACI 302.1R. The moisture barrier shall be fungi-resistant and shall have a vapor permeance rating not exceeding 0.01 perms (Perms [grains/ft<sup>2</sup>\*hr\*in. Hg]) per ASTM F1249 or ASTM E96) and 10 mils thickness (49 lbs/MSF). The moisture barrier shall be a high-performance underslab vapor retarder made from polyethylene resins that exceed ASTM E1745, Class A. Sheets shall be lapped 6-inches at joints and sealed with 2-inch wide tape or as recommended by the manufacturer. The vapor barrier should have all laps, seams, penetrations and terminations sealed and should carry across footings.
- C. When no moisture barrier is used, the earth, concrete masonry, or other water-permeable material against which concrete is to be placed shall be thoroughly saturated with water immediately before concrete is placed. No concrete shall be placed until the consolidation of the ground and the arrangement and details of forms and reinforcing have been inspected and approved by the Engineer.
- D. When joining fresh concrete to concrete which has attained full set, the latter shall be cleaned by chipping and washing off all dirt and scum and laitance. It then shall be moistened prior to placing new concrete.
- E. Concrete surfaces that act as a seat for structural members (other than those resting on grout) shall be troweled to an extremely flat and level surface. If necessary, such surfaces shall be ground off to achieve the required flatness and level.
- F. Fill concrete on top of concrete shall be placed in the locations indicated on the drawings or designated by the Engineer. Before fill concrete is placed, the following procedures shall be used to prepare surfaces; all dirt, scum and laitance shall be removed by chipping and washing. The clean, roughened base surface shall be saturated with water, but shall have no free water on the surface. A coat of 1:2 cement-sand grout, approximately 1/8-inch thick, shall be well scrubbed into the thoroughly dampened concrete base. The concrete fill shall be placed immediately, before grout has dried or set. Fill concrete shall be brought to the lines and grades shown on the drawings or approved by the Engineer.
- G. Concrete for thrust and anchor blocks shall be placed against undisturbed earth and wooden side forms shall be used to provide satisfactory lines and dimensions. Felt roofing paper shall be placed to protect joints. No concrete shall be placed so as to cover joints, bolts or nuts, or to interfere with the removal of the joints. Minimum bearing areas and dimensions shall be as shown on the drawings.

3.03 MIXING:

- A. Concrete shall be ready-mixed, or transit-mixed, as produced by equipment acceptable to the Engineer. No hand-mixing will be permitted. Adding water in controlled amounts during the mixing cycle shall be done only with the express approval of, and in the presence of the Engineer.
- B. Ready-mix or transit-mixed concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of rated capacities for the respective conditions as stated on the nameplate. Discharge at the site shall be within 1-1/2 hours after cement was first introduced into the mix. Central mixed concrete shall be plant-mixed a minimum of 1-1/2 minutes per batch and then shall be truck-mixed or agitated a minimum of 8 minutes. Agitation shall begin immediately after the pre-mixed concrete is placed in the truck and shall continue without interruption until discharge. Transit-mixed concrete shall be mixed at mixing speed for at least 10 minutes immediately after charging the truck, followed by agitation without interruption until discharged.
- C. All central plant and rolling stock equipment and methods shall conform to the latest Truck Mixer and Agitator Standards of the Truck Mixer Manufacturers' Bureau of the National Ready-Mixed Concrete Association, as well as ACI 304 and ASTM C94.
- D. Attention is called to the importance of dispatching trucks from the batching plant so that they shall arrive at the site of the work just before the concrete is required, thus avoiding excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.

3.04 INSTALLATION/APPLICATION/ERECTION:

A. PLACING:

- 1. No concrete shall be placed by pumping methods without the prior written approval of the Engineer. Should the Contractor be allowed to place concrete by pumping methods, procedures, mix design of concrete, and all other precautions shall be in accordance with ACI 304.2R and as approved by the Engineer.
- 2. Concrete shall be placed in alternate areas, as defined by the construction and control joints indicated on the design drawings. A minimum of 3 days shall elapse between placement of adjacent sections.
- 3. Segregation of the concrete shall be prevented during handling; should any segregation occur, the concrete shall be remixed before it is placed. Concrete shall be placed in the forms in horizontal layers not over 1 to 2 feet thick. Concrete shall not be allowed to drop freely more than 4 feet. If the free drop to the point of placement must exceed 4 feet, the Contractor shall obtain the approval of the Engineer for the proposed method of depositing the concrete. The concrete shall not be required to flow over distances greater than 3 feet in any direction in the forms or on the ground, unless otherwise permitted by the Engineer.

4. Unless otherwise noted, the work begun on any day shall be completed in daylight of the same day.
5. "Cold Joints" are to be avoided, but if they occur, they are to be treated as bonded construction joints.
6. Chutes for conveying concrete shall be of U-shaped design and sized to insure a continuous flow of concrete. Flat (coal) chutes shall not be employed. Chutes shall be metal or metal-lined, and each section shall have approximately the same slope. The slope shall not be less than 25 nor more than 45 degrees and shall be such as to prevent segregation of the ingredients. The discharge end of the chute shall be provided with a baffle plate or spout to prevent segregation. If the discharge end of the chute is more than 5 feet above the surface of the concrete in the forms, a spout shall be used and the lower end maintained as near the surface of deposit as practicable. When the operation is intermittent, the chute shall discharge into a hopper. Chutes shall be thoroughly cleaned before and after each run, and the debris and any water shall be discharged outside the forms. Concrete shall not be allowed to flow horizontally more than 5 feet.
7. Concrete during and immediately after depositing shall be thoroughly compacted by means of suitable tools. Internal type mechanical vibrators shall be employed to produce the required quality of finish. Vibration shall be done by experienced operators under close supervision and shall be carried on long enough to produce homogeneity and optimum consolidation without permitting segregation of the solid constituents or "pumping" or migration of air. All vibrators shall be supplemented by proper wooden spade puddling adjacent to forms to remove included bubbles and honeycomb. This is essential for the top lifts of walls. All vibrators shall travel at least 10,000 rpm and be of adequate capacity. At least one vibrator shall be used for every 10 cubic yards of concrete per hour. In addition, one spare vibrator in operating condition shall be on the site.
8. Concrete slabs on the ground shall be well-tamped into place and foundation material shall be wet, tamped, and rolled until thoroughly compacted prior to placing concrete.
9. Concrete shall be deposited continuously in layers of such thickness that no concrete will be deposited on concrete that has hardened sufficiently to cause the formation of seams and planes of weakness within the section. If a section cannot be placed continuously, construction joints may be located at points as provided for in the drawings or approved by the Engineer.
10. Chutes, hoppers, spouts, adjacent work, etc., shall be thoroughly cleaned before and after each run, and the water and debris shall not be discharged inside the form.

B. CONCRETE PLACING DURING COLD WEATHER:

1. Concrete shall not be placed on frozen ground, and no frozen material or material containing ice shall be used. Materials for concrete shall be heated when concrete is mixed, placed, or cured when the mean daily temperature is below 40°F, or is expected to fall to below 40°F, within 72 hours, and the concrete after placing shall be protected by covering, heat, or both. No accelerant shall be used to prevent freezing.
2. The temperature of concrete surfaces shall not be permitted to drop below 50°F. for at least 7 days after placement of the concrete.
3. All details of Contractor's handling and protecting of concrete during freezing weather shall be subject to the approval of the Engineer. All procedures shall be in accordance with provisions of ACI 306.

C. CONCRETE PLACING DURING HOT WEATHER:

1. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing shall be sprinkled with cold water. The Contractor shall make every effort to minimize delays that will result in excessive mixing of the concrete after arrival on the job.
2. During periods of excessively hot weather (90°F, or above) ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 90°F, when ready for placement will not be acceptable, and will be rejected.
3. Temperature records shall be maintained throughout the period of hot weather giving an temperature, general weather conditions (calm, windy, clear, cloudy, etc.) and relative humidity. The record shall include checks on temperature of concrete as delivered and after placing in forms. Data should be correlated with the progress of the work so that conditions surrounding the construction of any part of the structure can be ascertained.

D. PIPES AND EMBEDDED METALS:

1. Special care shall be taken to bring the concrete into solid contact with pipes and iron work embedded in the walls and floors, particularly underneath and around all pipes where a head of water exists, making watertight joints.
2. In general, such embedded items are not shown on the structural design drawings. Design drawings of the other trades shall be consulted for their location and details.
3. Anchor bolt location, size and details shall be verified with the equipment manufacturer's certified drawings before installation.

4. Anchor bolts, reglets, sleeves, edge angles and similar embedded items will be provided, delivered to the site under other Sections of the specification, for installation under this Section.
5. Where edge angles, etc., have nuts welded on to receive machine screws, the threads of the nuts shall be protected from concrete, and the concrete shall be excluded from the space to be occupied by the screw, by the use of wood plugs or other effective means.
6. Inserts required for hanging mechanical and electrical items will be provided and installed in the forms under the mechanical and electrical Sections of the specification.
7. Should the Contractor be allowed to leave openings in the concrete for pipes or ironwork, to await the arrival of items that would delay the prosecution of the work, the openings shall be subject to the approval of the Engineer. Appropriate construction joints shall be provided. In filling any such openings with concrete, a mixture of 1: 1-1/2 : 3 shall be used and a watertight bond shall be secured between the old and new concrete.
8. In bolting miscellaneous items to concrete after the concrete has set, expansion bolts of an approved pattern and type shall be used. The Contractor shall submit to the Engineer, for approval, the types of expansion bolts. Expansion bolts shall not be used until they are approved.

E. CURING:

1. Concrete curing shall be performed as specified in ACI 301 and as stated herein. All curing procedures shall have prior approval of the Engineer.
2. Concrete Floors

Concrete floors which are to receive paint, concrete fill, mortar setting beds, grout fill, or any other subsequent finish shall be cured by one of the following procedures immediately after completion of placement and finishing:

- a. Ponding or continuous sprinkling.
- b. Application of absorptive mats or fabric kept continuously wet.
- c. Application of sand kept continuously wet.
- d. Application of waterproof sheet materials conforming to ASTM C171.
- e. Application of curing compounds conforming to ASTM C309, if it can be demonstrated to the Engineer's satisfaction that the compound is applicable



and that it will not prevent bonding of the subsequent finish to be received. Compound shall be placed at a rate of 200 square feet per gallon, in two applications perpendicular to each other.

3. Curing procedure shall be continued for at least 7 days.
  - a. Moisture loss from surface placed against metal or wood forms shall be minimized by keeping forms wet until removal.
  - b. Curing shall be continued for at least 7 days. When forms are removed during the curing period, surfaces shall be cured by spraying or by the use of a curing compound as previously specified.
  - c. Surfaces shall be protected from traffic or damage until surfaces have hardened sufficiently. If necessary, 1/2-inch thick plywood sheets shall be used to protect the exposed surface.

F. BRACING AND SUPPORTS:

1. All concrete members shall be adequately and safely supported and braced until the permanent supports and braces are installed.
2. Backfilling against exterior walls shall not be done until supporting slabs are in place and have attained 70 percent of design strength, otherwise walls shall be braced against earth lateral pressure, using a system approved by the Engineer.
3. Backfilling against retaining walls shall not commence until the wall concrete has reached its 28-day strength.

G. REMOVING FORMS AND SUPPORTS:

1. Removal of forms shall take place in accordance with ACI 347, Section 3.6. Except as otherwise specifically authorized by the Engineer, forms shall not be removed until the concrete has aged for the following number of day-degrees or attained 50 percent strength. (Day-degrees equals the total of number of days times the average daily air temperature at the surface of concrete. For example, 5 days at a daily average temperature of 60°F. equals 300 day-degrees.)

<u>Location</u>	<u>Day-Degrees</u>
Beams and Slabs	500
Walls and Vertical Surfaces	200

2. Shores under beams and slabs shall not be removed until the concrete has attained at least 70 percent of the specified cylinder strength and also sufficient strength to support safely its own weight and the construction loads upon it.

H. PATCHING:

1. Defective concrete and honeycombed areas as determined by the Engineer shall be chipped down reasonably square and at least one-inch deep to sound concrete by means of hand chisels or pneumatic chipping hammers. Irregular voids or surface stones need not be removed if they are sound, free of laitance, and firmly imbedded in the parent concrete, subject to Engineer's final inspection. If honeycomb exists around reinforcement, chip to provide a clear space at least 1-inch wide all around the steel. For areas less than 1-1/2 inches deep, the patch may be made following the procedure for filling form tie holes, described in the subsection below, using adequately dry (non-trowelable) mixtures to avoid sagging. Thicker repairs will require build-up in 1-inch layers on successive days. Unless otherwise indicated, thicker repairs shall be made with Vertipatch mortar mixture blended with Acryl-Set, both by Master Builders, Inc., Cleveland, Ohio, or approved equal.
2. For concrete areas exposed to serious abrasion and/or impact forces, the Engineer may order the use of grout with a non-shrink metallic aggregate (Embeco by Master Builders, Inc.; Ironite by Fox Industries, Madison, IL, or approved equal) as an additive in the proportions listed below:

Material	Small Patches		Large Formed Patches	
	Volumes	Weights	Volumes	Weights
Cement	1.0	1.0	1.0	1.0
Metal Aggregate	0.15	0.25	0.2	0.33
Sand	1.5	1.5	1.5	1.0
Pea Gravel		--	1.5	1.5

I. FINISHING OF FORMED SURFACES:

1. All concrete that is to be left exposed to view shall be scraped to remove projecting imperfections left by voids in the forms.
2. In addition to scraping, exterior exposed concrete shall be covered with a cement-base plaster mix. The mix shall consist of Thoroseal Plastic Mix and Acryl 60, as manufactured by Standard Drywall Products, Miami, FL, or approved equal. It shall be mixed and applied in accordance with the manufacturer's recommendations.
3. In addition to scraping, interior concrete surfaces which will be exposed to view and concrete surfaces which are to be prepared and painted as specified in Section 09900, PAINTING, shall receive a smooth rubbed finish, in accordance with ACI 301 and as described below.
4. To permit satisfactory finishing, forms shall be removed from the vertical faces of the concrete as early as is possible without damaging the surface. Immediately after

stripping forms, any fins or projections left by the forms shall be chipped off, and the surfaces rubbed smooth.

5. Form tie holes and other voids and faults shall be patched. Voids shall be cleaned out, roughened, thoroughly wetted, coated with neat cement paste, and filled with mortar of cement and sand in the same proportions, materials, and color as used in the concrete. The surface of the patch shall be flush with the surrounding surface after finishing operations are complete. Surface shall be kept continuously damp until patches are firm enough to be rubbed without damage.
6. Rubbing shall be performed while the surface is wet using a carborundum or cement sand brick, to achieve a smooth uniform, even textured finish. Patched and chipped areas shall be blended to match as closely as possible the appearance of the rest of the surface. No cement wash or plastering will be permitted, and no mortar shall be used except as required above.
7. Where finishing is performed before the end of the curing period, concrete shall under no circumstances be permitted to dry out, and shall be kept continuously moist from time of placing until end of curing period or until curing membrane is applied.

J. CONCRETE FLOOR FINISHING REQUIREMENTS:

Unless designated otherwise, concrete floors shall have a troweled finish as specified in Section II.7 of ACI 301. Troweled finishes shall conform to the requirements of "Class A Tolerances," Section II.9 as specified in ACI 301.

K. TESTING:

1. The Contractor shall provide all field testing and inspection services, and shall pay for all such services. The Engineer shall approve the testing laboratory and shall inform the Contractor when samples are to be taken for testing. The Contractor shall forward all test results to the Engineer as soon as they are available.
  - a. The Testing Laboratory shall conform to the requirements of ASTM E-329 as modified in the State Building Code.
2. At least one slump test shall be performed from each truckload of concrete. The sample for slump shall be taken from the middle third of a truckload. Air content tests shall be made at the discretion of the Engineer. If the measured slump or air content falls outside the specified limits, a check test shall be made immediately on another portion of the same sample. In the event of a second failure, the concrete shall be considered to have failed the requirements of the specification and shall be immediately removed from the jobsite to be discarded.
3. The Contractor shall advise the Engineer of his readiness to proceed with concrete placement at least one working day prior to each placement. The Engineer will

inspect the preparations for concrete, including the preparation of previously placed concrete, the reinforcing, and the alignment and tightness of formwork. No placement shall be made without the prior approval of the Engineer.

4. A minimum of four standard compression test cylinders shall be made and tested for each 100 cubic yards or fraction thereof for each type and design strength of concrete from each day's placement of concrete. One cylinder shall be tested at 7 days and two cylinders at 28 days. The fourth cylinder from each set shall be kept until the 28 day test report on the second and third cylinders in the same set has been received. The Engineer reserves the right to require test cylinders to be made for each truckload of concrete if the nature of the project or project experience indicates such additional tests are required for proper control of concrete quality; such tests will be at the contractor's expense.
5. The strength level shall be considered satisfactory so long as the averages of all sets of three consecutive strength test results equal or exceed the specified strength  $f'_c$ , and no individual strength test (average of two cylinders) result falls below the specified strength  $f'_c$  by more than 500 psi.
6. In the event the average compressive strength of the two 28 day cylinders do not achieve the required level, the Engineer may elect to test the fourth cylinder immediately or test it after 56 days.

L. FAILURE TO MEET REQUIREMENTS:

1. The Engineer shall have the right to reject concrete represented by low strength tests or to agree to further testing of the concrete. Rejected concrete shall be promptly removed and replaced with concrete conforming to the specification. The decision of the Engineer as to whether substandard concrete is to be accepted or rejected or additional tests shall be conducted shall be final. All direct and indirect costs associated with further curing and testing of the concrete shall be at the Contractor's expense. All costs associated with removing rejected concrete, placing new concrete, and conducting tests on new concrete shall be at the Contractor's expense.
2. If the Engineer agrees to consider further curing and/or testing of the concrete before making a final decision, the Contractor shall submit a detailed plan to the Engineer, including proposed criteria for acceptance of the concrete. The plan may include additional curing of the concrete, drilling and testing of cores, load testing of the structure, or a combination.
3. If additional curing is permitted before further inspection and testing, the Contractor shall provide any necessary materials and labor to further cure the suspect concrete.
4. If drilling and testing of cores is permitted, the Contractor shall be responsible for obtaining the cores, including provision of ladders, scaffolding, and such incidental

equipment as may be required. If additional curing is permitted, cores shall be drilled after the curing period, and shall be in accordance with ASTM Methods C39 and C42. The Contractor shall repair all core holes to the satisfaction of the Engineer.

5. The burden of proof, including, but not limited to the work of cutting and testing the cores, inspection, evaluation, engineering, repair of the holes, or removal and replacement of the concrete in question, and all associated costs therefor, shall be at the expense of the Contractor.
6. If load testing of the concrete is permitted, and if not otherwise indicated, slabs or beams under load test shall be loaded with their own weights plus a superimposed load of 2 times the design live load. The load shall be applied uniformly over the portion being tested in the approved manner and left in position for 24 hours. The structure shall be considered satisfactory if deflection "D" in feet, at end of 24-hour period, does not exceed the following value:

$$D \text{ equals } 0.001 (L \times L)$$

in which "L" is span in feet, "t" is depth of slab, or beam in inches. If deflection exceeds "D" in the above formula, the concrete shall be considered faulty unless within 24 hours after removal of the load, the slab, or beam under test recovers at least 75 percent of the observed deflection.

7. If the suspect concrete still fails to meet specification requirements, the Engineer shall have the right to reject the concrete, have it removed and replaced, in accordance with paragraph 5 above, or to require mechanical strengthening of the concrete to satisfy project requirements. The Contractor shall submit a removal and replacement plan for review by the Engineer.

M. TEST FOR WATERTIGHTNESS:

1. All concrete shall be watertight against leakage or groundwater infiltration. Special care shall be taken in the construction joints and any noticeable leakage or seepage causing wet spots on the concrete walls or slabs shall be repaired by and at the expense of the Contractor and by methods approved by the Engineer. See Section 03150, WATERSTOPS.
2. All liquid holding concrete structures shall be tested for leakage before backfilling and after the concrete has attained the specified minimum 28-day design strength, as indicated by test cylinders.
3. The structure shall be filled with water to the overflow level, allowed to stand for at least 24-hours, and refilled to overflow to begin the test. After 72 hours, the liquid loss per 24 hour period shall be determined, either by measuring the amount required to refill the tank to overflow, by measuring the drop in water level, or by an equivalent procedure approved by the Engineer. Evaporative losses shall be

calculated and deducted from the measured loss to determine net liquid loss (leakage). If the leakage per 24-hour period exceeds the allowable, the structure shall be repaired and retested until the leakage falls within the allowable limit.

4. For structures designed to hold water, one twentieth of one percent leakage will be allowed during a 24-hour period. No leakage (zero leakage) will be permitted for structures designed to hold liquid chemicals or fuels.
5. The Contractor shall pay all costs (including water) incurred in the testing for watertightness.
6. The Engineer shall be given a minimum notice of 48 hours prior to commencement of the leakage test.

END OF SECTION

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

SECTION 03931

REPAIR OF EXISTING CONCRETE STRUCTURES

PART 1 GENERAL

1.01 WORK INCLUDED:

Furnish all labor, materials, equipment and incidentals required to repair deteriorated areas of existing concrete structures including the sealing of existing joints as required by the Engineer in the field and as specified herein.

1.02 RELATED WORK:

- A. Section 01330, SUBMITTALS
- B. Division 2 – SITE WORK
- C. Division 3 – CONCRETE
- D. Section 05500, MISCELLANEOUS METALS

1.03 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING

- A. Prior to shipment, and in accordance with Section 01330, the Contractor shall submit to the Engineer for review the following: manufacturer's technical literature for epoxy bonding agent, adhesive anchor system, repair mortar, polyurethane chemical grout, and stain and seal system. The Contractor shall include manufacturer's installation and or application instructions in the submittal.
- B. A complete, easily readable functional description of the proposed product.
- C. Upon completion of installation, the results of the field and acceptance tests as specified under this section of the specification shall be submitted to the Engineer.
- D. Furnish written certification from the manufacturer's representative of the proper installation and use of each product.

1.04 REFERENCES:

- A. The following standards form a part of this specification and indicate the minimum standards required:

American Society for Testing and Materials (ASTM)

ASTM C881 -Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

ASTM C882 -Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.

- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE:

- A. Do not begin repair work until authorized by the Engineer to do so.
- B. When removing deteriorated concrete erect barriers or other protective devices to prevent damage to the structures beyond the limits of new work, protect personnel, control dust and prevent damage by falling or flying debris.
- C. Unless otherwise indicated or specified, saw cut the limits of all concrete repairs.
- D. Furnish a notarized certificate stating that the materials to be provided meet the requirements of this Section and have the manufacturer's current printed literature on the specified product.

1.06 MANUFACTURER'S QUALIFICATIONS:

- A. Consideration shall be given only to well-established and reliable manufacturers who are regularly engaged in such work and thoroughly experienced in the design and manufacture of said systems. The manufacturer shall certify a minimum of ten (10) years of experience in the manufacture and use of the products specified under this section as evidence of meeting the experience requirement.
- B. The system described herein and shown on the drawings establishes a standard of required type, function and quality to be met by any proposed substitute or "or-equal" systems. All "or-equal" systems shall meet the exact system configuration and operational function as shown on the drawings and specified herein. No "or-equal" system shall be considered by the Engineer unless written request for approval has been submitted for and approved by the Engineer in writing. The burden of proof of merit for the proposed "or-equal" systems is upon the Contractor and the proposed equipment manufacturer. The Engineer's decision of approval or disapproval of a proposed item shall be final. If the Engineer approves any "or-equal" item, the Contractor shall indemnify, hold harmless and defend both the Owner and the Engineer from any claims associated with the "or-equal" systems. Approval of "or-equal" systems does not relieve the Contractor of any requirements specified herein, called for by the Engineer or shown on the drawings.



1.07 DELIVERY, STORAGE AND HANDLING:

Deliver products in original, unopened containers clearly labeled with the manufacturer's name, product identification, batch numbers and printed instructions. Storage and condition of products shall be as recommended by the manufacturer.

1.08 WARRANTY:

- A. The manufacturer shall warranty, in writing, that the products supplied under this Section fully meet the criteria specified herein, and shall further warranty that the products are free from all defects in materials and workmanship.
- B. The manufacturer's warranties from defects shall contain a provision that the manufacturer shall repair or replace any defects, to the satisfaction of and at no additional cost to the Owner, for a period of twelve (12) months from the date of Substantial Completion.

PART 2 – Products

2.01 PATCHING MATERIALS:

- A. Materials shall comply with this section and any Federal, State or local VOC limitations.
- B. Epoxy Bonding Agent

Provide a two-component, solvent-free, asbestos free moisture insensitive epoxy resin material used to bond plastic concrete to hardened concrete where indicated on the Drawings or directed by the Engineer. The Epoxy bonding agent shall comply with the requirements of ASTM C881, Type 11, Grade 2. Epoxy bonding agent shall be Sikadur 32, Hi-Mod by Sika Corporation, Lyndhurst, NJ; Epoxy Adhesive CR631 by Sto Concrete Restoration Division, Amherst, MA; Euco 452MV by Euclid Chemical Co., Cleveland, OH, or equal.

C. Repair Mortar

- 1. Repair mortar shall be a two-component, polymer-modified, cementitious, fast-setting, trowel grade, non-sag, structural repair mortar suitable for use on horizontal, vertical and overhead surfaces, on grade, above, and below grade on concrete and mortar.
- 2. Material

- a. The polymer modified cementitious system shall consist of a factory pre-proportioned two-component system whose components conform to the following requirements:
3. Component A shall be a liquid polymer emulsion of an acrylic copolymer base and additives. This acrylic copolymer shall have the following properties:
- i. Minimum film forming temperature approximately 68 degrees F
  - ii. Tensile Strength approximately 990 to 1,420 psi
  - iii. Elongation at break 500 to 900 percent
  - iv. Particle Size Range Less than 0.1 micron
4. Component B shall be a blend of selected Portland cements, specially graded aggregates, organic accelerator and admixtures for controlling setting time, water reducers for workability and a corrosion inhibitor.
5. The component ratio A:B shall be 1:7 by weight for horizontal repairs and 1:5.2 by weight for vertical and overhead repairs. The system shall not contain chlorides, nitrates, added gypsum, added lime, or high alumina cements. The system shall be non-combustible, either before or after cure.
- a. Typical Properties of Mixed Components
1. Application Time (Working Time) -15 minutes after combining components
  2. Finishing Time -20 to 60 minutes after combining components
  3. Color - Concrete Gray
- b. Typical Properties of Cured Material
1. Splitting Tensile Strength (ASTM C496) -750 psi minimum at 28 days
  2. Bond Strength.(ASTM C882) -2,200 psi minimum at 28 days
  3. Thermal Compatibility (ASTM C884) -passes test
  4. Compressive Strength (ASTM C109) -1 day, 3,000 psi minimum 7 days, 5,500 psi minimum 28 days, 7,000 psi minimum
  5. Flexural Strength (ASTM C293) -28 days, 2,000 psi minimum
  6. This system shall not produce a vapor barrier.
  7. This system shall be thoroughly compatible with concrete.
  8. For horizontal repairs greater than 1-inch in thickness 3/8-inch coarse aggregate may be added. Do not use limestone aggregate.
- c. Approved manufacturers include:

1. Repair mortar for horizontal surfaces shall be SikaTop 122 Plus by Sika Corporation, Lyndhurst, NJ or equal.
2. Repair mortar for vertical and overhead surfaces shall be SikaTop 123 Plus by Sika Corporation, Lyndhurst, NJ or equal.

#### 2.02 BACKER RODS:

- A. Open Cell Backer Rod -Extruded, open cell polyurethane foam. Diameter shall be not less than 200 percent of the joint width dimension.
- B. Closed Cell Backer Rod -Extruded, nonstaining, resilient closed cell polyethylene foam, compatible with sealant. Diameter shall be not less than 25 percent greater than the joint width. Sealant shall not adhere to backer rod.

#### 2.03 POLYURETHANE CHEMICAL GROUT:

##### A. General

- a. The grouting compound shall be a single component, expanding, moisture reactive polyurethane grout that is designed to seal cracks and open joints in concrete. The cured chemical grout shall form a compressed closed cell urethane foam that shall completely fill the crack or joint.
- b. An accelerator may be used if recommended by the approved polyurethane chemical grout manufacturer.
- c. Injection packers shall be required for application of polyurethane chemical grout in existing concrete.

##### B. Material

- a. Properties of cured material
  1. Tensile Strength (ASTM D 1623): 15.5 psi minimum at 1 day.  
Elongation at Break – 25 percent.
  2. Shear Strength (ASTM C273): 11.70 psi minimum at 1 day.
  3. Shrinkage (ASTM D2126): 0 percent
  4. Water Absorption (ASTM D2842): 0.09 lb/square ft
  5. Density (ASTM D1 622): 1.64 lb/cubic ft

##### C. Approved manufacturers include:

Sika Corporation, Lyndhurst, NJ – SilcaFix HH-LV, or equal.

## PART 3 – EXECUTION

### 3.01 GENERAL:

- A. Repair deteriorated areas of concrete and seal existing joints and cracks as required by the Engineer and as specified herein.
- B. All commercial products shall be stored, mixed and applied in strict compliance with the manufacturer's recommendations and as specified herein.
- C. Where concrete is repaired in the vicinity of an expansion joint or control joint, preserve the isolation between components on either side of the joint.

### 3.02 CONCRETE REMOVAL:

- A. When removing deteriorated concrete, saw cut the limits of removal. Remove concrete such that existing concrete and reinforcing to be left in place and existing equipment in place are not damaged.
- B. Remove fractured, loose, deteriorated and unsound concrete by bush hammering, chipping, high pressure water blast or other appropriate means. Remove all dirt, oil, grease and all other bond inhibiting materials from surface. Exposed reinforcing steel, reinforcing to be incorporated into repair mortar, and corroded reinforcing steel shall be treated as specified herein. Saturate existing concrete surfaces with water. Restore area to original limits or as shown using repair mortar. Comply with manufacturer's recommendations for concrete removal, surface preparation, mixing, application, finishing, and curing.
- C. Repair or replace concrete specified to be left in place, which is damaged during concrete modifications as required by the Engineer at no additional cost to the Owner.

### 3.03 CONNECTION SURFACE PREPARATION FOR NEW CONCRETE:

- A. Prepare connection surfaces as specified below for concrete areas requiring patching or repairs as indicated on the Drawings, specified herein, or as required by the Engineer.
- B. Remove all loose and deteriorated materials, dirt, oil, grease, and all other bond inhibiting materials from the surface by dry mechanical means such as sandblasting, chipping or wire brushing. Uniformly roughen the concrete surface to approximately 1/4-in. amplitude with pointed chipping tools. Thoroughly clean surface of loose or weakened material and dust by dry mechanical means such as sandblasting and air blasting. Irregular voids or surface stones need not be removed if they are sound, free of laitance, and firmly embedded into the parent concrete.

- C. If reinforcing steel is exposed, clean it by dry mechanical means to remove all loose material, contaminants and rust as approved by the Engineer. If half of the diameter of the reinforcing steel or more is exposed, chip out a minimum of 1-in of concrete behind the steel. Do not damage reinforcing to be incorporated in new concrete while removing existing concrete.
- D. Prepare concrete surfaces in accordance with the following as indicated, specified or as required by the Engineer.
  - a. Method A – After the existing concrete surface at connection has been roughened and cleaned, thoroughly saturate with water and maintain saturation for a period of at least 12 hours. Brush on a 1/16-in. layer of cement and water mixed to the consistency of a heavy paste. Immediately after application of cement paste, place new concrete or grout mixture as indicated.
  - b. Method B – After the existing concrete surface has been roughened and cleaned, apply epoxy-bonding agent as connection surface. The field preparation and application of the epoxy-bonding agent shall comply strictly with the manufacturer's recommendations. Place new concrete or grout mixture as indicated within time constraints recommended by the manufacturer to ensure bond.

#### 3.04 POLYURETHANE CHEMICAL GROUT

- A. Apply polyurethane chemical grout to leaking cracks, joints, and voids in existing concrete.
- B. Clean concrete surfaces as required by the manufacturer of the polyurethane chemical grout.
- C. The polyurethane chemical grout shall be installed through drilled-in injection ports installed as recommended by the polyurethane chemical grout manufacturer. Installation and curing of polyurethane chemical grout shall be in accordance with manufacturer's requirements.
- D. Remove all excess material from the interior face of walls, floors, etc. and the exterior face of walls to the satisfaction of the Engineer.
- E. Remove all injection ports and seal with grout. The repair area shall be flush with the surrounding concrete surface.
- F. At completion of repairs, the Contractor, Engineer, and installers of the materials used on the repairs shall inspect the work. Any leaky joints, cracks, or voids shall be repaired in accordance with the manufacturer's instructions at no additional cost

to the Owner. At the completion of the repairs, the Contractor, Engineer, and installers of the materials shall again inspect the repaired problem areas.

END OF SECTION

\\Wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 3\03931 - Repair Existing Concrete Structures.docx

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

SECTION 04200

MASONRY

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This Section covers unit masonry complete, including but not limited to, concrete masonry units, brick, precast caps and copings, miscellaneous membranes and flashing, reinforcing, mortar and grout, ties, insulation, and other accessories as drawn and as otherwise required for complete and functional installations.
- B. Anchor bolts, loose lintels, metal frames, mechanical and electrical sleeves, access doors, louvers and similar items will be furnished under other sections for installation in the masonry work under this section of the specification.

1.02 RELATED WORK:

- A. Section 05500, MISCELLANEOUS METALS
- B. Section 06200, FINISH CARPENTRY
- C. Section 07920, JOINT PROTECTION
- D. Section 10700, DEPLOYABLE FLOOD BARRIERS

1.03 REFERENCES

- A. The following standards form a part of these specifications, as referenced:

American Society for Testing and Materials (ASTM)

ASTM	C67	Sampling and Testing Brick
ASTM	C90	Hollow Load-Bearing Concrete Masonry Units
ASTM	C140	Sampling and Testing Concrete Masonry Units
ASTM	C144	Aggregate for Masonry Mortar
ASTM	C150	Portland Cement
ASTM	C207	Hydrated Lime for Masonry Purposes
ASTM	C216	Facing Brick

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Complete, dimensioned, checked shop drawings of the concrete masonry units, shall be submitted for review by the Engineer before any work is started. Drawings shall show layouts, details, method of anchoring and location of all special shapes.
- B. One full size sample of the concrete masonry units and of each anchoring, tying and reinforcing device shall be submitted to the Engineer before the material is delivered to the job.
- C. If requested by the Engineer, before delivery of any concrete masonry units, a manufacturer's certificate that the block complies with this Section 04 01 00 of the specification shall be submitted.

1.05 DELIVERY AND STORAGE OF MATERIALS:

Concrete masonry units shall be palletized for delivery. Concrete masonry units shall be protected by means of polyethylene covers during storage.

PART 2 - PRODUCTS:

2.01 MATERIALS:

- A. Concrete masonry units shall be normal weight conforming to ASTM C90. The minimum average net area compressive strength of any individual unit shall be 1900 psi. All special shapes shall be included.
- B. Brick shall match existing units at the adjacent building walls, as drawn.
- C. Wall anchors, ties, joint reinforcing and other bonding devices shall be hot-dip galvanized.
- D. Bond ties shall be long enough to extend to within one-inch of concrete masonry unit faces.
- E. Horizontal masonry joint reinforcing for walls and partitions shall be "Dur-O-Wall," "Bet-R-Wall," "Trus-Mesh," or approved equal, galvanized ladder-type reinforcing. Longitudinal wires shall be a minimum of number 9 gage.
- F. Metal lath (to support concrete fill or mortar in cells of masonry units) shall be galvanized small diamond mesh lath weighing 3.4 pounds per square yard.



- G. Mortar for all concrete masonry units, brick and precast concrete units, where used, shall consist of 1 part portland cement, 1/2 part hydrated lime, and 4 parts sand and a waterproofing admixture, or a premixed blend meeting ASTM C270 Type "S" or Type "M" and approved by the Engineer. Mortar at concealed areas to be standard gray; mortar at exposed brick and precast concrete shall match existing mortar at adjacent brick areas, subject to Engineer's approval.
- H. Grout shall consist of 1 part portland cement and 3 parts maximum of sand, conforming to ASTM C476, with a slump of 8- to 11-inches.
- I. Portland cement shall be any American Brand conforming to ASTM C150, Type II.
- J. Sand shall conform to ASTM C144. Sand shall be natural sand, washed and cleaned, free from organic or other deleterious matter. When dry, 100 percent shall pass a No. 8 sieve, not more than 34 percent shall pass a No. 50 sieve, and not more than 10 percent shall pass a No. 100 sieve.
- K. Water shall be potable and maintained at recommended temperature prior to mixing.
- L. Lime shall be an approved brand of Type S mason's hydrated lime conforming to the requirements of ASTM C207.
- M. Waterproofing admixture for mortar shall be equal to one of the following: Hydratite Plus, W.R. Grace Company; Medusa Waterproofing, Medusa Portland Cement Company; or Omicron Mortarproofing, Master Builders Company.
- N. Tar paper for bond breaker at construction joints and similar locations shall be 15 pound impregnated felt conforming to ASTM D226.
- O. Reinforcing steel bars shall conform to ASTM A615, Grade 60.

- 2.02 - not used -
- 2.03 - not used -
- 2.04 - not used -
- 2.05 -not used-

2.06 HORIZONTAL JOINT REINFORCEMENT:

- A. Horizontal joint reinforcement shall be placed in joints of alternate courses in both solid and back-up walls and partitions 6-inches and more in thickness, and in every course of those less than 6-inches thick.
- B. The first 2 courses over door openings and similar openings shall have reinforcement extending beyond jambs a minimum of 24-inches. Splices shall overlap at least 6-inches.

2.07 - not used -

2.08 CONTROL JOINTS:

Walls shall have control joints at intervals as indicated on the Drawings. Control joint shall be a continuous vertical joint. Joint shall be filled with a hard rubber control spacer plus backup leaving a clean, straight sealant recess on each face of wall. Sealant recess shall be a minimum of 3/8-inch wide at 50°F, but not more than 5/8-inch wide and 1/4 to 3/8-inch deep. Reinforcement shall not continue across control joints.

PART 3 - EXECUTION

3.01 SAMPLE WALL:

Before masonry work has commenced, the Contractor shall build a sample wall for the approval of the Engineer. The wall shall be 6 feet long, and 2 feet high, and shall be constructed of the approved concrete masonry units with facing brick on each side. The wall shall be constructed before masonry materials for the project are delivered to the job site. The panel shall show the CMU and brick wall work for the Engineer's approval of bond, spacing and jointing. The Contractor shall make any changes requested until the panel is approved by the Engineer. The panel shall remain until removal is approved by the Engineer.

3.02 MORTAR MIXING REQUIREMENTS:

- A. Mortar color for exposed masonry work will be selected by the Engineer from fully-cured mortar samples submitted for this purpose by the masonry subcontractor. For other masonry work, only one brand and color of cement and one color of sand, all from the same source, shall be used on the work.
- B. For all exterior masonry, mortar waterproofing shall be added to the mortar in accordance with the manufacturer's directions.
- C. Plasticity of mortar shall be maintained by retempering as required up to 2-1/2 hours after original mixing of mortar. Mortar requiring retempering to maintain proper workability after this period shall be discarded.
- D. Mixers, mortar boxes, and all tools used with mortar shall be clean, and free from rust and any foreign material, particularly salt. No salt shall be permitted on the work.
- E. Except as otherwise approved for small batches, all mortar shall be mixed in a mechanically operated batch mixer of the drum type in which the water can be accurately and uniformly controlled. The mortar shall be thoroughly mixed for at least five minutes after all materials are in the mixer.
- F. For exposed concrete masonry the cement used in the mortar shall show no signs of efflorescence when tested in accordance with provisions of ASTM C67.

### 3.03 MASONRY CONSTRUCTION:

- A. Vertical joints in each course shall break at the centerlines of the units of the course below. All joints shall be 3/8-inch. Load-bearing, fire-rated, and solid block shall be laid with all contact surfaces fully embedded in mortar.
- B. Other block may be laid with face shell mortar bedding. All vertical edges shall be fully butted and all joints filled. Each course shall be bonded at corners and intersections.
- C. Masonry shall be laid to lines, with walls and partitions built plumb, true, and square. Joints shall be of uniform thickness. Units shall be laid with common running bond, except where otherwise noted, with vertical joints accurately centered relative to units above and below. Walls of one unit thickness shall be laid to obtain the smoothest surface that the variation in thickness or the units will permit; discrepancies shall be absorbed equally in both faces of wall where appearances of both sides of wall is of importance.
- D. Masonry shall be protected from entrance of water and from other damage during construction. Any masonry built of cracked, pitted, chipped, stained, or otherwise injured or defaced units shall be taken down as far as the Engineer directs and be rebuilt. Poorly tooled joints, and joints not uniform in color and texture, will be adequate grounds for rejection of the work. All masonry shall be covered at night and during inclement weather with non-staining waterproof coverings.
- E. Temporary bracing and shoring shall be introduced wherever necessary to support loads to which the masonry may be subjected. The supports shall be left in place as long as required for safety.
- F. As work progresses, and before staging is raised or removed, all exposed masonry shall be pointed up, all holes and joints filled, loose mortar removed, and defective joints cut out and repointed if necessary. Completed joints shall be neat, true, uniform, and free of voids, mortar crumbs, and other defects. Only first class jointing will be acceptable on joints which will be exposed to view in the completed work.
- G. All masonry walls shall start on concrete floors or walls and shall terminate against beam soffits or structural ceilings, except where otherwise noted on the drawings or specified herein. No partitions shall terminate at the underside of dropped ceilings or acoustical tile construction, except where noted on the Drawings.
- H. Masonry shall be laid in courses as indicated on the drawings with joints of uniform thickness. All joints, both horizontal and vertical, shall be in proper alignment. When mortar becomes "thumb-print" hard, exterior and interior joints shall be thoroughly tooled so as to be slightly concave, and to have a glassy-hard, polished surface, free from drying cracks.

- I. Masonry over lintels, metal frames, and other supporting members on which the masonry will produce a perceptible deflection shall be erected in a triangular pattern, starting at midspan and working simultaneously in each direction toward the jambs or other rigid supporting member.
- J. Masonry units shall be dry when laid. Masonry saws shall be used for cutting and fitting masonry units, to produce straight, true edges and joints of the same width as the remainder of the work. Power masonry saws shall be used to facilitate close tolerance work.
- K. All anchors, ties, frames, steel sections, and other material required to be embedded in masonry shall be accurately placed, plumbed, and braced as required. Masonry to which door bucks or frames are to be anchored shall not be permitted to distort their alignment.
- L. The completed masonry assemblies shall present a flush, uniform, and finished appearance, with no awkward gaps, openings, or recesses at locations where structural or mechanical items penetrate, intersect, or rest on masonry, except where such gaps, openings, or recesses are indicated on the Drawings.
- M. Wherever possible, all miscellaneous metal items shall be erected, plumbed, braced and built into the masonry; where this is not possible, suitable metal anchors shall be built into the masonry for attaching the miscellaneous metal item. Steel door and other frames shall be filled solid with mortar or grout.
- N. All reinforced hollow vertical cells shall be filled with grout (not mortar). The grout shall be rodded and vibrated until well consolidated and all voids are filled.
- O. At wall and wall intersections, and similar locations, hollow blocks having flush, flat face visible on the face of the wall or partition and in reveal shall be used. No cells shall be left visible in the face of end of walls or partitions, at reveals or openings, etc. Mortar or mortar and masonry fill shall be used between concrete masonry units and adjacent roof framing or other structural members, except where the Drawings indicate otherwise.
- P. Install air/vapor barrier membrane against the exterior surface of the CMU, taking particular care to seal all penetrations with a manufacturer approved sealant system. Lap and seal membrane around windows, doors, openings, etc., and ensure a continuous and unbroken connection with the air/vapor barrier of the roof assembly.
- Q. Masonry shall not be laid overhand. Where necessary to avoid laying masonry overhand, staging shall be constructed on both sides of the wall.
- R. Masonry at intersections of walls or partitions shall be bonded with masonry or approved metal ties. Ties shall be spaced at not more than 16-inches O.C. unless otherwise noted on the Drawings.

- S. No masonry work shall be done when the mean daily temperature is below 40 degrees F., or is expected to fall below 40 degrees within 72 hours, except with the permission of, and in accordance with the requirements of subsection 3.04, below. No salt or other anti-freeze or accelerator admixtures shall be used in the mortar.
- T. All necessary channels, chases, holes, and openings shall be made, and all sleeves that may be required for piping or wiring installation shall be set. Pipes, conduits, and outlet boxes shall be built-in as required, and all cutting and patching of the work of this section shall be done as required to accommodate the work of other trades. Drawings covering the work of other trades shall be consulted as necessary to determine the extent of such work required.

3.04 MASONRY WORK AT TEMPERATURES BELOW 40 DEGREES F.:

- A. All materials shall be covered to prevent wetting and shall be stored off the ground. At temperatures below 20 degrees F, all materials shall be stored in covered enclosures and kept at a temperature above 32 degrees F. Mortar shall be between 70 degrees F. and 120 degrees F. when used.
- B. When temperature in the air is between 30 and 40 degrees F., either the water or the sand shall be heated to between 70 degrees F. and 160 degrees F. (Heating the sand is preferable, as it makes the mortar more workable and maintains workability longer than heating the water). When temperature of the air is between 10 degrees F. and 30 degrees F., both the sand and the water shall be heated to between 70 degrees F. and 160 degrees F. When the temperature of the air is or is expected to fall below 10 degrees F. within 24 hours, no masonry shall be erected.
- C. Masonry work under construction shall be protected with canvas or other windbreak material. All such material shall be flame-proofed. Canvas shall completely enclose that portion of work requiring protection, but shall be held off to allow air circulation between canvas and masonry. Canvas shall be securely held, and lapped at edges to prevent heat loss.
- D. Temperatures shall be recorded frequently, at least every hour, and supplemental heat supplied as required to maintain 40 degrees F. under the canvas. Points at which temperature is measured shall be those designated by the Engineer. Care shall be taken that one side of masonry is not heated more rapidly than the other side; air circulation shall be provided as required to maintain even temperatures.
- E. Covering shall be used on both completed and unfinished work. The warmed enclosure shall be kept on masonry for 72 hours after laying. Following the 72 hour period, the masonry shall be brought gradually to ambient temperature but shall not be allowed to drop faster than one degree F. per hour. The Contractor shall furnish and install maximum/minimum thermometers in an enclosure which contains a hasp and staple.
- F. The Engineer shall designate the number and location of the thermometers.

3.05 CLEAN-UP:

- A. Mortar droppings on face of wall shall be allowed to set up and shall then be promptly removed with a trowel and by rubbing with a piece of block. Droppings shall not be allowed to remain on the wall until completion of the masonry. Walls shall be cleaned by brushing with a stiff brush. No acid cleaners shall be used.
- B. Masonry surfaces to be left exposed, either painted or unpainted, shall be thoroughly cleaned. Spattering and staining of floors, finished surfaces, pipe, equipment, etc., shall be avoided, and all finished surfaces shall be left in clean and perfect condition. Suitable drop cloths or other adequate means of protection shall be provided as necessary.

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 4\04200 Masonry FINAL.docx

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

SECTION 05120

STRUCTURAL STEEL

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. The work of this Section consists of providing all labor, materials, and equipment required to furnish, fabricate, and erect the work of this Section including but not limited to:

1. Providing leveling plates, bearing plates, anchor bolts, beams, baseplates, bracing and connections, angles, channels, stiffeners, separator plates, clips, supports for steel deck at columns, openings, connections, welding filler material and electrodes, connection bolts, erection bolts, and any other structural steel called for on the Drawings.
2. Items of structural steel required to be built into concrete or masonry, as indicated or specified, shall be furnished to the respective trades at the proper time with complete instructions and template to facilitate inspection.
3. Design of bolted/welded connections.
4. Furnishing and installation of non-shrink grout under leveling and base plates.
5. Unless specifically excluded, providing all other items for structural steel work indicated on the Drawings, specified, or obviously needed to make the work of this Section complete.
6. All steel items shown or indicated on the Structural Drawings.
7. Furnishing any temporary bracing necessary for support and alignment of the work, and shop painting as herein specified.
8. Structural steel shall consist of all material as defined in Section 2, "Definition of Structural Steel," of the AISC Code, and accessory material called for, or reasonably implied by the drawings.

1.02 RELATED WORK:

- A. Section 05500 - MISCELLANEOUS METALS
- B. Section 09900 – PAINTING

1.03 REFERENCES:

A. The following standards from a part of these specifications as referenced:

1. American Institute of Steel Construction (AISC)
  - a. Code of Standard Practice for Steel Buildings and Bridges
  - b. Specification for Structural Steel for Buildings
  - c. Manual of Steel Construction
  - d. Specification for Structural Joints Using ASTM A325 or A490 Bolts
2. American Society for Testing and Materials (ASTM)
  - a. ASTM A36 Structural Steel
  - b. ASTM A307 Carbon Steel Externally and Internally Threaded Standard Fasteners
  - c. ASTM A325 High Strength Bolts for Structural Steel Joints
  - d. ASTM A490 Heat-treated Steel Structural Bolts, 150 ksi Min. Tensile Strength
  - e. ASTM A500 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing
  - f. ASTM A563 Carbon and Alloy Steel Nuts
  - g. ASTM F436 Hardened Steel Washers
  - h. ASTM A992 Standard Specifications for Structural Steel Shapes
3. American Welding Society (AWS)
  - a. AWS D1.1 Structural Welding Code Steel
4. Steel Structures Painting Council (SSPC)
  - a. SSPC-SP 6 Commercial Blast Cleaning
  - b. SSPC-PA 2 Shop, Field and Maintenance Painting
5. State Building Code, Latest Edition.



1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Product Data: Provide manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
  2. High-strength bolts (each type), including certified copies of mill reports for nuts and washers; include direct tension indicators if used.
  3. Structural steel primer paint.
  4. Touch-up paint for galvanized steel.
  5. Grout.
  6. Headed Stud Anchors.
  7. Adhesive/Expansion Anchors
- B. As-built Survey: Submit to the Engineer an as-built survey showing the locations of the anchor bolts prior to installation of leveling and bearing plates. This submittal is for information and file record.
- C. Standard Shop Details and Connection Design Calculations: Submit to the Engineer prior to submitting detailed shop drawings, design calculations and details for connections not shown on the Drawings. Calculations shall be prepared, signed, and sealed by a registered professional engineer. Calculations and drawings are subject to review by the Engineer. The Engineer reserves the right to require revisions to this work at no additional cost to the Owner.
- D. Checked shop drawings shall be submitted to the Engineer for review and approval. Fabrication shall not begin until the Engineer has approved the shop drawings.
- E. Shop drawings shall include detail drawings, erection drawings, certifications, schedules, and all other information necessary for the fabrication and erection of component parts of the structure. The shop drawings shall be checked and properly coordinated with other parts of the construction. The following shall be included in the shop drawings:
1. Type of steel for each member, location and identification mark of each member, dimensions, size and weight of members, location and size of cuts, copes, slots, holes and openings required by other trades, type and location of shop and field

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

connections, type, size, and extent of all welds, joint welding procedures, welding sequence, and painting requirements.

2. All requirements such as temporary members required for erection, including connections.
3. Use standard welding symbols of the American Welding Society.

F. Except as otherwise noted, the approval of shop drawings will be for size and arrangement of primary and secondary components and strength of connections. Any error in dimensions shown on the shop drawings shall be the responsibility of the Contractor.

G. Submit manufacturer's certification of bolts, nuts, and filler metal for welding.

#### 1.05 QUALITY ASSURANCE:

A. Testing and Inspection

1. Refer to Section 01450 for Structural Testing and Inspections. Comply with the additional requirements specified in Section 01450, Structural Tests and Inspections.
2. The inspection and testing services provided by the Independent Testing Agency do not relieve the Contractor, the steel fabricator and erector from the responsibility to provide supervision, testing, inspection, and quality control in order to assure conformance with these specifications.

B. The Contractor must utilize the services of a Professional Structural Engineer licensed in the State of Connecticut to design, sign, and seal calculations and drawings for the following:

1. Connection designs indicated on the Drawings to be designed by the Contractor.
2. Weld repairs.
3. Welded and bolted connection repairs.
4. Revisions required because of erection misalignment, fabrication defects, damage from construction activities.

C. The Contractor is responsible for fit up and installation of all steel work and shall field verify all dimensions and conditions.

D. The fabricator shall possess a valid certificate, category I Conventional Steel Building Structures as issued through the AISC Quality Certification Program or shall have a detailed Quality Control Plan subject to audit as indicated in Section 01450.

- E. Welder, Tacker and Welding Operator Qualifications: Use welders, tackers and welding operators who are currently qualified by tests as prescribed in the Structural Welding Code, AWS D1.1 of the American Welding Society to perform type of work required. Headed stud welding operators shall also be qualified in accordance with AWS D1.1.
- F. Welded connections shall be designed and detailed utilizing AWS prequalified joints.
- G. Domestically manufactured steel and iron products must be used. Submit certification to the Owner.

1.06 DELIVERY, STORAGE, AND HANDLING:

- A. Store steel on platforms, skids, blocking or other supports to prevent dirt and debris contact. Protect from exposure to conditions that produce rust.
- B. Handle steel so no parts are bent, broken or otherwise damaged and avoid damage to other material and work. Store beams with webs vertical. Exercise care to avoid scraping and overstressing the steel work.
- C. Ship small parts, such as bolts, nuts, washers, pins, fillers, and small connecting plates and anchors, in boxes, crates, or barrels. Pack separately each length and diameter of bolt and each size of nut and washer. Plainly mark an itemized list and description of the contents on the outside of each container.

PART 2 - PRODUCTS

2.01 STRUCTURAL STEEL MATERIALS:

- A. Rolled steel wide-flange shapes: ASTM A992.
- B. Steel channels, angles, plates and bars: ASTM A36.
- C. Structural Steel Tubing: ASTM A500 Grade B.

2.02 BOLTS, CONNECTORS, AND ANCHORS:

- A. High-Strength Structural Steel Bolts, Nuts and Washers:
  - 1. Bolts: ASTM A325.
  - 2. Nuts: ASTM A563.
  - 3. Washers: ASTM F436.

4. Where steel is indicated on the Drawings to be galvanized, bolts, nuts and washers shall be hot dip galvanized in accordance with ASTM A153.
  5. Refer to the Drawings for bolt head style requirements.
- B. Anchor Bolts: ASTM F1554. Grade 36, unless noted otherwise. Headed type unless otherwise noted. Provide suitable nuts in accordance with ASTM F1554 and ASTM A563 and washers in accordance with ASTM F436.
- C. Beveled Washers: Square, smooth and sloped to make contact surface of bolt head and nut parallel.
- D. Headed Stud Anchors: Embedment anchors shall be headed anchors with fluxed ends or approved equal. Stud size as indicated on the Drawings. Studs shall be automatically end welded with suitable equipment in the shop or field on spacing's indicated on the Drawings. All welds shall be made in accordance with the stud manufacturer's requirements. Field installed anchors shall be classified as Structural Steel.
1. Mechanical Properties of Headed Anchors. Low Carbon Steel complying with ASTM A108 Physical Properties:
    - a. Tensile (Minimum) 60,000 PSI (60KSI)
    - b. Yield (Minimum) 50,000 PSI (50KSI) (0.2% Offset)
    - c. Elongation (Minimum) 20% in 2 inches.
- E. Adhesive Anchor Bolt Anchoring Systems: Composed of an anchor rod, nut, washer and an anchor rod adhesive cartridge.
1. Anchor Rod Assembly: Chamfered end, all thread steel anchor rod with nut and washer. Size and load capacity as indicated on the Drawings.
  2. Adhesive Cartridge: Sealed capsule containing premeasured amounts of (resin, quartz sand aggregate, and a hardener contained in a separate vial within the capsule. Capsule ingredients activated by the insertion procedure of the anchor rod assembly.
  3. Acceptable Manufacturers:
    - a. Hilti Fastening Systems; HVA Adhesive System.
    - b. Powers Fastening, Inc.; Rawl Fastening Systems.
    - c. Or Approved Equal.

- F. Welding Electrodes: E70XX in accordance with AWS D1.1. Refer to the Drawings for special requirements at moment connections.

2.03 GROUT:

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.04 SHOP PRIMER PAINT:

- A. Products to be used shall meet the regulations of jurisdiction for Volatile Organic Compounds (VOC) emissions.
- B. Exterior Exposed Steel, Not Galvanized: Zinc-rich epoxy primer followed by a intermediate coat of epoxy paint.
- C. Other Steel, Not Galvanized: Zinc-rich epoxy primer.
- D. Shop primer paint shall be compatible with the specified finish paint system. Finish paints shall be in accordance with Section 09900.

2.05 HOT-DIPPED GALVANIZING:

- A. Hot-dip galvanized steel fabrications so designated herein and on the drawings and after fabrication in compliance with ASTM A 123.
- B. Hot-dip galvanized iron and steel hardware shall be in accordance with ASTM A 153.

PART 3 - EXECUTION

3.01 FABRICATION:

- A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in the shop to the greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings.
  1. Provide camber in structural members where indicated.
  2. Do not splice steel members unless given written approval by the Engineer.
  3. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.

4. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
- B. Holes for Other Work: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on the final shop drawings.
- C. Cut, drill, and punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.
- D. Welding:
1. Provide quality control and qualification of welders and welding procedures and operations as specified under "Testing and Inspection" in this Section.
  2. Shop Welded Process: Use shielded metal-arc, submerged arc, gas metal-arc, and flux cored-arc, or other process as approved by the Engineer.
  3. Groove Welds: Provide complete penetration unless otherwise noted on the Drawings.
  4. Fillet Welds: Where weld symbol is not shown or welds are not dimensioned, provide continuous fillet welds all around and on both sides as appropriate. Minimum dimension shall be as indicated in AISC Specification.
  5. Base metal shall be checked by Contractor to insure absence of laminations or other defects. Welds shall be sound throughout and have no cracks.
  6. Where structural joints are required to be welded, details of joints, technique of welding employed, appearance and quality of welds made, and methods used in correcting defective work shall conform to applicable requirements noted under References in this Section.
  7. Prepare joint welding procedures and program of welding sequence (for each component and for welding jointing components to each other) and submit to Engineer for approval before any welding is done. After approval, welding procedures and sequences shall be followed without deviation unless specific approval for change is obtained from the Engineer. Engineer may require requalification's of these welding procedures by tests prescribed in AWS "Standard Qualification Procedures".
  8. Each welder working on the project shall be assigned an identification symbol or mark. Each welder shall mark or stamp their identification symbol to each weldment completed, whether in shop or field.

9. Corrective Work: Structural steel elements having fabrication errors and/or which do not satisfy tolerance limits shall not be incorporated in finished work. Such elements may be corrected if permitted by the Engineer and/or Testing Agency. Submit to the Engineer drawings showing details of proposed corrective work. These drawings shall be approved by the Engineer prior to performing corrective work. Corrective work shall be performed in accordance with requirements of Contract Documents. Corrective work and any retesting which may be required shall be at the Contractor's expense.
10. Members scheduled to be fireproofed shall have surfaces prepared as required by the fireproofing material manufacturer.

3.02 SHOP PRIMER PAINTING:

- A. General: Shop paint all structural steel, except as noted below:
  1. Do not paint members which are to be galvanized.
  2. Do not paint surfaces within two inches of any field weld (including shear connectors) or high strength bolted friction type connection.
  3. Do not paint surfaces to be high strength bolted with slip-critical connections, unless the paint is specifically compatible with slip-critical connections.
  4. When members are to be partly embedded in concrete or mortar in the finished work, paint only the exposed portions and initial 2-inches of embedded areas. Do not paint members which will be entirely embedded in concrete or mortar in the finished work.
  5. Do not paint surfaces to receive metal deck and/or shear connectors fastened by welding.
  6. Do not paint surfaces to receive sprayed-on fireproofing.
- B. Surface Preparation: At a minimum, clean steel in accordance with Steel Structures Painting Council (SSPC) as follows; except clean to more stringent surface preparation standard if required by primer manufacturer:
  1. Steel to be primed with zinc-rich primer: Commercial Blast Clean (SSPC-SP6).
  2. Comply with AISC requirements for slip-critical connections.
- C. Painting
  1. Immediately after surface preparation apply shop primer paint in accordance with manufacturer's recommendations.

2. Apply shop paint in accordance with SSPC-PA-2.
3. Minimum dry film thickness of shop paint shall be 4.0 mils.
4. Comply with AISC requirements for slip-critical connections.
5. Complete shop painting operations on completed shop welded connections after the connections have passed the specified structural tests and inspections.
6. Apply two coats of paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

### 3.03 GALVANIZING:

- A. General: Hot-dip galvanize all steel exposed to weather or corrosive environments and as indicated on the drawings.
- B. Hot-dip galvanized steel shall be inspected for compliance with ASTM A 123 and shall be marked with a stamp that indicates the name of the galvanizer, the ASTM number, and the ounces of zinc per square foot of surface. A notarized Certificate of Compliance with all of the above shall be required from the galvanizer.
- C. Hot-dip galvanized hardware shall comply with ASTM A 153.
- D. Provide thickness of galvanizing specified in referenced standards.
- E. Fill vent holes and grind smooth after galvanizing.
- F. All hot-dip galvanized steel shall be safeguarded against embrittlement in conformance with ASTM A-143.
- G. Finish color, if required, will be specified by the Engineer.

### 3.04 ERECTION:

- A. Erect structural steel in accordance with the Drawings, the approved submittal documents, pertinent regulations, the referenced AISC standards and these Specifications.
  1. Allow concrete foundations to reach a minimum of 14-day curing time before torquing of anchor bolts.
  2. Prior to installation of metal decking, clean the unpainted top flanges of structural steel members to be free of heavy rust, mill scale, dirt or such other substances detrimental to welding.
  3. Comply with 29 CFR Part 1926 - Safety Standards for Steel Erection.



- B. Surveys: Employ a licensed Land Surveyor or licensed engineer for accurate erection of structural steel. Check elevations on concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Engineer. Do not proceed with erection until corrections have been made or until compensating adjustments to structural steel work have been agreed upon with Engineer.
- C. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.
- D. Setting base and bearing plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surface. Clean bottom surfaces of leveling and bearing plates.
1. Set loose and attached leveling plates and bearing plates for structural members on steel wedges, shims, leveling devices, or as shown on the Drawings.
  2. Grout under the plates after they have been positioned, plumbed and leveled. Do not remove wedges or shims but, if protruding, cut off flush with top or edges of base plates, or both prior to packing with grout.
  3. Pack grout solidly between bearing surfaces and bases or plates to ensure no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
  4. For proprietary grout materials, comply with manufacturer's instructions.
- E. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of the complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure within specified AISC tolerances.
  2. Establish required leveling and plumbing references with respect to expected mean service operating temperature inside the building. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
- F. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges".

- G. Splice members only where indicated and accepted on shop drawings.
- H. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.

3.05 FIELD CONNECTIONS:

- A. General: Beams shall have framed connections using ¾-inch diameter, minimum, high strength bolts in accordance with the requirements of AISC “Manual of Steel Construction” and Contract Drawings.
- B. High-Strength Bolts: Install high-strength steel-bolts in accordance with RCSC’s “Specifications for Structural Joints Using ASTM A325 or A490 Bolts” for type of bolt and type of joint specified.
  - 1. Joint Type: Snug tightened unless indicated otherwise on the drawings or where pretension or slip critical joints are recommended or required by RCSC or AISC.
  - 2. Do not enlarge holes in members by burning or by using drift pins. Ram holes that must be enlarged to admit bolts.
- C. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
  - 1. Comply with AISC’s “Code of Standard Practice for Steel Buildings and Bridges” and “Specification for Structural Steel Buildings” for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
- D. Adhesive Anchor Bolt Anchoring System Installation:
  - 1. General: Install adhesive anchors in strict accordance with manufacturer's instructions and in accordance with the following.
  - 2. Drilling Holes: Use rotary hammer-type drill and make drill holes to the required diameter and depth as consistent with anchor manufacturer's instructions for size of anchors being installed,
    - a. Prior to setting cartridge and anchor rod clean drilled holes free of loose material by vacuum process, finishing with a blast of compressed air and cover hole until actual use.
  - 3. Anchor Rod Installation: Following cartridge installation in prepared drill holes, set anchor rod to the required depth. Set anchor rods truly perpendicular (normal) to the base plate of item being anchored.

E. Headed Stud Anchors:

1. Welding Specifications: All materials shall be clean, dry and free of paint, rust, oil or other contaminants. Test welding should be done in the same position being used for production. Test welds, after cooling, should be bent by hammer 45° from the vertical position without failure. Non-failure of two studs indicates that the weld setup is satisfactory and production welding may be started.
2. Inspection Requirements: After welding, the ceramic ferrule should be removed from each stud and the weld fillet visually inspected. A fillet of less than 360° is cause for further inspection. Such studs should be hammer tested, bending the stud 15° from the vertical toward the closest end of the embedment plate or steel member. Bending without failure indicates a satisfactory weld. Bent studs may be left bent unless stud projects into concrete cover or obstructs other materials. All bending and straightening when required shall be done without heating before completion of the production stud welding operation.
3. Do not weld studs to steel plates or members with temperatures below 32° F. Welding shall not be done when the steel surface is wet or exposed to rain or snow.
4. The Engineer reserves the right to require the Contractor to repair any welds, which are not a complete 360° weld at no additional cost. The Engineer also reserves the right to require replacement of studs and the repair of the base metal at no additional cost. Any additional testing and inspection required will be at no additional cost to the Owner.

3.06 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspection agency to inspect field welds and high-strength bolted connections.
  1. Testing agency shall conduct and interpret tests, state in each report whether test specimens comply with requirements, and specifically state any deviations there from.
  2. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.
  3. Testing agency may inspect structural steel at plant before shipment.
- B. Bolted Connections: Field and shop-bolted connections will be inspected according to RSCS's "Specification for Structural Joints Using ASTM A325 or A490 Bolts.

- C. Welded Connections: Inspect and test during erection of structural steel as follows:
1. Review welder's certifications and certify welders if required. Conduct inspections and tests as required. Record types and locations of defects found in the work. Record work required and performed to correct deficiencies.
  2. All field welds will be visually inspected according to AWS D1.1.
  3. Test all full penetration welds using ultrasonic inspection methods in accordance with ASTM E164.
  4. Perform magnetic particle inspection in accordance with ASTM E709 on at least 20% of fillet welds. Magnetic particle inspection shall be performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
- D. Correct deficiencies in structural steel work that inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as necessary to reconfirm any noncompliance of original work and to show compliance of corrected work.

3.07 FIELD TOUCH-UP PAINTING OF SHOP PRIMER PAINTED STEEL AND GALVANIZED STEEL:

- A. General: Immediately after erection, clean field welds, bolted connections, and other surfaces required to be painted. Apply paint to areas required to be painted using same material as used for shop painting. Apply by brush or spray to provide minimum dry film thickness specified in Part 2 of this Section for the shop-applied coat.
- B. Touch-up paint welded connections after the connections have passed the specified structural tests and inspections.
- C. Do not paint when ambient temperature is below 40 degrees F, or when conditions differ from paint manufacturer's recommendations, as approved by the Engineer.
- D. Touch up damaged galvanizing with zinc-rich paint in accordance with ASTM A 780 and manufacturer's written instructions.

END OF SECTION

R:\Lenox MA\Henry Avenue Pumping Station\SPECS\Contract 1 - Pump Station\Div 5 - Metals\05120 - Structural Steel.docx

SECTION 05400

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes:

1. Metal stud non-load-bearing exterior walls.

B. Related Sections:

1. Section 06200 – FINISH CARPENTRY
2. Section 09200 - DRYWALL SYSTEM.

1.02 PERFORMANCE REQUIREMENTS:

A. Design Load: Lateral load shall be design wind load as set forth by the Connecticut Building Code, latest edition.

B. Allowable Deflection: Design system to limit deflection of the exterior curtain wall framing under full design load acting both inward and outward. Do not take into account the contribution to stiffness due to the sheathing, the interior finish, or exterior veneer or cladding. Design system to limit rotation of members to 1/16-inch (1.6 mm).

1. Maximum Deflection at Masonry Veneer:  $L/600$ , where  $L$  = the height of the unbraced stud
2. Maximum Deflection at Metal Panels or other finish assemblies:  $L/240$ , where  $L$  = the height of the unbraced stud

C. Component Design: Installer shall engineer the exterior curtain wall framing to comply with these performance requirements. Compute structural properties of studs in accordance with AISI "Specification for Design of Cold-Formed Steel Structural Members.

D. Design system with consideration to method of and type of fastening of components to each other and to structure. Make provision for movement of structure and framing system due to thermal, moisture, creep, settling and deflection.

1.03 SUBMITTALS:

A. Prepare submittals in accordance with the General Conditions and Section 01330 - Submittals.

- B. Product Data: Submit manufacturer's specifications and installation instructions for studs and accessories. Provide sufficient information on structural properties of studs to demonstrate compliance with performance requirements.
- C. Samples: Submit samples of studs and other cold-formed metal framing components if requested by Engineer.
- D. Shop Drawings: Submit full shop drawings for framing system. Show elevations, proposed attachment and other details. Submit shop drawings for special components and installations not fully dimensioned or detailed in manufacturer's product data. Include placing drawings for framing members showing size and gage designations, number, type, location and spacing. Indicate supplemental strapping, bracing, splices, accessories, and details required for proper installation.
- E. Engineering Calculations: Submit complete engineering calculations for the proposed system prepared and stamped by a Registered Professional Structural Engineer licensed in Connecticut.
- F. Pre-Installation Conference: Prior to the start of the installation of metal framing systems, meet at project site with installers of other work, including door and window frames and mechanical and electrical work. Review areas of potential interference and conflicts and coordinate layout and support provisions for interfacing work.

## PART 2 - PRODUCTS

### 2.01 METAL FRAMING COMPONENTS

- A. Rolled Steel Sections: ASTM A36 steel angles, hot-dip galvanized; profile and size as shown.
- B. Studs: Pre-punched steel studs complying with ASTM C645 and fabricated of structural quality steel sheet complying with ASTM A446 (structural quality hot-dip galvanized sheet steel) with a minimum yield point of 40,000 psi for 16-gauge and heavier units; 33,000 psi for 18-gauge units.
  - 1. Provide units galvanized per ASTM A525 Grade G-90.
  - 2. Gauge as indicated on drawings, or if not shown, as required to meet deflection limitations at spacing shown, but in no case less than 18-gauge for framing components.
  - 3. Depth: 6" minimum or as shown on drawings.
- C. Runners: Galvanized steel, matching studs. Provide type recommended by stud manufacturer for application indicated.

- D. Accessories: Provide stud manufacturer's standard steel clips, shoes, ties, reinforcements, fasteners, and other accessories as needed to provide a complete metal framing system.

## 2.02 MISCELLANEOUS MATERIALS:

- A. Fasteners: Hot dip galvanized bolts, zinc plated and chromated self-tapping sheet metal screws and galvanized malleable iron inserts, wedges and associated fasteners.
- B. Galvanizing Repair Paint: Cold-galvanizing compound with not less than 94% zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20. Provide the following or equal:
  - 1. ZRC Chemical Products; Z.R.C. Cold Galvanizing Compound.
  - 2. First Zinc by Brite Products;
  - 3. Or approved equal.

## PART 3 - EXECUTION

### 3.01 INSPECTION:

- A. Examine the locations, substrates and conditions under which the light gage framing is to be installed. Notify the Engineer in writing of conditions detrimental to the proper completion of the work. Do not proceed with the installation until unsatisfactory conditions have been corrected.

### 3.02 TOLERANCES:

- A. Erect framing plumb, level and accurate in position in plan as specified.
- B. Plumb:
  - 1. ¼-inch in 10 feet (2 mm in 3 m).
  - 2. 3/8-inch in 20 feet (9.5 mm in 6.1 m) up to 40 feet (12.2 m) height.
  - 3. ½-inch (12.7 mm) maximum variation overall for heights greater than 40 feet (12.2 m).
- C. Level: ¼-inch (6.4 mm) in any bay or 20 feet (6.1 m), not to exceed 3/8-inch (9.5 mm) overall.
- D. Position in Plan: Variation not to exceed 1/2 inch (12.7 mm) in any bay or 20 feet (6.1 m) length, nor 3/4-inch (19 mm) overall.

### 3.03 INSTALLATION OF METAL FRAMING:

- A. Install metal framing system in accordance with manufacturer's printed instructions and recommendations, unless otherwise indicated.
- B. Runners: Install continuous runner tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure as recommended by stud manufacturer for type of construction involved. Do not exceed 24-inches (610 mm) o.c. spacing for nail or power-driven fasteners or 16-inches (406) o.c. for other types of attachment, unless more stringent requirements are specified by manufacturer. Provide fasteners at corners and ends of tracks.
- C. Studs: Set studs plumb (except for diagonal bracing). Secure to top and bottom runner tracks by welding or by screw fastening at both inside and outside flanges. Anchor ends of stiffeners to supporting structure where stud system abuts structural columns or walls. Install horizontal stiffeners at not more than 4'-6" (1.4 m) o.c. vertically.
- D. Frame wall openings larger than 2'-0" (610 mm) square with double stud at each jamb of frame. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs.
- E. Frame expansion and control joints with separate studs both sides; do not bridge the joint with components of stud system.
- F. Install supplementary framing, blocking and bracing wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition.
- G. Touch-up abraded and welded areas of support system with galvanizing repair paint.
- H. Install joists level, straight and plumb, with at least 1-1/2 inches bearing each end, complete with bracing, end reinforcing, and additional reinforcing shown or required for structural performance and rigidity. Secure joists to supports to prevent lateral movement of bottom flange.
- I. Touch-up abraded and welded areas of support system with galvanizing repair paint.

END OF SECTION



SECTION 05500

MISCELLANEOUS METALS

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This Section covers all miscellaneous metal items required for the work, except as specified elsewhere.
- B. All miscellaneous metalwork shall be fabricated as detailed or approved and shall be installed complete with all necessary anchors, anchor bolts, eye bolts, guides, bolts and other accessories.
- C. In general, site and shop fabricated items are included under this section, and factory fabricated items excluded. This section includes but is not limited to: lintels, louvers, stairs, railings and posts, grating, hatches, frames and covers, loose metal frames, nosings, edgings, ladders, vents, protective grilles and frames, and all other site or shop fabricated metal items not specifically provided under other Sections or otherwise excluded.

1.02 RELATED WORK:

- A. Section 04200, MASONRY
- B. Section 05519, METAL GRATING, STAIR, GRATINGS AND RAILINGS
- C. Section 06100, ROUGH CARPENTRY
- D. Section 06200, FINISH CARPENTRY
- E. Section 07920, JOINT PROTECTION
- F. Section 09900, PAINTING

1.03 QUALITY ASSURANCE:

- A. The drawings show the character and extent of the work required, but do not attempt to show all methods, materials, and details of construction, fastening, etc. Supplementary parts customarily necessary to complete an item, though such parts are not definitely shown or specified, shall be included as part of the item.
- B. Details of construction of the various items shall be submitted on the shop drawings. High quality construction with a neat, finished, and workmanlike appearance will be required.

- C. The size and spacing of screws, connectors, anchors, and similar items, and the size and dimensions of metal items stated herein shall apply in general; specific sizes and spacing of fasteners and dimensions of metal items listed on the drawings shall take precedence.
- D. Items supplied hereunder which are required to be built into the concrete, masonry, etc., shall be delivered to the site at locations as required by the Owner or Engineer, and as required by the overall construction schedule.
- E. Manufacturers of other products comparable in quality and type to those specified will be acceptable if satisfactory data on past performance and other required information is furnished by the Contractor, and if approved by the Engineer.
- F. Color galvanized system shall be guaranteed by manufacturer for 20 years.
- G. Contractor shall submit an affidavit to Engineer that materials used are protected from or will not be subject to galvanic action.

1.04 REFERENCES:

- A. The following standards from a part of these specifications, and indicate the minimum standards required:

American Institute of Steel Construction (AISC)

AISC                      Specifications for Structural Steel Buildings

American Society for Testing and Materials (ASTM)

ASTM    A36              Structural Steel

ASTM    A53              Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless

ASTM    A123              Zinc (Hot-Dip-Galvanized) Coatings on Iron and Steel Products

ASTM    A153              Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM    A239              Test for Uniformity of Coating by the Preece Test (Copper Sulfate Dip) on Zinc-Coated (Galvanized) Iron or Steel Articles

ASTM    A307              Carbon Steel Externally and Internally  
Threaded Standard Fasteners

ASTM    A366              Steel, Carbon, Cold-Rolled Sheet, Commercial Quality

ASTM A525	Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, General Requirements
ASTM A569	Steel Carbon (0.15 Maximum Percent) Hot-Rolled Sheet and Strip, Commercial Quality
ASTM B221	Aluminum-Alloy Extruded Bars, Rods, Shapes and Tubes
ASTM B308	Aluminum-Alloy Standard Structural Shapes, Rolled or Extruded
ASTM C478	Precast Reinforced Concrete Manhole Sections

American Welding Society (AWS)

AWS	D1.1 Structural Welding Code Steel
-----	------------------------------------

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Before fabricating or assembling any aluminum or stainless steel items, samples indicating full range of finish, color, and texture to be supplied shall be submitted to the ENGINEER for review.
- B. Shop drawings for all metalwork included in this Section shall be submitted to the Engineer for review.
- C. The shop drawings shall be complete and checked, showing sizes, layout, method of assembly, fastenings, anchorage or connection with other work, finish, and coatings, etc. Shop drawings for stainless-steel and aluminum work shall indicate alloys, temper and finish to be used.
- D. Samples of colors and finishes for items that are to be color galvanized shall be submitted to ENGINEER for selection, from manufacturer's full range. ENGINEER shall have discretion of selecting up to four colors for application to fabricated items.

## PART 2 - PRODUCTS

### 2.01 PRODUCTS:

- A. Miscellaneous and ornamental items include the following. Requirements for materials, hot-dip galvanizing, and shop-applied primers are included with each item as applicable.
1. Galvanized steel framing and supports for mechanical and electrical equipment.
  2. Steel framing and supports for applications where framing and supports are not specified in other Sections; galvanized at exterior locations and in exterior walls.
  3. Galvanized steel lintels with shop-applied primer at exterior locations.
  4. Steel lintels with shop-applied zinc-rich primer at interior locations.
  5. Galvanized shelf angles with shop applied primer at exterior locations.
  6. Shelf angles with zinc-rich shop-applied primer at interior locations.
  7. Loose steel bearing and leveling plates, including bearing plates for steel joists or other structural members, galvanized at exterior locations and in exterior walls.
  8. Interior ductile iron floor and trench drain grating.
  9. Galvanized steel plates and angles at window and door openings.

### 2.02 MATERIALS:

A. Steel:

1. Materials, fabrication, and erection of miscellaneous steel sections shall conform to the applicable requirements of the AISC Specification.
2. Steel shapes, plates and bars shall conform to ASTM A36/A 36M.
3. Stainless Steel Sheet, Strip, Plate and Flat Bars: ASTM A666, Type 316L
4. Sheet steel shall be cold-rolled or hot-rolled carbon sheet steel conforming to ASTM A366 or ASTM A569 as appropriate.
5. Steel pipe shall conform to ASTM A53/A 36M.

B. Stainless Steel:

1. Stainless steel shall be Type 304 unless otherwise indicated or specified.

C. Aluminum:

1. Aluminum shall be fabricated of plates, rolled or extruded shapes, sheets or castings conforming to the specific aluminum alloy and temper designation of the Aluminum Association as specified for the item.
2. Aluminum work shall be fabricated in a shop where the quality of work is of the highest standard for work of this type. All work shall be executed by mechanics skilled in the fabrication of aluminum, and shall be true to detail with sharp clean profiles, fitted with proper joints and intersections, and with finishes as specified.
3. The Contractor shall furnish the Engineer with mill certificates and a signed statement from the fabricator that all aluminum work furnished is of the proper alloys as specified.

### 2.03 FASTENERS:

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.
1. Metalwork shall be complete, with all bolts, anchors, plates, washers, clamps, screws, studs, and other such devices for proper securing and anchoring. Where positions of anchorages can be predetermined, they shall be shop-installed on the item; otherwise the material or equipment to be fastened shall be expansion bolted, toggle bolted, screwed, or otherwise fastened as shown on the drawings or called for herein.
  2. Bolts and nuts for general anchorage and for miscellaneous ferrous metal assemblies and fasteners shall be galvanized, unfinished bolts conforming to ASTM A307 unless otherwise noted on the drawings.
  3. The centerline of expansion shields shall not be closer than 3-inches to the edge of any concrete or masonry in which they are placed.
  4. Material for fasteners shall match or be galvanically compatible with the materials fastened. Washers, nuts and other accessories shall match the bolts.
  5. Where the specific type, material, size and spacing of fasteners has not been called for on the drawings or in specifications, the fasteners proposed by the Contractor shall be reviewed by the Engineer. If, in the opinion of the Engineer, they are not in accordance with good safety practices, the contractor shall revise and resubmit appropriate fasteners.
- B. Anchor Bolts: ASTM F 1554, Grade 36. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

- C. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
  - 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.
- D. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
  - 1. Acceptable Manufacturers: Kwik-Bolt 3 by Hill, Inc., TruBolt Wedge Anchor by ITW Red Head or Power-Stud by Powers Fasteners.

2.04 MISCELLANEOUS MATERIALS:

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Universal Shop Primer: Fast-drying, lead- and chromate-free, universal modified alkyd primer complying with MP#79. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- C. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in steel complying with SSPC-Paint 20.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- F. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.05 MISCELLANEOUS STEEL CLIPS, ANGLES, CHANNELS AND PLATES:

- 1. Supplemental support of overhead doors and its operating motors
  - a. Galvanized
- 2. Supplemental support of mechanical equipment

## 2.06 MISCELLANEOUS FRAMING AND SUPPORTS:

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
  - 1. Fabricate units from slotted channel framing where indicated.
  - 2. Furnish inserts if units are installed after concrete is placed.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

## 2.07 LOOSE STEEL LINTELS:

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Weld adjoining members together to form a single unit where indicated. Examine all drawings (architectural, structural, mechanical, electrical, plumbing, fire protection, and equipment) to determine lintel requirements.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8-inches, unless otherwise indicated.
- C. Provide one angle for each 4-inch thickness of masonry, long leg set vertically. Refer to lintel schedule on structural drawings for lintel size and thickness.

## 2.08 SHELF ANGLES:

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6-inches from ends and 24-inches o.c., unless otherwise indicated.
  - 1. Provide mitered and welded units at corners.
  - 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2-inches larger than expansion or control joint.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

- C. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.09 LOOSE BEARING AND LEVELING PLATES:

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

2.10 STEEL WELD PLATES AND ANGLES:

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

2.11 MISCELLANEOUS STEEL TRIM:

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
  - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

2.12 METAL LADDERS:

- A. General:
  - 1. Comply with ANSI A14.3, unless otherwise indicated.
  - 2. Support each ladder at top and bottom and not more than 60-inches o.c. with welded or bolted brackets, made from same metal as ladder.
  - 3. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
  - 4. Roof Ladder:
    - a. Basis of Design: Alaco Ladder Co., Model 564 Parapet Return with Crossover platform; or approved equal.
      - i) Material: 6061-Td aluminum alloy.
      - ii) Rungs: 1-1/8-inch (29 mm) round, serrated.



iii)Wall Brackets: 3/8-inch (9.5 mm) thick.

iv)Platform: Provide 4-inch (102 mm) high toe boards..

## 2.13 FLOOR HATCHES:

### 1. Frames and covers:

- a. Interior floor doors, frames and covers shall be fabricated from aluminum materials.
- b. Aluminum floor hatches/floor doors, covers and frames shall be extruded aluminum with built-in neoprene cushion and connectors bolted or welded to the exterior.
- c. Door leaf shall be aluminum checkered plate reinforced with aluminum stiffeners as required.
- d. Hinges shall be heavy bronze or stainless steel pintle hinges, compression spring operators enclosed in telescopic tubes, with positive snap latch with turn handles.
- e. The doors shall open to 90 degrees and lock automatically in that position.
- f. A vinyl grip handle shall be provided to release and close the cover with one hand. A removable key wrench shall be provided.
- g. Doors shall be built to withstand a minimum live load of 300 pounds per square foot and be equipped with a snap lock and removable wrench lift handle.
- h. Hardware shall be cadmium plated or stainless steel and factory finish shall be a prime coat of red oxide applied to steel doors and frames, or aluminum mill finish with bituminous coating shall be applied to the exterior of the aluminum frames or stainless steel for corrosive or explosive atmosphere areas.
- i. Hatches shall be fabricated in accordance with the details shown on the drawings. Hatch covers and frames shall be manufactured by Bilco Co., New Haven, Connecticut; Inryco/Milnor, Lima, Ohio; U.S.F. Fabrication, Hialeah, Florida; or an approved equal.
- j. Hatches shall be equipped with a channel and drain type frame to prevent penetration of raw water into the system.
- k. The manufacturers shall guarantee against defects in material or

workmanship for a period of five years from date of Owner's acceptance.

1. Fall through prevention system consisting of hinged aluminum safety grate provided for all access hatches. Hinged grating shall be secured and seat to access hatches as per manufacturer's specifications. Grating shall be factory painted in accordance with Section 09900 with an OSHA safety orange or safety yellow finish.

#### 2.14 METAL BOLLARDS:

- A. Fabricate metal bollards from Schedule 40 steel pipe.
  1. Finish: Galvanized with shop applied primer in accordance with finish specifications below.
  2. Tops: Provide flat steel plate welded tops.
- B. Fabricate bollards with 3/8-inch-thick steel baseplates for bolting to concrete slab. Drill baseplates at all 4 corners for 3/4-inch anchor bolts.
  1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.

#### 2.15 ABRASIVE METAL NOSINGS:

- A. Cast-Metal Units: Cast gray iron, Class 20 with an integral abrasive finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in sizes and configurations indicated and in lengths necessary to accurately fit openings or conditions.
- B. Drill for mechanical anchors and countersink. Locate not more than 4-inches from ends and not more than 12-inches o.c., evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by manufacturer.
- C. Apply bituminous paint to concealed bottoms, sides, and edges of cast-metal units set into concrete.
- D. Basis of Design: Wooster Products, Spectra Safety Treads, Type WP2J; or approved equal.
  1. Size: 2-inch wide by 3/8-inch thick.

#### 2.16 FINISHES, GENERAL:

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Finish metal fabrications after assembly.

## 2.17 STEEL PRIMERS AND FINISHES:

- A. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
  - 1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Urethane Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 2. Interiors (SSPC Zone 1A): SSPC-SP 7, "Brush Off Blast Cleaning." 3. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be field welded, embedded in concrete or masonry, unless otherwise indicated. Extend priming of partially embedded members to a depth of 2-inches.
  - 3. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
  - 4. Comply with SSPC-PA 2, "Measurement of Dry Coating Thickness with Magnetic Gages."
- B. Zinc-Rich Primer: Urethane zinc rich primer compatible with topcoat Specified in Section 09900 – PAINTING. Provide primer with a VOC content of 340 g/L (2.8 lb./gal.) or less per VOC and HAPs COMPLIANT STANDARDS PER 2007 standards when calculated according to 40 CFR 59, Subpart D (EPA Method 24). Provide Tnemec Series 254 Primerprime at 3.0 mils DFT or approved equal by DuPont or Caboline.
- C. Hot-Dip Galvanizing: For steel exposed to the elements, weather or corrosive environments and other steel indicated to be galvanized, provide coating for iron and steel fabrications applied by the hot-dip process. Comply with ASTM A 123 for fabricated products and ASTM A 153 for hardware. Provide thickness of galvanizing specified in referenced standards. The galvanizing bath shall contain high grade zinc and other earthly materials. Fill vent holes and grind smooth after galvanizing.
- D. Hot-Dip Galvanizing And Factory-Applied Primer for Steel: Provide hot-dip galvanizing and factory-applied prime coat, certified OTC/VOC compliant less than 2.8 lbs/gal. and conforming to EPA and State requirements. Apply primer within 12 hours after galvanizing at the galvanizer's plant in a controlled environment meeting applicable environmental regulations and as recommended by the primer coating manufacturer. Blast cleaning of the surface is unacceptable for surface preparation. Primer shall have a minimum two year coat window for

application of finish coat. Coatings must meet or exceed the following performance criteria:

1. Fire proofing adhesion: ASTM E736
2. Adhesion: ASTM D 4541 5 mm crosshatch 1150 psi.
3. Humidity Resistance: ASTM D 4585, 5000 hours
4. Salt Spray (Fog): ASTM B 117, 10,000 hours

#### 2.18 STAINLESS-STEEL FINISHES:

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. Bright, Directional Satin Finish: No. 4.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces physically and chemically clean.

### PART 3 - EXECUTION

#### 3.01 GALVANIZING:

- A. Hot-Dip Galvanizing:
  1. Provide a coating for iron and steel fabrication applied by the hot-dip process. The galvanizing bath shall contain 0.05-0.09% nickel. Immediately before galvanizing, the steel shall be immersed in a bath of zinc ammonium chloride. The use of the wet kettle process is prohibited. Comply with ASTM A-123 for fabricated products and ASTM A-153 for hardware. Provide thickness of galvanizing specified in referenced standards. Provide coating by Duncan galvanizing or approved equal.
- B. Factory-Applied Primer Over Hot-Dip Galvanizing:
  1. Provide a factory-applied polyamide epoxy coating primer, 2.0 mils dry film thickness minimum. Apply primer within 12 hours after galvanizing at the galvanizer's plant in a controlled environment meeting applicable environmental regulations or mechanically abrade to create a uniform surface profile of 1.0 – 2.0 mils, and as recommended by coating manufacturer. Provide primer coating by Duncan Galvanizing, Thnemec Co. or approved equal.

C. Factory – Or Field-Applied Architectural Finish Over Primer And Hot-Dip Galvanizing:

1. Provide a factory- or field-applied polyurethane color coating, 2.5 mils dry film thickness minimum. Apply coating at the galvanizer's plant or coating shop, immediately after application of the prime coat, in a controlled environment meeting applicable regulations, and as recommended by the coating manufacturer. Provide finish coating by Duncan Galvanizing, Tnemec Co. or approved equal.

D. Items noted as "color galvanized" shall have an architecturally compatible factory finish formulated to be applied over galvanized members, suitable for use in harsh environments, and applied by the galvanizer at the factory or coating shop.

E. The Contractor shall be responsible for determining if any fabricated items are not suitable to be hot-dip galvanized and shall notify the Engineer in writing.

F. Surfaces of metal to be galvanized shall be free from all dirt, grease, rust and moisture. Burrs and sharp projections shall be removed from edges, holes, etc., before galvanizing. Fabricated items shall be galvanized after fabrication.

3.02 WELDING OF STEEL:

Welding of steel shall be done in accordance with the AWS Code. Welds shall be continuous along entire line of contact, except where plug or tack welding is noted. Exposed welds shall be ground smooth.

3.03 WELDING OF ALUMINUM:

Welding of aluminum shall be done in accordance with the AWS "Welding Aluminum" as reprinted from the Welding Handbook. Aluminum shall be fusion welded by the inert gas-shielded-arc method. Where appearance is not a factor and anodizing is not required, alloy 4043 rods may be used. For appearance match, rods shall be of an alloy similar to the alloy being welded.

3.04 FABRICATION AND ERECTION:

A. Metalwork shall be complete, with all necessary bolts, nuts, washers, anchors, plates, fastenings, and other fittings. To the extent possible, holes for attachment of blocking, clip angles, etc. shall be shop punched. Where shop punching is impracticable, holes shall be field drilled. Burned holes will not be permitted.

B. Material shall be straight, accurately fabricated with joints neatly framed, square, and well-riveted, bolted, or welded.

- C. Metalwork to receive hardware shall have all cutouts and attachments accurately made using the hardware itself or templates where necessary.
- D. Metalwork shall be accurately set and secured in position, with lines plumb and level and surfaces flush and square, or as otherwise required to conform to the structure as shown on the drawings.
- E. Wherever possible, all metalwork shall be built into the masonry work and shall have sufficient anchors, well- fastened. Anchors shall be welded to steelwork and shall be staggered where attached to structural shapes. Metal- work impracticable to set before masonry is built shall be anchored to it with approved expansion bolts set in solid masonry units or in concrete.
- F. Miscellaneous metalwork shall be plainly marked to indicate its location in the structure.

### 3.05 ALUMINUM WORK PROTECTION:

- A. Aluminum surfaces, which after erection are to be in contact with wood or treated wood, shall be given a heavy brush coat of aluminum-pigmented bituminous paint or two (2) coats of aluminum metal and masonry paint.
- B. Aluminum surfaces, which after erection are to be in contact with masonry or concrete, shall be given a heavy brush coat of alkali-resistant bituminous paint.
- C. Aluminum surfaces which after erection are to be in contact with dissimilar metals, other than zinc or stainless steel, shall receive a heavy brush coat of zinc chromate primer, followed by two (2) coats of aluminum metal and masonry paint, or shall receive a heavy brush coat of alkali-resistant bituminous paint.
- D. Aluminum surfaces which are to be exposed to the weather, including anodized surfaces, shall receive two sprayed-on shop coats of water-white methacrylate lacquer, capable of withstanding the action of lime mortar for at least one week in an atmosphere of 100 percent humidity at room temperature. Surfaces shall be perfectly clean and dry before lacquering.
- E. Prior to the application of any of the above coatings, any and all areas where the paint has been damaged by abrasion or other cause shall be cleaned and repainted as required by the Engineer so that the aluminum will have a complete protective paint film when brought into contact with the material against which it is being protected.
- F. Before application of any coating, the surface shall be cleaned of all dirt, heavy deposits of grease or oil, and other foreign substances such as paint, lacquer, tape,

moisture, or other material, which might interfere with the adhesion of the coating to be applied. Aluminum shall be left in a clean condition. Cleaning methods shall employ steam, mild soaps, mild detergents, or solvents such as kerosene, or naphtha. Lacquered surfaces may be cleaned with a mineral solvent or turpentine. Thorough rinsing with clean water and drying with clean, soft cloths shall follow any of the above cleaning methods. No other cleaning method may be used without the specific permission of the Engineer.

- G. After suitable cleaning, all aluminum work shall be given an approved shop coating of methacrylate lacquer to protect the surface from stain. The protective coating of lacquer on all aluminum work worn off due to handling or erection shall be replaced by a new coating of lacquer of the same type.
- H. During construction, precautions shall be taken to prevent damage to the aluminum work from splashing or the accumulation of paint, concrete, mortar, or other similar materials, or from staining adjacent surfaces during cleaning operations. Any staining or damage that does occur shall be immediately and completely removed.
- I. Each piece of aluminum in transit and in storage shall be individually wrapped with a non-scratching material, with the joints securely sealed. Wrapping shall completely cover and protect each item. Storage shall be out of the weather, protected from moisture and with adequate ventilation around each piece of aluminum.

### 3.06 PAINTING:

- A. Ferrous metals of this section, except for galvanized or stainless steel shall be shop primed in accordance with the following:
  1. Submerged service components shall be sandblasted clean in accordance with SSPC-SP-10, Near White, immediately prior to priming.
  2. Non-submerged service components shall be sandblasted clean in accordance with SSPC-SP-6, Commercial Grade, immediately prior to priming.
  3. Shop primer, except as otherwise noted, shall be one spray applied coat with dry film thickness of 3.5 to 4.5 mils of Tnemec 66 Boston Gray Primer by Tnemec Co.; or Aquapun by PPG, Inc; or approved equal.
  4. Portions of ferrous metals to be embedded in concrete or masonry shall be given a heavy brush coat of alkali resistant bituminous paint.
  5. Scratches or abrasions in the shop coat and areas at field welds, bolts, nuts and other unpainted areas shall be touched up after erection with the paint specified for the shop coat. Cold galvanized paint shall be used for touch-up of galvanized surfaces. Paint shall be one of the following; Sealube Co.,

ZRC; Galvicon Corp., Galvicon; Stanley Chemical Div., Zinc Shield; Duncan Galvanizing Corp., ZIRP; or an approved equal.

6. Shop and field prime paint systems shall be compatible with finish coat.

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 5\05500 Misc Metals FINAL.docx

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY



SECTION 05519

METAL GRATING STAIR, GRATINGS AND RAILINGS

**PART 1 - GENERAL**

1.01 SUMMARY

- A. Furnish and install:
  - 1. Prefabricated exterior pre-engineered hot-dipped galvanized steel stairs with intermediate landing construction, complete with all supporting members, guards and railings.
  - 2. Exterior gratings, railings and guardrails.
- B. Furnish the following items for installation under related sections:
  - 1. Anchors, bolts, inserts, and sleeves, required to attach stair, grating and rail components to structural steel, miscellaneous metals, concrete and other assemblies provided under other Sections.
- C. Perform post-erection touch-up of shop prime coat, using the same material as shop-prime coating.

1.02 RELATED REQUIREMENTS

- A. Section 03300 - CAST-IN-PLACE CONCRETE
- B. Section 05120 - STRUCTURAL STEEL
- C. Section 05500 - MISCELLANEOUS METALS
- D. Section 07400 - MINERAL FIBER CEMENT SIDING
- E. Section 09900 - PAINTING

1.03 REFERENCES

- A. Referenced Standards: Comply with applicable requirements of the following standards and those others referenced in this Section. The standards referenced herein are included to establish recognized minimum quality only. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. Equivalent quality and testing standards will be acceptable, subject to their timely submission, review and acceptance by the Engineer.
  - 1. ASTM A 283 - Carbon Steel Plates, Shapes, and Bars.
  - 2. ASTM A 307 - Carbon Steel Externally Threaded Standard Fasteners.
  - 3. ASTM A 500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.

4. ASTM A 53 - Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe.
5. AISC - Code of Standard Practice for Steel Buildings and Bridges.
6. AISC - Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings.
7. AISI - Referenced standards.
8. AWS - Standard Code for Arc and Gas Welding in Building Construction.
9. NAAMM, applicable publications.

#### 1.04 SUBMITTALS

A. Submit the following under provisions of Section 01330 - SUBMITTALS:

1. Literature: Manufacturer's complete product data and specifications for all prefabricated items, shop primer paints, liquid zinc coating, and hydraulic cements, to be furnished hereunder.
2. Shop drawings:
  - a. Include large scale details of stairs, intermediate landings, railings, and guards bearing registration stamp of a Professional Structural Engineer registered in State of Connecticut.
  - b. Indicate on the shop drawings all erection marks for various places of miscellaneous metals, and ensure that the actual field pieces bear corresponding marks.
3. Provide calculations for loading and stresses for metal stairs, landings, railings and guards bearing the Professional Structural Engineer's seal. Show how design load requirements and other performance requirements as required under the applicable Sections of the current Connecticut Building Code.
4. Quality standards sample. Fabricate a sample showing a typical handrail section demonstrating component connections. Sample section shall be minimum 18 inches in horizontal length and 12 inches in height and include a corner post. Provide a shop primed finish.
  - a. Accepted sample will be used to establish the quality standard for handrail and guardrail fabrication and workmanship.

B. Closeout Submittals: Submit the following under provisions of Section 01770 – PROJECT CLOSEOUT.

1. Special Inspections: Submit prior to request for Certificate of Occupancy, to both Engineer and local Building Official having jurisdiction, the following:
  - a. All certifications, reports and programs as required under the applicable Sections of the current Connecticut Building Code for work engineered by Subcontractor's Professional Engineer under the requirements of this Section.

## 1.05 QUALITY ASSURANCE

- A. General: Notify the Engineer where conflicts apply between referenced standards and existing materials, and existing methods of construction.
  - 1. Galvanizer's tagging: The galvanizer shall mark all lots of material with a clearly visible stamp or tag indicating the name of the galvanizer, the weight of the zinc coating, and the applicable ASTM Specification Numbers.
- B. Qualifications:
  - 1. Welders: Utilize only qualified welders employed on the Work. Submit verification that Welder's are AWS D1.1 and D1.4 qualified within the previous 12 months.
- C. Engineering: Provide the services of a Professional Structural Engineer, registered in the State of Connecticut to design and certify that the work of this section meets or exceeds the performance requirements specified in this section and as required under the applicable Sections of the current Connecticut Building Code.
  - 1. Prepare Shop Drawings for stairs, handrails, guardrails and handrail brackets under direct supervision of a same Engineer experienced in design of this work.

## 1.06 COORDINATION

- A. Be responsible for establishing locations and levels for all work of this Section, except such parts as may be delivered to others and set by them. In such cases assist them in properly locating said parts.

## 1.07 DELIVERY, STORAGE AND HANDLING

- A. All materials under this Section shall be carefully prepared for delivery, and handled and stored under cover in a manner to prevent defacement, deformation, or other damage to the materials and to shop finishes, and to prevent the accumulation of foreign matter on the metal work. All such work shall be repaired and cleaned prior to erection.
- B. Delivery and Acceptance Requirements:
  - 1. Do not order or deliver any materials until all submittals, required in the listed Specification Sections included as part of this Section, have been received and approved by the Engineer.
- C. Storage and Handling Requirements:
  - 1. Handle and store materials under cover in a manner to prevent defacement, deformation, or other damage to the materials and to shop finishes, and to prevent the accumulation of foreign matter on the metal work. All such work shall be repaired and cleaned prior to erection.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS, GENERAL**

- A. All materials shall be new stock, free from defects impairing strength, durability or appearance, and of best commercial quality for each intended purpose. Unless specifically called for otherwise, work shall be fabricated from the following:
  - 1. Steel shapes, plates and bars: ASTM Designation A 36.
  - 2. Steel pipe: ASTM A53, grade A, seamless pipe, black finish unless otherwise noted.
  - 3. Structural steel tubing, square and rectangular shapes; ASTM A500, Grade B.
  - 4. Steel bars and bar-size shapes: ASTM A306, grade 65, or ASTM A36.
- B. Metal surfaces, general: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.
- C. Provide all fasteners and attachments of the same material and finish as the metal to which it is applied unless otherwise noted. Provide all fasteners and attachments for work specified herein and as indicated on the Drawings.
- D. Welding rods: AWS E70XX grade, or select in accordance with AWS specifications for the metal alloy to be welded and in accordance with the recommendation of the welding rod manufacturer.

### **2.02 ACCESSORIES**

- A. Grout: Ready mixed, non-metallic high-strength controlled expansion grout of flowable consistency, conforming to ASTM C 1107 with minimum compressive strength of 8,000 pounds per square inch (55.2 MPa) at 28 days.
  - 1. Products which may be considered as equal include the following, or approved equal:
    - a. Five Star Products, Inc., Fairfield CT, product "Five Star Grout."
    - b. L&M Construction Chemicals, Omaha NE, Product: "Crystex."
    - c. Master Builders, Cleveland, OH (BASF), product "Masterflow 713".
    - d. Sika Corporation, Lyndhurst, NJ., product "SikaGrout 212".
    - e. ChemMasters, Madison, OH., product "Conset".
    - f. Allied Building Products Corp. product "Sonogrout 10K".
- B. Metal paste filler: 2 component epoxy, high strength, structural adhesive putty:
  - 1. Abatron, Inc. Gilberts IL, product: "Ferrobond-P".

2. Dynatron/Bondo Corp., Atlanta, GA, product: "Bondo Plastic Filler".
- C. Primer for non-galvanized steel surfaces, modified alkyd rust-inhibitive, high solids primer, equal to the following:
  1. Rust-Oleum: 1069 Heavy Duty Rust Inhibitive Red Primer.
  2. Sherwin Williams: Kem Flash Primer HS, Red Oxide E61R706.
  3. Tnemec: 10-99 Red Primer.
  4. California Paints: Prime Line® Primer.

### 2.03 FABRICATION - GENERAL

- A. Metal surfaces shall be clean and free from mill scale, flake, rust and rust pitting; well formed and finished to shape and size, true to details with straight, sharp lines, and angles and smooth surfaces. Curved work shall be to true radii. Exposed sheared edges shall be eased.
- B. Shop fabricate items wherever practicable, accurately fitting all parts and making all joints tight. Do not fabricate materials until all specified submittals have been submitted to, and approved by, the Engineer.
- C. Do all cutting, punching, drilling, and tapping required for attachment of anchor bolts and other hardware and for attachment of work by other trades.
- D. Grind all edges of bars and plates completely free from nicks and machine marks, prior to shop priming.
- E. Weld all permanent connections, make all welds in a continuous manner; tack-weld only where specifically indicated on the Drawings. Grind all exposed-to-view welds completely smooth and flush to the surface plane of the base metals.
- F. Use screws and bolts only where welding cannot be performed, of sufficient size to ensure against loosening from normal usage of miscellaneous metal items furnished hereunder.
  1. Countersink all screw heads and bolt heads as far as practicable. Use not less than two screws, bolts, or other anchorage items, at each connection point.
  2. Draw up all threaded connections tightly, after buttering them with pipe joint compound, to exclude water.
- G. Carefully coordinate the installation of metal fabrications with the work of trades responsible for the installation of interfacing work, and for the installation of work into the various assemblies furnished hereunder, and permit the installation of the related materials to be made at the appropriate times.
- H. Fit and assemble metal fabrications in largest practical sections for delivery to site, ready for installation.

## 2.04 FABRICATION – STAIRS AND RAILINGS

- A. Refer to the Drawings for location and details of steel stairs and handrails to be furnished and installed hereunder.
  - 1. Verify heights shown in Drawings comply with referenced codes and regulations.
- B. Stair and railing performance requirements; conform to all requirements of those codes and regulations referenced hereunder.
  - 1. Stairs and Gratings: Design, fabricate and install stairs to safely support a minimum live load of 150 pounds per square foot and a concentrated load of 300 pounds on any area of four square inches as required under the applicable Sections of the current Connecticut Building Code.
  - 2. Railings: Design, fabricate and install all railings in a manner which will ensure the railings will be capable of withstanding loads as follows and as required under the applicable Sections of the current Connecticut Building Code.
    - a. Resist a load of 50 pounds per linear foot (0.73 kN/m) applied in any direction at the top and to transfer load through railing supports to structure.
    - b. Resist a single concentrated load of 250 pounds (0.89kN) applied in any direction at any point along the top, and to transfer load through railing supports to structure. Concentrated loading requirements are not concurrent with other loading requirements.
    - c. Intermediate rails, balusters and panel fillers shall resist a horizontally applied load of 50 pounds (0.89 kN) on an area equal to 1 square foot (.093m<sup>2</sup>), including openings and space between rails. Reactions due to this loading are not required to be superimposed with loadings specified for top rail.
- C. Sizes of all headers, stringers, and other structural members; and gauges and configurations of all riser/tread and landing plates and pans, handrails, stringers, and posts shall be as indicated on the approved shop drawings, and in accordance with the standards of the National Association of Architectural Metal Manufacturers.

## 2.05 SHOP APPLIED COATINGS

- A. Thoroughly clean all steel of all loose mill scale by power wire brushing or sandblasting. Remove all rust, dirt, weld flux, weld spatter, and other foreign matter by wire-brushing or scraping (power wire-brushing, if necessary). Grind smooth any sharp projections.
- B. Shop apply specified primers thoroughly and evenly on the surfaces and worked into the joints and other open areas on the surfaces. Surfaces inaccessible after assembly shall be given two coats. Dry film thickness of primer shall be not less than 2.4 mils per coat.

- C. Hot-Dip Galvanizing:
1. Provide coating for iron and steel fabrications applied by the hot-dip process. Comply with ASTM A 123 for fabricated products and ASTM A 153 for bolts, nuts, washers, and other rough hardware. Provide thickness of galvanizing specified in referenced standards.
    - a. Wherever possible, perform galvanizing after assembly of items.
    - b. Galvanized items shall be straightened to remove all warpage and distortion caused by the galvanization process.
    - c. Touch-up all breaks on hot-dip surfaces caused by cutting, welding, drilling or undue abrasion with liquid zinc coating as specified herein above. Apply liquid zinc by brush or spray on all damaged areas in two coats to a total dry film thickness of not less than 3 mils. Apply first coat within two hours after damage to hot-dip film to prevent undue oxidation of exposed surface. On all welds remove weld spatter by power wire brushing or equivalent before applying liquid zinc coating. Repair material should extend at least 3 inches beyond all edges of the damaged galvanized area as possible to assure continuity of galvanic protection.
    - d. Touch-up of galvanized surfaces with aerosol spray, silver paint, bright paint, white paint, or aluminum paints is not acceptable.
  2. Liquid zinc coating, for touch-up of welds, scratches, and abrasions in galvanized steel: Low VOC organic zinc-rich coating containing 92% metallic zinc, by weight in the dry film (ASTM D520, Type III) and conforming to SSPC Paint 20, Type II, Level I. Liquid zinc coating shall be recognized under the Component Program of Underwriter's Laboratories, Inc. as an equivalent to hot-dip galvanizing; conforming to MIL P 21035B and SSPC Paint 29, Type II, Level I, for repair of hot-dip galvanizing and meeting the requirements for Zinc-Rich Paints.
    - a. VOC limit: not more than 250 g/L.

### **PART 3 - EXECUTION**

#### **3.01 ERECTION**

- A. Accurately set all work to established lines and elevations, and rigidly fasten in place with suitable attachments to the construction of the building. At the completion of the work, check all work, re-adjust, and leave in perfect condition. Grind all exposed to view welds smooth to the touch.
- B. Construct and install stairs, ratings, guards and handrails in strict accordance with the details, the approved shop drawings, and requirements of all codes, laws, and ordinances bearing on the work.
  1. Pipe rails set in exposed concrete surfaces shall be grouted with expanding grout. Hole to receive pipe shall be formed with galvanized sheet metal sleeve and provide at least 1/2 inch clearance around entire perimeter. Hold expanding grout

back 1/2 inch from finish surface and fill void with Portland cement grout to match color and texture of adjacent surface.

### 3.02 FIELD WELDING

- A. Field weld components indicated on Shop Drawings in accordance with AWS D1.1.
- B. Immediately after welding, touch-up welds, burned areas and damaged surface coatings.
  - 1. Thoroughly remove all spatter by power wire-brushing (or if inaccessible, wire brushing) per SSPC, surface preparation specification SP2 or SP3. Allow surface to cool to ambient temperature. Clean surface with solvent wipe to remove oils, grease and dirt in accordance with SSPC surface preparation specification SP1.
  - 2. Touch-up all welded areas using the same coatings as specified under the Article titled Shop Applied Finishes.

### 3.03 FIELD BOLTING

- A. Accurately drive all bolts into holes, protecting the bolt heads so as not to damage the thread during the driving. Ensure that bolt heads and nuts rest squarely against the metal. Where structural members have sloping flange faces, provide approved beveled washers at the bolted connections to afford square seating for bolt heads or nuts. Nick bolt threads for unfinished bolts to prevent the nuts from backing off.

### 3.04 INSTALLATION OF STAIRS AND GRATINGS

- A. Preparation:
  - 1. Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
  - 2. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
  - 3. Perform cutting, drilling, and fitting required for installing metal stairs.
- B. Stair Installation: Construct and install stairs in strict accordance with the details, the approved shop drawings, and requirements of all codes, laws, and ordinances bearing on the work. Additionally comply with manufacturer's instructions for prefabricated stair systems, as applicable. Set stair units accurately in location, alignment, and elevation, measured from established lines and levels and free from distortion or defects.
  - 1. Fit exposed connections accurately together to form hairline joints.
  - 2. Weld stair framing to steel structure or to cast-in-placed weld plates, unless otherwise indicated on Drawings.
  - 3. Weld connections that cannot be shop welded because of shipping size limitations.
    - a. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.



4. General requirements for field welding: As specified herein above, and the following additional requirements:
    - a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
    - b. Obtain fusion without undercut or overlap.
    - c. Remove welding flux immediately.
    - d. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
  5. Stair installation tolerances:
    - a. Maximum Variation from Plumb: 1/4 inch (6 mm) for full height of stair.
    - b. Maximum Variation from Level: 1/8 inch (3 mm) in 10 feet (3000 mm).
    - c. Maximum Angular Variation of the Tread from True Position: 3 degrees.
- C. Grouted baseplates (as applicable):
1. Clean cementitious bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of baseplates.
  2. Set steel stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
    - a. Use nonmetallic, non-shrink grout, unless otherwise indicated.
    - b. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

### 3.05 INSTALLATION OF RAILINGS

- A. Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loading. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:
1. Anchor posts to steel with steel flanges, angle type or floor type as required by conditions, welded to posts and bolted to steel supporting members.
  2. Anchor rail ends into concrete and masonry with round steel flanges welded to rail ends and anchored into wall construction with lead expansion shields and bolts.
  3. Anchor rail ends to steel with round flanges welded to rail ends and bolted to structural steel members, unless otherwise indicated.
  4. Install removable railing sections where indicated in slip-fit metal sockets cast into concrete. Accurately locate sockets to match post spacing.
- B. Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1-1/2 inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated, or if not indicated, at spacing required to support

structural loads. Secure rails to walls with wall brackets, wall return fittings and anchor plates, in a manner required to meet code requirements, and as follows:

1. Each bracket shall be fastened with not less than 2 bolts.
2. For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.
3. For hollow masonry anchorage, use toggle bolts having square heads.
4. For steel framed gypsum board assemblies, fasten brackets directly to steel framing or concealed anchors to steel reinforcing plate, using bolts of size and type required to support structural loads.
5. For wood stud partitions, use lag bolts set into wood blocking or backing between studs. Coordinate with stud installations for accurate location of blocking or backing members.

### 3.06 TOUCH-UP

- A. Touch-up all scratches, abrasions, and other surface damaged on shop-primed or painted metals, using the same coatings as specified under shop applied finishes, herein above.

### 3.07 SCHEDULES

- A. General: Items listed hereinbelow provide further description of those already indicated in the Drawings. This list does not represent a complete list of miscellaneous metal components or types required to complete the Work.
  1. Carefully review all Drawings and furnish and install metal fabrications required by the various trades, whether or not specifically listed herein, such as miscellaneous clip angles, miscellaneous steel bracketing, and other miscellaneous metal items as indicated on the Drawings, reasonably implied therefrom, or reasonably necessary for the thorough completion of the work.
- B. Steel grating stair and related support components, as detailed on the Drawings and specified herein above, hot-dip galvanized.
- C. Exterior railings: 1-1/4 inch (I.D.) steel pipe as detailed on the Drawings. Fabricated assemblies shall be hot-dipped galvanized.
  1. Pipe railings: To prevent unnecessary damage to the galvanized coating by field welding, provide slip-fit method of connecting pipe railings. Fabricate pipe railing from mechanical steel tubing internally vented with holes 3/4 the size of the pipe's internal diameter.

END OF SECTION

SECTION 06100

ROUGH CARPENTRY

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This Section covers tools, equipment, labor, and materials necessary to perform rough carpentry work complete and miscellaneous carpentry items not specified elsewhere including fasteners and supports.
- B. Nails, screws, bolts, anchors, brackets, and other hardware for fastening and securing items provided under this section of the specification shall be furnished under this section.
- C. Vented Nailable insulated roof deck assembly. Shown on drawings as the "Vented roof panel w/ nailbase sheathing". Metal roofing by Section 07620, STANDING SEAM METAL ROOF.

1.02 RELATED WORK:

- A. Section 02252, SUPPORT OF EXCAVATION
- B. Section 04200, MASONRY
- C. Section 05500, MISCELLANEOUS METALS
- D. Section 06112, PREFABRICATED WOOD TRUSSES
- E. Section 06200, FINISH CARPENTRY
- F. Section 07460, MINERAL FIBER CEMENT SIDING
- G. Section 07620, STANDING SEAM METAL ROOF
- H. Section 08110, HOLLOW METAL DOORS AND FRAMES
- I. Section 09200, DRYWALL SYSTEM
- J. Section 09900, PAINTING
- K. Division 16, ELECTRICAL

1.03 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Three sets of certificates of wood treatment upon delivery of treated wood product. Treated wood product shall bear appropriate American Wood Preservers Bureau (AWPB) quality mark.

1.04 DELIVERY:

Lumber, plywood, and other wood material shall be delivered to the job dry, and shall be protected from injury, dirt, dampness, and extreme changes of temperature and humidity at all times.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. LUMBER:

1. The grades of all materials under this section shall be defined by the rules of the recognized associations of lumber manufacturers producing the material specified, but the maximum defects and blemishes permissible in any specified grades shall not exceed the limitations of the American Lumber Standards.
2. Lumber shall bear the grade and trademark of the association under whose rules it is produced, and a mark of mill identification. Lumber shall be of sound stock, thoroughly seasoned, and dried to a moisture content not exceeding 15 percent.
3. Exposed surfaces of wood which are to be painted shall be free from defects or blemishes that will show after the second coat of paint is applied.
4. All lumber for rafters, furring, and blocking shall be seasoned No. 1 Dimension of Common pine, fir, or spruce, S4S. As approved by the Engineer blocking may also be built up with 3/4" ACX plywood, glued and screwed to the required thicknesses.
5. Framing Lumber for joists, rafters, plates, headers, stair stringers and carriages, and sleepers shall be Hem-Fir #1 with the following minimum properties:

$$E = 1.5 \times 10^6 \text{ PSI}$$

$$\text{Density} = 0.01736 \text{ lb/in.}^3$$

$$F_b = 1400 \text{ PSI}$$

$$F_v = 75 \text{ PSI}$$

$$F_c = 1050 \text{ PSI}$$

$$F_t = 800 \text{ PSI}$$

6. Studding shall be 2- inch x 4- inch Western or Eastern Species, Construction Grade, or KD Stud Grade Southern Yellow Pine or studgrade Spruce-pine-fir. Where two

or more studs are nailed together, such assemblies may be No. 2 or Better Grade Southern Yellow Pine and stud grade Southern Yellow Pine.

7. Roof Sheathing shall be 5/8- inch thick B-D exterior grade plywood.
8. Wall Sheathing shall be 3/4- inch thick B-D exterior grade plywood.
9. Soffits shall be 5/8- inch thick medium density overlay plywood with exterior glue.
10. Materials not specifically listed shall be of an accepted grade dictated by good practice.

**B. PRESSURE PRESERVATIVE TREATED WOOD:**

1. The nailers, blocking, sills, and similar items encased in or in contact with concrete, masonry, or the ground shall be pressure preservative treated.
2. Chemical Manufacturer: Subject to compliance with the requirements specified herein. Products which may be incorporated in the work include:
  - a. Osmose, Inc., Griffin GA, product "Nature Wood".
  - b. Universal Forest Products, Inc., Grand Rapids MI, product "ProWood ACQ".
  - c. Viance, LLC., Charlotte NC, product "Preserve".
3. Treatment: Ammoniacal Copper Quaternary Compound (ACQ), arsenic-free and chromium-free chemical "ACQ Preservative" in accordance with AWPA Standards. Apply the preservative in a closed cylinder by pressure process in accordance with AWPA standard C15.
  - a. Minimum preservative retention for floor plates, framing, lumber and plywood above ground use: 0.25 pounds per cubic foot (4.0 kg/m<sup>3</sup>) of ACQ chemical, in accordance with AWPA UC1, UC2, UC3A, UC3B, or NER-643 as appropriate.
  - b. Minimum preservative retention for framing, lumber and plywood in contact with water, ground, concrete, and masonry: 0.40 pounds per cubic foot (6.4 kg/m<sup>3</sup>) of ACQ chemical, in accordance with AWPA, UC4A, UC4B, UC4C, or NER-643 as appropriate.
  - c. Minimum preservative retention for framing, lumber and plywood in permanent wood foundations: 0.60 pounds per cubic foot (9.6 kg/m<sup>3</sup>) of ACQ chemical, in accordance with AWPA UC4B, or NER-642.
4. Fixation of Chemical: Treated wood shall not be shipped from treatment plant until fixation of the preservative has occurred in the wood.

**C. WOOD FIRE RETARDANT TREATMENT:**

1. Exposed wood blocking and sheathing shall receive fire-retardant treatment conforming to American Wood Preservers Association, AWPAC Standard C20 for lumber and AWPAC C27 for plywood.
2. Fire retardant treated lumber shall bear UL label and shall have UL Fire-Hazard Classification "FR-S", when tested in accordance with ASTM E84.
3. Material to receive interior grade fire-retardant treatment shall be pressure impregnated with "Dricol" fire-retardant chemicals manufactured by Hickson Corporation, Atlanta, Georgia, in accordance with manufacturer's instructions.

Material to receive interior grade fire retardant treatment shall be as indicated, specified, and as otherwise required by applicable local codes and standards.

2.02 NAILABLE COMPOSITE INSULATED PANELS (Shown on drawings as the "vented roof panel w/ nail-base sheathing". Metal roofing by Section 07620, STANDING SEAM METAL ROOF.

- A. Vented Nailable Composite Insulation: Provide polyisocyanurate foam core insulation panels with a vent space and nailable wood fiber composite board surface that is acceptable to the roofing manufacturer for its warranties.

1. Provide panels consisting of an polyisocyanurate foam core bonded to oriented strand board (OSB) top layer and a fiber reinforced facer sheet on the bottom layer complying with ASTM C1289, Class 1 type V panel.

- a. Nailable face: APA Rated Sheathing OSB, 7/16 inch thick having a minimum span rating of 24/16, touch-sanded OSB.
- b. Air Space: 3/4 inches with two direction air flow.
- c. Core: closed cell polyisocyanurate foam having a nominal compressive strength of 20 PSI (38 kPa) and a density of 2.0 pounds per cubic foot (32 kg/m<sup>3</sup>).
- d. Bottom face: black glass fiber-reinforced felt facing sheet.
- e. Panel Size: 4 by 8 feet.
- f. Total Panel thickness: As indicated on Drawings (R-30 minimum).

2. Acceptable products:

- a. Atlas Roofing Corporation, Meridan MS, product "ACFoam Vented-R".
- b. Cornell Corporation, Cornell WI, product "Vent-Top ThermaCal 1".
- c. Hunter Panels, Portland ME, product "Cool-Vent"
- d. Rmax, Inc., Dallas TX, product "Vented Nailable Base".

PART 3 - EXECUTION

3.01 CONSTRUCTION:

- A. Work shall be erected plumb, true and square.
- B. Coordinate delivery and erection of prefabricated components. Field applied items shall be installed in accordance with good trade practices. Cutting and carpentry for other trades shall be performed. Cut ends of lumber previously treated with preservative specified shall be brushcoated with the same material.
- C. Except as otherwise indicated on the design drawings, fasteners for roof nailers and for other wood members used as nailers or anchorage material shall be the equivalent of 1/2-inch diameter bolts at 2'-6" o.c. for 2-inch material, and 3/8-inch diameter bolts at 2'-0" o.c. for 1-inch material. Wood members in general shall be fastened to masonry with masonry nails, power-driven fasteners, or bolts in expansion shields, except where otherwise indicated.
- D. Minimum length of nails shall be twice the thickness of wood being fastened.
- E. Furring, blocking, nailers, and similar items shall be provided wherever required for the support, proper erection, fastening, or installation of carpentry or other materials, and as shown on the drawings.
- F. Roofs require wood nailing strips and/or curbs at eaves, edges, walls, roof openings, etc., for proper securing of metal flanges. Nailers and/or curbs must be securely and firmly attached to the adjacent deck or concrete.
- G. Nailers that serve as insulation vents shall have 1/2-inch vent hole openings 18-inches on center before installation. If wood nailers with vent holes are installed before the vapor barrier, then the vapor barrier shall not cover the holes when installed.
- H. Roof Sheathing shall be installed with face grain across rafters except where otherwise noted. Nail at 6 inches o.c. along panel edges and 12- inches o.c. at intermediate supports with 6d common nail or approved nailing system. Temporary wood planking, sized to provide safe walking areas and protection against rough usage in construction, shall be placed over sheathing during construction operations. Where wheeling of building material is necessary, special provision shall be made to protect sheathing. Make necessary allowance for expansion of sheathing at roof edges as required by the A.P.A.

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 6\06100 Rough Carpentry FINAL.docx

SECTION 06112

PREFABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section of the specification covers design, furnishing of materials, fabrication, delivery and installation of the prefabricated wood trusses, including furnishing and installing all miscellaneous parts required to complete the truss system, such as bridging (temporary and permanent), bracing, connectors, anchors, metal hangers, and any other items necessary to the complete installation.

1.02 SYSTEM DESCRIPTION:

A. DESIGN CRITERIA:

1. Allowable deflection:  $L/240$
2. Ground snow load: 40 lbs./s.f. before adjustment for configuration.
3. Top chord dead load: 10 lbs./s.f.
4. Bottom chord dead load: 12 lbs./s.f., 40 psf at catwalk
5. Bottom chord live load: 40 lbs./s.f. at catwalk
6. Wind pressure or suction: 21 lbs./s.f. acting perpendicular to the plane of the roof.

1.03 RELATED WORK:

- A. Section 06100, ROUGH CARPENTRY
- B. Section 04200, MASONRY

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Submit computations or certification of design stamped by a professional engineer registered in the state where the project is located, for record only.



B Submit complete truss shop and erection drawings to Engineer for review, containing the following data:

1. Design and fabrication data.
  2. Connector: gauge, sizes of connectors, and name of manufacturer.
  3. Lumber specifications.
  4. Pitch, span and spacing of trusses.
  5. Design loadings and allowable unit stress increase, if any.
  6. Size and location of all connector plates.
  7. Truss supports and anchorage details.
  8. Camber, if any.
  9. Permanent bracing and bridging.
  10. Handling and erection instructions.
- C. Three sets of certificate of wood treatment upon delivery of treated wood product. Treated wood product shall bear appropriate American Wood Preservers Bureau (AWPB) quality mark.
- D. Do not order materials or begin fabrication or installation until the Engineer has authorized it.

PART 2 - PRODUCTS

2.01 LUMBER:

- A. All lumber used for truss members shall conform to the published stress ratings for the species and grades as set out in the official grading rules of the appropriate lumber associations or as listed in the referenced specifications.
- B. The moisture content of all lumber shall be within the proper limits, as stated in the reference specifications, but shall not in any case, exceed 15% nor be less than 7% at the time of the fabrication. All lumbars to be kiln dried.
- C. All lumber shall conform to the specified and fully recognized nominal sizes shown on truss engineering designs. All members shall be cut from lumber which bears the proper grade-mark stamp of a recognized grading association or licensed lumber inspection

agency. No lumber shall be used which does not conform to the proper dimensions and grades.

D. WOOD FIRE RETARDANT TREATMENT:

1. Exposed wood trusses shall receive fire-retardant treatment conforming to American Wood Preservers Association, AWPAC Standard C20 for lumber.
2. Fire retardant treated lumber shall bear UL label and shall have UL Fire-Hazard Classification "FR-S", when tested in accordance with ASTM E84.
3. Material to receive interior grade fire-retardant treatment shall be pressure impregnated with "Dricon" fire-retardant chemicals manufactured by Hickson Corporation, Atlanta, Georgia, in accordance with manufacturer's instructions.
  - a. Material to receive interior grade fire retardant treatment shall be as indicated, specified, and as required by State Building Code.

2.02 CONNECTORS:

- A. All truss connector plates shall be manufactured from prime commercial quality galvanized sheet steel of no less than 18 gauge thickness. The corrosion resistant coating shall be 1.25 oz. per sq. ft. commercial class hot dipped galvanized.
- B. The connector plates shall be manufactured so as to have a series of nail-like projections and each projection shall have essentially parallel sides throughout its length, with no offsets, and the end shall be shaped to a blunt point or a wedge. The length of each nail-like projection shall be not less than five times the dimensions of its greater width and the projection shall be formed in a manner which permits it to separate rather than to cut wood fibers, in accordance with accepted nailing techniques.
- C. Each plate shall bear the stamped name of its manufacturer, which shall be the same as the company furnishing the approved truss engineering designs. Where field connections of truss sub-assemblies are necessary, special nail-on splice plates are acceptable, provided the plate sizes and positions are shown on the truss engineering designs as approved by a professional engineer.

2.03 FABRICATION:

- A. All trusses and other roof structural components shall be fabricated in a properly equipped manufacturing facility of a permanent nature. They shall be manufactured by experienced workmen, using precision cutting and truss fabricating equipment, under the direct supervision of a qualified foreman. All trusses shall be fabricated under strict rules of inspection and quality control, as the local code may require, open to inspection by the Engineer at all times.

- B. All truss members shall be accurately cut to length, angle and true to line to assure tight joints for the finished truss.
- C. All truss members and connector plates shall be accurately placed in special jigs and the members tightly clamped in place; remaining in that position until the connector plates have been pressed into the lumber simultaneously on both sides of the joints.
- D. No open joints which depend on the stiffness of the metal connector plate to transmit stresses, nor improperly fitting points will be permitted.
- E. Camber shall be built into the trusses, as noted on the engineering truss designs, by properly positioning the members in the fabrication jig.
- F. Each truss shall be permanently stamped with the name and address of the truss fabricator.

### PART 3 - EXECUTION

#### 3.01 HANDLING AND ERECTION:

- A. Fabricated trusses and sub-assemblies shall be handled with care so that they are not subject to damage. If the trusses are to be stockpiled or stored prior to erection, they shall be set in a vertical position, resting on temporary bearing supports and braces so that they will not be subjected to unusual bending or to being tipped over.
- B. During erection, care shall be exercised to keep horizontal bending of the trusses at a minimum.
- C. Proper erection bracing shall be installed to hold the trusses true and plumb and in a safe condition until permanent truss bracing and bridging can be solidly nailed in place to form a structurally sound roof framing system. All erection and permanent bracing shall be installed and all components permanently fastened before the application of any loads, except the weight of the erectors.
- D. Field erection of the trusses shall include proper handling, safety precautions, temporary bracing, and any other safeguard or procedures consistent with good workmanship and good building erection practices.
- E. Framing anchors and/or truss hangers shall be provided by the contractor as shown on the engineering design drawings and erection drawings.
- F. During the entire construction period provision shall be made for adequate distribution of concentrated loads so that the carrying capacity of any one truss or other component is not exceeded.

3.02 ANCHORAGE:

- A. An anchorage system to provide hold-down capability for the trusses at the roof edge shall be installed along the walls of the building. This may be via either TECO "Ty-Down, Junior" clips, Simpson H1 or H2.5 "Hurricane Anchors" or approved equal.

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 6\06112 Prefabricated Wood Trusses-REV 1.docx

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 06200

FINISH CARPENTRY

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This section of the specification covers furnishing tools, equipment, labor and materials necessary to perform finish carpentry work (exterior and interior) complete, and miscellaneous carpentry items not specified elsewhere including fasteners and supports.
- B. Metal fasteners, plates, brackets, and accessories connected directly into woodwork shall be a part of this section of the specification. Nails, screws, bolts, anchors, brackets, and other similar hardware for fastening and securing woodwork and other items provided under this section of the specification shall be furnished under this section.

1.02 RELATED WORK:

- A. Section 04200, MASONRY
- B. Section 06100, ROUGH CARPENTRY
- C. Section 07460, MINERAL FIBER-CEMENT SIDING
- D. Section 08100, METAL DOORS AND FRAMES
- E. Section 08520, PREFABRICATED ALUMINUM WINDOWS
- F. Section 08710, DOOR HARDWARE
- G. Section 09900, PAINTING

1.03 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Three sets of samples of paneling shall be submitted to the Engineer for selection of finishes and colors.
- B. Three sets of certificates of wood treatment upon delivery of treated wood product. Treated wood product shall bear appropriate American Wood Preservers Bureau (AWPB) quality mark.

- C. Coordinate submittals with 01330 – SUBMITTALS regarding electronic submissions for review.

1.04 DELIVERY AND STORAGE:

Finish carpentry material shall be delivered to the job dry, and shall be protected from injury, dirt, dampness and extreme changes of temperature and humidity at all times. Doors, trim, and other prefinished material shall be completely wrapped as required to prevent injury during shipment and storage. Finish materials shall not be delivered until the building is heated and all masonry and other "wet" work has been completed and allowed to become thoroughly dry.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. The grades of all materials under this section shall be defined by the rules of the recognized associations of lumber manufacturers producing the material specified, but the maximum defects and blemishes permissible in any specified grades shall not exceed the limitations of the American Lumber Standards. Materials not specifically listed shall be of an accepted grade dictated by good practice.
- B. Lumber shall bear the grade and trademark of the association under whose rules it is produced, and a mark of mill identification. Finished woodwork shall be of sound stock, thoroughly seasoned, kiln dried to a moisture content not exceeding 12 percent.
- C. Finish carpentry and millwork, in general, shall comply with the following sections, as applicable, of the Architectural Woodwork Quality Standards, Guide Specifications and Quality Certification Program as published by the Architectural Woodwork Institutes for Material and Work of "Custom Grade":

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

Section 100	Lumber
Section 200	Plywood
Section 300	Trim
Section 400B	Architectural Cabinets (Laminate Clad)
Section 400C	Architectural Cabinets (Tops)
Section 600	Shelving

- D. Wood trim shall be solid stock, in commercial long lengths.
- E. Exposed surfaces of wood which are to be painted shall be free from defects or blemishes that will show after the second coat of paint is applied. Interior trim to be painted, including shelving, shall be B Select or better white pine. White pine shall include northern white pine, western white pine, and sugar pine.
- G. WOOD FIRE RETARDANT TREATMENT:

1. Exposed wood trim and sheathing shall receive fire-retardant treatment conforming to American Wood Preservers Association, AWPAC Standard C20 for lumber and AWPAC C27 for plywood.
2. Fire retardant treated lumber shall bear UL label and shall have UL Fire-Hazard Classification "FR-S", when tested in accordance with ASTM E84.
3. Material to receive interior grade fire-retardant treatment shall be pressure impregnated with "Dricon" fire-retardant chemicals manufactured by Hickson Corporation, Atlanta, Georgia, in accordance with manufacturer's instructions.
  - a. Material to receive interior grade fire retardant treatment shall be as indicated, specified, and as required by State Building Code.

2.02 - not used -

### PART 3 - EXECUTION

#### 3.01 CONSTRUCTION:

- A. Work shall be erected plumb, true and square. Finish work shall be accurately mitered or butted to meet in straight hairline joints, in accordance with the best commercial practice.
- B. All exterior wood trim shall be fully back primed prior to installation. Prime cut edges after installation and prior to application of additional wood members.
- C. Finish nails shall be used on all exposed trim. Galvanized or stainless-steel nails shall be used on all exterior finish work.
- D. Minimum length of nails shall be twice the thickness of wood being fastened. Nail heads in finished work shall be sunk neatly with a nail set and the resulting hole filled with putty. Fasteners in items such as mouldings shall be concealed.
- E. Exposed surfaces of woodwork shall be machine sanded to an even, smooth surface, free of defects, blemishes, machine or tool marks, abrasions, dirt, smudges, or raised grain. Adequate protection shall be provided as necessary to prevent damage or staining of carpentry items.
- F. Woodwork abutting masonry or other finish materials shall be scribed and fitted as tightly to abutting material as is possible without damage. Where sealant joints are indicated, joint width shall be nominally 3/8" unless otherwise noted.

END OF SECTION

SECTION 07210

BUILDING INSULATION

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This section of the specification covers rigid insulation and batt type insulation, including incidental foamed-in-place insulation and other required accessories.
- B. Insulation for the following is excluded from this Section: Masonry cavity and metal rain screen panel rigid wall insulation, Roof, duct, electrical items, equipment, joint at top of partition, and pipe.

1.02 RELATED WORK:

- A. Section 04200, MASONRY
- B. Section 06100, ROUGH CARPENTRY
- C. Section 06112, WOOD TRUSSES
- D. Section 07620, STANDING SEAM METAL ROOF
- E. Section 09200, DRYWALL SYSTEM

1.03 REFERENCES:

The following standards form a part of this specification, as referenced:

American Society for Testing and Materials (ASTM)

ASTM C177 Thermal Conductivity of Materials by Means of the Guarded Hot Plate

ASTM E84 Surface Burning Characteristics of Building Materials

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Provide shop drawings of the materials specified herein shall be submitted to the Engineer for review.

1.05 DELIVERY, STORAGE, AND HANDLING:



Insulation materials shall be stored off the ground in a dry space protected from the weather. Materials shall be delivered to the job in the manufacturer's original containers, bearing the manufacturer's label identifying contents.

## PART 2 - PRODUCTS

### 2.01 RIGID INSULATION:

- A. Insulation shall be Dow Chemical Company's "Styrofoam Type SM", or approved equal, and shall be supplied in boards of full thickness required; multiple layers of thinner boards will not be acceptable.
- B. Thickness of rigid insulation shall be that which will produce a minimum thermal resistance, "R" value, of  $5.5 \text{ h} \times \text{ft}^2 \times \text{°F/Btu}$  as determined in accordance with ASTM C 177, at an average mean temperature of 75 degrees Fahrenheit.
- C. Adhesive for rigid insulation shall be compatible with materials with which it will be in contact. Adhesive shall be subject to the approval of the Engineer. Adhesive shall be that recommended by the manufacturer of the insulation, such as Armstrong Cork Company No. 536 adhesive or "Daxcel Foamstik NoD", manufactured by Dacar Chemical Company.
- D. Protection board shall be 1/2 inch thick Celotex or Homasote asphalt-impregnated cane fiber sheathing board, or as otherwise indicated on the Drawings.
- E. Accessory foamed-in-place insulation as needed to close gaps, block thermal bridging and create water stops within existing wall cavities shall be low-expansion, closed-cell type, compatible with adjacent rigid insulation and other surfaces.

### 2.02 THERMAL BATT INSULATION:

- A. Blanket or batt-type insulation shall be Owens-Corning "Fiberglas Commercial Wall Insulation" unfaced blankets, or approved equal, with a thermal conductance, "C" value, not exceeding  $0.064 \text{ Btu/h} \times \text{ft}^2 \times \text{°F}$ . Insulation shall have a flame-spread and smoke-developed rating of twenty-five or less, as measured by ASTM E84.
- B. Insulation adhesive shall be Benjamin Foster "Block-Fas 82-70" or "Kold-Fas 82-08"; H.B. Fuller "BC 680" or "BC 688"; or U. S. Gypsum Co. "Durabond 200" or "Durabond 300".
- C. Rigid fiberglass supporting insulation shall be Owens-Corning "Commercial Use Board" VRF facing with white finish, or approved equal.

## PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL:

- A. Installation shall be in accordance with the insulation manufacturer's instructions except as modified herein and on the drawings.
- B. Work which involves adhesives shall be done in dry weather and when the temperature is above 40 degrees Fahrenheit, and in accordance with manufacturer's instructions.
- C. Surfaces to receive insulation shall be clean and dry.
- D. Form release and curing compounds which might interfere with adherence of adhesive shall be removed from concrete surfaces.
- E. In general, building insulation is shown schematically or omitted on the drawings, for clarity in presenting other features of construction. The entire exterior face of the building shall be blanketed with insulation, including pilasters, beams, columns, and soffits. Insulation shall be cut to form a snug fit, filling the entire space and leaving no voids.

3.02 RIGID INSULATION INSTALLATION:

- A. Rigid insulation shall be installed around the perimeter of building, where slab is on grade, except as otherwise noted on the drawings.
- B. Vertical perimeter insulation shall be secured with adhesive to the inner face of the foundation wall as shown on the drawings. Boards with one face asphalt coated shall be applied with the opposite face against the wall. Sufficient adhesive shall be used to secure insulation firmly in correct position until backfilling is completed. Protection board to cover perimeter insulation on vertical surfaces shall be adhered to the insulation with sufficient adhesive to hold it in position until the backfill is placed.
- C. Vertical insulation shall extend from bottom of floor slab down inner face of foundation wall to 24 inches below finish grade (at outer face of wall).
- D. Horizontal insulation beneath floor slab shall be placed only after subgrade has been accurately leveled and is smooth. Horizontal insulation will not require protection board.
- E. Horizontal perimeter insulation shall extend from inner face of vertical insulation to 24 inches from the inner face of the insulation.

END OF SECTION

SECTION 07215

SPRAYED-ON INSULATION

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. Work under this section consists of furnishing all labor, materials and equipment necessary for and incidental to the complete and proper installation of sprayed-on insulation, as shown on the drawings or specified herein.
- B. Material and installation shall conform to the applicable building code requirements, and the requirements of authorities having jurisdiction.

1.02 RELATED WORK:

Section 04200, MASONRY

Section 06100, ROUGH CARPENTRY

Section 07210, BUILDING INSULATION

Section 07920, JOINT PROTECTION

Section 09200, DRYWALL SYSTEM

1.03 QUALITY ASSURANCE:

Sprayed-on insulation work shall be performed by a firm having experience in the installation of materials similar to those specified herein on projects comparable to this project.

1.04 REFERENCES:

The following standards form a part of these specifications, and indicate the minimum standards required:

American Society for Testing and Materials (ASTM)

ASTM	E84	Test Method for Surface Burning Characteristics of Building Materials.
ASTM	E136	Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Provide manufacturers data describing the product and application techniques, including the thermal insulating value and durability of the finished application.

1.06 DELIVERY, STORAGE AND HANDLING:

- A. Materials shall be delivered to the project site in the manufacturer's unopened packages.
- B. Materials shall be stored indoors, above ground in a dry location protected from the weather.
- C. Damaged packages found unsuitable for use shall be rejected and removed from the job site.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. The sprayed-on insulation shall be asbestos free HEAT-SHIELD products as supplied by Isolatak International, or approved equal.
- B. Insulation materials shall be free of vermiculite and certified asbestos-free.

2.02 PRODUCT REQUIREMENTS:

- A. The sprayed insulation shall have a fire hazard classification in accordance with ASTM E-84, exhibiting the following characteristics:

Flame Spread.....	0
Smoke Developed.....	10

PART 3 - EXECUTION

3.01 SURFACE PREPARATION:

- A. All surfaces to receive sprayed-on insulation shall be thoroughly cleaned so that they are free of mill scale, dirt, grime, oil, grease, loose rust or other material which would impair proper bonding.
- B. Any required cleaning shall be accomplished just prior to the application of sprayed-on insulation.

3.02 AREA PREPARATION:

- A. Provide all necessary measures for protection of the general public and for prevention of air pollution. Enclose exterior openings at areas where spray application is in progress.
- B. Provide masking, drop cloths or other satisfactory coverings for all materials which are not to receive insulation so as to prevent damage from overspray.

3.03 PROJECT/SITE CONDITIONS:

- A. Sprayed-on insulation shall not be installed when ambient or surface temperatures may fall below 40°F (4°C) or rise above 155°F (68°C) during the application or drying processes.
- B. If necessary for job progress, provide enclosures with heat to maintain temperatures.
- C. Provide natural ventilation to properly dry the sprayed on insulation during and subsequent to its application.

3.04 APPLICATION:

- A. Equipment, mixing and applications shall be in accordance with the written application instructions.
- B. Insulation shall be applied to a thickness of 3/4 inch, minimum, to achieve an R value of 2.7.

3.05 CLEANING:

After completion of insulation work in an area, equipment shall be removed and walls, floors, ceiling and other surfaces not to be sprayed shall be cleaned of all deposits of insulation materials.

END OF SECTION

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 07271  
MODIFIED BITUMINOUS SHEET AIR BARRIERS

PART 1 – GENERAL

1.01 SUMMARY:

- A. The work of this Section consists of air and vapor membrane system where shown on the Drawings, as specified herein, and as required for a complete and proper installation. The Work of this Section may also be referred to as “AVB” on the Contract Drawings. Work includes, but is not limited to the following.
- B. Furnish and install the following:
  - 1. Self-adhesive elastomeric sheet membrane air and vapor barrier system, including specified sheet membrane, required primers and adhesives where shown on Drawing and as otherwise required.

1.02 RELATED REQUIREMENTS:

- A. Section 06100 – ROUGH CARPENTRY
- B. Section 06200 – FINISH CARPENTRY
- C. Section 07210 - THERMAL INSULATION
- D. Section 07215 – SPRAYED-ON INSULATION
- E. Section 07460 – MINERAL FIBER CEMENT SIDING
- F. Section 07920 - JOINT SEALANTS

1.03 REFERENCES:

- A. Referenced Standards: Comply with applicable requirements of the following standards and those others referenced in this Section. The standards referenced herein are included to establish recognized minimum quality only. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. Equivalent quality and testing standards will be acceptable, subject to their timely submission, review and acceptance by the Engineer.
  - 1. ASTM E 96 - Test Methods for Water Vapor Transmission of Materials.
  - 2. ASTM D 570 - Test Method for Water Absorption of Plastics.
  - 3. ASTM E 154 - Test Method for Water Vapor Retarders used in contact with Earth Under Concrete Slabs, on Walls or as Ground Cover.

4. ASTM D 1004 - Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
5. ASTM D 1938 - Test Method for Tear Propagation Resistance of Plastic Film and Thin Sheeting by a Single-Tear Method.
6. ASTM D 1876 - Test Method for Peel Resistance of Adhesives.
7. ASTM D 1970 - Standard Specifications for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
8. ASTM D 412 - Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers – Tension.
9. ICC ES (ICC Evaluation Service) AC48 – Acceptance Criteria for Roof Underlayment for Use in Severe Climate Areas.

#### 1.04 ADMINISTRATIVE REQUIREMENTS:

##### A. Coordination:

1. General: Coordinate the work of this Section with the respective trades responsible for installing interfacing and adjoining work for proper sequence of installation, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.

#### 1.05 SUBMITTALS:

##### A. Information and Review Submittals. Submit the following under provisions of Section 01330 - SUBMITTALS.

1. Product Data: Manufacturer's product data sheets, specifications, performance data, physical properties.
  - a. Include certification of data indicating Volatile Organic Compound (VOC) content of all components of waterproofing system.
2. Shop Drawings: Developed for specific project conditions including mock-up, submittal of manufacturer's standard details are prohibited.
  - a. Show the locations and extent of air and vapor barrier system including details of typical conditions including:
    - 1) Intersections with other envelope systems and materials.
    - 2) Membrane counter-flashings.
    - 3) Bridging of gaps.
    - 4) Penetrations through barrier including conduits, pipes and similar items.

3. Verification Samples:
    - a. Self-adhered air and vapor barrier membrane.
    - b. Through-wall flashing membrane.
    - c. Transition membrane.
  4. Test and Evaluation Reports:
    - a. Provide an Evaluation Report as the manufacturer's documentation confirming material has been evaluated and conforms to the requirements of the ASTM E2176 Standard for Air Barrier Materials.
    - b. Provide dew point analysis of exterior wall assembly and field testing of mockup for static air, pressure air, static water, and bond/adhesion in compliance with applicable ASTM standards.
  5. Manufacturer's Instructions:
    - a. Installation Instructions: indicate preparation, installation requirements and techniques, joint and crack treatment and application temperature range, product storage and handling criteria and limitations of the material.
  6. Special Procedure Submittals:
    - a. Written statement, signed by the air barrier applicator, stating that the Contract Drawings have been completely reviewed with an agent of the air barrier and vapor barrier system manufacturer; accompanied by a written statement from the manufacturer that the selected air barrier and vapor barrier system is proper, compatible, and adequate for the application shown.
      - 1) Manufacturer's review shall include recommendations for detailed conditions and specific application requirements for project. Copies shall be sent to Engineer, Owner, General Contractor and application sub-contractor.
    - b. The applicator will notify the Engineer and Owner in writing that the existing conditions when exposed are in conflict with the Contract Documents for the proper application of the selected air barrier and vapor barrier system or the warranty requirements.
  7. Qualification Submittals:
    - a. Submit proof of License of the Contractor by ABAA (Air Barrier Association of America, Inc.) at the time of bidding and prior to commencing the work
- B. Closeout Submittals: Submit the following under provisions of Section 01770 – PROJECT CLOSEOUT.
1. Bonds and Warranty Documentation:
    - a. Manufacturer's Warranties and Guarantees as specified elsewhere herein this Section.



1.06 QUALITY ASSURANCE:

- A. General: Notify the Engineer where conflicts apply between referenced standards and existing materials, and existing methods of construction.
- B. Sole Source: Obtain products required for the Work of this Section from a single manufacturer, or from manufacturers recommended by the prime manufacturer of air barrier system.
- C. Qualifications:
  - 1. Installer/Applicator: Minimum of 3 years documented experience demonstrating previously successful work of the type specified herein, and approved by product manufacturer.
- D. Manufacturer's Installation Review: Make arrangements to have manufacturer's representative (employed by manufacturer) on-site during work of this Section to periodically review installation procedures. A minimum of 2 site visits are required.

1.07 MOCK-UPS:

- A. Provide mock-up areas using air and vapor membrane system, minimum 20 square feet, demonstrating the minimum standard for the Work.
- B. Locate mock-ups where directed and include all materials which are part of the air and vapor membrane system. Incorporate as part of the mock-up area, substrate, window frame, attachment of insulation, and showing air and vapor barrier membrane application details.
- C. Allow 24 hours for inspection of mock-up by Engineer. before proceeding with air/vapor barrier work. Accepted mock-ups may remain as part of the work; the number of mock-ups shall not be restricted.

1.08 DELIVERY, STORAGE AND HANDLING:

- A. Delivery and Acceptance Requirements:
  - 1. Do not deliver items to the site, until all specified submittals have been submitted to, and approved by, the Engineer.
  - 2. Deliver and store waterproofing materials in new, sealed, containers showing manufacturer's identification, year of production, net weight, date of packaging, and location of packaging.
- B. Storage and Handling Requirements:
  - 1. Store and handle materials following manufacturer's recommended procedures, and in accordance with material safety data sheets.
    - a. Protect primers, mastic and adhesives from high heat, flames or sparks.

2. Store all materials in an elevated, dry location, protected by waterproof coverings. Following manufacturer's recommended storage procedures for humidity and temperature conditions, protect materials from freezing.

1.09 SITE CONDITIONS:

- A. Maintain ambient temperature above 30 degrees Fahrenheit for 24 hours before, during, and after installation until liquid or mastic accessories have cured.

1.10 WARRANTY:

- A. General: Submit warranties under provisions of Section 017700 – PROJECT CLOSEOUT.
- B. Manufacturer Warranty:
  1. Provide 5 year Manufacturer's product warranty which shall include replacement of defective materials.
    - a. Warranty shall include provisions for coverage of the following: Membrane will bridge ruptures caused by cracking of the immediate substrate up to 1/16 inch width.
- C. Special Warranty:
  1. Provide 2 year Applicator's warranty or bond which shall include removal and replacement of defective materials, and repairs or replacement of Owner's materials and products damaged due to failure of air and vapor barrier installation to resist water or moisture penetration.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
  1. Henry Company, Inc., Huntington Park, CA. (Henry)
  2. Carlisle Coatings & Waterproofing Inc., Wylie, TX. (Carlisle)
  3. W.R. Grace & Co., Construction Products Division, Cambridge MA. (Grace)
  4. Tremco, Inc., Beachwood OH. (Tremco)

2.02 DESCRIPTION:

- A. Regulatory Requirements: Comply with the 2018 State of CT Building Code.

2.03 PERFORMANCE/DESIGN CRITERIA

- A. General: The air barrier shall have the following characteristics:

1. It must be continuous, with all joints made airtight.
2. It shall have an air permeability not to exceed 0.004 cfm/ft<sup>2</sup> under a pressure differential of 0.3 in. water. (1.57 psf.) (equal to 0.02 L/s/m<sup>2</sup> @ 75 Pa.) when tested in accordance with ASTM E2178-01.
3. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
4. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Transition connections shall be made between the following:
  - a. Foundation and walls.
  - b. Walls and windows or doors.
  - c. Different wall systems.
  - d. Wall and roof.
  - e. Wall and roof over unconditioned space.
  - f. Walls, floor and roof across construction, control and expansion joints.
  - g. Walls, floors and roof to utility, pipe and duct penetrations.
5. All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made airtight.

#### 2.04 MATERIALS:

- A. Sheet membrane: Prefabricated composite sheet 0.9 mm (36 mils) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (4 mils) of cross-laminated, high-density polyethylene film to provide a minimum 1 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed.
  1. Performance Requirements:
    - a. Water Vapor Transmission: ASTM E 96, Method B - 2.9 ng/m<sup>2</sup>sPa (0.05 perms) maximum.
    - b. Water Absorption: ASTM D 570 - Max. 0.1% by weight.
    - c. Puncture Resistance: ASTM E 154 - 178 N (40 lbs.).
    - d. Tear Resistance:
      - 1) Initiation: ASTM D 1004 - min. 58 N (7.0 lbs.) M.D.
      - 2) Propagation: ASTM D 1938 - min. 40 N (4.0 lbs.) M.D.
    - e. Lap Adhesion at -4 degrees C (25 degrees F): ASTM D 1876 - 880 N/m (5.0 lbs./in.) of width.

- f. Low Temperature Flexibility: ASTM D 1970 - Unaffected to -43 degrees C (-45 degrees F).
- g. Tensile Strength: ASTM D 412, Die C Modified, Min. 2.7 MPa (400 psi).
- h. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D 412 - Die C - Min. 200%.
2. Acceptable products:
- Henry product: "Blueskin SA".
  - Carlisle product: "CCW-705 Vapor/Air Barrier System".
  - Grace product: "Perm-A-Barrier Wall Membrane (Air and Vapor Barrier)".
  - Tremco product: "ExoAir 110" or "ExoAir 110LT" (low temperature), as recommended by manufacturer for field conditions present at time of installation.
- B. Surface conditioner, liquid membrane tape, crack filler, mastics, and accessories as recommended by the sheet membrane manufacturer and comply with the following:
- Description: Latex-based, water-dispersible liquid for substrate preparation.
    - Flash Point: No flash to boiling point.
    - Solvent Type: Water.
    - VOC Content: Not to exceed 300 g/l.
    - Application Temperature: 4 degrees C (25 degrees F) and above.
    - Freeze/Thaw Stability: 5 cycles min.
    - Freezing point (as packaged): -20 degrees C (-5 degrees F).
- C. Termination Mastic: Rubberized asphalt-based mastic with 200 g/l max. VOC Content.
- Acceptable Products:
    - Grace product: "Bituthene Mastic".
    - Carlisle product: "CCW-704".
    - Henry product: "Air-Bloc 21".
    - Tremco product "ExoAir Termination Mastic".
- D. Primer: Rubber-based primer in solvent with 680 g/l max. VOC content.
- Acceptable Products:
    - Grace product: "Bituthene P-3000" Primer.
    - Carlisle product: "CCW-702" or "CCW-714" as recommended by manufacturer.
    - Henry product: "Blueskin Primer", "Aquaprime" or "Aquatek" as recommended by manufacturer.
    - Tremco product: "ExoAir 10 Primer".

## PART 3 - EXECUTION

### 3.01 EXAMINATION:

- A. Verification of Conditions: Inspect all surfaces and verify that they are in proper condition to receive the work of this Section.
  - 1. Verify items which penetrate surfaces to receive air barrier and vapor barrier are rigidly installed.
  - 2. Verify surfaces are free of cracks, depressions, waves, or projections which may be detrimental to successful installation.
  - 3. Concrete Substrates: Notify the Contractor in writing if concrete substrate requires patching of holes over 1/2 inch in diameter or length and over 1/4 inch deep, by Section 03300 - CAST-IN-PLACE CONCRETE. Do not proceed until patching is completed.
  - 4. Do not apply air barrier and vapor barrier system to damp, frozen, dirty, dusty or surfaces unacceptable to membrane manufacturer.
  - 5. Examine joints and transitions to other building materials. Verify surfaces and size of transitions are suitable for products specified herein.
  - 6. Report in writing defects in substrates which may adversely affect the performance of the air and vapor barrier.
  - 7. Beginning of installation means acceptance of existing substrate and project conditions.

### 3.02 PREPARATION:

- A. Perform all preparation work on receiving surfaces as required, including removal of fins, scaling, and projecting rough spots. Remove all dirt, oil, and other foreign matter from the concrete surfaces. Clean substrate surfaces (broom, vacuum or compressed air) to remove dust, loose stones and debris.
- B. All masonry joints shall be filled and struck flush with the face of masonry and limestone, using a 3:1 mix of sharp sand and Portland cement mixed with a one part bonding agent to five parts water, and allowed to cure.
- C. Apply primer as recommended by manufacturer at a rate of 250 to 350 square feet per gallon; Prime only the area which will be covered with membrane in a working day, areas not covered with membrane in 24 hours must be reconditioned.
- D. Prepare inside corners by installing a fillet of liquid membrane, latex modified cement mortar or epoxy mortar, extend 6 inches in all directions beyond the corner.
- E. Cracks and joints in substrate surface must be properly sealed with waterstop, joint filler and sealant as recommended by the sheet membrane waterproofing manufacturer.

### 3.03 APPLICATION:

- A. Perform the application of the sheet membrane air barrier and vapor barrier system in strict accordance with the manufacturer's installation specifications, details, and recommendations, and as specified herein.
- B. Condition and prime substrate surfaces:
  - 1. When required by dirty or dusty site conditions; by surfaces having irregular or rough texture, or if it becomes difficult to adhere the air and vapor barrier to the substrate, apply surface conditioner by spray, brush, or roller at the rate recommended by manufacturer, prior to membrane installation. Allow surface conditioner to dry completely before membrane application.
  - 2. Apply a bead or trowel coat of mastic along membrane edges, seams, cuts, and penetrations.
  - 3. Apply primer by brush or heavy nap, natural material roller at rate recommended by manufacturer prior to membrane installation. Allow primer to dry completely before membrane application.
- C. Application of Membrane:
  - 1. Precut pieces of air and vapor barrier into easily handled lengths.
  - 2. Remove silicone-coated release paper and position membrane carefully before placing length horizontally against the surface.
  - 3. Begin installation at the base of the wall placing top edge of membrane immediately below any masonry reinforcement or ties protruding from substrate.
  - 4. When properly positioned, place against surface by pressing firmly into place. Roll membrane with extension-handled countertop roller immediately after placement.
  - 5. Overlap horizontally adjacent pieces 2 inches [50 mm] and roll seams.
  - 6. Subsequent sheets of membrane applied above shall be positioned immediately below masonry reinforcement or ties. Bottom edge shall be slit to fit around reinforcing wires or ties, and membrane shall overlap the membrane sheet below by 2 inches [50 mm]. Roll firmly into place.
  - 7. Seal around masonry reinforcing or ties and all penetrations with termination mastic.
  - 8. Continue the membrane into all openings in the wall, such as doors, windows, and terminate at points that will prevent visibility from interior.
  - 9. Coordinate the installation of air and vapor barrier with roof installer to ensure continuity of membrane with rooftop air and vapor membrane.
  - 10. At end of each working day seal top edge of air and vapor barrier to substrate with termination mastic.

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

11. Do not allow the rubberized asphalt surface of the air and vapor barrier membrane to come in contact with polysulfide sealants, creosote, uncured coal tar products or EPDM.

3.04 INTERFACE WITH OTHER WORK:

- A. Coordinate the work of this Section installation of windows and door frames. Ensure air and vapor barrier transitions from windows and door frames is completed.

3.05 FIELD QUALITY CONTROL:

- A. Field inspection will be performed as specified.
  1. Fully inspect air and vapor barrier installation, including transitions, prior to enclosing. Repair punctures, damaged areas and inadequately lapped seams with a patch of the membrane sized to extend 6 inches [150 mm] in all directions from the perimeter of the affected area.
- B. Manufacturer Services: Make arrangements to have Manufacturer's representative (employed by manufacturer) on-site during work of this Section to periodically review installation procedures. A minimum of 3 site visits are required.

3.06 CLEANING:

- A. Daily clean work areas by sweeping and disposing of debris, and scraps.

3.07 PROTECTION:

- A. Protect finished work under provisions of Section 015219 - TEMPORARY FACILITIES.
- B. Do not expose air and vapor barrier membrane to sunlight for more than thirty days prior to enclosure.

END OF SECTION

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 07460  
MINERAL FIBER CEMENT SIDING

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Furnish and install:
  - 1. Factory primed and finished mineral fiber cement panelized siding.
  - 2. Factory primed and finished mineral fiber cement trim as indicated on the Drawings.
  - 3. Cellular PVC trim, moldings and panels

1.02 RELATED SECTIONS

- A. Section 06100 - ROUGH CARPENTRY: Wood blocking, framing, curbs, nailers, and backer boards.
- B. Section 06200 – FINISH CARPENTRY
- C. Section 07210 – BUILDING INSULATION
- D. Section 07271 – MODIFIED BITUMINOUS SHEET AIR BARRIERS
- E. Section 07620 – STANDING SEAM METAL ROOF
- F. Section 07621 – SHEET METAL TRIM
- G. Section 07920 – JOINT PROTECTION
- H. Section 08520 – ALUMINUM WINDOWS
- I. Section 08900 – LOUVERS AND VENTS
- J. Section 09900 – PAINTING

1.03 REFERENCES

- A. Reference Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 – REFERENCES.
  - 1. ASTM B136 - Standard Method for Measurement of Stain Resistance of Anodic Coatings on Aluminum.
  - 2. ASTM B244 - Standard Test Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments.
  - 3. ASTM C834 - Standard Specification for Latex Sealants.



4. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
5. ASTM C1186 - Standard Specification for Flat Non-Asbestos Fiber-Cement Sheets.
6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
7. ASTM D1730 - Standard Practices for Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting.
8. ASTM E96 - Test Methods for Water Vapor Transmission of Materials.
9. ASTM D1117 - Standard Guide for Evaluating Nonwoven Fabrics.
10. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
11. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure.
12. AATCC127 - Water Resistance: Hydrostatic Pressure Test

#### 1.04 SUBMITTALS

- A. Information and Review Submittals: Submit the following under provisions of Section 01330 - SUBMITTALS:
  1. Product Data: Manufacturer's data sheets on each product to be used, including:
    - a. Preparation instructions and recommendations.
    - b. Storage and handling requirements and recommendations.
    - c. Installation methods, including fastening patterns.
  2. Shop Drawings: Provide shop drawings and erection plans for review including the following:
    - a. Layout of furring, finished sheets and fastener pattern.
    - b. Details at base and top of walls, corners, at window trim and at other openings and connections.
  3. Product certificates including Research//Evaluation report or Code Authority approval of the system use for intended application.
  4. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
  5. Verification Samples: For each finish product specified, two samples, minimum size 3 inches by 6 inches (76 mm by 150 mm) square, representing actual product, color, and patterns.

#### 1.05 QUALITY ASSURANCE

- A. Discard lengths of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements, or which are of defective manufacture with respect to surfaces, sizes or patterns.

## 1.06 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver cement panels to site until job is ready for their installation.
- B. Ship and handle all materials in a manner which will prevent damage; protect edges and corners from chipping.
- C. Stack mineral fiber cement panels and trim on edge or lay flat on a smooth, level dry surface. Store sheets under cover and keep dry prior to installing.
  - 1. Store materials off the ground, flat and under cover in a dry place until erection.
  - 2. Keep materials dry and protect from freezing.
  - 3. Store materials in such a way to accommodate easy inspection of the materials prior to installation.

## 1.07 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

## 1.08 WARRANTY

- A. Furnish the following warranties under provisions of Section 01770 - CLOSEOUT SUBMITTALS:
  - 1. Provide manufacturer's 30 year transferable limited materials warranty, covering mineral fiber board panel siding and soffit panels, providing coverage for:
    - a. Damage in siding resulting from defects in material and fabrication.
    - b. Cracking, rotting, or delamination.
    - c. Damage from hail.
  - 2. Provide manufacturer's 10 year transferable limited materials warranty, covering mineral fiber board trim, providing coverage for:
    - a. Damage in siding resulting from defects in material and fabrication.
    - b. Cracking, rotting, or delamination.
    - c. Damage from hail.

## PART 2 - PRODUCTS

### 2.01 SYSTEM DESCRIPTION

- A. Performance Requirements:
  - 1. Design system to accommodate, without damage to system, components or deterioration of seals; movement within system; movement between system and perimeter framing components; dynamic loading and release of loads; and deflection of structural support framing.
  - 2. Design to accommodate vertical inter-story movement and provide an allowance for the following tolerances:

- a. Building floor slab live load differential deflection.
- b. Structural creep.
- c. Thermally induced expansion and contraction of framing members.
- d. Fabrication and erection tolerances.

## 2.02 COMPONENTS

- A. Specified Manufacturer and Product: To establish a standard of quality, design and function desired, Drawings and specifications have been based on James Hardie Building Products, Inc., Orlando, FL.
- B. Acceptable Manufacturers: Subject to compliance with the requirements specified herein and approval with specified liquid air barrier (for compatibility), manufacturers offering similar products include the following, or approved equal:
  - 1. James Hardie Building Products, Inc., Orlando, FL, product: "Hardipanel and Hardietrim".
  - 2. Nichiha USA, Inc., Norcross, GA, product "Sierra Premium Fiber Cement Panels".
  - 3. Allura USA, Houston, TX, product "Plycom and Fiber Cement"
- C. Lap Siding: Cellulose fiber-reinforced cement lap siding with smooth surface texture, factory primed and finished with acrylic paint. Equal to James Hardie Building Products, Inc., Orlando FL, product "Hardie Plank Lap Siding" shall conform to the following:
  - 1. ASTM Standard Specification C1186 Grade II, Type A.
  - 2. Weight: 2.4 pounds per square foot.
  - 3. Flexural strength:
    - a. Along direction of plank: 2300 psi (tested in accordance with ASTM C473).
    - b. Across plank: 2900 psi (tested in accordance with ASTM C473).
  - 4. Tensile strength:
    - a. Along direction of plank: 1600 psi.
    - b. Across plank: 1000 psi.
  - 5. Lap Siding size: 6 1/4" with 5" exposure x 12'-0" long x 0.312" thick
- D. Smooth Wall Panels: Cellulose fiber-reinforced cement panel siding with smooth surface texture, factory primed and finished with acrylic paint. Equal to James Hardie Building Products, Inc., Orlando FL, product "Hardie Panel Smooth Panel Siding". Panels shall conform to the following:
  - 1. ASTM Standard Specification C1186 Grade II, Type A.
  - 2. Weight: 2.3 pounds per square foot.
  - 3. Flexural strength:
    - a. Along direction of plank: 2300 psi (tested in accordance with ASTM C473).

- b. Across plank: 2900 psi (tested in accordance with ASTM C473).
    - 4. Tensile strength:
      - a. Along direction of plank: 1600 psi.
      - b. Across plank: 1000 psi.
    - 5. Panel size: 5/16 inch thick. Best size for optimizing waste of product.
  - E. Trim / Watertable / Fascia: Cellulose fiber-reinforced 4/4 cement boards with smooth finish, nominal 1 inch thick by nominal 12 foot length Equal to James Hardie Building Products, Inc., Orlando FL. Trim shall conform to the following minimum requirements:
    - 1. ASTM Standard Specification C1186 Grade II, Type A.
    - 2. Weight: 2.3 pounds per square foot.
    - 3. Flexural strength:
      - a. Along direction of plank: 2,300 psi (tested in accordance with ASTM C473).
      - b. Across plank: 2,900 psi (tested in accordance with ASTM C473).
    - 4. Tensile strength:
      - a. Along direction of plank: 1,600 psi.
      - b. Across plank: 1,000 psi.
  - F. Soffit Panels: Cellulose fiber-reinforced cement soffit panel with smooth surface texture, factory primed and finished with acrylic paint. Equal to James Hardie Building Products, Inc., Orlando FL product "HardiSoffit Panels". Panels shall conform to the following:
    - 1. ASTM Standard Specification C1186 Grade II, Type A.
    - 2. Weight: 1.98 pounds per square foot.
    - 3. Flexural strength:
      - a. Along direction of plank: 2300 psi (tested in accordance with ASTM C473).
      - b. Across plank: 2900 psi (tested in accordance with ASTM C473).
    - 4. Tensile strength:
      - a. Along direction of plank: 1600 psi.
      - b. Across plank: 1000 psi.
    - 5. Panel size: 1/4 inch thick x 12" wide x 12'-0" long

### 2.03 ACCESSORIES

- A. Fasteners: Stainless steel fastener, equal to SFS Intec LTD, product No. TW-S-D12. Color as to match material color.
- B. Permeable insect barrier: Crush resistant extruded polypropylene fluted core with integral enhanced insect screen, equal to Cor-A-Vent, Inc., Mishawaka, IN., product

No. SV-5.

- C. Reveal trim: Extruded aluminum 6063 aluminum alloy in T-5 temper with a minimum thickness of 0.050 inch, furnished in 12 foot lengths.
1. Reveal Trim Finish: Clear anodized conforming to ASTM B244 and ASTM B136.
  2. Manufacturers: Subject to compliance with the requirements specified herein manufacturers offering similar products include the following, or approved equal
    - a. Fry Reglet Architectural Metals, Santa Fe, CA
    - b. Tamlyn, Stafford, TX.
    - c. Pittcon Industries, Riverdale, MD.
- D. Cellular PVC trim, pre-formed moldings and panels
1. Expanded rigid poly vinyl chloride with a smooth cell microstructure, in profiles indicated, and complying with the following:
    - a. Density: Minimum of 0.50 g/cc per ASTM D792.
    - b. Water absorption: Less than 1 percent per ASTM D570.
    - c. Hardness: At least 50 per ASTM D240 (Shore D).
    - d. Flexural strength: At least 3,300 psi per ASTM D790.
    - e. Tensile strength: At least 2,200 psi per ASTM D638.
  2. Acceptable manufacturers include the following:
    - a. New England Specialty Lumber Inc., W. Springfield MA, product: "Nels-Tek 600".
    - b. Vycon Corporation, Moosic PA, product: "Azek".
    - c. CertainTeed Corp., Valley Forge PA, product "Restoration Millwork".
    - d. Men-Weld Corporation, Dubuque IO, product "Miratec".
    - e. Wolpac Technologies Inc., Aliquippa PA, product: "Versatex".
    - f. Fypon LLC., Maumee OH, product: "Cellular PVC Trim".
    - g/ PVC Sheets and Trim: "Celltec550" as distributed by New England Lumber Specialties, Inc., West Springfield, MA.

#### 2.04 FINISH

1. Factory Finish: Provide manufacturer's factory applied universal primer and baked-on color finish in color selected by Architect from manufacturer's full available palette of colors. Factory applied finish shall be applied in a climate-controlled environment within the fiber cement manufacturer's own facility utilizing a multi-coat, heat cured finish in one manufacturing process.
2. Each finish color must have documented color match to delta E of 0.5 or better between product lines, manufacturing lots or production runs as measured by photospectrometer and verified by a third party.
3. Field-applied paint finish at PVC surfaces and as elsewhere required for

priming of cut ends, incidental touch-up or color correction, refer to 09 90 00  
– PAINTING.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Verify adequacy of sheathing, backing and support framing for all siding work.

#### 3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

#### 3.03 INSTALLATION, GENERAL

- A. Install siding in strict accordance with Manufacturer's written instructions and as additionally specified herein. Install claddings to dry surfaces.
- B. Do not fasten mineral fiber cement boards to each other under any circumstance.
- C. Panel Cutting:
  - 1. Cut panels using a high-speed circular saw with a segmented diamond blade.
  - 2. Cut panels from the front side and protect the face from being damaged during cutting.
  - 3. For incidental cuts, cut panels from the front side using a jigsaw with a carbide tip blade.
  - 4. Provide adequate ventilation during cutting. Use of a dust extractor is recommended.
  - 5. Touch up all cut edges with manufacturer's recommended sealer or paint system.
- D. Drilling:
  - 1. Drilling of holes must be done from the front of the panel using a carbide tip drill bit.
  - 2. Holes are recommended to be done using a universal drill.
  - 3. Larger holes, or cut-outs on the panel, can be made by a jig saw with a carbide blade or a hole saw with a diamond blade.

#### 3.04 INSTALLATION, PANEL SIDING

- A. Block framing between furring where panel siding horizontal joints occur.

B. Place fasteners no closer than 3/8 inch from panel edges and 2 inch from panel corners.

C. Install panel using spacers at all joints to allow for reveal dimensions indicated on the Drawings. Leave bottom edge of panel above all horizontal trims exposed, no caulking shall be placed at this overlap of horizontal reveal trim. Factory primed edge shall always be used.

D. Allow minimum 1 inch vertical clearance between roofing and bottom edge of siding.

E. Maintain clearance between siding and adjacent finished grade as indicated on the Drawings.

F. Specific framing and fastener requirements refer to Tables 2 and 3 in National Evaluation Service Report No. NER-405.

### 3.05 INSTALLATION, - TRIM

A. Fasten through trim into furring or blocking. Fasteners must penetrate minimum 3/4 inch or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.

B. Place fasteners no closer than 3/4 inch and no further than 2 inch from side edge of trim board and no closer than 1 inch from end. Fasten maximum 16 inch on center.

C. Allow 1/8 inch gap between trim and siding. Seal gap with high quality, paintable caulk.

### 3.06 INCIDENTAL SITE FINISHING

A. Carefully set exposed nails flush with siding coating.

B. Touch-up blemished siding materials to match siding color.

### 3.07 TOLERANCES

A. Maximum variation for siding from true position of 1/8 inch in 8 feet for plumb.

### 3.08 CLEANING

A. Daily clean work areas by sweeping and disposing of scraps and sawdust.

END OF SECTION

SECTION 07620

STANDING SEAM METAL ROOF

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. Furnish and install pre-coated galvanized steel architectural roofing systems:
1. Associated integral flashings and underlayment.
  2. Integral gutters, downspouts and rain leaders.
  3. Integral fascias.
  4. Related flashings and running sheet metal work, on all non-specified locations in conjunction with the roofs.
  5. Sealants in conjunction with metal work furnished hereunder, and plastic wedges for cap flashings terminating in reglets.

1.02 RELATED WORK:

- A. Section 06100, ROUGH CARPENTRY
- B. Section 06200, FINISH CARPENTRY
- C. Section 07200, BUILDING INSULATION
- D. Section 07460, MINERAL FIBER CEMENT SIDING
- E. Section 07621, SHEET METAL TRIM

1.03 PERFORMANCE REQUIREMENTS:

- A. The installation shall be designed to safely resist the positive and negative loads as specified below:

Roof covering	+ <u>45</u> psf	- <u>20</u> psf
Roof ridges, eaves and rakes	+ <u>45</u> psf	- <u>20</u> psf
Ridge ends, eave and rake corner	+ <u>45</u> psf	- <u>20</u> psf



- B. Roof panels shall be able to support walking loads without excessive distortion or telegraphing of the structural supports. For the maximum span used on the project, panels shall withstand a 250 lb. concentrated load applied to a four square inch pad located at the center of the panel flat without buckling of the rib or noticeable permanent distortion of the panel.
- C. Roof panel and flashing attachments shall be designed to accommodate the thermal expansion and contraction of the exterior material through a 250°F temperature change.
- D. Roof panels shall carry the uniform design loads stated herein with a maximum total panel deflection of L/140 as measured in the flat of the panel.
- E. Factors of safety on design loads to ultimate strength of fasteners shall be as stated in the industry standard for the material into which the fastener is driven.

Aluminum	American Aluminum Association
Steel	American Iron and Steel Institute
Wood	National Forest Products Association

1.04 REFERENCES:

- A. The following standards from a part of these specifications:

American Society for Testing and Materials (ASTM)

ASTM A446 Structural, Physical Quality for Galvanized Steel Sheet.

ASTM A525 General Requirements for galvanized Steel Sheet.

ASTM A792 General Requirements for Aluminum-Zinc Coated Sheet.

ASTM B209 Aluminum Alloy Sheet and Plate.

ASTM D1056 Flexible Cellular Materials.

ASTM E330 Structural Performance by Air Pressure Difference.

Aluminum Association, Inc. (AA)

Specifications for Aluminum Sheet Metal work in Building Construction.

Specifications for Aluminum Structures.

Standards and Data.

American Iron and Steel Institute (AISI), Light Gauge Cold-formed Steel Design Manual.

National Forest Products Association (NFPA), National Design Standards for Stress Grade Lumber and its Fastenings.

National Roofing Contractors Association (NRCA), The NRCA Construction Details.

Sheet Metal and Air conditioning Contractors National Association (SMACNA), Architectural Sheet Metal Manual.

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

A. Submit the following in accordance with requirements of general specifications:

1. Literature: Manufacturer's data sheets for each metal type and accessories furnished hereunder, include material specifications, performance data, physical properties and finishes.
2. Certification: Provide certifications that materials and systems comply with the specified requirements for the use indicated.
3. Shop Drawings:
  - a. Fully dimensioned large scale design details showing material profiles, splices, flashing terminations and other jointing details, fastening methods and installation details. Indicate material type, sizes, and weights or gages. Indicate extent of adjacent work specified under other Sections of the Specifications.
  - b. Fully detail methods of relieving stresses due to thermal movement, including sealing of expansion seams.
  - c. All details bearing dimensions of actual measurements taken at the project.
4. Selection samples:
  - a. Finished metal sample chips, indicating Manufacturer's full range of finish colors available for selection by Engineer.
  - b. Provide additional samples as requested by Engineer to facilitate initial selection of colors and finishes.
5. Verification samples:
  - a. 12 by 12 inch samples illustrating metal finish color.

B. Submit the following under provisions of Section 01770 – Project Closeout:

1. Manufacturer's field quality control reports of field inspections, including, revised "as-built" shop drawings and manufacturer's final punchlist.
2. Manufacturer's warranties: Include coverage of materials and installation and resultant damage from failure of installation to resist penetration of moisture.

1.06 DELIVERY, STORAGE AND HANDLING:

- A. Protection shall be provided during fabrication, shipment, storage and erection. During shipment, finished surfaces shall be protected from abrasion by a removable plastic film between areas of contact. Jobsite storage shall be in a clean, dry area out of direct contact with the ground, under cover or sloped for drainage, protected from abuse by traffic and from contamination by corrosive or staining materials, or materials which may cause discoloration. Stored materials and unfinished work shall be secured against wind damage. It shall be the responsibility of the Contractor to provide walk boards in areas of heavy traffic and any other measures required to prevent damage to the roofing materials.
- B. General: Submit warranties under provisions of Section 01770 – Project Closeout.

1.07 WARRANTIES:

- A. Prior to completion of the project, submit:
  1. Panel manufacturers' 20-year warranty against structural defects or corrosion and 20-year warranty on finish durability. Warranty shall completely cover all labor and materials required to repair the roof. The warranty shall be provided by the manufacturer and installer through the Contractor.
  2. Contractor's 10-year guarantee on workmanship and leaks.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

- A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal.
  1. Berridge Manufacturing Company, Houston, Texas.
  2. Englert, Inc., Perth Amboy, NJ.
  3. MBCI, Houston TX.

- B. Specified Manufacturer: To establish a standard of quality, design and function desired. Drawings and specifications have been based on MBCI, Houston, TX, product: "SuperLok".
- C. Manufacturer shall have had at least 10 years of experience in architectural roofing and the proposed roof panel system shall have been in use for at least ten years. Manufacturer shall demonstrate past experience with examples of projects of similar type and exposure.
- D. The installer shall be authorized by the panel manufacturer, and the actual work shall be supervised by personnel trained by the manufacturer in proper application of the product. The installer shall have capability for preparation of shop details and fabrication of all flashings not furnished by the panel manufacturer.
- E. Alternate products proposed must be submitted in writing to the Engineer not less than seven (7) days prior to bid opening. The request shall include technical data on all characteristics of the proposed item and list all deviations from these specifications.

2.02 MATERIALS - PANELS AND SHEET:

- A. Panels shall be fabricated in full lengths from ridge to ridge without end laps or with end laps only as shown on the drawings. Panels shall be Model "SuperLok", 12-inches wide with concealed anchors that resist wind uplift yet permit expansion and contraction with temperature changes. Standing ribs 1-1/2 inches high shall have a continuous groove capillary break. Ribs shall be securely locked over anchor clips with a field operated roll-forming tool. Individual panels shall be removable for replacement of damaged material. Two intermediate stiffener ribs 3/8 inch high shall be located in the flat pan to minimize oil-canning and telegraphing of structural members. Panels shall be smooth prefinished 22 gage steel. Embossed panels will not be acceptable.
- B. Flashing shall be same material type and finish as the roof panel, but the temper may be reduced to facilitate forming. Minimum thickness shall be the same as the roof panel.
- C. Finish shall be Kynar 500 Fluorocarbon coating (20-year warranty) in Color to be selected by the Engineer from manufacturer's standard color range.
- D. Product Performance:
  - 1. Structural - Uniform load capacity shall be determined by testing in accord with the principles of ASTM E330 adapted to testing of formed sheet panels by additions to specific sections as follows:
    - a. Roof test specimens shall be representative of the main body of the roof, free from influence of perimeter conditions. The setup shall be continuous over one or more supports and contain at least five panel widths for standing seam roofing.

- b. No roof attachments are permitted at the sides other than the standard gable or rake condition. For uplift tests, at least one end seal shall be flexible and in no way restrain the crosswise distortion of panels. One end may simulate an eave condition if at least 12 feet away from the mid-roof clip under evaluation.
  - c. Roofing panels and accessories are to be production material of the same type and thickness proposed for use on the project.
  - d. Longitudinal seals or plastic film shall not span any crevice or cracks that may tend to separate under pressure.
2. Design capacity for conditions of gauge, span or loading other than those tested may be determined by interpolation of test results. Extrapolation outside the range of the tests is not acceptable.
  3. Weathertightness - When tested in accord with the principles of NAAM TM-1, the roof system without sealant in the ribs shall show no leakage when exposed to dynamic rain and wind velocity of 70 mph for five minutes.

2.03 MATERIALS - ACCESSORY ITEMS:

- A. Anchor clips with steel panels shall be a High Beam Clip designed to minimize wear from thermal movement. Fasteners and screws shall be installed so that no sharp edges may be in contact with roof material. Clips to allow thermal movement of roof relative to the structure throughout a temperature range of 140 degrees F.
- B. Screws holding anchor clips to plywood sheathing or wood sleepers shall be stainless cadmium plated wood screws.
- C. Exposed fasteners shall be stainless steel. For weathertightness, screws shall have separate washers with hot bonded neoprene faces, and poprivets shall be set in wet sealant. Exposed fasteners shall be a minimum #14 size screw or 3/16-inch diameter rivet.
- D. Precut foam profile closures shall be black closed-cell foam meeting specification ASTM D-1056 grade SCE-41 Black EPT. Field fabricated hip closures shall be foam PVC supported and protected from weathering by a metal channel matching the roof flashing.
- E. Sealant used with the roofing shall be applied between surfaces during assembly with a minimum amount exposed on the completed installation.
  1. Concealed sealant may be a non-curing, non-skinning butyl, polyisobutylene or polybutane tape of sufficient thickness to make full contact with both surfaces.
  2. Exposed sealant shall be a curing type with excellent weather and sunlight resistance. Color shall be as selected by the Engineer. Apply in accord with the sealant manufacturer's recommendations.

- F. Snow guards shall be manufacturer's standard, located as shown on the drawings. Each snow guard shall be attached to the panels per manufacturer recommendations in a manner able to resist 300 pounds per linear foot force parallel to the roof. Color to match roof.
- G. Underlayment shall be as recommended by the manufacturer for this product.

2.04 FABRICATION:

- A. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance. To the greatest extent applicable, fabricate sheet metal components in shop, and thoroughly clean all joints on both sides of the sheet metal work.
- B. Fabricate cleats and starter strips of same material as roofing, interlockable with sheet.
- C. Form material with standing seams.
- D. Hem exposed edges on underside 1/2 inch, miter and seam corners.
- E. Form flashings as required, or to profiles indicated on the Drawings, to protect materials from physical damage and shed water.
- F. Fabricate corners from one piece with minimum 18 inch long legs, seam for rigidity, seal with sealant.
- G. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.
- H. Fabricate flashings to allow to extend 2 inches over roofing. Return and brake edges.

2.05 FABRICATION – GUTTERS AND DOWNSPOUTS

- A. General: Gutters and downspouts shall conform to requirements of AAMA Specification 1405.1 - Specifications for Aluminum Gutters and Downspouts.
- B. Gutters: Preformed and prefinished 0.032 inch thick alloy 3005, H25 temper aluminum sheet stock having a minimum yield strength of 27,000 pounds per square inch, equal to Alcoa Building Products, Sidney OH. product "System 6," having a nominal 6 inch dimension front to back and 4 inches deep.
  - 1. End caps: 0.19 inch thick aluminum, finished to match gutters.
  - 2. Provide gutters with factory fabricated inside and outside corners.
  - 3. Expansion joint material: EDPM.

- C. Strap hangers, 0.082 inch thick aluminum, as recommended by gutter manufacturer, provided with roof aprons.
- D. Downspouts: Nominal 3 by 4 inch rectangular preformed and prefinished 0.027 inch thick alloy 3005, H25 temper aluminum sheet stock having a minimum yield strength of 27,000 pounds per square inch.
  - 1. Downspout clips: 0.14 inch thick aluminum, finished to match downspouts.
- E. Roof Aprons, same materials and finish as downspouts.
- F. Finishes:
  - 1. Aluminum gutters, downspouts, trim and any other aluminum indicated for factory applied enamel or color finish: Shop-applied polyvinylidene fluoride enamel finish system equal to PPG Industries, Product: "Duramar", applied as follows, in the selected colors.
    - a. Prime all surfaces with a corrosion resistant, epoxy-based primer compatible with finish coating, minimum 2.0 mills dry film thickness, fully oven-cured.
    - b. Provide a finish coating of polyvinylidene fluoride enamel on all exposed surfaces, including all exposed screws, fastenings, with a minimum coating of 1.0 to 1.3 mills. dry film thickness.
    - c. Provide a clear top coating of polyvinylidene fluoride enamel on all exposed surfaces, including all exposed screws, fastenings, with a minimum coating of 1.0 to 1.3 mills. dry film thickness.
    - d. Ensure that all coatings, proposed to be applied hereunder, are compatible with the receiving substrate material for each condition, thoroughly clean, and treat aluminum by chromate process.
- G. Fasteners: Stainless steel wood screws, of sizes most appropriate for the specific application, and equipped with soft neoprene washers.
- H. Precast Concrete Splash Pans.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION:

- A. Inspect roof deck to verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped to drain.

- B. Verify deck is dry and free of snow or ice. Verify joints in wood deck are solidly supported and fastened.
- C. Verify correct placement of wood nailers.
- D. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets in place.
- E. Verify roofing termination and base flashings are in place, sealed, and secure.
- F. Beginning of work shall constitute acceptance of the conditions of the surfaces to which this work is to be applied.

### 3.02 PREPARATION:

- A. Field measure site conditions prior to fabrication.
- B. Install starter and edge strips, and cleats before starting installation.
- C. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.
- D. Insert flashings into reglets to form tight fit. Secure in place with lead wedges at a maximum of 8 inches on center. Pack remaining spaces with lead wool. Seal flashings into reglets with sealant.
- E. Seam and seal all joints. Apply plastic cement compound between metal flashings and felt flashings, asphalt shingle roofing or asphalt roll roofing.
- F. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- G. During the installation of work of this Section, protect the work of other trades against undue soilage and damage by the exercise of reasonable care and precautions. Repair or replace any work so damaged and soiled.

### 3.03 INSTALLATION – ROOFING:

- A. Comply with manufacturers standard instructions and conform to standards set forth in the Architectural Sheet Metal Manual published by SMACNA, in order to achieve a watertight installation.
  1. Install panels in such a manner that horizontal lines are true and level and vertical lines are plumb.
  2. Install starter and edge trim before installing roof panels.
  3. Remove protective strippable film prior to installation of roof panels.



4. Attach panels using manufacturer's standard clips and fasteners, spaced in accordance with approved shop drawings.
- B. Install accessory components required for a complete roof panel system including, trim, copings, fascia, mullions, sills, corner units, ridge closures, clips, seam covers, battens, flashings, gutters, sealant, gaskets, fillers, closure strips, and similar items.
- C. Installation tolerances: Shim and align panel units within tolerance of 3/8 inch in 40 feet on level/plumb/slope and location line as indicated and within 1/8 inch offset to adjoining faces and of alignment of matching.
- D. Install sealant for preformed roofing panels as approved on shop drawings.
- E. Do not allow panels or trim to come into contact with dissimilar materials.
- F. Do not allow traffic on completed roof. If required, provide cushioned walk boards.
- G. Protect installed roof panels and trim from damage caused by adjacent construction until completion of installation.
- H. Remove and replace any panels or components which are damaged beyond successful repair.
- 3.04 INSTALLATION – FLASHINGS
- A. Clean and seam all joints. Apply plastic cement compound between metal flashings and felt flashings, asphalt shingle roofing or asphalt roll roofing.
- B. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- C. Seal joints watertight.
- 3.05 INSTALLATION – PROTECTION MEMBRANE:
- A. Preparation:
1. Substrate, general: Remove all dust, dirt, loose nails and other protrusions from sheathing.
- B. General: Apply protection membrane in accordance with manufacturer's instructions, starting application at low point and working upwards. At ridges, start at center and work outwards. Lap sides a minimum of 3-1/2 inches (90 mm) and lap ends 6 inches (150 mm).
1. Extend eave protection membrane minimum of 3 feet up-slop beyond interior face of exterior wall.

2. At ridges, install protection membrane using cut 12 inch width sheets centered on peak.

3.06 INSTALLATION – GUTTERS:

- A. Hangers: Fabricate in accordance with SMACNA Architectural Sheet Metal Manual details, Figures 1-12 through 1-20, as appropriate to conditions indicated on Drawings.
- B. Secure gutter to substrate with continuous flat cleats along edges of gutters.
- C. Seam and seal gutters watertight. Solder gutter to drain joint.

3.07 INSTALLATION – DOWNSPOUTS

- A. Shop fabricate downspout sections and heads to size and shape indicated. Flat seam lock longitudinal joints.
- B. Support downspouts in position clear of the wall and secure to wall with anchoring devices specified by manufacturer, sized and spaced for adequate support.
- C. Seam and seal downspouts watertight. Flash and seal downspouts to gutter.
- D. Set Splash Pans under downspouts.

END OF SECTION

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 07621

SHEET METAL TRIM

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This section of the specification covers furnishing tools, equipment, labor and materials necessary to perform exterior sheet metal trim, complete as shown in the Drawings and as specified herein.
- B. Metal fasteners, plates, brackets, insect screen, and accessories connected directly with the work shall be a part of this section of the specification. Nails, screws, bolts, anchors, brackets, and other similar hardware for fastening and securing the trim shall be furnished under this section.

1.02 RELATED WORK:

- A. Section 03300, CAST-IN-PLACE CONCRETE
- B. Section 04200, MASONRY
- C. Section 06100, ROUGH CARPENTRY
- D. Section 07460, MINERAL FIBER CEMENT SIDING
- E. Section 07620, STANDING SEAM METAL ROOF
- F. Section 07900, JOINT SEALANTS
- G. Section 08520, ALUMINUM WINDOWS
- H. Section 09900, PAINTING

1.03 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

American Society for Testing and Materials (ASTM)

ASTM B209 Specification for Aluminum and Aluminum-Alloy Sheet and Plate

Sheet Metal and Air Conditioning Contractors National Association  
(SMACNA)

SMACNA Architectural Sheet Metal Manual

Federal Specification (FS)

FS L-P-512

- B. Where reference is made to one of the above standards, the revisions in effect at the time of bid opening shall apply.

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Six sets of manufacturer's literature of the materials of this section shall be submitted to the Engineer for review.
- B. Three sets of samples of metal trim shall be submitted to the Engineer for review. These samples shall show at least two inside and two outside joints.

1.05 QUALITY ASSURANCE

- A. Fabricator: Company specializing in sheet metal work with 10 years' experience.
- B. Source: For each material type required for the work of this section, provide primary materials that are the product of one manufacturer. Provide secondary or accessory materials that are acceptable to manufacturer of primary materials.

1.06 DELIVERY AND STORAGE:

- A. Metal trim material shall be delivered to the job dry, and shall be protected from injury, dirt, dampness and extreme changes of temperature and humidity at all times.
- B. Handle materials with care. Do not dump off of trucks or delivery vehicles nor handle in any manner likely to cause damage
- C. Metal trim abutting masonry or other finish materials shall be scribed and fitted as tightly to abutting material as is possible without damaging it.

PART 2 - PRODUCTS

2.01 SHEET MATERIALS:

- A. Pre-Finished 0.050-inch sheet aluminum shop pre-coated with KYNAR 500 coating; color white.

## 2.02 FABRICATION:

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form material without seams.

## 2.03 FACTORY FINISHING

- A. FLUOROPOLYMER “KYNAR 500” system conforming to AAMA 605.2.
- B. Aluminum Finishes

1. Fluorocarbon Coating: Provide minimum 1.0 dry film thickness of thermo-cured fluorocarbon coating containing minimum 70% Dymar 500/Hylar 5000 resin. Properly prepare substrates by inhibited chemical cleaning, conversion coating, and priming in compliance with coating manufacturer’s instructions and recommendations.
2. Colors: As approved by the Engineer from manufacturer’s complete line of standards, premium, and deluxe colors.

## 2.04 RELATED MATERIALS

- A. Nails: Provide “Stronghold” type, with large flat heads, annular rings, and needle points. Provide nails no smaller than No. 12 Stubs gauge and of sufficient length to penetrate wood substrates no less than 1/8-inch. Provide nails of same materials and finish as sheet metal with which used.
- B. Provide screws, bolts, and other accessories of same material and finish as sheet metal with which used.
- C. Isolation Coating: SSPC Paint 12.
- D. Plastic Underlayment: 6-mil polyethylene film.
- E. Roofing Cement: ASTM D 2822, asphaltic
- F. Reglets: Provide fabricated metal units of type and profile as required to properly complete the work. Fabricate reglets from metal that is compatible with flashings used.
- G. Primer: Zinc Molybdate Type
- H. Protective Backing Pain: Zinc Molybdate Alkyd.

- I. Underlayment: 6 mil polyethylene

### PART 3 - EXECUTION

#### 3.01 EXAMINATION:

- A. Verify dimensions before proceeding with fabrication.

#### 3.02 FABRICATION

- A. Shop fabricate work true to shape, accurate in size, square and free from distortion or defects to the greatest extent possible. Fabricate work straight, plumb, level and square, and to provide the best watertight, weatherproof performance with proper expansion provisions in running work. Comply with referenced SMACNA Manual standards and details.

1. Minimize oil-canning, buckling, tool marks and other noticeable defects.
2. Fold edges to form hems.
3. Make joints watertight.
4. Form moving seams with 1/2-inch lapped, bayonet-type, sealant filled joints.
5. Isolate dissimilar materials with isolation coating.

- B. Fabricate cleats of aluminum.

#### 3.03 INSTALLATION

- A. Secure flashings in place using concealed fasteners.

- B. Seal Metal joints watertight.

#### 3.04 FIELD QUALITY CONTROL

- A. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 07840

FIRESTOPPING

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Drawings and general provisions of contracts, including general supplementary conditions and Division 1 Sections, that apply to any work specified in this Section.
- B. The extent of the work is shown and shall include, but not be limited to:
  - 1. Firestop Silicone Sealants
  - 2. Firestop Ceramic Sealants
  - 3. Firestop Acrylic Sealants
  - 4. Fire Intumescent Sealants
  - 5. Firestop Wrap Strips
  - 6. Firestop Putty
  - 7. Firestop Mortar
  - 8. Firestop Pillows
  - 9. Firestop Devices
  - 10. Firestop Cast-in-Place Firestop Systems
  - 11. Firestop Sleeve Intumescent Devices
- C. Work, in general, includes furnishing and installation of those fire and smoke penetration seals for openings in floors, walls and other elements of construction that are in accordance with ASTM E814, ASTM E119 and/or UL 1479 and UL 263.

1.02 RELATED SECTIONS:

- A. Coordination of the sections listed below with this Section includes, but is not limited to:
  - 1. Section 03300 – CAST-IN-PLACE CONCRETE
  - 2. Section 04200 - MASONRY

3. Section 05120 – STRUCTURAL STEEL
4. Section 07920 – JOINT PROTECTION
5. Section 09260 - DRYWALL SYSTEM
6. Divisions 15 and 16 - HVAC and ELECTRICAL.

1.03 REFERENCES:

- A. ASTM E 814 for Through Penetrations and ASTM E 119 for Joints and Gaps.
- B. UL 1479 for Through Penetrations and UL 263 for Joints and Gaps

1.04 QUALITY ASSURANCE:

- A. Applicator Qualifications: Minimum two years-experience installing tested and classified firestop systems or manufacturer certification.
- B. Standards: All firestop systems shall have a F(flame) rating and T (temperature) rating conforming to applicable building codes and in accordance with project drawings and specifications.
- C. Single-Source Responsibility: Obtain firestopping materials from a single manufacturer for each different product required.

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Submit shop drawings, or manufacturer's detail sheets showing each condition that requires a penetration or joint seal. These details must be in accordance with the proposed approved system. Details must include materials to be used, anchorage, methods of installation, and relationship to all adjacent construction.
- B. Submit copies of all manufacturer's specification data, recommendations, and installation instructions for each type of material required.

1.06 MOCK-UPS:

As required by the Owner, Contractor, or Engineer.

1.07 DELIVERY, STORAGE, AND HANDLING:

General:



1. All materials shall be delivered and stored in original, unopened and clearly labeled containers. Containers shall list the name of the manufacturer and bear proper independent test laboratory label/logo.
2. Materials shall be stored and protected from environmental conditions as required by manufacturer.

1.08 ENVIRONMENTAL CONDITIONS:

Existing Conditions: Installer shall verify that existing conditions and substrates conform to manufacturer's requirements before starting work. Unsatisfactory conditions shall be corrected before proceeding.

PART 2 - PRODUCTS

2.01 MATERIALS:

Provide firestop and accessory materials with fire resistance rating included that are identical to those assemblies whose fire endurance has been determined by testing per ASTM E 814 or ASTM E 119, by Underwriters Laboratories, Inc., or other testing and inspecting agencies acceptable to authorities having jurisdiction.

2.02 FIRESTOP SEALANTS:

A. General:

1. All materials shall comply with ASTM E 814 (UL 1479) or ASTM E 119 (UL 263) and shall be manufactured of nontoxic, nonhazardous, asbestos-free materials.
2. Primers: Conform to manufacturer's recommendations for primers required for various substrates and conditions.
3. Back-Up Materials: Back-up materials, supports, and anchoring devices shall be provided as required by UL testing.

B. Silicone Sealant:

One-part, low modulus, moisture-activated silicone capable of withstanding high movement in compression and extension.

Product shall be manufactured by Specified Technologies, Inc. - Somerville, NJ; International Protective Coatings Corp. - Oakhurst, NJ; or 3M Fire Protection Products - St. Paul, MN or equal.

C. Ceramic Sealant:

One-part, moisture-curing, water-based ceramic sealant with a melting point not less than 3,000EF.

Product shall be manufactured by Specified Technologies, Inc. - Somerville, NJ; International Protective Coatings Corp. - Oakhurst, NJ; or 3M Fire Protection Products - St. Paul, MN or equal.

D. Acrylic Sealant:

One-part, moisture-curing, paintable acrylic sealant capable of withstanding high movement in compression and extension.

Product shall be manufactured by Specified Technologies, Inc. - Somerville, NJ; International Protective Coatings Corp. - Oakhurst, NJ; or 3M Fire Protection Products - St. Paul, MN or equal.

E. Intumescent Sealant:

One-part, water-based intumescent sealant unaffected by water or moisture when cured.

Product shall be manufactured by Specified Technologies, Inc. - Somerville, NJ; International Protective Coatings Corp. - Oakhurst, NJ; or 3M Fire Protection Products - St. Paul, MN or equal.

F. Intumescent Wrap Strips:

Solvent-free intumescent wrap strips, unaffected by water, frost, or ultraviolet light.

Product shall be manufactured by Specified Technologies, Inc. - Somerville, NJ; International Protective Coatings Corp. - Oakhurst, NJ; or 3M Fire Protection Products - St. Paul, MN or equal.

G. Intumescent Putty:

One-part, intumescent putty unaffected by water or frost.

Product shall be manufactured by Specified Technologies, Inc. - Somerville, NJ; International Protective Coatings Corp. - Oakhurst, NJ; or 3M Fire Protection Products - St. Paul, MN or equal.

H. Fire Prevention Mortar:

Hydraulic, fire and impact resistant, cementitious mortar.

Product shall be manufactured by Specified Technologies, Inc. - Somerville, NJ; International Protective Coatings Corp. - Oakhurst, NJ; or 3M Fire Protection Products - St. Paul, MN or equal.

I. Firestop Pillows:

Intumescent, dust-free pillows impervious to water, humidity, frost and ultraviolet light.

Product shall be manufactured by Specified Technologies, Inc. - Somerville, NJ; International Protective Coatings Corp. - Oakhurst, NJ; or 3M Fire Protection Products - St. Paul, MN or equal.

J. Firestop Devices:

Prefabricated devices (collars) consisting of intumescent wrap strips, unaffected by humidity, moisture, and frost.

Product shall be manufactured by Specified Technologies, Inc. - Somerville, NJ; International Protective Coatings Corp. - Oakhurst, NJ; or 3M Fire Protection Products - St. Paul, MN or equal.

K. Cast-in-Place Firestop Devices:

One-step, prefabricated, cast-in-place devices for use in floor penetrations.

Product shall be manufactured by Specified Technologies, Inc. - Somerville, NJ; International Protective Coatings Corp. - Oakhurst, NJ; or 3M Fire Protection Products - St. Paul, MN or equal.

L. Sleeve Intumescent Devices:

Prefabricated device composed of intumescent wrap strips, for firestopping within wall assemblies. Device is unaffected by moisture, humidity, and frost.

Product shall be manufactured by Specified Technologies, Inc. - Somerville, NJ; International Protective Coatings Corp. - Oakhurst, NJ; or 3M Fire Protection Products - St. Paul, MN or equal.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. General:

Examine joints and openings indicated to receive firestop sealers, with installer present, for compliance with requirements for proper configuration, installation tolerances, and other conditions affecting firestop performance. Do not proceed with installation of firestop sealers until unsatisfactory conditions have been corrected.

B. Commonly Made Mistakes:

1. Use of incorrect sealant within the installation.
2. No use of mineral wool insulation within a system that requires it.
3. Use of mineral wool insulation when ceramic fiber insulation is required.
4. Incorrect amount of material installed within a system.
5. No use of an accessory seal within a system that requires one.
6. Use of an incorrect system with a fire wall penetration.

3.02 PREPARATION:

Clean surfaces to be in contact with firestop sealers of fire, grease, loose materials, or other substances that may affect proper fitting or adhesion.

3.03 INSTALLATION:

General:

1. Apply in strict accordance with manufacturer's recommendations to provide fire and temperature rated seal as required.
2. Apply firestop sealant with sufficient pressure to properly fill and seal openings, then tool or trowel exposed surfaces.

3.04 FIELD QUALITY CONTROL:

All sealed areas should be inspected by an appointed code official and the Contractor to ensure proper installation. All sealed areas shall remain accessible until inspection by applicable authorities has been completed.

3.05 CLEAN UP:

GENERAL:

1. Clean adjacent surfaces immediately and leave work neat and clean.
2. Remove excess materials using recommended procedures as work progresses.
3. Remove dams after initial set of firestop sealers as required.

END OF SECTION

SECTION 07920

JOINT PROTECTION

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This section covers the sealing of joints designated on the drawings or specified herein, including but not limited to, concrete to concrete, masonry to concrete, structural steel to concrete, structural steel to masonry, and any other metal surfaces butting to another metal, concrete or masonry.
- B. The above-mentioned joints shall be sealed even if not called out on the drawings.
- C. Seal beneath threshold and other items required to be set in caulking compound shall be by the trade installing the item.

1.02 RELATED WORK:

- A. Section 03300, CAST-IN-PLACE CONCRETE
- B. Section 04200, MASONRY
- C. Section 05500, MISCELLANEOUS METALS
- D. Section 06200, FINISH CARPENTRY
- E. Section 07210, BUILDING INSULATION
- F. Section 07215, SPRAYED-ON INSULATION
- G. Section 07460, MINERAL FIBER CEMENT SIDING
- H. Section 07620, STANDING SEAM METAL ROOF
- I. Section 07621, SHEET METAL TRIM
- J. Section 08110, METAL DOORS AND FRAMES
- K. Section 08520, ALUMINUM WINDOWS
- L. Section 08900, LOUVERS AND VENTS

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

- M. Section 09200 - DRYWALL SYSTEM
- N. Divisions 15 and 16 - HVAC and ELECTRICAL.

1.03 REFERENCES:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

American Society for Testing and Materials (ASTM)

ASTM C920 Specification for Elastomeric Joint Sealant

ASTM C 1193 Standard Guide for Use of Joint Sealants

ASTM D1667 Specification for Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Closed-cell Foam)

United States of America Standards Institute (USA)

USA 116.1 Standard Specification for Polysulfide-Base Sealing Compounds for the Building Trade

- B. When reference is made to one of the above standards, the revisions in effect at the time of bid opening shall apply.

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Provide manufacturer's literature of the materials of this section shall be submitted to the Engineer for review.

1.05 DELIVERY, STORAGE, AND HANDLING:

- A. Materials shall be delivered to the site in the original, unopened, factory-sealed containers, bearing the manufacturer's label fully identifying the material and the producing company.
- B. Handle materials with care. Do not dump from trucks or delivery vehicles nor handle in any manner likely to cause damage.

1.06 QUALITY ASSURANCE:

- A. Materials shall not be applied in wet weather or to wet or damp surfaces. No work shall be performed when temperature is below 40 degrees Fahrenheit. Surfaces shall not be caulked until thirty days after completion of concrete, masonry work, or patching,

whichever is later. At least three good drying days shall immediately precede application. Application shall in each case be in accordance with the instructions of the manufacturer of the material, except as modified herein.

- B. Surrounding areas which are not to be coated shall be completely protected from spray, spattering, or dripping, using drop cloths or other protective measures, as required. Spillage or dripping which occurs shall be immediately and completely removed, leaving no stain. Solvents or cleaning methods shall be those recommended by the manufacturer of the material being used.
- C. Furnish the service of a competent field representative of the approved manufacturer of the sealant. The field representative shall be present at the work site prior to any mixing of components to instruct on application and inspection of procedures and to inspect the finish or the prepared surfaces prior to application of the sealant. The representative shall make at least one additional visit to the site as the work progresses and shall report on each visit to the Contractor and the Engineer, advising as to whether the application is being performed in accordance with this specification and the printed instructions of the manufacturers.

## PART 2 - PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS:

- A. Sealants and primers for use with sealants shall be as manufactured by J.B. Fred Kuhls, Brooklyn, New York; Minvax Co., Inc., New York, New York; Dewey and Almy Chemical Division of W.R. Grace & Co., Cambridge, Massachusetts; Sonneborn Building Products, New York, New York; or an approved equal product.

### 2.02 MATERIALS:

- A. Sealants
  - 1. Sealants shall be non-staining materials conforming to the requirements of United States of America Standards Institute "Standard Specification for Polysulfide-Base Sealing Compounds for the Building Trade", USA 116.1. Compound shall be Class A (self-leveling), or Class B (non-sag), as applicable in each case for the joint to be caulked. Color of sealant shall match as closely as possible the color of the surrounding materials, and when used adjacent to masonry work the compound shall match the color of the mortar in the masonry joints. Precise color shall in all cases be subject to the approval of the Engineer.
- B. Joint Cleaner
  - 1. Non-corrosive and non-staining type, recommended by sealant manufacturer and compatible with joint forming materials.

C. Primer

1. Primer shall be non-staining type as recommended by the manufacturer of the sealant.

D. Back-Up Material

1. Back-up material for sealer shall be a non-staining type oakum, treated to prevent rot, or shall be a non-staining, compressible, closed-cell joint filler of polyvinyl chloride, neoprene vinyl, or a similar inert and permanent back-up material approved in advance by the Engineer. Back-up materials containing oil or grease and materials which are not compatible with the primers and caulking compound shall not be used. Tremco Joint Backing and Dow Corning "Ethafom" are approved back-up materials.

E. Bond Breaker

1. Bond breaker tape shall be an adhesive-backed glazed butyl or polyethylene tape which will satisfactorily adhere to the pre-molded joint filler or concrete surface as required. The tape shall be the same width as the joint.
2. Bond breaker for concrete other than where tape is specifically called for shall be either bond breaker tape or a non-staining type bond prevention coating such as Williams Tilt-up Compound by Williams Distributors, Inc. Silcoseal 77 by Nox-Crete Incorporated or equal.

PART 3 - EXECUTION

3.01 EXAMINATION:

- A. Verify that substrate surfaces and joint openings are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION:

- A. Where recommended by the manufacturer of the sealant, primer shall be used before sealant is applied. Copper to be in contact with sealant shall be primed with five-pound cut shellac or as recommended by the sealant manufacturer, before sealant material is applied. Aluminum, stainless steel, and other materials shall have any protective film removed using a cloth dampened with Toluol, Xylol, or other suitable solvent.

3.03 APPLICATION:

- A. Sealant shall be mixed and applied in accordance with the manufacturer's printed directions. No materials shall be added to the compound.



- B. Joints and spaces to be caulked shall be clean, dust-free, and dry. Mortar droppings, construction debris, and other foreign matter shall be removed from the joint before it is caulked. Raking out excess mortar in masonry and similar joints which are to be caulked shall be performed by the trade responsible for installing the mortar.
- C. The joint or space to be sealed shall be packed tight with oakum or other approved filler materials, leaving a space approximately square in cross-section, and in no case deeper than half of its width, to receive the caulking compound. Filler materials shall be sufficiently wider than the joint in which they are used to provide adequate resistance when sealant material is being gunned into the joint.
- D. Sealant shall be applied with a gun, using a nozzle of proper size to fit the joint width, and shall be forced into the joints with sufficient pressure to expel all air and fill the joint solid. Superficial pointing of joints with a skin bead will not be accepted. Sealant shall be uniformly smooth and free from wrinkles, and shall have a slightly concave joint profile when dry. Intersections of beads shall form neat miter. Sealant at edges of the joint shall be flush with the edges of the adjacent surfaces. Excess sealant material shall be removed. Improperly filled or finished joints shall be raked out and resealed.
- E. Sealant depth shall not exceed one-half of joint width.
- F. Particular care shall be taken not to soil adjacent surfaces. Spillage or excess material shall be removed immediately, leaving no stain. Masking tape shall be used as required to protect surrounding surfaces and prevent staining. Masking tape shall be removed immediately after tooling of the sealant. Adjacent surfaces soiled by operations under this section shall be cleaned to equal their condition before the start of the caulking work.
- G. Spaces left between walls and elements of roof shall be filled with back-up material inserts and then caulked on both sides.

END OF SECTION

SECTION 08100

METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This Section covers overhead rollup doors, hollow metal doors, panels, and pressed steel frames, complete.
- B. Finish hardware is furnished under Section 08700 DOOR HARDWARE for installation under this Section.

1.02 RELATED WORK:

- A. Section 04200, MASONRY
- B. Section 06100, ROUGH CARPENTRY
- C. Section 06200, FINISH CARPENTRY
- D. Section 07460, MINERAL FIBER CEMENT SIDING
- E. Section 07920, JOINT PROTECTION
- F. Section 08700, DOOR HARDWARE
- G. Section 09200, DRYWALL SYSTEM
- H. Section 09900, PAINTING

1.03 QUALITY ASSURANCE:

Doors and frames so noted in door schedule shall be U.L. labeled for fire rated doors.

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Provide manufacturer's literature of the materials of this section shall be submitted to the Engineer for review.
- B. Provide door schedules showing door sizes and types, frames sizes and types, shall be submitted to the Engineer for review.

1.05 DELIVERY AND STORAGE:

- A. Work shall be coordinated with the hardware supplier who will provide templates for mortised hardware to the door manufacturer.
- B. Materials included in this section shall be delivered in perfect condition and shall be protected from damage during storage and construction periods and until acceptance of the building.
- C. Doors shall be stored in an upright position under cover on the building site on wood sills or on floors in a manner that will prevent rust and damage.

## PART 2 - PRODUCTS

### 2.01 MATERIALS:

#### A. Exterior Swing Doors

- a. Exterior metal doors shall be extra heavy duty full flush galvanized, primed seamless doors, 1-3/4-inch thick unless otherwise indicated.
- b. Door faces shall be 16-gauge color rolled stretcher leveled steel.
- c. Vertical steel rib stiffeners shall be 20-gauge, one piece, spaced at 6-inches.
- d. Lock rail shall be one piece full height 14-gauge channel continuously welded to face sheet.
- e. Hinge rail shall be one piece full height 12-gauge channel continuously welded to face sheet.
- g. Lock edge shall be beveled (1/8-inch in 2-inches).
- h. Hardware reinforcements shall be compatible to the specified hardware and shall meet the minimum requirements below:
  - 1) Overhead holders - 12-gauge channel
  - 2) Closures - 12-gauge channel
  - 3) Rim panics - 14-gauge
  - 4) Checks and pivots - 7-gauge
- i. All spaces between ribs shall be insulated with fiberglass insulation.
- j. Exterior doors shall be by Republic Builders Products, McKenzie, TN, or approved equal.
- k. Double door fixed panel shall be internally latched upper and lower.

1. Door and/or transom panel shall accommodate existing hoisting apparatus as required to maintain door function. Include gaskets, weatherstripping or other compatible closure to replicate original function.

#### B. Interior Doors

1. Interior metal doors shall be full flush galvanized, primed seamless doors, 1-3/4-inches thick, unless otherwise indicated.
2. Door faces shall be 18 gauge cold-rolled stretcher leveled steel.
3. Doors shall be stiffened and insulated with a solid slab of expanded polystyrene foam permanently bonded to the inside of each face skin.
4. Lock rail shall be one piece full height 14 gauge pressed channel.
5. Hinge rail shall be one piece, full height 14 gauge pressed channel formed and tapped for hinges.
6. Both lock and hinge rail edge of door shall be welded, filed and ground smooth.
7. Top and bottom of doors shall have 16 gauge steel closure channels.
8. Lock edge shall be beveled (1/8-inch to 2-inches).
9. Hardware reinforcements shall be suitable to the specified hardware and shall meet the minimum requirements below:
  - a. Overhead holders - 12 gauge channel
  - b. Rippanics - 14 gauge
  - c. Checks and pivots - 7 gauge
10. Interior doors shall be by Republic Builders Products, McKenzie, TN, or approved equal.

#### C. Pressed Metal Frames

1. Frames shall be fabricated to suit the wall type.
2. Frames shall be fabricated of 16 gauge cold rolled steel for openings up to and including 3'0" x 7'2" in size, and of 14 gauge cold rolled steel for larger openings. All frames shall be hot-dipped galvanized after fabrication.
3. Joints shall be die mitered with integral tabs for reinforcement and interlocking of the jambs to the head.

4. Frames shall be set up and welded.
5. Frames shall be mortised, reinforced and drilled and tapped for all mortise finish hardware.
6. Frames shall be reinforced for surface mounted hardware, with drilling and tapping to be done in the field by the Contractor.
7. Mortised cutouts shall have metal plaster guards.
8. Hardware reinforcements shall be compatible to hardware specified and shall meet the following minimum requirements:
  - a. Hinge - 7 gauge x 1-5/8-inch x 10-inch
  - b. Lock Strike - 14 gauge x 1-5/8-inch x 4-inch
  - c. Closer - 12 gauge x contour of head x 16-inch
9. Frames shall have fixed, adjustable or stud anchors as required by wall conditions. Anchors shall be galvanized 14 gauge corrugated steel with dimensions as recommended by the manufacturer.
10. Frames at doors shall be supplied with adhesive rubber silencers, 3 on the strike jamb for single doors and 2 per head for double doors.
11. Framing for transom and sidelights shall be provided with beads to accept glass. Screw holes shall be pre-drilled in both frames and bead.

D. Metal Panels

1. Panels shall be 1-3/4-inches thick and fabricated of 18 gauge cold rolled stretcher leveled steel.
2. Panels shall be insulated with a solid slab of expanding polystyrene foam bonded to the inside of each face skin.
3. Edges shall be reinforced with 14 gauge channels.

E. Shop Priming

All metal doors, panels and frames shall receive a degreaser phosphate treatment and one baked on coat of alkyd phenolic primer.

F. Door Accessories

1. Doors, where indicated, shall be supplied with manufacturer's stock metal louver, fixed reversed V type, size as indicated on the door schedule. Louver to be closeable by fusible link in label openings.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

- A. Frames shall be erected plumb and true, and shall be braced during construction until the attached anchors are built into the masonry system, or until there is no danger of movement.
- B. Door frames shall be grouted to masonry using Portland cement.
- C. Doors shall be fitted with hardware, accurately hung, and adjusted for proper and smooth operation.
- D. Hardware shall be mounted in accordance with the hardware manufacturer's instructions with the fasteners supplied by the hardware manufacturer.
- E. Doors to be adjusted for equal gap all around and at meeting of double doors. Final approval shall be by Engineer.
- F. Thresholds shall be set in non-hardening caulking compound in a method approved by the threshold manufacturer. Screw holes and joints with other materials shall be sealed with caulking compound.

END OF SECTION

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 08390

FLOOD DOORS AND FRAMES

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This Section covers interior flood door systems, including door frame, door panel, threshold, and door hardware.

1.02 RELATED WORK:

- A. Section 01330, SUBMITTAL PROCEDURES
- B. Section 01760, O&M MANUALS
- C. Section 01770, PROJECT CLOSEOUT
- D. Section 03300, CAST-IN-PLACE CONCRETE
- E. Section 04200, MASONRY
- F. Section 05120, STRUCTURAL STEEL
- G. Section 05400, COLD-FORMED METAL FRAMING

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM)
- B. ANSI FM2510
- C. ASCE 24-14, ASCE 7-10
- D. ASME Structural Welding Code Section IX.
- E. AWS D1.1 – Structural Welding Code – Steel
- F. AWS D1.2 – Structural Welding Code - Aluminum
- G. CT Public Act 18-82
- H. FEMA P-936 Floodproofing Non-Residential Buildings
- I. FEMA Technical Bulletin 3-93 Non-Residential Floodproofing
- J. Flood Insurance Rate Map (FIRM)
- K. NFIP Floodproofing Certificate for Non-Residential Structures
- L. All applicable federal, state, and municipal codes, laws, and regulations.

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

1.04 QUALITY ASSURANCE:

- A. Contractor shall engage the services of a Professional Structural Engineer, registered in the state of Connecticut to design and certify that the work of this Section meets or exceeds the performance requirements specified in this Section and as required by State Building Code, ASCE, and FEMA. The structural engineer shall be responsible for
1. Determination of sizing and loading of components in accordance with applicable codes and regulations. Flood door assemblies shall provide a minimum 2:1 factor of safety based on the yield strength of materials and provide an effective seal against design flood level.
  2. Production, review, stamp, and signature of shop drawings in accordance with manufacturer literature and warranties.
  3. Observation of work of this Section during fabrication and installation.
  4. Final review of record drawings with an affidavit of work performed in accordance with Structural Engineering recommendations upon completion.
- B. The qualifications of the person performing the work of this section shall be forwarded to the Owner's Engineer for approval. Work of this section shall be executed by competent installers with a minimum of 10 years experience in application of products, systems and assemblies specified and with approval and training of the approved product manufacturers.
- C. The product manufacturer must demonstrate a minimum of five (5) years successful experience in design and manufacture of similar flood related closures. Upon request, provide supporting evidence including list of installations, descriptions, name and method of contact.
- D. The product manufacturer must demonstrate compliance and certification of a Quality Management System administered by the International Organization for Standardization (ISO). Documentation of current certification status to be provided upon request.
- E. The product manufacturer must provide qualifications for welders such that they are certified in accordance with American Welding Society Procedures for applicable material used in production of specified product.
- F. The Contractor shall arrange for product manufacturer's technical representative to provide the following services:
1. Meet and discuss conditions on site with the Contractor, Owner, and Owner's Engineer.
  2. Inspect existing surfaces and provide solutions for a watertight seal, including adverse conditions.
  3. Inspect the installation of work of this Section and report unsatisfactory conditions to the Contractor, Owner, and Owner's Engineer.



4. Product Testing: Proof test and leak test all seals per manufacturer's instructions. Provide certification from an independent testing laboratory indicating satisfactory test results from leak testing. A minimum of one successful leak test shall be conducted on-site on the finished assembly for each proposed product type at the location of the maximum flood depth to the design flood level. Test procedures shall be acceptable to the Owner's Engineer and Manufacturer's technical representative. The test shall be overseen by the Contractor, Owner, Owner's Engineer, and manufacturer's technical representative. Following the leak test, the manufacturer shall provide recommendations to modify the finished assembly to improve performance (if needed). The Owner's Engineer reserves the right to require additional testing if the leak test does not meet performance criteria as specified in industry standards.
  5. Attend a final inspection with the Contractor, Owner, and Owner's Engineer, perform a test closure and opening of each finished door, and submit written certification that products, frames, systems, and assemblies have been installed in accordance with the manufacturer's requirements.
  6. Provide Owner operations and maintenance (O&M) training on-site and prepare a comprehensive O&M plan for the Owner in accordance with the requirements described in this Section.
- G. Owner's Engineer reserves the right to perform inspections and testing at any time during the execution of the work.
- H. Contractor shall store product systems in a manner to keep them protected from damage from construction and other causes.
- I. Contractor shall assume full responsibility for quality control inspection and testing and give sufficient notice to the Engineer to permit the witnessing of the inspections or tests.
- J. Notification Point: The Contractor shall give the Owner's Engineer at least 2 days' notice in advance of quality control tests and inspections.
- 1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:
- A. Literature from the Manufacturer, including
1. Product data sheets, including but not limited to product physical and structural characteristics, expected life cycle, and fabrication methods.
  2. Specifications with performance data indicating products and materials meet performance standards in this Section and relevant industry certifications.
  3. Manufacturer's testing showing compliance with specified requirements for largest anticipated assemblies.
  4. Operational requirements, including but not limited to operational instructions; repair and/or replacement instructions; and on-going maintenance instructions, including testing protocol.

5. Actual warranties for all materials to be furnished under this Section with clearly defined terms, conditions, and time periods of coverage.
- B. Schedule of flood doors to be furnished hereunder. The schedule must identify all proposed modifications to the building envelope and site needed for installation of the food door.
- C. Structural calculations provided by the Contractor's Professional Structural Engineer indicating that the flood door meets the required design loading conditions.
- D. Stamped shop drawings with scaled design details of product assemblies, indicating sizes, types, and gauges of all components; types and thickness of structural members; connection attachments and/or brackets; and complete installation details. All submittals shall be reviewed and acceptable to the Owner's Engineer prior to conducting any work. The Contractor shall forward submittals in advance considering that re-submittals may be required prior to acceptance.
- E. Quality Control Inspection Results and Written Certification: Submit the proposed test (proof/leak/etc.) procedures, results of all quality control inspections and tests and written certification from the manufacturer and structural engineer. Submittals reviewed beyond the second rejection (or required submittal) shall be provided at no cost to the Owner and shall be reviewed by the Engineer at the Contractor's expense.
- F. Operations and Maintenance Plan: Submit a comprehensive operations and maintenance plan that provides detailed information including but not limited to maintenance protocols, operations protocols, repair/replacement protocols, training protocols, testing protocols, and an emergency response plan.
- 1.06 DELIVERY AND STORAGE:
- A. Store materials and products according to manufacturer's specifications.
- B. Materials included in this section shall be delivered in perfect condition and shall be protected from damage during storage and construction periods and until acceptance of the building.

## PART 2 – PRODUCTS

### 2.01 MANUFACTURERS

- A. Flood doors are defined herein as hinged flood doors that are permanently installed at the opening location. When closed they are temporarily affixed to the contiguous work via locking mechanisms, often levers, providing a watertight seal. Some products require a step or raised sill at the ground surface to seal against.
- B. Acceptable Manufacturers: Subject to compliance with requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
1. PS Flood Barriers™ products, such as Mechanical Room Flood Door (PD-525)

2. Presray products, such as Hinged Watertight Door with Mechanical Seal (D3C)

C. Equipment Details

1. Sealing Requirements: Flood Door and compression gasket design shall provide an effective barrier per performance requirements.
2. Operation: Provide with latching operable from both sides.
3. Mounting/Load Transfer: Anchor to existing structure. Flood Door designed for specified hydrostatic pressure (and other loads as specified) and will transfer loads to adjacent structure.
4. Frames to be anchored utilizing mechanical, chemical or other framing methods as designed. Manufacturer to include all anchors, water-stop, and sealants, as designed.
5. Loading Direction: Positive Pressure Loading, (direction of loading against flood door so as to further compress gaskets against flood door frame - "seating").
6. Provide rectangular door opening with square corners to facilitate easy passage.

2.02 MATERIALS

- A. All materials shall be resistant to environmental and chemical exposure, corrosion, and bacteria (mold). The manufacturer shall provide information on exposure thresholds and procedures for cleaning and preserving products.
- B. Manufacturer shall provide standard repair and maintenance kits for flood door systems, including but not limited to seals, fasteners, flexible fabrics or membrane elements, etc. Where possible, the manufacturer shall select products that are readily available and easily replaced and/or repaired.
- C. The product connection materials shall integrate with contiguous work.
- D. Finishes of permanently fixed materials and assemblies shall match contiguous work where feasible.
- E. Permanently fixed materials and assemblies shall be protected from damages resulting from environmental exposure and impact forces expected under fair weather and storm conditions.
- F. The waterproofing materials (sealant and grout) shall meet manufacturer's requirements for product assemblage. Sealants and grouts shall be compatible with all substrates and field applied in accordance with the manufacturer's recommendations.

2.03 PERFORMANCE REQUIREMENTS

- A. Flood doors shall be designed, fabricated, assembled, and erected to interface with adjacent work to ensure continuity of building enclosure and that all segments of the assemblies will be free from leakage, in accordance with industry standards.
- B. Flood doors shall be engineered to comply with the applicable requirements based on the

standards and engineer code practices referenced in this Section for operating forces, deflections, and deformation solely or in combinations of, temporary super-imposed live loads as indicated below as described below. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. All applied types of flood related loadings are transferred from the flood product barriers, solely or in combinations of, by mullion anchorage to structural floor slabs and/or jamb anchorage and direct pressure contact to structural walls or other structural elements.

1. Hydrostatic loading with maximum hydrostatic water protective heights

### PART 3 – EXECUTION

#### 3.01 INSTALLATION:

- A. Substrates shall be prepared in accordance with manufacturer recommendations.
- B. Install products in accordance with manufacturer installation instructions.
- C. Frames shall be erected plumb and true, and shall be braced during construction until the attached anchors are built into the masonry system, or until there is no danger of movement.
- D. Sealants, water-stop, and grouting to be applied per product application directions and in accordance with manufacturer's instructions. Field Grouting to be completed in accordance with product application directions, and manufacturer's instructions.
- E. Doors shall be fitted with hardware, accurately hung, and adjusted for proper and smooth operation.
- F. Tolerances: All dimensional requirements must be in accordance with manufacturer's installation instructions
- G. Hardware shall be mounted in accordance with the hardware manufacturer's instructions with the fasteners supplied by the hardware manufacturer.
- H. Inspect gaskets for damage, wear, and adhesion. Replace compromised gaskets immediately.
- I. Verify that latching assemblies operate freely and correctly.
- J. Verify all anchorage is in accordance with manufacture's installation instructions and applicable data sheets.
- K. Inspect installation sealants to ensure a watertight juncture.

#### 3.02 OPERATIONS & MAINTENANCE

- A. The manufacturer representative shall provide Owner operations and maintenance (O&M) training on-site, including but not limited to storage and handling protocols, operation protocols, maintenance protocols, repair/replacement protocols, training protocols, and testing protocols. The training should be tailored to the Owner's actual operational capacity and consider adverse site and operations conditions.

- B. The manufacturer representative shall prepare a comprehensive O&M plan for the Owner, including but not limited to the following maintenance and operational requirements
- a. operation instructions;
  - b. on-going maintenance instructions, including testing and training schedules;
  - c. warranty restrictions;
  - d. emergency response plan.

END OF SECTION

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

SECTION 08520

ALUMINUM WINDOWS

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section covers limited repair of windows, hardware, weatherstripping and seals, re-glazing and the installation of solid panels or operable hatches at existing aluminum windows, associated trim panels and HVAC louvers, as drawn.

1.02 RELATED WORK:

- A. Section 04200, MASONRY
- B. Section 06100, ROUGH CARPENTRY
- C. Section 06200, FINISH CARPENTRY
- D. Section 07920, JOINT PROTECTION
- E. Section 09900, PAINTING

1.03 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Provide complete shop drawings of the materials shall be submitted to the Engineer for review. Refer to Division 1, Section 01330, SUBMITTALS, for requirements.
- B. Samples of frames shall be submitted to the Engineer for color selection.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. REFERENCE TYPE:

Existing aluminum windows are typically double glazed, thermal break protected fixed and/or operable units, as installed. Contractor shall verify all dimensions, profiles and window configurations in the field.

B. SUPPLEMENTAL EXTERIOR PANELS:

Panels shall be metal-faced insulating foam panels in locations and thicknesses as shown on the plans. Panels may be face-applied to existing window or panel assemblies or set

in existing glazing channels, as drawn. At one (1) location a panel shall be installed behind an existing HVAV louver. Panel thickness shall be 1-1/2" nominal throughout, or to match existing glazing thickness when set in glazing channels.

All edges of panels shall be metal clad. Panel finish shall be factory-applied fluoropolymer paint system to match adjacent window or panel surfaces, subject to Engineer's approval. Texture to match adjacent surfaces.

C. HARDWARE, WEATHERSTRIPPING AND SEALS

Where new glazing or panels are indicated to be installed at existing operable sash, all existing hardware, weatherstripping and seals shall be inspected, adjusted and replaced as necessary to ensure positive closure and sealing against water intrusion.

D. REPLACEMENT GLAZING:

New glazing as indicated shall be installed in the existing glazing channel of fixed or operable sash. Overall glazing thickness shall match existing unless otherwise approved by the Engineer. Glass color shall match existing. Inner pane shall be 1/4" tempered glass, outer pane shall be 1/4" shatterproof laminated safety glass.

F. WATERPROOF MARINE HATCH

Provide watertight, lockable, positive latching marine-grade aluminum access hatch with hold-open feature as shown on the Drawings. Hatch to be installed on an aluminum mounting plate face-mounted to existing lower window frame, as drawn and noted. Existing frame to be cleaned, patched and re-sealed prior to installation of mounting plate and hatch assembly.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. All work shall be set flat, level, plumb, and square without springing, forcing, or distorting, in accordance with best trade practice and manufacturer's standard recommendations. Sealants and accessories as specified in Section 07920 shall be used in sufficient quantity to provide a watertight seal between windows, panels and surrounding construction.
- B. Where unprotected aluminum comes into contact with lime content masonry, the aluminum shall be coated with zinc chromate primer or bitumastic paint.

END OF SECTION

SECTION 08700

DOOR HARDWARE

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.

1.02 SUMMARY

A. Section Includes

- 1. Furnishing and installation of all mechanical and electrical finish hardware necessary for all doors, and hardware as specified herein and as enumerated in hardware sets and as indicated and required by actual conditions at the building. The hardware shall include the furnishing of all necessary screws, bolts, expansion shields, drop plates, and all other devices necessary for the proper application of the hardware. Installation shall include field modification and preparation of existing doors and/or frames for new hardware being installed. Provide necessary fillers, Dutchmen, reinforcements, and fasteners for mounting new hardware and to cover existing door/frame preps.

B. Related Sections

- 1. Section 06200 – FINISH CARPENTRY
- 2. Section 08100 – METAL DOORS AND FRAMES
- 3. Division 16 – ELECTRICAL

C. Specific Omissions: Hardware for the following is specified or indicated elsewhere, unless specifically listed in the hardware sets:

- 1. Windows
- 2. Flood Doors and Barriers
- 3. Waterproof Hatches and Covers

1.03 REFERENCES

- A. Applicable state and local building codes and standards.
- B. FIRE/LIFE SAFETY



1. NFPA - National Fire Protection Association
    - a. NFPA 70 – National Electric Code
    - b. NFPA 80 - Standard for Fire Doors and Fire Windows
    - c. NFPA 101 - Life Safety Code
    - d. NFPA 105 - Smoke and Draft Control Door Assemblies
  
  - C. UL - Underwriters Laboratories
    1. UL 10B - Fire Test of Door Assemblies
    2. UL 10C - Positive Pressure Test of Fire Door Assemblies
    3. UL 1784 - Air Leakage Tests of Door Assemblies
    4. UL 305 - Panic Hardware
  
  - D. Accessibility
    1. ADA - Americans with Disabilities Act.
    2. ANSI 117.1 / 2009 Accessible and Usable Building and Facilities
  
  - E. DHI - Door and Hardware Institute
    1. Sequence and Format for the Hardware Schedule
    2. Recommended Locations for Builders Hardware
  
  - F. ANSI - American National Standards Institute
    1. ANSI/BHMA A156.1 - A156.29, and ANSI A156.31 - Standards for Hardware and Specialties
- 1.04 SUBMITTALS
- A. General: Submit the following in accordance with Conditions of Contract and Division 1 requirements. Advise architect within the submittal package of incompatibility or issues.
  
  - B. Catalog Cuts: Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
  
  - C. Final Hardware Schedule Content: Submit schedule with hardware sets in vertical format as illustrated by the Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, Include the following information:

1. Door Index; include door number, heading number, and Architects hardware set number, if used.
  2. Opening Lock Function Spreadsheet; list locking device and function for each opening.
  3. Type, style, function, size, and finish of each hardware item.
  4. Name and manufacturer of each item.
  5. Fastenings and other pertinent information.
  6. Location of each hardware set cross-referenced to indications on Drawings.
  7. Explanation of all abbreviations, symbols, and codes contained in schedule.
  8. Mounting locations for hardware.
  9. Door and frame sizes and materials.
  10. Name and phone number for the local manufacturer's representative for each product.
  11. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer holder units, and/or access control components). Operational description should include how the door will operate on egress, ingress, and/or fire/smoke alarm connection.
- D. Key Schedule: After a keying meeting between representatives of the Owner, Architect, hardware supplier, and, if requested, the representative for the lock manufacturer, provide a keying schedule, listing the levels of keying, as well as an explanation of the key system's function, the key symbols used, and the door numbers controlled. Utilize ANSI A156.28 "Recommended Practices for Keying Systems" as a guideline for nomenclature, definitions, and approach for selecting the optimal keying system.
- E. Samples: If requested by the Architect, submit production sample or sample installations as requested of each type of exposed hardware unit in the finish indicated, and tagged with a full description for coordination with the schedule.
1. Samples will be returned to the supplier in like-new condition. Units that are acceptable to the Architect may, after final check of operations, be incorporated into the Work, within limitations of key coordination requirements.
- F. Templates: After final approval of the hardware schedule, provide templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware.

- G. Riser and Wiring Diagrams: After final approval of the hardware schedule, submit riser and wiring diagrams as required for the proper installation of complete electrical, electromechanical, and electromagnetic products.
- H. Operations and Maintenance Data: Provide in accordance with Division 1 and include the following:
1. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
  2. Catalog pages for each product.
  3. Name, address, and phone number of local representative for each manufacturer.
  4. Parts list for each product.
  5. Copy of final approved hardware schedule, edited to reflect "As installed."
  6. Copy of final keying schedule.
  7. As installed "Wiring Diagrams" for each opening connected to power, both low voltage and 110 volts.
  8. One (1) complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
  9. Copy of warranties including appropriate reference numbers for manufacturers to identify the project.
- I. Certificates of Compliance: Upon request of Architect or Authority Having Jurisdiction certificates of compliance for fire-rated hardware and installation instructions shall be made available.

#### 1.05 QUALITY ASSURANCE

- A. Substitutions: Products are to be those specified to ensure a uniform basis of acceptable materials. Requests for substitutions must be made in accordance with Division 1 requirements. If proposing a substitute product, submit product data for the proposed item with product data for the specified item and indicate basis for substitution and savings to be made. Provide sample if requested. Certain products have been selected for their unique characteristics and particular project suitability.
1. Items specified as "no substitute" shall be provided exactly as listed.
  2. Items listed with no substitute manufacturers listed have been requested by the Owner or Architect to match existing for continuity and/or future performance and maintenance standards or because there is no known equal product.
  3. If no other products are listed in a category, then "no substitute" is implied.

- B. **Supplier Qualifications:** A recognized architectural hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides a certified Architectural Hardware Consultant (AHC) available to the Owner, Architect, and Contractor, at reasonable times during the course of the Work for consultation.
- C. **Single Source Responsibility:** Obtain each type of hardware (latch and locksets, hinges, exit devices, closers, etc.) from a single manufacturer.
- D. **Fire-Rated Openings:** Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwrites Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to the authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.
- E. **Electronic Security Hardware:** When electrified hardware is included in the hardware specification, the hardware supplier must employ an individual knowledgeable in electrified components and systems, who is capable of producing wiring diagrams and consulting as needed. Coordinate installation of the electronic security hardware with the Architect and electrical engineers and provide installation and technical data to the Architect and other related subcontractors. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Tag each item or package separately with identification related to the final hardware schedule, and include installation instructions with each item or package.
- B. Each article of hardware shall be individually packaged in manufacturer's original packaging.
- C. Contractor will provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- D. Items damaged in shipment shall be replaced promptly and with proper material and paid for by whomever did the damage or caused the damage to occur.
- E. Hardware shall be handled in a manner to avoid damage, marring, or scratching. Irregularities that occur to the hardware after it has been delivered to the Project shall be corrected, replaced, or repaired by the Contractor. Hardware shall be protected against malfunction due to paint, solvent, cleanser, or any chemical agent.
- F. No direct shipments will be allowed unless approved by the Contractor.

#### 1.07 WARRANTY

- A. Provide manufacturer's warranties as specified in Division 1 and as follows:
  - 1. Closers: 30 years, except electronic closers, 2 years.
  - 2. Exit Devices: 3 years, except electrified devices, 1 year.
  - 3. Locksets: 3 years, except electrified locksets, 1 year.
  - 4. Other hardware: 1 year.
- B. No liability is to be assumed where damage or faulty operation is due to improper installation, improper use, or abuse.
- C. Products judged to be defective during the warranty period shall be replaced or repaired in accordance with the manufacturer's warranty, at no additional cost to the Owner.

1.08 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. The Awarding Authority has determined that certain products should be selected for their unique characteristics and particular project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product offerings the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute" (NO OTHER PRODUCTS WILL BE CONSIDERED FOR THOSE LISTED IN PROJECTS DOCUMENTS.)
- B. Approval of manufacturers other than those listed shall be in accordance with paragraph 1.05.A.
- C. Note that even though an acceptable substitute manufacturer may be listed, the product must provide all the functions and features of the specified product or it will not be approved.

Item	Scheduled Manufacturer	Acceptable Substitute
Hinges	Ives (IVE)	Hager, Stanley
Electric Power Transfer	Von Duprin (VON)	Markar
Flush Bolts & Coordinators	Ives (IVE)	Burns, Rockwood
Locksets & Deadlocks	Sargent	No Substitute

Exit Devices	Von Duprin (VON)	No Substitute
Power Supplies	Von Duprin (VON)	No Substitute
Roller Latches	Ives (IVE)	Burns, Rockwood
Door Closers	LCN (LCN)	No Substitute
Electro-Hydraulic Automatic Operators	LCN (LCN)	No Substitute
Door Trim	Ives (IVE)	Burns, Rockwood
Protection Plates	Ives (IVE)	Burns, Rockwood
Overhead Stops	Glynn-Johnson (GLY)	Rixson, Sargent
Stops & Holders	Ives (IVE)	Burns, Rockwood
Thresholds & Weatherstrip	Zero (ZER)	National Guard, Reese
Silencers	Ives (IVE)	Burns, Rockwood
Door Contacts	Sargent	No Substitute
Cylinders & Keying	Sargent	No Substitute
Key Cabinets	Telkee (TEL)	HPC Lund

- D. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
- E. Where the hardware specified is not adaptable to the finished shape or size of the members requiring hardware, furnish suitable types having the same operation and quality as the type specified, subject to the Architect's approval. All components shall be rated for marine environment.

## 2.02 MATERIALS

### A. Fasteners

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. All components shall be rated for marine environment.
2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent that no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Review door specification and advise Architect if thru-bolts are required.
4. Hardware shall be installed with the fasteners provided by the hardware manufacturer.

## B. Hinges

1. Provide five-knuckle, ball bearing hinges of type, material, and height as outlined in the following guide for this specification:
  - a. 1-3/4-inch thick doors, up to and including 36 inches wide:  
Exterior: standard weight, bronze/stainless steel, 4-1/2 inches high  
Interior: standard weight, steel, 4-1/2 inches high
  - b. 1-3/4-inch thick doors over 36 inches wide:  
Exterior: heavy weight, bronze/stainless steel, 5 inches high  
Interior: heavy weight, steel, 5 inches high
  - c. 2 inches or thicker doors:  
Exterior: heavy weight, bronze/stainless steel, 5 inches high  
Interior: heavy weight, steel, 5 inches high
2. Provide three hinges per door leaf for doors 90 inches or less in height, and one additional hinge for each 30 inches of additional door height.
3. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
  - a. Steel Hinges: Steel pins
  - b. Non-Ferrous Hinges: Stainless steel pins
  - c. Out-Swinging Exterior Doors: Non-removable pins
  - d. Out-Swinging Interior Lockable Doors: Non-removable pins
  - e. Interior Non-lockable Doors: Non-rising pins
4. The width of hinges shall be 4-1/2 inches at 1-3/4 inch thick doors, and 5 inches at 2 inches or thicker doors. Adjust hinge width as required for door, frame, and/or wall conditions to allow proper degree of opening.
5. Provide hinges with electrified option where specified. Provide with sufficient number and gage of concealed wires to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to the electrified locking component.
6. Provide mortar guard for each electrified hinge specified, unless specified in hollow metal frame specification.
7. Provide spring hinges where specified. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches or less in height. Provide one additional bearing hinge for each 30 inches of additional door height.
8. Acceptable manufacturers and/or products: Ives 5BB series, Hager BB series, Stanley FBB Series.

## C. Electric Power Transfer

1. Provide power transfer sufficient for number and gage of wires to accommodate electric function of specified hardware.
2. Electric power transfer is to be located per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items. All components shall be rated for marine environment.
3. Acceptable manufacturers and/or products: Von Duprin, Markar.

D. Flush Bolts

1. Provide automatic and manual flush bolts with forged bronze face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch steel or brass rods at doors up to 90 inches in height. Top rods at manual flush bolts for doors over 90 inches in height shall be increased by 6 inches for each additional 6 inches of door height. Provide dust-proof strikes at each bottom flush bolt. All components shall be rated for marine environment.
2. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

E. Coordinators

1. Provide a bar-type coordinating device, surface applied to the underside of the stop at the frame head where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors. All components shall be rated for marine environment.
2. Provide a filler bar of the correct length for the unit to span the entire width of the opening, and appropriate brackets for parallel arm door closers and surface vertical rod exit device strikes. Factory-prep coordinators for vertical rod devices if required.
3. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

F. Mortise Locks

1. Provide mortise locks certified as ANSI A156.13, Grade 1 Operational, Grade 1 Security, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. All components shall be rated for marine environment. Lock case shall be multi-function and field reversible for handing without opening the case. Cylinders: Refer to 2.04 KEYING.
2. Provide locks with a standard 2-3/4 inches backset with a full 3/4 inch throw stainless steel mechanical anti-friction latchbolt. Deadbolt shall be a full 1 inch throw, constructed of stainless steel.
3. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.



4. Provide electrical options as scheduled. Provide electrified locksets with micro switch (RX) option that monitors the retractor crank and is actuated when rotation of the inside or outside lever rotates the retractor hub. Provide normally closed contacts or normally open contacts as required by security system.
5. Lever trim shall be solid brass, bronze, or stainless steel, cast or forged in the design specified, with wrought roses and external lever spring cages. Levers shall be thru-bolted to assure proper alignment and shall have a 2-piece spindle.
  - a. Lever trim on the secure side of doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.

#### G. Deadlocks

1. Provide mortise deadlock series conforming to ANSI A156 and function as specified. All components shall be rated for marine environment. Cylinders: Refer to 2.04 KEYING.
2. Provide deadlocks with a standard 2-3/4 inches backset. Deadbolt shall be a full 1-inch throw, constructed of stainless steel.
3. Provide manufacturers standard strike.
4. Acceptable manufacturer: Sargent, No substitute.

#### H. Exit Devices

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, and UL listed for Panic Exit and/or Fire Exit Hardware. Cylinders: Refer to 2.04 KEYING. All components shall be rated for marine environment.
2. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to the standard architectural finishes to match the balance of the door hardware.
3. Exit devices shall incorporate a fluid damper or other device that eliminates noise associated with exit device operation. Touchpad shall extend a minimum of one half of the door width, but not the full length of the exit device rail. End-cap will have two-point attachment to door. Touch-pad shall match exit device finish, and shall be stainless steel for US26, US26D, US28, US32, and US32D finishes; for all other finishes, the touch-pad finish shall be of compatible finish to exit device. Only compression springs will be used in devices, latches, and outside trims or controls.
4. Devices to incorporate a deadlatching feature for security and/or for future addition of alarm kits and/or other electrical requirements.

5. Vertical rod devices shall be capable of being field modified to less bottom rod devices by removal of bottom rod and adding firing pin(s), if required at fire rated openings.
6. Provide manufacturer's standard strikes.
7. Provide exit devices cut to door width and height. Locate exit devices at a height recommended by the exit device manufacturer, allowable by governing building codes, and approved by the Architect.
8. Mechanism case shall sit flush on the face of all flush doors, or spacers shall be furnished to fill gaps behind devices. Where glass trim or molding projects off the face of the door, provide glass bead kits.
9. Non-fire-rated exit devices shall have cylinder dogging.
10. Removable mullions shall be a 2 inches x 3 inches steel tube. Where scheduled, mullion shall be of a type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
11. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to a 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.
  - a. Lever style will match the lever style of the locksets.
  - b. Lever trim on door serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.
12. Exit devices for fire rated openings shall be UL labeled fire exit hardware.
13. Field drill weep holes per manufacturer's recommendation for exit devices used in full exterior application, highly corrosive areas, and where noted in the hardware sets.
14. Provide electrical options as scheduled.
15. Acceptable manufacturers and/or products: Von Duprin 99/33 series, No Substitute.

#### I. Roller Latches

1. Provide roller latches with a 4-7/8 inches strike at single doors to fit ANSI frame prep. If dummy levers are used in conjunction with roller latch mount the roller latch at a height as to not interfere with the proper mounting and height of the dummy lever.

2. Provide roller latches 2-1/4 inches full lip strike at pair doors. Mount roller in the top rail of each leaf per manufacturer's template.
3. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

J. Door Closers

1. Provide door closers certified to ANSI/BHMA A156.4 Grade 1 requirements by a BHMA certified independent testing laboratory. Surface mounted mechanical closers shall be certified to exceed ten million (10,000,000) full load cycles by a recognized independent testing laboratory. Closers shall be ISO 9000 certified. Units shall be stamped with date of manufacture code.
2. Door closers shall have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder, and shall utilize full complement bearings at shaft. Double heat-treated pinion journal shall be 11/16-inch diameter.
3. Provide hydraulic fluid requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F. Fluid shall be fireproof and shall pass the requirements of the UL10C "positive pressure" fire test.
4. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force as required by accessibility codes and standards. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and backcheck.
5. Provide closers with a solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers. When closers are parallel arm mounted, provide closers which mount within a 6-inch top rail without the use of a mounting plate so that closer shall not be visible through vision panel from pull side.
6. Closers shall not incorporate Pressure Relief Valve (PRV) technology.
7. Closer cylinders, arms, adapter plates, and metal covers shall have a powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or shall have special rust inhibitor (SRI). All components shall be rated for marine environment.
8. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other finish hardware items interfering with closer mounting.
9. Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.
10. Door closers meeting this specification: LCN 4040XP series, No Substitute.

K. Door Trim

1. Provide push plates 4 inches wide x 16 inches high x 0.050-inch thick and beveled 4 edges. Where width of door stile prevents use of 4 inches wide plate, adjust width to fit.
2. Provide push bars of solid bar stock, diameter and length as scheduled. Push bars shall be of sufficient length to span from center to center of each stile. Where required, mount back to back with pull. All components shall be rated for marine environment.
3. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
4. Provide flush pulls as specified. Where required, provide back-to-back mounted model.
5. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
6. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

L. Protection Plates

1. Provide kick plates, mop plates and armor plates minimum of 0.050-inch thick as scheduled. Furnish with machine or wood screws, finished to match plates. All components shall be rated for marine environment. Sizes of plates shall be as follows:
  - a. Kick Plates – 8 inches high x 2 inches less width of door on single doors, 1-inch less width of door on pairs
  - b. Mop Plates – 4 inches high x 2 inches less width of door on single doors, 1-inch less width of door on pairs
  - c. Armor Plates – 36 inches high x 2 inches less width of door on single doors, 1-inch less width of door on pairs
2. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

M. Overhead Stops and Overhead Stop/holders

1. Provide heavy duty concealed mounted overhead stop or overhead stop/holder as specified for exterior and interior vestibule single acting doors. All components shall be rated for marine environment.
2. Provide heavy or medium duty and concealed or surface mounted overhead stop or overhead stop/holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140

degrees before striking a wall, open against equipment, casework, sidelights, and/or where conditions do not allow a wall stop or a floor stop presents a tripping hazard.

3. Where overhead holders are specified provide friction type at doors without a closer and positive type at doors with a closer.
4. Acceptable manufacturers and/or products: Glynn-Johnson, Rixson, Sargent.

N. Door Stops and Holders

1. Provide door stops for all doors in accordance with the following requirements:
  - a. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used. All components shall be rated for marine environment.
  - b. Where wall stops cannot be used, provide dome type floor stops of the proper height.
  - c. At any opening where a wall or floor stop cannot be used, a medium duty surface mounted overhead stop shall be used.
2. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

O. Thresholds, Seals, Door Sweeps, Automatic Door Bottoms, and Gasketing

1. Provide thresholds, weatherstripping (including door sweeps, seals, astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. All components shall be rated for marine environment. Match finish of other items as closely as possible. Size of thresholds shall be as follows:
  - a. Exterior Saddle Thresholds – ½-inch high x jamb width x door width
  - b. Interior Saddle Thresholds – ¼-inch high x jamb width x door width
  - c. Bumper Seal Thresholds – ½-inch high x 5 inches wide x door width
2. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
3. Acceptable manufacturers and/or products: Zero, Reese, National Guard.

P. Silencers

1. Provide "Push-in" type silencers for each hollow metal or wood frame. Provide three for each single frame and two for each pair frame. Omit where gasketing is specified or required by code.
2. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

Q. Door Contacts

1. Provide recessed or surface mounted type door position switches as specified.
2. Switches shall be installed as recommended by manufacturers installation instructions and coordinated with other hardware being installed on the opening. Coordinate door and frame preparations with door and frame suppliers. If separate switches are being used with a magnetic locking device provide a minimum of 4 inches between the switch and the magnetic locking device. All components shall be rated for marine environment.

## 2.03 FINISHES

A. Finish of all hardware shall be US26D (BHMA 626/652) with the exceptions as follows:

1. Hinges at Exterior Doors: US32D (BHMA 630).
2. Push Plates, Pulls, and Push Bars: US32D (BHMA 630).
3. Protection Plates: US32D (BHMA 630).
4. Overhead Stops and Holders (Exterior Doors): US32D (BHMA 630).
5. Overhead Stops and Holders (Interior Doors): Powder Coat to Match.
6. Door Closers: Powder Coat to Match.
7. Weatherstripping: Clear Anodized Aluminum.
8. Thresholds: Mill Finish Aluminum.
9. All components shall be rated for marine environment.

## 2.04 KEYING

A. Provide cores and cylinders for the Owner's existing Sargent key system conforming to the following requirements:

1. Keying to be coordinated with Cohen's Key Shop, Inc., New Haven, CT.
2. Provide permanent cores and cylinders keyed by the manufacturer or authorized distributor into the existing key system as directed by the Owner. Provide owner with a copy of the bitting list, return receipt requested.
3. The hardware supplier, accompanied by a qualified factory representative for the manufacturer of the cores and cylinders, shall meet with Owner and Architect to review keying requirements and lock functions prior to ordering finish hardware. Submit a keying schedule to Architect for approval.
4. Provide keys as follows

- a. Ten master keys for each set.
  - b. Three keys per core and/or cylinder.
  - c. Two construction core control keys
  - d. Two permanent core control keys
  - e. Six construction master keys for each type (Contractor is to provide one set of construction keys to Architect)
5. Visual key control:
- a. Keys shall be stamped with their respective key set number and stamped "DO NOT DUPLICATE".
  - b. All keys shall be stamped with their respective key set letters.
  - c. Do not stamp any keys with the factory key change number.
  - d. Do not stamp any cores with key set on face (front) of Core. Stamp on back or side of cores so not to be visible when core is in cylinder.
6. Deliver all keys and/or key blanks from the factory or authorized distributor directly to the Owner in sealed containers, return receipt requested. Failure to comply with these requirements may be cause to require replacement of all or any part of the keying system that was compromised at no additional cost to the Owner.

## 2.05 KEY CONTROL SYSTEM

- A. Provide a key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of the number of locks required for the Project.
  1. Provide complete cross index system set up by the hardware supplier, and place keys on markers and hooks in the cabinet as determined by the final key schedule.
  2. Provide hinged-panel type cabinet for wall mounting.
  3. Approved products: Telkee, HPC, Lund.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Prior to installation of any hardware, examine all doors, frames, walls and related items for conditions that would prevent proper installation of finish hardware. Correct all defects prior to proceeding with installation.

### 3.02 INSTALLATION

- A. Coordination:

1. Prior to installation of hardware, schedule and hold a meeting for the purpose of instructing installers on proper installation and adjustment of finish hardware. Representatives of locks, exit devices, closers, automatic operators, and electrified hardware shall conduct training; provide at least 10 days notice to representatives. After training a letter of compliance, indicating when the training was held and who was in attendance, shall be sent to the Architect.
  2. Prior to ordering electrified hardware, schedule and hold a meeting for the purpose of coordinating finish hardware with security, electrical, doors and frames, and other related suppliers. A representative of the supplier of finish hardware, and doors and frames, the electrical subcontractor, and the Owner's security contractor shall meet with the Owner, Architect, and General Contractor prior to ordering finish hardware. After meeting a letter of compliance, indicating when the training was held and who was in attendance, shall be sent to the Architect.
- B. Hardware will be installed by qualified tradesmen, skilled in the application of commercial grade hardware. For technical assistance if necessary, installers may contact the manufacturer's rep for the item in question, as listed in the hardware schedule.
  - C. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
  - D. Install each hardware item in compliance with the manufacturer's instructions and recommendations, using only the fasteners provided by the manufacturer.
  - E. Do not install surface mounted items until finishes have been completed on the substrate. Protect all installed hardware during painting.
  - F. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
  - G. Operating parts shall move freely and smoothly without binding, sticking, or excessive clearance.
  - H. Wire (including low voltage), conduit, junction boxes, and pulling of wire is by Division 26, Electrical. Electrical Contractor shall connect wire to door position switches and run wire to central room or area as directed by the Architect. Wires shall be tested and labeled with the Architects opening number. Connections to/from power supplies to electrified hardware and any connection to fire/smoke alarm system, and/or smoke evacuation system where specified is by Division 26 Electrical.
- 3.03 ADJUSTING, CLEANING, AND DEMONSTRATING
- A. Adjust and check each operating item of hardware and each door, to insure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly.



- B. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make a final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- C. Clean adjacent surfaces soiled by hardware installation.
- D. Instruct Owner's personnel in the proper adjustment, lubrication, and maintenance of door hardware and hardware finishes.

#### 3.04 FIELD QUALITY CONTROL

- A. Prior to Substantial Completion, the installer, accompanied by representatives of the manufacturers of locks, exit devices, closer, and any electrified hardware, shall perform the following work:
  1. Examine and re-adjust each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.
  2. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures.
  3. Replace hardware items that have deteriorated or failed due to faulty design, materials, or installation of hardware units.
  4. Prepare a written report of current and predictable problems of substantial nature in the performance of the hardware.
  5. At completion of project, a qualified factory representative for the manufacturers of locksets, closer, exit devices, and access control products shall arrange and hold a training session to instruct the Owner's personnel on the proper maintenance, adjustment, and/or operation of their respective products. After training a letter of compliance, indicating when the training was held and who was in attendance, shall be sent to the Architect.

#### 3.05 PROTECTION

- A. Provide for the proper protection of complete items of hardware until the Owner accepts the project as complete. Damaged or disfigured hardware shall be replaced or repaired by the responsible party.

#### 3.06 HARDWARE SCHEDULE

- A. Provide hardware for each door to comply with requirements of Section "Finish Hardware," hardware set numbers indicated in door schedule, and in the following schedule of hardware sets.

- B. It is intended that the following schedule includes complete items of finish hardware necessary to complete the work. If a discrepancy is found in the schedule, such as a missing item, improper hardware for a frame, door or fire codes, the preamble will be the deciding document.
- C. Locksets, exit devices, and other hardware items are referenced in the Hardware Sets for series, type, and function. Refer to the preamble for special features, options, cylinders/keying, and other requirements.
- D. Hardware Sets:

HEADING # 01 - (EXTERIOR PAIR – STOREROOM LOCKSET FUNCTION)

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2 EA	CONT. HINGE	700	630	IVE
1 EA	LOCKSET STOREROOM LEVER)	M9080 – LRB X 660002 (KNURLED	630	DORM
1 EA	CYLINDER, MORTISE	SARGENT – MORTISE	630	SCH
2 EA	BOLT, FLUSH	555-US26D	626	ROCK
1 EA	DUST PROOF STRIKE	570-US26D	630	ROCK
1 EA	SURFACE CLOSER	8916-S-DS-FC-SNL	689	DORM
1 EA	HOLDER / STOP	9-ADJ 336 – HOLD OPEN	689	RIX
2 EA	KICK PLATE	8400 10" X 1" LDW	630	IVE
1 EA	DRIP CAP	142A	AL	ZER
1 EA	SEALS	429A	AL	ZER
1 EA	ASTRAGAL	3578P W/ S88 X 84"	AL	PEM
2 EA	DOOR SWEEP	8100AA	AL	ZER
1 EA	THRESHOLD	526A (VERIFY JAMB DEPTH)	AL	ZER
1 EA	DOOR CONTACT	679-05HM/WD	BLK	SCE

ALL WIRING AND CONNECTIONS BY DIVISION 26.

OPERATIONAL DESCRIPTION:

IMMEDIATE EGRESS ALWAYS ALLOWED. ACCESS BY KEY

EXIT AND DOOR CONTACT CONNECTED TO BUILDING'S SECURITY SYSTEM.

HEADING # 02- (EXTERIOR SINGLE WITH STOREROOM LOCKSET X CLOSER)

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HINGE	5BB1 NRP	630	IVE
<b>1 EA</b>	<b>STOREROOM LOCK</b>	<b>ND80</b>	<b>626</b>	<b>SCH</b>
1 EA	SURFACE CLOSER	SC71 SS	689	FAL
1 EA	KICK PLATE	8400 8" X 2" LDW	630	IVE
1 EA	DRIP CAP	142A	AL	ZER
1 EA	GASKETING	429A	A	ZER

1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	625A (VERIFY JAMB DEPTH)	A	ZER
1	EA	DOOR CONTACT	679-05HM/WD	BLK	SCE

ALL WIRING AND CONNECTIONS BY DIVISION 26.  
 OPERATIONAL DESCRIPTION:  
 DOOR CONTACT CONNECTED TO BUILDING'S SECURITY SYSTEM.

HEADING # 03 - (DOUBLE WITH PANIC HARDWARE)

PROVIDE EACH PAIR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 SERIES AS SPECIFIED	652	IVE
2	EA	PANIC HARDWARE	CD-99-L-07	626	VON
2	EA	MORTISE CYLINDER	AS REQUIRED	626	SCH
2	EA	RIM CYLINDER	AS REQUIRED	626	SCH
1	EA	SURFACE CLOSER	8916-S-DS-FC-304	689	DOR
1	EA	HOLDER / STOP	9-ADJ-326 - HOLD OPEN	689	RIX
4	EA	KICK PLATE	8400 10" x 1" LDW	630	IVE
2	EA	STOP	WS407/FS436 AS SPECIFIED	626	IVE
6	EA	SILENCER	SR64	GRY	IVE

NOT FOR BIDDING PURPOSES  
 REFERENCE COPY ONLY

END OF SECTION

SECTION 08900  
LOUVERS AND VENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Furnish and install the following:
1. Prefinished aluminum exterior fixed louvers, complete with aluminum wire mesh bird screens, and related items.

1.02 RELATED REQUIREMENTS

- A. Section 07460 – MINERAL FIBER CEMENT SIDING
- B. Section 07920 - JOINT PROTECTION: Providing perimeter sealant and backing materials.
- C. Division 15 - HEATING, VENTILATING AND AIR CONDITIONING:
1. Furnishing and installing motorized dampers.
  2. Blank-off plates on back side of louvers.
- D. Division 16 – ELECTRICAL:
1. Power supply to motorized louvers.
  2. Connections to control terminals for smoke detection devices and fire alarm system activation of louver.

1.03 REFERENCES

- A. Referenced Standards: Comply with applicable requirements of the following standards and those others referenced in this Section. The standards referenced herein are included to establish recognized minimum quality only. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. Equivalent quality and testing standards will be acceptable, subject to their timely submission, review and acceptance by the Engineer.
1. AAMA 2605 - Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.
  2. ASCA 96 - Voluntary Specification for Performance of Organic Coatings on Architectural Aluminum Curtainwall, Extrusions and Miscellaneous Aluminum Components.
  3. AMCA Standard 500-L - Laboratory Methods of Testing Louvers for Rating.
  4. AMCA Publication 501, "Application Manual for Air Louvers".
  5. ASTM B 209 - Aluminum-Alloy Sheet and Plate.
  6. ASTM B 221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.

#### 1.04 SUBMITTALS

- A. Submit the following under provisions of Section 01330 - SUBMITTALS:
1. Literature: Manufacturer's product data sheets, specifications, performance data, physical properties for each type of louver and related components furnished hereunder.
  2. Manufacturer's sample warranties for louvers and finishes.
  3. Schedule: Schedule of all louvers to be furnished hereunder, indicating locations for each size and type of louver, and locations and sizes of blank off panels
  4. Shop drawings:
    - a. Large scale details of louver and blank off panel construction, indicating all sizes, gages, and thickness; large scale details of bird screens and accessory items; and complete installation details, coordinated to the specific receiving conditions. All details bearing dimensions of actual measurements taken at the project.
  5. Samples:
    - a. Sample card indicating Manufacturer's full range of colors available for selection by Engineer.
    - b. 12 inch long finish samples of louver frame showing each type material finish and color selected specified

#### 1.05 QUALITY ASSURANCES

- A. Perform work in accordance with AMCA Certification for louvers. Mark units with AMCA Certified Ratings Seal

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Store all materials in an elevated dry location, protected by waterproof coverings

#### 1.07 WARRANTY

- A. Provide the following warranties under provisions of Section 01770 – PROJECT CLOSEOUT:
1. Louver manufacturer's standard warranty.
  2. 10 year warranty on louver finish which shall include covering the applied finish against defects, including color fading, chipping, crazing, pitting, and delamination.
  3. 10 year warranty on polyvinylidene fluoride enamel finish which shall include covering the applied finish against defects, including color fading, chipping, crazing, pitting, and delamination.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
1. AiroLite Company, Schofield WI.
  2. Construction Specialties, Inc., Cranford NJ.
  3. Industrial Louvers, Inc., Delano MN.

### 2.02 ARCHITECTURAL LOUVERS

- A. Exterior Louvers: Continuous blade, drainable architectural louvers in the arrangements and dimensions shown on the Drawings. Louvers shall be stationary, continuous blade, horizontal fixed, drainable louvers, equal to AiroLite Model CB6776.
1. Nominal Louver depth: 6 inches (152.4 mm).
  2. Framing: Heads, sills, jambs and mullions to be one piece structural members of 6063-T5 alloy minimum 0.081 inch thick (2.06 mm).
  3. Blades: 35 degree continuous design, minimum 0.081 inch thick with back lip.
    - a. Fabricate louver with close-fitting, field made splice joints in blades designed to permit expansion and contraction without deforming blades or framework and with mullions recessed from front edges of blades so blades have continuous appearance.
  4. Designed by louver manufacturer to sustain a wind load of not less than 25 pounds per square foot, and 40 pounds per square foot at the corners.
  5. Screen: 1/2 inch mesh by 0.063 inch (1.6 mm) diameter bird screen secured within a extruded aluminum frame.
  6. Performance criteria:
    - a. Minimum Free Area: 54.0 percent (As determined in accordance with AMCA Standard 500, and certified by AMCA Standard 511).
    - b. Free Area Velocity at beginning point of water penetration: 1106 FPM.
      - 1) Water penetration shall not exceed 0.01 ounces of water per square foot of free area at a velocity of 1125 FPM [6.35 m/s] when tested per AMCA Standard 500.
    - c. Air volume delivered at beginning point of water penetration: 10,700 CFM [5.06 m<sup>3</sup>/s].
    - d. Pressure Drop at beginning point of water penetration: 0.18 inches water [0.045 kPa].

- B. Provide permanent and removable louver units or panels, as indicated on Drawings or as otherwise required by mechanical systems.

## 2.03 ACCESSORIES

- A. Fasteners and Anchors: Stainless steel type.
- B. Primer: Zinc chromate, alkyd type.
- C. Flashings: Of same material as louver frame.
- D. Sealant: Joint Sealer Type P2 as specified under Section 07920 - JOINT SEALANTS.

## 2.04 FACTORY FINISHING

- A. Shop-applied Polyvinylidene Fluoride (PVDF) resin based, high performance thermoplastic organic coating conforming to AAMA 2605, NAAAMM - Metal Finishes Manual, and the following:
  - 1. Resin base of 70 percent PVDF by weight, Atochem North America, Inc., product "Kynar 500" or Ausimont USA, product "Hylar 5000".
  - 2. Finish Coating shall be manufactured as one of the following products:
    - a. Akzo Chemical; product "Trinar"
    - b. Glidden Company; product "Nubelar"
    - c. Morton International; product "Fluoroceram".
    - d. PPG Industries Inc.; product "Duramar".
    - e. Valspar Corp., product "Fluoron".
  - 3. Surface Preparation: Properly clean aluminum with inhibited chemical cleaner and pretreat with acid chromate-fluoride-phosphate conversion coating, in accordance with Aluminum Association method AA-C12C42.
  - 4. Shop-prime all surfaces with a corrosion resistant, epoxy-based primer compatible with finish coating, averaging 0.2 to 0.4 mils dry film thickness, fully oven-cured.
  - 5. Shop finish with one color coat, of polyvinylidene fluoride enamel minimum 1.0 to 0.80 mil dry film thickness on all exposed surfaces, including all exposed screws, fastenings.
  - 6. Total system dry film thickness: 1.2 mils.
  - 7. Provide custom color to match standard Kynar 500 color or equivalent of adjacent Insulated Metal Panels.
- B. Concealed Steel Items: Galvanized in accordance with ASTM A386 to 2.0 ounces per square foot.
- C. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Inspect all surfaces and verify that they are in proper condition to receive the work of this Section. Verify that prepared openings and flashings are ready to receive the work of this Section and opening dimensions are as indicated on the shop drawings. Verify that all blocking and nailers are set in place and secure.
- B. Beginning of installation means acceptance of existing project conditions.

### 3.02 INSTALLATION

- A. Install louver assembly in accordance with manufacturer's instructions. Erect louvers plumb and level, free of warp or twist. Maintain dimensional tolerances, aligning with adjacent work.
  - 1. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.
  - 2. Secure louvers in opening framing with concealed fasteners.
  - 3. Install bird screen and frame to interior of louver. Hinge screens for access.
- B. Install perimeter sealant and backing rod in accordance with Section 07920 - JOINT Protection.
- C. No permanent exposed to view labels of any kind will be permitted to remain on the louvers or frames.

### 3.03 TOLERANCES

- A. Maximum Variation from Level or Plumb: 0.06 inches every 3 feet non-cumulative or 0.5 inches per 100 feet, whichever is less.

### 3.04 CLEANING AND TOUCH UP

- A. Upon completion of the work of this Section in any given area, remove tools, equipment and all rubbish and debris from the work area; leave area in broom-clean condition.
- B. Remove excess sealant by solvent acceptable to sealant manufacturer. All exposed edges of sealant and gaskets shall be left smooth, uniform in line, and with edges neatly struck.
- C. Remove protective material from prefinished aluminum surfaces. Wash down exposed surfaces free of dirt, handling marks, packing tapes, and foreign matter, using a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.



- D. Touch-up all scratches, abrasions, and other defects in the prefinished metal surfaces with shop-coat finish material, supplied with the various items to be furnished hereunder.

END OF SECTION

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 09900

PAINTING

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This Section covers field painting and coating of surfaces, complete. Shop painting of metal items is specified under the applicable item.
- B. A schedule listing the various types of surfaces to be painted and the types of paints to be applied is included herein.
- C. Unless otherwise indicated, the following items shall not be painted:
  - 1. Labels on equipment, such as Underwriters Laboratories and Factory Mutual, equipment identification, performance rating, and name or nomenclature plates.
  - 2. Moving parts of operating units, exposed bolt threads, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts.
  - 3. Electrical conduit unless mounted on painted or finished surfaces or exposed in a finished room.
  - 4. Structural steel not exposed to view, and other parts of buildings also not exposed to view.
  - 5. Stainless steel.
  - 6. Concrete.
  - 7. Plumbing fixtures.
  - 8. Fiberglass and polyethylene storage tanks.
  - 9. Uninsulated PVC piping (to be banded only)
  - \* 10. Factory prefinished architectural components.
  - \* 11. Electrical panels and cabinets factory finish painted.

---

\* Except for touch-up painting when required

1.02 RELATED WORK:

- A. Section 04200, MASONRY
- B. Section 05500, MISCELLANEOUS METALS
- C. Section 06100, ROUGH CARPENTRY
- D. Section 06200, FINISH CARPENTRY
- E. Section 08100, METAL DOORS & FRAMES
- F. Section 09200, DRYWALL SYSTEM
- G. DIVISIONS 15, 16

1.03 SYSTEM DESCRIPTION:

- A. The term "paint" as used herein includes emulsions, enamels, paints, stains, varnishes, sealers, and other coatings, organic or inorganic, whether used as prime, intermediate, or finish coats.
- B. The Contractor shall do a complete painting job throughout the work in accordance with generally approved modern practices for work of high quality. Unless otherwise specified, all materials and surfaces customarily painted shall be given not less than one shop coat and two field coats or one prime coat and two finish coats, regardless of whether or not the surface to be painted is specifically mentioned.
- C. Paints containing lead shall not be used.
- D. To ensure a satisfactory painting job it is essential that the paints applied in the shop and in the field be mutually compatible. The Contractor shall determine what shop paints have been used and shall verify that field applied paints are compatible therewith.
- E. The colors of finish coatings shall be selected by the Engineer from color chips submitted by the Contractor for review. The color selection shall be in the form of a schedule indicating the colors to be used on the various surfaces. The colors used in the final work shall be in accordance with the color schedule and shall match the selected color chips.
- F. All coating systems used for potable water applications shall be previously approved by the National Sanitation Foundation (N.S.F.) in accordance with Standard 61. Evidence of such approval shall be an approval letter from N.S.F. listing the submitted materials.
- G. Paints submitted shall meet all Federal and State E.P.A. regulations pertaining to volatile

organic compounds (VOC) compliance.

1.04 REFERENCES:

- A. The following standards form a part of these specifications, and indicate the minimum standards required:

American Society for Testing and Materials (ASTM)

ASTM F1869 Moisture Vapor Emission Rate Using Anhydrous Calcium Chloride

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL CONDITIONS, SUBMIT THE FOLLOWING:

- A. Provide manufacturer's literature of proposed paints shall be submitted to the Engineer for review.
- B. The painting schedule shall be submitted to the Engineer for review.
- C. Three (3) sets of color chips shall be submitted to the Engineer for selection of colors.

1.06 DELIVERY AND STORAGE:

- A. Paint shall be delivered to the site in the manufacturer's sealed containers. Each container shall bear the manufacturer's label, listing the brand name, type and color of paint, and instructions for thinning. Thinning shall be done only in accordance with directions of the manufacturer. Job mixing or job tinting may be done when approved by the Engineer and for preparing sample colors.
- B. Painting materials shall be stored and mixed in a single location designated by the Engineer for this purpose. The Contractor shall not use any plumbing fixture or pipe for mixing or for disposal of any refuse. He shall carry all necessary water to his mixing room and shall dispose of all waste outside of the building in a suitable receptacle. The Contractor will be held responsible for any damage done due to failure to observe these precautions.
- C. The paint storage area shall be kept clean at all times, and any damage thereto or to its surroundings shall be repaired. Any oily rags, waste, etc., shall be removed from the building every night, and every precaution shall be taken to avoid danger of fire.
- D. Heat must be provided in the storage area if paints are to be stored during winter months. The temperature shall be maintained above 40 degrees F. at all times.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. PAINT SCHEDULE:

Except as otherwise indicated, all paint used shall be of the type listed in the schedule below, by Tnemec Company, Inc., or equivalent paints by Sherwin-Williams Company, International Paints, or other approved paint fully equal to paint manufactured by the above-named companies. No brand other than those named will be considered for approval unless the brand and type of paint proposed for each item in the following painting schedule are submitted in writing to the Engineer, along with sufficient data supported by certified tests.

PAINT SCHEDULE

<u>Key</u>		<u>Tnemec</u>	<u>Note 1</u>
AGE	Acryli Gloss Enamel	1029 Enduracore	3.5
APE	Acrylic Polyurethane	FC Endura Shield Enamel	3.0
ABF	Cementitious Block Filler	130 Envirofill	80-100 s.f./gal
BO	Bleaching Oil	Note 5	
CEE	Catalyzed Epoxy	L69F Epoxoline II	4.0
CEM	Catalyzed Epoxy Mastic	27 WB Typoxy	Note 3
CEP	Catalyzed Epoxy Primer	L69F Epoxoline	3.0
EMC	Epoxy Modified Cement	218 Mortar-Clad	Fill/Surface
EP	Epoxy-Polyamide (thinned 30% #4 thinner)	FC 22 Pota-pox	25-30
EPW	Water-based Epoxy Primer	151 Elasto-Grip	1.0-1.5
HGV	High Gloss Varnish		Note 2
HSE	High Solids Epoxy (Minimum 69%)	L69 Epoxy	6.0
MA	Modified Acrylic	115 Uni-bond	3.0
MAE	Modified Acrylic Elastomer	156 Envirocrete	6.0-8.0
MCU	Moisture Cured Urethane	Series 1 - Omnithane	2.5-3.0
MPE	Modified Polyamine Epoxy	Series 435 - Permaglaze	15-20 mils

<u>Key</u>		<u>Tnemec</u>	<u>Note 1</u>
NE	Novolac Epoxy	282 Tneme-Glaze	7.5
PEF	Polyamine Epoxy Finish	280 Tneme-Glaze	6.0-8.0
PEP	Polyamine Epoxy Primer	201 Epoxoprime	6.0-8.0
PVA	PVA Sealer	151 Elasto Grip	0.75-1.5
PWC	Potable Water Coating	Series FC 22 Pota Pox	25-30
SA	Silicone Aluminum	39-1261 (Note 4)	1.5
VB	Vapor Barrier	262 Elasto Shield	50-100
WP	Wood Primer	151 Elasto-Grip	1.0-1.5
WS	Wood Sealer	Note 2	-
Z	Zinc-Rich Primer	90G-1K97 Tneme-Zinc	2.5

- Notes
- 1: Minimum Dry Film Thickness/Coat (mils)
  - 2: Furnished by reputable manufacturer and acceptable to the Engineer.
  - 3: Shall be used as a tie-coat between incompatible paints @ 3.0-4.0 mils.
  - 4: This paint is suitable for temperatures up to 1200°F and must be final cured at 400°F for one hour.
  - 5: Bleaching oil is a translucent gray paint stain with a chemical additive to enhance the natural bleaching tendencies of cedar shingles.

B. PAINTING SCHEDULE:

Paint shall be applied in accordance with the paint key listed on the following schedule and defined in the preceding Paint Schedule:

<u>Item</u>	<u>Field Coats</u>		
	1st	2nd	3rd
<u>Walls:</u>			
Interior concrete masonry units	ABF	HSE	HSE
Interior concrete designated to be painted, to include top and outside of all concrete containment curbs	HSE	HSE	--
Interior chemical containment curbs on the chemical storage side	PEP	NE	NE
Exterior concrete masonry units (if sprayed, backroll first coat)***	MAE	MAE	--
Exterior wood shingles	BO	BO	--
Plaster & gypsum wallboard	PVA	HSE	HSE

Floors:

Concrete floors designated to be painted	PEP	PEF	PEF
Concrete floor slab in chemical containment areas including tank pads	PEP	NE	NE
Concrete floor and pads in chemical feed and fluoride rooms	PEP	NE	NE

Ceilings and Walls:

Exposed galvanized metal deck/bar joists, dry spaces^	MA	--	--
Exposed galvanized metal deck/bar joists, wet spaces^	CEE		
Exposed galvanized wall panel	CEE	CEE	--
Plaster & gypsum wallboard	PVA	CEE	CEE

Equipment Items:

With shop prime coat, including machinery and pumps (non-submerged) (submerged)	Interior	*CEP	CEE	--
	Exterior	*CEP	APE	
	Exterior	MPE	MPE	
With shop finish coat (when designated to be painted)	Interior	*CEM	CEE	--
	Exterior	*CEM	APE	

Tanks:

Steel tanks (interior)	*MCU	CEE	CEE
Steel tanks (exterior)	*MCU	CEE	APE
Exterior of potassium permanganate (KMnO4) tanks (steel only)(with CEP shop coat)	HSE	HSE	--
Interior of potassium permanganate tanks	NE	NE	

Potable Water Coatings (immersion service):

Concrete Tanks (when designated to be brush blasted and painted)	EMC	PWC	
Steel Tanks (SSPC-SP#10 prep. required)	PWC	PWC	--

Metals:

Exposed interior structural steel including monorails and supports	*Z	CEE	CEE
Exposed exterior structural steel including monorails and supports	*Z	CEE	APE
Interior miscellaneous galvanized and non-ferrous metals	CEE	CEE	--

and piping

Exterior miscellaneous galvanized and non-ferrous metals and piping (SP7 required)	CEE	APE	--
Miscellaneous interior ferrous piping, metalwork, ferrous parts or operating devices, valve handles, levers, pumps, and ferrous hangers and supports (exterior exposure)	CEP	CEE	--
Exposed electrical conduit, conduit fittings, outlet boxes	CEP	CEE	APE
Hot ferrous metal surface	SA	SA	--

Wood and Carpentry Items:

Wood trim (natural finish)	WS	HG V	HGV
----------------------------	----	---------	-----

Wood trim (unprimed)	WP	AGE	AGE
----------------------	----	-----	-----

Doors and Frames:

Interior hollow metal doors, frames and panels	AGE	AGE	--
--	-----	-----	----

Exterior hollow metal doors	AGE	AGE	--
-----------------------------	-----	-----	----

Interior wood doors (painted)	WP	AGE	AGE
-------------------------------	----	-----	-----

Interior wood doors (natural)	HGV	HG V	--
-------------------------------	-----	---------	----

Piping:

PVC Piping designated to be painted (SP7 or hand sand)	CEE	CEE	--
--	-----	-----	----

Pipe insulation (plastic or metal sheathed paint as scheduled for plastic or metal surface)	PVA	CEE	CEE
---	-----	-----	-----

Other piping (see metals)			
---------------------------	--	--	--

\* Spot Prime

- \*\*\*For existing, painted masonry walls, use EPW primer, followed by two coats of MAE.
- ^ If galvanized metal is provided with a light top coat sealer, light brush blast surface preparation is required prior to first field coat

B. SPARE PAINT:

1. Furnish to the Owner one unopened gallon of each type and color of paint used on the work.
2. Furnish both components for each type and color of epoxy paints used on the work.



## PART 3 - EXECUTION

### 3.01 SURFACE PREPARATION:

- A. Before any surface is painted, it shall be cleaned carefully of all dust, dirt, grease, loose rust, mill scale, old weathered paint, efflorescence, etc. All necessary special preparatory treatment shall then be applied. Where required, imperfections and holes in surfaces to be painted shall be filled in an approved manner.
- B. Cleaning and painting shall be so programmed that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surfaces which have been cleaned, pretreated, or otherwise prepared for painting, shall be painted with the first field coat as soon as practicable after such preparation has been completed, but in any event prior to any deterioration of the prepared surface.
- D. Wood shall be sanded to a smooth and even surface and then dusted off. Before priming wood that is to be painted, shellac shall be applied to all knots, pitch and sapwood. After priming or stain coat has been applied, nail holes and cracks shall be thoroughly filled with plastic wood or putty. For natural finish work, putty shall be colored to be imperceptible in the finished work.
- E. Exposed nails and other ferrous metal surfaces to be painted with water-thinned paint shall be spot primed with aluminum.
- F. Cracks and holes in masonry and concrete surfaces to be painted shall be filled with patching material recommended by the coatings manufacturer. Surfaces shall be clean and dry before painting. All efflorescence, grease, oil, etc., shall be removed before painting, and all loose, crumbling material shall be removed by vigorous wire brushing over entire surface, followed by removal of all dust. All high areas on masonry and concrete surfaces such as mortar daubs, mortar ridges at joints, and ridges at form joints in concrete shall be removed.
- G. All holes in plaster shall be filled with plaster of paris and all cracks shall be cut out and filled. No sandpaper shall be used on plastered surfaces. Prior to painting, surfaces shall be tested with a moisture detecting device, such as Kaydel Plaster Tester, Type CP-48, as manufactured by Hard Moisture Gauges, Inc. No sealer or paint shall be applied when the moisture content of the plaster exceeds 8 percent, as determined by the test. Testing shall be done in the presence of the Engineer's representative, and in as many locations as directed. Plaster shall be thoroughly dry-brushed before painting or sealing.
- H. All nonferrous metal surfaces to be painted shall be cleaned of all dirt, grease, oil and other foreign substances uniformly profiled per SSPC SP 7.
- I. All galvanized surfaces to be painted shall be brush blasted to create a uniform surface profile per SSPC SP7.

- J. Before application of the first full field coat, abraded areas of all non-galvanized ferrous metal items having shop coats shall be touched up with paint of the type indicated on the Painting Schedule.
- K. All items of equipment such as motors, pumps, instrumentation panels, electrical switchgear, and similar items, that have been given shop coats, paint filler, enamel or other treatment customary with the manufacturer, shall have, after installation, all scratches and blemishes touch up prior to application of the first field coat. Factory prefinished items not to be field painted shall be touched up with matching paint to repair any areas damaged during installation.
- L. All submerged concrete surfaces that are to receive an epoxy coating shall be brush blasted to remove surface laitance and provide a uniform surface profile, reference SSPC SP #13. Surface preparation may commence one week after the concrete has been pronounced cured. The curing period is defined as that length of time during which the concrete is fully hydrated (28-day cure). Patch holes and voids with specified modified epoxy cement prior to coating.
- M. Concrete floors that are to receive epoxy coating shall be brush blasted or shot blasted per SSPC SP #13 and ICRI Surface Profile requirements per the coating manufacturer (Blastrack). Check for excessive moisture migration per ASTM F1869, Moisture Vapor Emission Rate Using Anhydrous Calcium Chloride. Test results not to exceed 3 lbs per 1,000 square feet in one 24-hour period.
- N. Hardware accessories, machine surfaces, plates, lighting fixtures, and similar items in place prior to cleaning and painting, and not intended to be painted, shall be removed during painting operations and repositioned upon completion of each area or shall otherwise be protected.
- O. All PVC pipe to be painted shall be brush blasted per SSPC SP7 or shall be sanded to provide a uniform surface profile.

### 3.02 APPLICATION:

- A. Paint shall be used and applied as recommended by the manufacturer without being extended or modified, and with particular attention to the correct preparation and condition of surfaces to be painted.
- B. Paint shall be applied only within the temperature range recommended by the manufacturer. Painting of surfaces when they are exposed to the sun shall be avoided.
- C. Paint shall not be applied to wet or damp surfaces and shall not be applied in rain, snow, fog, or mist, or when the relative humidity exceeds 85 percent.
- D. No paint shall be applied when it is expected that the relative humidity will exceed 85

percent or that the air temperature will drop below 40°F within 18 hours after the application of paint. Dew or moisture condensation should be anticipated and if such conditions are prevalent, painting shall be delayed until midmorning to be certain that the surfaces are dry. Further, the days painting should be completed well in advance of the probable time of day when condensation will occur, in order to permit the film an appreciable drying time prior to the formation of moisture.

- E. All paint shall be applied under favorable conditions by skilled painters and shall be brushed out carefully to a smooth, even coating without run or sags. Enamel shall be applied evenly and smoothly. Each coat of paint shall be allowed to dry thoroughly, not only on the surface but also throughout the thickness of the paint film before the next coat is applied. Finish surfaces shall be uniform in finish and color, and free from flash spots and brush marks. In all cases, the paint film produced shall be satisfactory in all respects to the Engineer.
- F. Exposed nails and other ferrous metal or surfaces to be painted with water-thinned paints shall be spot primed with aluminum paints.
- G. In order to provide contrast between successive coats, each coat shall be of such tint as will distinguish it from preceding coats.
- H. The Contractor shall not only protect his work at all times but shall also protect all adjacent work and materials by the use of sufficient drop cloths during the progress of his work. Upon completion of the work, he shall clean up all paint, spots, oil, and stains from floors, glass, hardware, and similar finished items.
- I. Paint shall be applied so as to obtain coverage per gallon and the dry film thickness recommended by the manufacturer. Dry film thickness readings shall be taken to insure that required thicknesses have been achieved. The Contractor shall record in a manner satisfactory to the Engineer, the quantities of paint used for successive coats on the various parts of the work.
- J. Spraying with adequate apparatus may be substituted for brush application of those paints and in those locations for which spraying is suitable.
- K. If paints are thinned for spraying, the film thickness after application shall be the same as though the unthinned paint were applied by brush. That is, the addition of a thinner shall not be used as a means of extending the coverage of the paint, but the area covered shall be no greater than the area that would have been covered with the same quantity of unthinned paint.
- L. Blast cleaned metal surfaces shall be coated immediately after cleaning, before any rusting or other deterioration or contamination of the surface occurs. Blast cleaned surfaces shall be coated not later than 8 hours after cleaning under ideal conditions or sooner if conditions are not ideal.

- M. The use of carbon dioxide or carbon monoxide emitting heaters is not permitted during the painting operation. Only indirect hot-air systems shall be permitted.

3.03 PIPING COLOR CODE:

The following Tnemec colors shall be utilized to facilitate identification of piping. Only insulation is to be painted on chemical feed lines.

1. Water Lines

Raw	Olive Green	110GN
Settled or Clarified	Aqua	10GN
Finished or Potable	Dark Blue	11SF

2. Wastewater or Potable Waste Lines

Sewer (sanitary or drain)	Dark Gray	34GR
Backwash Waste	Light Brown	68BR
Sludge	Dark Brown	84BR
Sewage Plant Effluent	Clay	07RD

3. Chemical Lines

Chlorine (Gas and Solution)	Yellow	02SF
Fluoride Compounds	Light Blue with Red Band	25BL/06SF
Phosphate Compounds	Light Green with Red Band	08GN/06SF

4. Other

Compressed Air	Dark Green	91GN
Gas or Oil	Red	28RD
Other Lines	Light Gray	32GR

- B. In situations where two colors do not have sufficient contrast to easily differentiate between them, a 6-inch band of contrasting color shall be painted on one of the pipes at approximately 30-inch intervals.
- C. Piping which is not painted shall be color coded with bands placed at each change in direction and no more than 5 feet apart on straight runs.

3.04 PIPING IDENTIFICATION:

- A. After painting, piping shall be identified by stenciling using the same specified paint as used on the pipes. Stenciling shall be of wording and color selected by the Engineer and sized as follows:

<u>Outside Diameter of Pipe or Covering</u>	<u>Size of Legend Letters</u>
3/4-inch to 1-1/4-inch	2-inch
1-1/2-inch to 2-inch	3/4-inch
2-1/2-inch to 6-inch	1-1/4-inch
8-inch to 10-inch	2-1/2-inch
Over 10-inch	3-1/2-inch

- B. Arrows shall indicate direction of flows. Where "a" is equal to 3/4 of outside diameter of pipe or covering, the arrow shaft shall be 2 "a" long by 3/8 "a" wide. The arrow head shall be an equilateral triangle with sides equal to "a." Maximum "a" dimension shall be 6-inches.
- C. Where pipe passes through a wall, use pipe markers and directional arrows on each side of the wall.
- D. Use pipe markers and directional arrows every 50 feet along continuous pipe lines.
- E. Use a pipe marker and directional arrow at each rise and "T" joint.
- F. When using directional arrows, point arrowhead away from pipe markers and in direction of flow. If flow can be in both directions, use a double-headed directional arrow.
- G. The Engineer will assist in determining pipe content and direction of flows.

3.05 PARKING LOT LINE PAINTING:

- A. Paint for parking lot lines shall conform to Federal Specification TT-P-115-E Type I. Paint shall be 11-3 PPG Industries, Pittsburgh, PA, Series 6 Tneme-Cryl, Tnemec, St. Louis, MO, or approved equal.
- B. Contractor shall prepare the pavement surface according to the recommendations of the paint manufacturer.
- C. Applied markings shall have clean-cut edges, true and smooth alignment and uniform film thickness of 15 mils,  $\pm$  1.0.
- D. The Contractor shall be responsible for removing, to the satisfaction of the Engineer, tracing marks, and spilled paint applied in an authorized area.

3.06 CLEANUP:

- A. The Contractor shall at all times keep the premises free from accumulation of waste material and rubbish caused by his employees or work. At the completion of the painting, he shall remove all of his tools, scaffolding, surplus materials, and all of his rubbish from

and about the buildings and shall leave his work "broom clean" unless more exactly specified.

- B. The Contractor shall also, upon completion, remove all paint where it has been spilled, splashed, or splattered on all surfaces, including floors, fixtures, equipment, furniture, glass, hardware, etc., leaving the work ready for inspection.

END OF SECTION

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 09260  
DRYWALL SYSTEM

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section of the specification covers the drywall system, complete.

1.02 RELATED WORK:

- A. Section 06100, ROUGH CARPENTRY
- B. Section 06100, FINISH CARPENTRY
- D. Section 07210, BUILDING INSULATION
- E. Section 07840, FIRESTOPPING
- F. Section 07920, JOINT PROTECTION
- G. Section 08100, METAL DOORS AND FRAMES
- H. Section 09900, PAINTING

1.03 REFERENCES:

The following standards form a part of this specification and indicate the minimum standards required:

American Society for Testing and Materials (ASTM)

- ASTM C36 Gypsum Wallboard
- ASTM C475 Joint Treatment Materials for Gypsum Wallboard Construction
- ASTM C587 Gypsum Veneer Plaster
- ASTM C588 Gypsum Base for Veneer Plaster
- ASTM C630 Water-Resistant Gypsum Backing Board
- ASTM C645 Non-Load Bearing Steel Studs, Runners and Rigid Furring Channels  
for  
Screw Application of Gypsum Wallboard

ASTM C646 Steel Drill Screws for the Application of Gypsum Sheet Material to Light Gage Steel Studs

ASTM C843 Application of Gypsum Veneer Plaster

Federal Specification (FS)

FS SS-W-40 Wall Base, Rubber and Vinyl Plastic

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF THE GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Submit information on steel framing system for Engineer's review, including a sample section.

1.05 DELIVERY AND STORAGE OF MATERIALS:

Materials shall be delivered in their original unopened packages and stored in an enclosed shelter providing protection from damage and from exposure to the elements. Damaged or deteriorated materials shall be removed from the premises.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Water-Resistant Wallboard

Water-resistant wallboard shall have water-resistant core, glass fiber surface mats front and back coated with water and vapor retardant coating such as "Dens-Shield" manufactured by Georgia Pacific Corporation. Overall per rating of panel shall be 1.2. Continuous finish skin compound shall be synthetic flexible waterproof copolymer-based waterproof ground coat, mixed with equal amounts of Type 1 Portland Cement.

B. Moisture-Resistant Wallboard

Moisture resistant wallboard shall conform to ASTM C630, 5/8-in. thick and 4 feet wide, with tapered edges.

C. Gypsum Wallboard

Gypsum wallboard shall conform to ASTM C36. Wallboard which is to serve as a base for a veneer coat of plaster shall also conform to ASTM C588. It shall be 5/8-inch thick and 4 feet wide, with tapered edges. Wallboard shall be as manufactured by United States Gypsum, Gold Bond Building Products, Georgia Pacific, or an approved equal product.

D. Steel Framing



Steel framing members shall conform to ASTM C645 and shall be fabricated of steel, galvanized or protected with another corrosion resistant coating approved by the Engineer. Steel studs shall contain punch outs to accommodate conduits. Unless otherwise noted on the design drawings, framing shall be 3-5/8-inches wide, with conforming channels and runners.

E. Miscellaneous Accessories

1. Joint tape and compound shall be compatible with the other materials supplied and shall conform to ASTM C475.
2. Corner and casing beads shall be of galvanized steel. Corner beads shall be 1-inch by 1-1/4-inch.
3. Drill screws shall be type "S" conforming to ASTM C646.
4. Vapor barrier shall be 6 mil thick polyethylene sheet.

F. Resilient Furring Channels

Resilient furring channels shall be 1/2-inch deep galvanized steel manufactured by U.S. Gypsum Co., National Gypsum Co., or approved equal.

G. Plaster

Gypsum veneer plaster shall be a one component system conforming to ASTM C587 and shall be Uni-Kal Plaster by Gold Bond Building Products, Imperial Plaster by United States Gypsum or approved equal.

PART 3 - EXECUTION

3.01 PREPARATION:

- A. The Contractor shall examine and inspect all materials to which gypsum board is to be applied and shall remedy all defects prior to installation of drywall.
- B. The Contractor shall maintain a uniform room temperature between 55N F. and 70N F. during application of wallboard and joint treatment, until all work has completely dried. Adequate ventilation shall be provided to carry off excess moisture.

3.02 WALLBOARD INSTALLATION:

- A. Steel runners shall be attached at bottom and top to structural element with suitable fasteners located 2-inches from each end and spaced 16-inches O.C. or to suspended ceilings with toggle or molly bolts spaced 16 inches O.C.
- B. Studs shall be positioned vertically, engaging floor and ceiling runners and spaced

16-inches O.C. When necessary, studs shall be spliced with 8-inches nested lap and one positive attachment per stud flange. Studs shall be placed in direct contact with all door frame jambs, abutting partitions, partition corners, and existing construction elements. Where studs are installed directly against exterior walls and a possibility of water penetration through walls exists, asphalt felt strips shall be installed between studs and wall surfaces.

- C. Studs shall be anchored securely to jamb or head anchor clips of door or borrowed-light frames with bolts or screws. Over metal doors and borrowed-light frames, a cut-to-length section of runner shall be placed horizontally with a web flange bend at each end and secured with one positive attachment per flange. A cut-to-length stud extending to ceiling runner shall be positioned at vertical panel joints over door frame header.
- D. Gypsum panels shall be installed parallel to the studs with vertical joints occurring over channels. Panels shall be attached with 1-inch Type "S" screws spaced 16-inches O.C. in the field of panels and 8-inches at the edges. At exterior corners, 1-1/4-inch Type "S" screws spaced 16-inches O.C. shall be used. Gypsum wallboard shall be held in firm contact with the framing member while fasteners are being driven. Fastening shall proceed from center portion of the wallboard toward the edges and ends. Fasteners shall be set with the heads slightly below the surface of the wallboard in a dimple formed by the hammer or power screwdriver. Care shall be taken to avoid breaking the face paper of the wallboard. Improperly driven screws shall be removed. Joints shall be staggered on opposite sides of partitions.
- E. Gypsum wallboard shall be cut by scoring and breaking or by sawing, working from the face side. Where the board meets projecting surfaces, it shall be described accurately and neatly.
- F. Panels shall be installed with 1/8-inch clearance between floor and board to prevent wicking.
- G. Corner beads shall be screwed with gypsum wallboard screws spaced no greater than 12-inches apart on each flange of the beads, with the screws opposite.
- H. Resilient furring channels shall be installed in accordance with manufacturer's instructions.

### 3.03 JOINT AND CORNER FINISHING:

- A. Joint compound shall be mixed in accordance with printed instructions on the package.
- B. A uniformly thin layer of joint compound approximately 4-inches wide shall be applied over the joint. The tape shall be centered over the joint compound to provide proper bond. Ceiling and wall angles and inside corner angles shall be reinforced with the tape, folded to conform to the angle and embedded in the compound.
- C. After the compound is thoroughly dry, the tape shall be covered with a coat of joint or

topping compound spread approximately 3-inches on each side of the tape and feathered out at the edge. After the compound is thoroughly dry, another coat of joint or topping compound shall be applied and the edges feathered approximately 3-inches beyond the preceding coat.

- D. Inside corners shall be coated with at least one coat of joint or topping compound with the edges feathered out.
- E. Nail or screw head dimples shall receive three coats of compound.
- F. Flanges of wallboard corner bead shall be concealed by at least two coats of compound. The first coat shall be joint compound, and the second coat may be joint or topping compound feathered out approximately 9-inches on each side of the exposed metal nose.
- G. When each application of compound has dried, sand as necessary. Avoid excess sanding and roughing of the wallboard paper. When the installation is complete, wallboard and treated areas shall be smooth and ready for finishing.

#### 3.04 PLASTERING:

Gypsum veneer plaster shall be applied in a single coat at least 3/32-inch thick in accordance with ASTM C843, by experienced workmen. Surfaces shall have a smooth float finish, free of imperfections, meeting the approval of the Engineer.

END OF SECTION

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 10700

DEPLOYABLE FLOOD BARRIERS

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. Work included: Furnish all labor, supervision, equipment, supplies, and materials and perform all operations necessary to complete the work of this Section, including but not limited to the following:
  - 1. Removable flood panel assemblies
  - 2. Swing flood gates and/or doors
  - 3. Sliding flood gates
  - 4. Anchors and fasteners for installation and storage
  - 5. Waterproof sealant and grout
  - 6. Barrier accessories (including but not limited to frames and storage containers)
  - 7. Operations and Maintenance Plan

1.02 RELATED WORK:

- A. Section 01330 – SUBMITTAL PROCEDURES
- B. Section 01760 – O&M MANUALS
- C. Section 01770 – PROJECT PROTECTION
- D. Section 04200 – MASONRY
- E. Section 05120 – STRUCTURAL STEEL
- F. Section 05400 – COLLECTED METAL FRAMING
- G. Section 06200 – FINISH CARPENTRY
- H. Section 08700 – DOOR HARDWARE

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM)
- B. ANSI FM2510
- C. ASCE 24-14, ASCE 7-10
- D. CT Public Act 18-82
- E. FEMA P-936 Floodproofing Non-Residential Buildings
- F. FEMA Technical Bulletin 3-93 Non-Residential Floodproofing

- G. Flood Insurance Rate Map (FIRM)
- H. NFIP Floodproofing Certificate for Non-Residential Structures
- I. All applicable federal, state, and municipal codes, laws, and regulations.

#### 1.04 QUALITY ASSURANCE

- A. Contractor shall verify that field measurements and materials (ground surface and connection) are as indicated on all drawings.
- B. Contractor shall engage the services of a Professional Structural Engineer, registered in the state of Connecticut to design and certify that the work of this Section meets or exceeds the performance requirements specified in this Section and as required by State Building Code, ASCE, and FEMA. The structural engineer shall be responsible for
  1. Determination of sizing and loading of components in accordance with applicable codes and regulations. Flood barrier assemblies shall provide a minimum 2:1 factor of safety based on the yield strength of materials and provide an effective seal against design flood level.
  2. Production, review, stamp, and signature of shop drawings in accordance with manufacturer literature and warranties.
  3. Observation of work of this Section during fabrication and installation.
  4. Final review of record drawings with an affidavit of work performed in accordance with Structural Engineering recommendations upon completion.
- C. The qualifications of the person performing the work of this section shall be forwarded to the Owner's Engineer for approval. Work of this section shall be executed by competent installers with a minimum of 10 years-experience in application of products, systems and assemblies specified and with approval and training of the approved product manufacturers.
- D. The Contractor shall arrange for product manufacturer's technical representative to provide the following services:
  1. Meet and discuss installation procedures, storage locations, and unique conditions on site with the Contractor, Owner, and Owner's Engineer.
  2. Inspect ground surface and connection surfaces and provide solutions for a watertight seal, including adverse and/or seasonal conditions.
  3. Inspect the installation of work of this Section and report unsatisfactory conditions to the Contractor, Owner, and Owner's Engineer.
  4. Product Testing: Proof test and leak test all seals per manufacturer's instructions. Provide certification from an independent testing laboratory indicating satisfactory test results from leak testing. A minimum of one successful leak test shall be conducted on-site on the finished assembly for each proposed product type at the location of the maximum flood depth to the design flood level. Test procedures shall

be acceptable to the Owner's Engineer and Manufacturer's technical representative. The test shall be overseen by the Contractor, Owner, Owner's Engineer, and manufacturer's technical representative. Following the leak test, the manufacturer shall provide recommendations to modify the finished assembly to improve performance (if needed). The Owner's Engineer reserves the right to require additional testing if the leak test does not meet performance criteria as specified in industry standards.

5. Attend a final inspection with the Contractor, Owner, and Owner's Engineer, perform a test deployment and retraction of each finished assembly, and submit written certification that products, systems, storage, and assemblies have been installed in accordance with the manufacturer's requirements.
  6. Provide Owner operations and maintenance (O&M) training on-site and prepare a comprehensive O&M plan for the Owner in accordance with the requirements described in this Section.
- E. Owner's Engineer reserves the right to perform inspections and testing at any time during the execution of the work.
- F. Contractor shall store product systems in a manner to keep them protected from damage from construction and other causes.
- G. Contractor shall assume full responsibility for quality control inspection and testing and give sufficient notice to the Engineer to permit the witnessing of the inspections or tests.
- H. Notification Point: The Contractor shall give the Owner's Engineer at least 2 days' notice in advance of quality control tests and inspections.

#### 1.05 SUBMITTALS

- A. Literature from the Manufacturer for proposed product, including
1. Product data sheets, including but not limited to product physical and structural characteristics, expected life cycle, and fabrication methods.
  2. Specifications with performance data indicating products and materials meet performance standards in this Section and relevant industry certifications.
  3. Manufacturer's testing showing compliance with specified requirements for largest anticipated barrier assemblies.
  4. Operational requirements, including but not limited to deployment installation instructions (site preparation, duration of installation, resource requirements—manpower and tools); repair and/or replacement instructions; storage and handling instructions; retraction instructions (site/product cleaning, duration of retraction, resource requirements—manpower and tools); re-use of product instructions; and on-going maintenance instructions, including testing protocol.
  5. Actual warranties for all materials to be furnished under this Section with clearly defined terms, conditions, and time periods of coverage.

- B. Schedule of all deployable barriers to be furnished hereunder, indicating locations for each barrier, barrier size, product, and storage location. The schedule must identify all proposed modifications to the building envelope and site needed for installation of the barrier.
- C. Stamped shop drawings with scaled design details of product assemblies, indicating sizes, types, and gauges of all components; types and thickness of structural members; connection attachments and/or brackets; and complete installation details. All submittals shall be reviewed and acceptable to the Owner's Engineer prior to conducting any work. The Contractor shall forward submittals in advance considering that re-submittals may be required prior to acceptance.
- D. Quality Control Inspection Results and Written Certification: Submit the proposed test (proof/leak/etc.) procedures, results of all quality control inspections and tests and written certification from the manufacturer and structural engineer. Submittals reviewed beyond the second rejection (or required submittal) shall be provided at no cost to the Owner and shall be reviewed by the Engineer at the Contractor's expense.
- E. Operations and Maintenance Plan: Submit a comprehensive operations and maintenance plan that provides detailed information including but not limited to maintenance protocols, deployment protocols, retraction protocols, repair/replacement protocols, training protocols, testing protocols, storage and handling protocols, and an emergency response plan.

## PART 2 - PRODUCTS

### 2.01 FLOOD PANEL BARRIER PRODUCTS

- A. Panel barriers are defined herein as removable rigid and/or flexible panels. When deployed they are temporarily affixed to contiguous work via a permanently installed fixture, often a frame and/or channel system. Panel barriers may be singular panels or stackable in height.
- B. Acceptable Manufacturers: Subject to compliance with requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
  - 1. ILC Dover products, such as Flex-Cover® DW
  - 2. Presray products, such as FB33 Adjustable Lift-Out Barrier
  - 3. Presray products, such as FastLogs®
- C. Storage: Contractor shall work with the manufacturer and Owner to evaluate barrier storage containers and locations at each opening. The products shall be stored in accordance with the manufacturer's recommendations and shall be stored at the location of opening or within reasonable proximity to the location of deployment at the discretion of the Owner.

## 2.02 FLOOD SWING GATE PRODUCTS

- A. Flood swing gates and/or doors are defined herein as hinged flood barriers that are permanently installed at the opening location. When deployed they are temporarily affixed to the contiguous work via locking mechanisms, often levers. Some products require a step or raised sill at the ground surface to seal against.
- B. Acceptable Manufacturers: Subject to compliance with requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
  - 1. PS Flood Barriers™ products, such as Hinged Flood Barriers (HSS-550 or HPS-555)
  - 2. Flood Control International products, such as Swing-Hinged Flood Gates
- C. Storage: The products shall be stored in accordance with the manufacturer's recommendations, and shall be protected from damage from, but not limited to, environmental/chemical exposure, impact, and tampering.

## 2.03 FLOOD SLIDING GATE PRODUCTS

- A. Flood sliding gates are defined herein as sliding flood barriers that are permanently installed at the opening location. When deployed they are temporarily affixed to the contiguous work via locking mechanisms, often levers. Some products require a sill at the ground surface to seal against.
- B. Acceptable Manufacturers: Subject to compliance with requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
  - 1. Presray products, such as Sliding Flood Barrier with Mechanical Seals (CG3S)
  - 2. PS Flood Barriers™ products, such as Sliding Flood Barrier (HS-560)
- C. Storage: The products shall be stored in accordance with the manufacturer's recommendations, and shall be protected from damage from, but not limited to, environmental/chemical exposure, impact, and tampering.

## 2.04 MATERIALS

- A. All materials shall be resistant to environmental and chemical exposure, corrosion, and bacteria (mold). The manufacturer shall provide information on exposure thresholds and procedures for cleaning and preserving products.
- B. Manufacturer shall provide standard repair and maintenance kits for each type of barrier, including but not limited to seals, fasteners, flexible fabrics or membrane elements, etc. Where possible, the manufacturer shall select products that are readily available and easily replaced and/or repaired.
- C. The product connection materials shall integrate with contiguous work.



- D. Finishes of permanently fixed materials and assemblies shall match contiguous work where feasible.
- E. Permanently fixed materials and assemblies shall be protected from damages resulting from environmental exposure and impact forces expected under fair weather and storm conditions.
- F. The waterproofing materials (sealant and grout) shall meet manufacturer's requirements for product assemblage. Sealants and grouts shall be compatible with all substrates and field applied in accordance with the manufacturer's recommendations.

## 2.05 PERFORMANCE

- A. Barriers systems shall be designed, fabricated, assembled, and erected to interface with adjacent work to ensure continuity of building enclosure and that all segments of the assemblies will be free from leakage, in accordance with industry standards.
- B. All barrier systems shall be engineered to comply with the applicable requirements based on the standards referenced in this Section for operating forces, deflections, and deformation under load, including but not limited to leakage, hydrostatic pressure resistance, hydrodynamic force resistance, and debris impact force resistance. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. All work shall be installed in accordance with manufacturer and Structural Engineer's requirements.
- B. A minimum of one successful leak test shall be conducted on-site on the finished assembly for each proposed product type at the location of the maximum flood depth to the design flood level. Test procedures shall be acceptable to the Owner's Engineer and Manufacturer's technical representative. The test shall be overseen by the Contractor, Owner, Owner's Engineer, and manufacturer's technical representative. Following the leak test, the manufacturer shall provide recommendations to modify the finished assembly to improve performance (if needed). The Owner's Engineer reserves the right to require additional testing if the leak test does not meet performance criteria as specified in industry standards.
- C. A manufacturer's representative shall be present at completion of the barrier installations and shall certify in writing that all assemblies (including storage) have been properly installed.
- D. Following final inspection, the Owner will perform a test deployment and retraction of each finished assembly with the Contractor, Manufacturer's Technical Representative, and Owner's Engineer in attendance.

- E. The Contractor shall be responsible for submitting documentation that the barriers and assemblies have been installed in accordance with the Manufacturer and Structural Engineer's requirements and providing the actual warranties to the Owner.

### 3.02 OPERATIONS & MAINTENANCE

- A. The manufacturer representative shall provide Owner operations and maintenance (O&M) training on-site, including but not limited to storage and handling protocols, deployment protocols, retraction protocols, maintenance protocols, repair/replacement protocols, training protocols, and testing protocols. The training should be tailored to the Owner's actual operational capacity and consider adverse site and operations conditions, such as seasonal impacts and resource shortages.
- B. The manufacturer representative shall prepare a comprehensive O&M plan for the Owner, including but not limited to the following maintenance and operational requirements
  - a. deployment installation instructions: site preparation, duration of installation, resource requirements—manpower and tools;
  - b. repair and/or replacement instructions, including what is covered by the warranty;
  - c. storage and handling instructions;
  - d. retraction instructions: site/product cleaning, duration of retraction, resource requirements—manpower and tools;
  - e. re-use of product instructions;
  - f. on-going maintenance instructions, including testing and training schedules;
  - g. warranty restrictions;
  - h. emergency response plan.

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

END OF SECTION

SECTION 11000

EQUIPMENT - GENERAL

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. Furnish, install and test all equipment specified in this Contract and as shown on the Drawings.

1.02 RELATED WORK (WHEN APPLICABLE):

- A. Equipment Startup, Certification and Operator Training is specified Division 1.
- B. Site work is specified in Division 2.
- C. Concrete and grout are specified in Division 3.
- D. Metals are specified in Division 5.
- E. Painting is specified in Division 9.
- F. Controls and Instrumentation are specified in Division 13.
- G. Pipe, plumbing, and mechanical work are specified in Division 15.
- H. Electrical work and components, and variable frequency drives, are specified in Division 16.

1.03 QUALITY ASSURANCE:

- A. Provide only equipment of proven reliability manufactured by reputable manufacturers.
- B. Acceptable manufacturers are listed in each equipment item section in this Division. Substitute or "or-equal" equipment will be allowed only when indicated.
- C. Certificates, patents, licenses or other required legalities, when applicable, are specified in each Section of this Division.
- D. Manufacturer's names listed in "Acceptable Manufacturers" section of each specification are intended to indicate the type and quality of materials desired.

Where the words "or equivalent" or "or equal" are indicated other manufacturers of equal quality that comply fully with the specifications are allowed.

- E. The Specifications and Drawings direct attention to certain required features of the equipment but do not purport to cover all details entering into its design and construction. Nevertheless, the Contractor shall furnish the equipment complete in all details and ready for operation for the intended purpose.
- F. These Specifications are intended to provide standard equipment of a recognized manufacturer meeting all the requirements of the Specifications. Due to differences in such prefabricated equipment of various manufacturers, submit complete shop drawings, cuts, specifications, etc. to the Engineer to review for compliance with the Contract Documents prior to ordering any equipment. If the equipment differs materially from the dimensions given on the Drawings, submit complete drawings showing elevations, dimensions etc. for the installation. If Engineer's acceptance is obtained for alternate equipment, make any needed changes in the structures, piping or electrical systems necessary to accommodate the equipment at no additional cost to the Owner.
- G. Workmanship shall be first class in all respects.

#### 1.04 SUBMITTALS:

- A. Provide shop drawings and samples as specified in the General Conditions and Section 01330 of the Contract Documents. Equipment Systems Manufacturers shall integrate all required shop drawings into a common package.
- B. Catalog Data: Submit manufacturer's literature and illustrations for all equipment to be installed, including dimensions, construction details, shop painting details, and materials by generic name.
- C. Installation Instructions: Submit complete sets of manufacturer's instructions for each equipment item, including equipment storage requirements.
- D. Operating Data: Complete operating manuals.
- E. Maintenance Data:
  - 1. Maintenance instructions.
  - 2. Parts list.
  - 3. List of special tools (where applicable).
- F. Certificates: Submit manufacturer's certification that equipment, accessories and shop painting meet or exceed the Specification requirements. Submit equipment performance testing results as required by these specifications. Should the proposed equipment not comply with all the specification requirements, all deviations from the specification requirements shall be listed.

- G. Submit all requirements for interface with controls and/or equipment furnished in Divisions 13 and 16. Submit wiring diagrams as required to accurately depict all such interface requirements to ensure proper operations of each system or item of equipment.
- H. Submittals are further specified in this Division.
- I. Guarantees/Warranties as specified below.
- J. Attention is directed to the fact that the Drawings are based upon a particular piece of equipment.
  - 1. If the equipment to be provided requires an arrangement differing from that indicated on the Drawings, the Contractor shall prepare and submit for review, detailed mechanical drawings showing all necessary changes. Such changes shall be at no additional cost to the Owner.
- K. Contractor shall provide a letter, from each individual equipment manufacturer certifying that the equipment manufacturer or supplier has:
  - 1. Reviewed the Contract Documents, the intended installation by the Contractor, and the intended functional and operational conditions;
  - 2. Determined all conditions to be acceptable; and
  - 3. Found no conditions that would cause the warranty to be void or the equipment to function improperly.
  - 4. The submittals will not be reviewed without the inclusion of these noted certifications.

1.05 GUARANTEE/WARRANTIES:

- A. The Contractor shall obtain a warranty from the manufacturer in the name of the Owner. Submit the equipment manufacturer's warranty to the Engineer for review.
- B. Equipment that is supplied by a system supplier and is intended to function as a complete and integrated system shall be warranted by the system supplier as set forth in this specification section.
- C. The manufacturer's warranty must guarantee the equipment to be free of defects for a period of one year from the date of substantial completion as defined in the General Conditions, unless otherwise stated in the equipment item specification section.
- D. All required warranties that run longer than the Contractor's one-year warranty period shall be issued to the Owner after the Contractor's one-year warranty period has expired. The Contractor will be required to handle warranty problems during the one-year warranty period following substantial completion.

- E. Any part of mechanical equipment that shows undue or excessive wear, or that fails due to normal operational conditions within the first year of operation after the date of Substantial Completion, shall be considered as evidence of defective material or defective workmanship, and it shall be replaced with equipment or parts to meet the specified requirements at no cost to the Owner.

1.06 DELIVERY, STORAGE AND HANDLING:

- A. Coat all machined surfaces subject to corrosion with an easily removable rust preventive compound prior to shipment.
- B. Ship fabricated assemblies in the largest sections permitted by carrier regulations, properly labeled for field erection.
- C. Deliver equipment in manufacturer's original, unopened and undamaged packages, unless mounted on equipment assembly.
- D. Contractor shall perform all maintenance, as required by equipment manufacturer during storage.
- E. Should damage occur, immediately make all repairs and replacements necessary to the satisfaction of the Engineer at no cost to the Owner.
- F. Store in a manner to protect items with epoxy shop coatings from exposure to UV light that can cause chalking of the epoxy. Length of acceptable exposure prior to providing UV protective measures shall be in accordance with coating manufacturer's recommendations. This includes protection from UV light after installation while awaiting covering or filling of tanks, or prior to field painting for items scheduled to be topcoated.

PART 2 - PRODUCTS

2.01 GENERAL DESIGN OF EQUIPMENT:

- A. All parts and components of mechanical equipment shall be designed for satisfactory service under continuous duty without undue wear, under the specified operating conditions, for a period of not less than one year.
- B. All parts of mechanical equipment shall be amply proportioned for all stresses that may occur during operations, and for any additional stresses that may occur during fabrication and erection. Iron castings shall be tough, close-grained gray iron casting, Class 30, in accordance with ASTM A48, latest revision. Structural steel shall conform to ASTM A36.
- C. Mechanical equipment, including drives and electrical motors, unless otherwise noted, shall be supplied and installed in accordance with the Williams-Steiger Occupational Safety and Health Act of 1970 and subsequent amendments. The Contractor's attention is drawn to the requirements for equipment guards. The noise

level of equipment, drives and motors, unless otherwise noted, shall not exceed 90 dBA measured 3 feet from the unit under free field conditions.

- D. All equipment and machinery furnished under this Contract shall be the latest improved design suitable for the service specified. All equipment and machinery shall be designed and constructed to operate efficiently, continuously and quietly under the specified requirements with a minimum of maintenance, renewals and repairs. The design and construction of all equipment and machinery shall be such as to permit operation with minimum wear, vibration and noise when properly installed.
- E. Provide certified bearing life calculations on all equipment bearings.
- F. Ample room for erecting, repairing, inspecting and adjusting of all equipment and machinery shall be provided. The design, construction and installation of all equipment and machinery shall conform to and comply with the latest safety codes and regulations.
- G. All equipment of identical size, type and service shall be the product of the same manufacturer.
- H. All equipment selected shall suit the general arrangement of the space in which it is to be installed.
- I. Unless otherwise specified, electrical SCR controller units shall be furnished with the driven equipment, mounted and factory aligned, where applicable. Wiring of motors and controls shall be in accordance with the requirements of Division 16 and other applicable portions of the Specifications. Electrical variable frequency drives shall be furnished under this specification and installed by the electrical contractor, unless otherwise noted as specified in Division 16.
- J. Suitable provisions shall be made for easy access for service and replacement parts.

## 2.02 BOLTS, ANCHOR BOLTS AND NUTS:

- A. All necessary bolts, anchor bolts, nuts, washers, lock washers or locking nuts, plates and bolt sleeves shall be furnished by the Contractor in accordance herewith. Anchor bolts shall have suitable washers, lock washers and, where so required, their nuts shall be hexagonal.
- B. All anchor bolts, nuts, washers, lock washers, plates, and bolt sleeves shall be galvanized unless otherwise indicated or specified.
- C. Expansion bolts shall have malleable iron and lead composition elements of the required number of units and size.
- D. Unless otherwise specified, stud, tap, and machine bolts shall be of the best quality refined bar iron. Hexagonal nuts of the same quality of metal as the bolts shall be

used. All threads shall be clean cut and shall conform to AN Standard B 1.1-1974 for Unified Inch Screw Threads (UN and UNR Thread Form).

- E. Bolts, anchor bolts, nuts, washers, and lock washers specified to be galvanized, shall be zinc coated, after being threaded, by the hot-dip process in conformity with the ASTM Standard Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip, Designation A123, latest revision or the ASTM Standard Specifications for Zinc Coating (Hot Dip) on Iron and Steel Hardware, Designation A153, latest revision as is appropriate.
- F. Bolts, anchor bolts, nuts, washers, and lock washers specified to be stainless steel shall be Type 316 stainless steel.
- G. Anchor bolts and expansion bolts shall be set accurately. If anchor bolts are set before the concrete has been placed, they shall be carefully held in suitable templates of acceptable design. Where indicated on the Drawings specified, or required, anchor bolts shall be provided with square plates at least 4-inches by 4-inches by 3/8-inch or shall have square heads and washers and be set in the concrete forms with suitable pipe sleeves, or both. If anchor or expansion bolts are set after the concrete has been placed, all necessary drilling and grouting or caulking shall be done by the Contractor and care shall be taken not to damage the structure or finish by cracking, chipping, spalling, or otherwise during the drilling and caulking.
- H. All bolts shall be suitable size for the intended purpose, with direct input from the equipment or product manufacturer. In no case shall anchor bolt size be less than 3/8-inch diameter.
- I. Stainless steel hardware is required in all submerged applications, and all corrosive atmospheres, including but not limited to the wet well and valve vault areas.

#### 2.03 FOUNDATIONS, INSTALLATION AND GROUTING:

- A. The Contractor shall furnish the necessary materials and construct suitable concrete foundations for all equipment installed by him, even though such foundations may not be indicated on the Drawings. The tops of foundations shall be at such elevations as will permit grouting as specified below.
- B. All such equipment shall be installed by skilled mechanics and in accordance with the instructions of the manufacturer.
- C. In setting pumps, motors, and other items of equipment customarily grouted, the Contractor shall make an allowance of at least 1 in. for grout under the equipment bases. Shims used to level and adjust the bases shall be steel. Shims may be left embedded in the grout, in which case they shall be installed neatly and so as to be as inconspicuous as possible in the completed work. Unless otherwise permitted, all grout shall be a suitable non-shrink grout.



- D. Grout shall be mixed and placed in accordance with the recommendations of the manufacturer. Where practicable, the grout shall be placed through the grout holes in the base and worked outward and under the edges of the base and across the rough top of the concrete foundation to a peripheral form so constructed as to provide a suitable chamfer around the top edge of the finished foundation.
- E. Where such procedure is impracticable, the method of placing grout shall be as permitted by the Engineer. After the grout has hardened sufficiently, all forms, hoppers, and excess grout shall be removed, and all exposed grout surfaces shall be patched in an approved manner, if necessary, given a burlap-rubbed finish, and painted with at least two coats of an acceptable paint.

#### 2.04 ELECTRIC MOTORS:

- A. Unless otherwise specified or permitted by the Engineer, all electric motors furnished and installed by the Contractor shall conform to the requirements hereinafter set forth.

##### 1. Ratings of Motors

- a. Every motor shall be of sufficient capacity to operate the driven equipment under all load and operating conditions without exceeding its rated nameplate current or power or its specified temperature limit.
- b. When the horsepower rating is specified for a motor, the motor furnished shall meet the requirements of the output specified. When the horsepower rating is not specified, the motor shall have sufficient capacity to operate the driven equipment as given in the Detailed Specifications.
- c. All electric motors shall have either UL or FM approval ratings.
- d. Motor shall have a service factor of 1.15, unless otherwise specified. Motors intended for use on a variable frequency drive shall be rated for inverter duty.

##### 2. Type of Motors

- a. All motors shall be of a type having starting characteristics and ruggedness as may be necessary under the actual conditions of operation and, unless otherwise specified, shall be suitable for full-voltage starting.
- b. Motors shall be manufactured by General Electric Co., Reliance, Toshiba, Siemens, or be an equivalent product, that meets all the requirements herein.
- c. All motors shall have Class F insulation with temperature rise in accordance with NEMA Standards for Motors and Generators and based on a maximum ambient temperature of 40 deg. C.

- d. Explosion-proof motors shall comply with all requirements of Class I, Division 1, Group D, hazardous locations as defined by the National Electrical Code and with all other safety codes pertaining thereto. Explosion proof motors shall be rated explosion proof for continuous in air duty.
- e. All motors shall be premium efficiency type, unless specifically excluded under the Energy Independence and Security Act of 2007 (EISA). The minimum guaranteed efficiency shall be printed on the motor nameplate. The efficiency values (full-load for NEMA Premium efficiency motors) shall be the highest available for the type and size of motor, and meet or exceed the values in the following table for motors with 200 horsepower and less:

HP	Enclosed Motors		
	Nominal Efficiency (%)		
	2 Pole	4 Pole	6 Pole
1	77.0	85.5	82.5
1.5	84.0	86.5	87.5
2	85.5	86.5	88.5
3	86.5	87.5	89.5
5	88.5	89.5	89.5
7.5	89.5	91.7	91.0
10	90.2	91.7	91.0
15	91.0	92.4	91.7
20	91.0	93.0	97.7
25	91.7	93.6	93.0
30	91.7	93.6	93.0
40	92.4	94.1	94.1
50	93.0	94.5	94.1
60	93.6	95.0	94.5
75	93.6	95.4	94.5
100	94.1	95.4	95.0
125	95.0	95.4	95.0
150	95.0	95.8	95.8
200	95.4	96.2	95.8

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

3. General Design of Motors

- a. Motors shall comply with the latest NEMA Standards for Motors and Generators, unless otherwise specified.
- b. Motor windings shall be braced to withstand successfully the stresses resulting from the method of starting. The windings shall be treated thoroughly with acceptable insulating compound suitable for protection against moisture and slightly acid or alkaline conditions.
- c. Bearings shall be of the self-lubricating type, designed to ensure proper alignment of rotor and shaft and to prevent leakage of lubricant.
- d. Bearings for open motors shall be of the sleeve or ball type, as specified under the respective items of mechanical equipment. Bearings for totally enclosed and explosion-proof motors shall be of the ball type.

- e. Vertical motors shall be provided with thrust bearings adequate for all thrusts to which they can be subjected in operation.
- f. Vertical motors of the open type shall be provided with drip hoods of acceptable shape and construction. When the drip hood is too heavy to be easily removed, provision shall be made for access for testing.

4. Wound-Rotor Induction Motors

- a. Wound-rotor motors shall be designed for operation of the motor-driven equipment under the conditions specified in the Detailed Specifications.
- b. Motors shall be of the wound-rotor, induction type suitable for speed control by rotor resistance.
- c. The collector rings shall be constructed of hard composition metal of sufficient conductivity and ample contact surface. The rings shall be mounted accurately and securely on the shaft by means of acceptable insulating construction. The leads to the collector rings shall be fastened to and insulated from the shaft in a suitable manner.
- d. The collector rings and brushes for the wound-rotor induction motors shall be suitable for operation in an atmosphere containing moisture.
- e. The brushes shall be of the electrographite type, or other suitable type, of sufficient hardness and conductivity and shall have ample contact surfaces. Brush holders shall be provided with adjustable, spring-tension devices. Brushes shall be connected to the holders with tinned, flexible, copper-wire pigtails so arranged that no appreciable current shall be carried through the sliding contacts or springs. Brushes shall operate without noise or chattering. Rings and brushes shall be located on top of the motor, and shall be easily accessible for inspection and maintenance.

5. Synchronous Motors

- a. Synchronous motors shall comply in all respects with the latest NEMA Standards for Motors and Generators, and AN Standard C50 for Rotating Electrical Machinery.
- b. Synchronous motors shall be designed for operation of the motor-driven equipment under the conditions specified in the Detail Specifications.
- c. The temperature rise (based on a cooling temperature not exceeding 40 deg. C. and an altitude not exceeding 3,300 ft.) in the various parts of the motors, when operating continuously at rated voltage, frequency, and power factor, shall conform to the applicable requirements of the above-mentioned NEMA Standards.

- d. Synchronous motors shall be manufactured by General Electric Co., or be an equivalent product.

6. Single-Phase Motors with Auxiliary Devices

- a. Single-phase motors requiring switching devices and auxiliary starting resistors, capacitors, or reactors shall be furnished as combination units with such auxiliaries either incorporated within the motor housings or housed in suitable enclosures mounted upon the motor frames. Each combination unit shall be mounted upon a single base and shall be provided with a single conduit box.

7. Motor Terminal Boxes and Leads

- a. Motors shall be furnished with oversize conduit terminal boxes to provide for making and housing the connections and with flexible leads of sufficient length to extend for a distance of not less than 4-inches beyond the face of the box. The size of cable terminals and conduit terminal box holes shall be as permitted by the Engineer. An acceptable type of solderless lug shall be furnished. Totally enclosed and explosion-proof motors shall have cast-iron terminal boxes.

8. Special Motors

- a. Hoists and other devices complying with special safety codes shall be furnished complete with their control equipment and with all accessories and safety devices for code-approved, safe, and efficient operation.

2.5 DRIVE COUPLINGS:

- A. Couplings shall be all metal, flexible, designed for both angular and parallel misalignment, provided with a guard, and provided with a means for lubrication.
- B. Close-coupled connections shall have machined shouldered joints for motor and pump motor support.
- C. Acceptable Manufacturers:
  - 1. H.S. Watson, Co. Toledo, Ohio
    - a) Watson-Spicer Shafts
  - 2. Mechanics Universal Joint Division of Borg-Warner Corporation, Rockford, Illinois
    - a) Flexible Shafts

3. Or equivalent
- D. Drive couplings for mixers which differ from the above referenced all metal type, which are standard integral parts of a mixer manufacturer's assembly may be permitted, with review and approval of the Engineer.
- 2.06 BELT DRIVES:
- A. V-belt drives shall be provided with front removable guards (refer to Section 2.12), not requiring disturbing of the sheaves.
  - B. Capable of upsize and downsize sheaving.
  - C. Design shall be based upon minimum 1.5 service factor, unless specified elsewhere.
- 2.07 MECHANICAL-TYPE VARIABLE-SPEED DRIVE UNITS (When Applicable):
- A. Type as specified in equipment specification sections and as shown on the Drawings.
  - B. The variable-speed transmission shall be a self-contained drive which shall consist of a totally enclosed constant-speed motor, a housing on which the motor is mounted and which encloses an adjustable, heavy duty V-belt drive between two variable-pitch pulleys and the output shaft.
- 2.08 SCR CONTROLLERS:
- A. Each SCR controller shall be a completely solid state assembly consisting of an electronic switching amplifier, silicon controlled full wave rectifier and associated circuitry.
  - B. Bridge and gate trigger circuitry shall employ printed circuit boards.
  - C. Any required power transformers shall be supplied as appropriate.
  - D. The SCR units shall be heavy-duty type suitable for handling the full current rating of the motors and brief acceleration current.
  - E. The assembly shall be mounted on a heat sink but insulated therefrom.
  - F. Power supply to the SCR controllers shall be 115 volts, single phase, 60 Hz.
  - G. Each unit shall be factory wired and tested with all leads brought out to terminal strips to facilitate connections to the motors and local control stations.
  - H. Each SCR unit shall include the following features:
    - 1. Full wave rectification.

2. Power cube containing all power semi-conductors in a single component.
3. Armature contactor with auxiliary normally open and normally closed contacts.
4. Circuit breaker to provide overload protection.
5. Surge suppressers to protect semi-conductors from line surges and transients.
6. Adjustable current limit.
7. Adjustable IR compensation.
8. Voltage level and current capacities shall meet the requirements of the connected equipment (i.e. 90V DC output for 90V DC motors).

2.09 GEAR REDUCTION UNITS:

- A. Gears of gear reduction units shall be made of highest quality alloys treated for hardness and severe service. All gear reduction units on equipment shall be selected for Class II or more severe service as classified by the American Gear Manufacturers Association.
- B. Unless otherwise specified, the complete reduction unit shall be fully enclosed in a heavy cast-iron or fabricated steel housing with gears running in oil. All bearings shall be of the anti-friction type.
- C. The actual and rated horsepower, torque, overhang capacity, or bearing capacity of each reduction unit shall be not less than the horsepower rating of the drive motor, nor less than that which will be encountered under full load or under the most severe loading conditions of the equipment. The Engineer may reject any gear reduction unit that does not meet the above requirements. The manufacturer of gear reduction units shall be long established with a good reputation.
- D. Unless otherwise specified, all gear reduction units shall be helical or spiral bevel helical combinations. The planetary gear units and worm gear type units may be used only where specified. Class of service shall be Class II or heavier, as determined by the manufacturer or as required by the Engineer.
- E. The equipment manufacturer shall furnish the Engineer with complete engineering information, catalog data, design features, loading capacities, and mechanical efficiency ratings for every gear reduction unit incorporated in the work.

2.10 LUBRICATION FITTINGS:

- A. All lubrication fittings shall be brought to the outside of all equipment so that they are readily accessible from the outside without the necessity of removing covers, plates, housings, or guards, or without creating falling hazards by unusual

elevations. Fittings shall be buttonhead type. Lubrication fittings shall be mounted together wherever possible.

- B. Pressure grease-lubricated fittings shall be the "Zerk Hydraulic" type or the "Alemite" type.
- C. Housings of grease-lubricated bearings shall be automatically exhausted to the atmosphere to prevent excessive greasing.
- D. Oil drains shall be piped to a location outside the equipment frame for ease of draining. Provide ball valve for positive shutoff. Pipe shall be type-L copper or galvanized steel.

#### 2.11 SPECIAL TOOLS:

- A. For each type of equipment furnished by him, the Contractor shall provide a complete set of all special tools (including grease guns or other lubricating devices) that may be necessary for the adjustment, operation, maintenance, and disassembly of such equipment. Tools shall be high grade, smooth, forged, alloy, tool steel. Grease guns shall be lever type.
- B. Special tools are considered to be those tools which because of their limited use are not normally available, but which are necessary for the particular equipment.
- C. Special tools shall be delivered at the same time as the equipment to which they pertain. The Contractor shall properly store and safeguard such special tools until completion of the work, at which time they shall be delivered to the Owner.

#### 2.12 EQUIPMENT DRIVE GUARDS:

- A. All equipment driven by open shafts, belts, chains, or gears shall be provided with all-metal guards enclosing the drive mechanism. Guards shall be removable with quick open latches.
- B. Guards shall be constructed of galvanized sheet steel or galvanized woven wire or expanded metal set in a frame of galvanized steel members, unless otherwise specified.
- C. Guards shall be secured in position by steel braces or straps that will permit easy removal for servicing the equipment.
- D. The guards shall conform in all respects to all applicable safety codes and regulations.

#### 2.13 PROTECTION AGAINST ELECTROLYSIS:

- A. Where dissimilar metals are used in conjunction with each other, suitable insulation shall be provided between adjoining surfaces so as to eliminate direct contact and any resultant electrolysis.
- B. The insulation shall be bituminous impregnated felt, heavy bituminous coatings, nonmetallic separators or washers, or other acceptable materials.

2.14 NAMEPLATES:

- A. Each piece of equipment shall be provided with a substantial nameplate of noncorrodible metal, securely fastened in place and clearly and permanently inscribed with the manufacturer's name, model or type designation, serial number, principal rated capacities, electrical or other power characteristics, and similar information as appropriate.
- B. Provide a plastic engraved nameplate to be affixed to the equipment frame indicating the equipment name. Nameplate shall be black plastic with a white background.

2.15 SURFACE PREPARATION AND SHOP COATINGS:

- A. Provide surface preparation and shop coatings in accordance with Specification Section 09900.

2.16 ELECTRICAL CONTROLS:

- A. Additional controls for various items of equipment are specified under Division 13 and/or Division 16 as indicated on the Drawings, and as specified. Due to potential differences in electrical requirements for equipment of various manufacturers, the Contractor shall coordinate the electrical requirements of the equipment supplied with the work specified in Division 13 and/or Division 16.
- B. Provide auxiliary contacts as required for remote status and alarm conditions. Contractor to coordinate for each piece of equipment. Refer to the Electrical and Instrumentation Drawings.

2.17 GAGES:

A. General:

1. Gage assemblies shall be complete with 1/2-inch brass pipe and fittings, 1/2-inch ball valve with bronze body, stainless steel ball, Teflon seats and spring-closing handle and a tee with a brass test cock with female outlet end all arranged to allow field checking with a 4 1/2-inch test gage.
2. All gages shall be equipped with snubbers. If single snubber does not correct pulsing, provide additional snubbers in series.
3. All gages shall meet requirements as outlined hereinafter.



4. All gauges provided are to be from the same manufacturer.

B. Process Liquid Applications:

1. Gages shall be furnished for the suction and discharge nozzle of each pump and where called for on the Drawings or within other Specification Sections.
2. Gages shall be round black case, 4½-inches diameter, 1/2-inch NPT bottom male threaded connections, stainless steel rack and pinion movement, black micro-adjusted rezeroing pointers, rack and pinion movement, black micro-adjusted rezeroing pointers, and black figures with white plastic dials and a threaded ring. Gages shall have an accuracy of 1/2 percent of scale range.
3. Gages shall be bracket supported.
4. Gages shall be filled with glycerin and shall be furnished complete with factory-mounted protective diaphragm attachment and snubber which will allow cleaning of the lower diaphragm assembly without breaking the seal or refilling and shall not require recalibration of the gage. The diaphragm shall be stainless steel with a stainless steel seal and shall be fitted with a bleed screw on the lower side. The diaphragm shall be rated for gauge operating pressure range. Other diaphragm materials will be considered for acceptance on a case-by-case basis when dictated by chemical compatibility. Provide a locking plate or lock-wire to prevent turning of the assembly.
5. Suction gages shall be compound type having a range of 15 feet to 0 to +30 feet.
6. Discharge gage shall be selected at the nearest standard range to read in feet of water that provides a top limit above the pump shutoff head at the operating conditions or pump relief valve setting.

C. Water for Disinfection System:

D. Gages shall be manufactured by:

1. Ametek U.S. Gage Division
2. Ashcroft
3. Terice
4. or equal.

E. Contractor shall provide a gage schedule listing all gages, functions, locations, scales, etc., as part of the shop drawing submittal package.

### PART 3 - EXECUTION

#### 3.01 INSPECTION:

- A. Carefully inspect receiving structures and anchor supports for defects in workmanship prior to equipment arrival.
- B. Carefully inspect all equipment for:
  - 1. Damage in shipping.
  - 2. Defects in workmanship and materials.
  - 3. Tightness of all nuts and bolts.
- C. Inspection shall include, but not be limited to, the following as applicable:
  - 1. Soundness (without cracked or damaged parts).
  - 2. Correctness of setting, alignment, and relative arrangement of various parts.
  - 3. Adequacy and correctness of packing, sealing and lubricants.
  - 4. Completeness in all details, as specified.
- D. Field Quality Control
  - 1. As part of the equipment cost, the Contractor shall provide the services of the manufacturer's service representative to assist the Contractor with equipment adjustment, start-up, and necessary testing to prove that the equipment is in proper and satisfactory operating condition.
  - 2. On completion of his work, the manufacturer's service representative shall provide written certification that the equipment conforms to the requirements of the Contract and is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void, as outlined in the attached equipment certification form.
  - 3. As part of the start up services, the manufacturer's services representative shall provide the Owner's personnel with training in the proper operation and maintenance of all associated equipment. The equipment training certification form shall be used for this purpose.
  - 4. When the work is substantially complete the Contractor will be required to demonstrate, to the satisfaction of the Engineer, the ability of all equipment to operate as intended without defect including binding, vibration, jamming, overheating, etc.
  - 5. All equipment found defective by the Engineer shall be replaced by the Contractor at no expense to the Owner.

3.02 PREPARATION:

- A. Provide all required adhesives, sealants, insulation, lubricants, waterproofing, fireproofing or other protection specified in each Section of this Division.

3.03 INSTALLATION:

- A. Contractor shall install equipment in accordance with manufacturer's requirement.
- B. Do not install equipment until all defects or inadequacies in receiving structure have been corrected to meet Specifications.
- C. Erect and lubricate equipment in strict accordance with the manufacturer's instruction. Installation shall include all oil and grease required for proper operation.
- D. All equipment mechanisms shall withstand all stresses that may occur during fabrication, erection, and intermittent or continuous operation.
- E. Contractor to furnish and install supports as indicated on the Drawings, and as required by the equipment manufacturer.
- F. Thoroughly clean all equipment and appurtenant piping to remove all dirt, grease, mill scale, and other foreign matter and touch up factory finish to the satisfaction of the Engineer.

3.04 STARTUP AND TESTING:

- A. Test and adjust all equipment in accordance with the general requirements of Division 1 and Division 13.
- B. Contractor shall provide necessary water or other materials needed for testing.
- C. Demonstrate the equipment's ability to operate without overloading jamming, excessive vibration, etc. during normal operation conditions.

3.05 EXISTING EQUIPMENT RELOCATION:

- A. All relocated equipment shall be reconditioned and serviced prior to operation in the new locations. Equipment shall be cleaned, rust removed, reprimed and painted in accordance with Division 9, balanced, lubricated, oiled, calibrated and properly wired and plumbed to provide the intended service. Start up of relocated equipment shall be done in accordance with the manufacturers instructions.

END OF SECTION

SECTION 11304

SUBMERSIBLE WASTEWATER PUMPING EQUIPMENT

PART 1 - GENERAL

1.01 WORK INCLUDED:

This Section covers the submersible wastewater pumping equipment to be furnished and installed where indicated on the drawings. Each pump shall be complete with all equipment specified herein. All components, except as otherwise noted, shall be provided by one supplier and shall be installed by the Contractor.

1.02 RELATED WORK:

- A. Section 01330, SUBMITTALS
- B. Section 01750, EQUIPMENT CHECKOUT AND TESTING
- C. Section 01752, STARTUP AND TESTING
- D. Section 01760, OPERATION & MAINTENANCE MANUALS
- E. Division 2, SITEWORK
- F. Section 05500, MISCELLANEOUS METALS
- G. Section 09900, PAINTING
- H. Section 11000, EQUIPMENT - GENERAL
- I. Division 13, SPECIAL CONSTRUCTION
- J. Division 15, MECHANICAL
- K. Division 16, ELECTRICAL

1.03 SYSTEM DESCRIPTION:

- A. Each pump shall be furnished with motor, level controls, removal system, and all associated equipment and accessories required to make a complete system.
- B. Control of pumps shall be automatic using a programmable controller, variable speed drive and switches actuated by change in influent flow to the wastewater treatment plant based on the influent flow meter. All pumps shall operate automatically with provision for manual override.

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

- C. Equipment and accessories not specifically described herein shall be the manufacturer's standard catalog products unless otherwise approved by the Engineer.
- D. Pump monitoring signals shall be compatible with Control Systems of CT Inc. pump control panel or pump supplier shall provide switch for installation into pump panel. Contractor to coordinate.

1.04 QUALITY ASSURANCE:

A. All equipment shall conform to the following criteria:

1. Equipment shall be manufacturer's standard products presently in commercial production.
2. Conform to Hydraulic Institute Standards.
3. All the equipment specified under this Section shall be furnished by a single supplier and shall be products of manufacturers regularly engaged in the production of said equipment. The supplier shall have the sole responsibility for proper functioning of the complete pump packages.
4. Any reference to a specific manufacturer or model number is for the purpose of establishing a quality or parameter for specification writing and is not to be considered proprietary. In all cases any source or device that has the quality and operating capabilities specified may be acceptable.
5. Conform to requirements for materials, installation and equipment approvals of state, local, Underwriter's Laboratories, Inc., or other applicable codes, whether or not called for on the drawings or in the specifications.
6. Workmanship shall be first class in all respects.
7. Base the use of unspecified materials on their continuous and successful employment under similar conditions, as called for in this section.

B. Manufacturer's Qualifications

1. Quality Assurance System

Manufacturer shall have Quality Assurance System in place which complies with NQA-1, ISO 9001:2000, ANSI and MIL-Q-9858A. Upon request from the Engineer, the manufacturer shall submit to an audit to verify compliance with the referenced standards.

2. Consideration shall be given only to the equipment of well-established and reliable manufacturers who are regularly engaged in such work and thoroughly experienced in the design and manufacture of said equipment. The manufacturer shall certify a minimum of ten (10) successful operating installations in the State of Connecticut

and a minimum of five (5) years of experience in the United States using similar size equipment as specified herein as evidence of meeting the experience requirement.

3. The system described herein and shown on the drawings establishes a standard of required type, function and quality to be met by any proposed substitute or “or-equal” systems. All “or-equal” systems shall meet the exact system configuration and operational function as shown on the drawings and specified herein. No “or-equal” system shall be considered by the Engineer unless written request for approval has been submitted for and approved by the Engineer in writing. The burden of proof of merit for the proposed “or-equal” systems is upon the Contractor and the proposed equipment manufacturer. The Engineer’s decision of approval or disapproval of a proposed item shall be final. If the Engineer approves any “or-equal” item, the Contractor shall indemnify, hold harmless and defend both the Owner and the Engineer from any claims associated with the “or-equal” systems. Approval of “or-equal” systems does not relieve the Contractor of any requirements specified herein, called for by the Engineer or shown on the drawings.
4. The pumps shall undergo factory testing and all curves certified. This testing shall confirm the pumps meet the capacity and head requirements at the pump speeds specified based on water. The testing and tolerances shall be as specified by the Hydraulic Institute Standards.
5. All spare parts shall be available for same day shipment and next day delivery. The manufacturer shall maintain a fully equipped shop facility to perform all operations including welding, fabrication, assembly and testing. All materials shall be designed to withstand the stresses encountered in fabrication, erection and operation. All equipment shall be of corrosion resistant materials or shall be suitably protected by the supplier with corrosion resistant industrial coatings approved by the Engineer.
6. Submersible wastewater pumping equipment shall be as manufactured by:
  - a. HOMA Pump Technology, Inc, Ansonia, CT;
  - b. ABS Pumps, Meriden, CT;
  - c. Flygt, Xylem, Inc. Rye Brook, NY; or KSB – Pumps, Henrico, VA.
  - d. Wilo/EMU, Aqua Solutions Inc. Middleboro, MA

#### C. Factory Tests

The pumps and motors shall be given an operational test prior to shipment in accordance with the standards of the Hydraulic Institute, test level “B” criteria. Certified pump performance curves shall be submitted to the Engineer for approval. The data on the certified curves shall include the motor and pump nameplate information, serial numbers, performance curve showing five (5) points of operation including shut off head, pump speed, input horsepower, watts, volts, amperes and efficiency. Recordings of the test shall substantiate the correct performance of the equipment at the design head, capacity, speed and horsepower as herein specified.

D. Field acceptance tests shall be performed as specified in Part 3 Execution.

1.05 REFERENCES:

A. The following standards form a part of this specification:

American National Standard Institute (ANSI)

ANSI A21.10 Standard for Gray-Iron and Ductile Iron Fittings, 3-in. through 38-in., for Water and Other Liquids.

ANSI A21.11 Standard for Rubber-Gasket Joints for Ductile Cast-Iron and Gray-Iron Pressure Pipe and Fittings.

ANSI A21.15 Standard for Flanged Cast-Iron and Ductile-Iron Pipe with Threaded Flanges.

ANSI A21.51 Ductile-Iron Pipe Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

American Society for Testing and Materials (ASTM)

ASTM A48 Specifications for Gray-Iron Castings.

ASTM A53 Specifications for Pipe, Steel, Black and Hot-dipped, Zinc Coated, Welded and Seamless.

ASTM D429 Rubber Property - Adhesion to Rigid Substrates

ASTM D1785 Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.

National Electric Code (NEC)

NEC Code National Electrical Code.

National Electrical Manufacturers Association (NEMA)

NEMA Standard as Specified.

American Water Works Association (AWWA)

AWWA C509 Standard for Resilient-Seated Gate Valves, 3 through 12 NPS, for Water and Sewer Systems

1.06 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Prior to fabrication, the Contractor shall submit to the Engineer for review, six copies of each of the following: complete shop drawings, including manufacturer's data sheets, showing illustrated cuts of the item(s) with scale details, sizes, dimensions, capacities, performance characteristics, wiring diagrams, controls, and other pertinent information, complete operating and maintenance instructions, and parts lists. A secondary submittal shall include the actual performance of the units under factory testing.
- B. A complete, easily readable functional description of the proposed equipment.
- C. Refer to Section 01330 for submittal information. In addition, the submittals shall also include the following:
1. General arrangement drawings.
  2. Certified shop and erection drawings showing all important details of construction, dimensions, moment, rotational and torsion loads, anchor bolt locations, and field connections.
  3. Descriptive literature, bulletins, and catalogs of the equipment.
  4. Detailed data on the pumps, motors, control panels and appurtenances.
  5. Certified performance test reports.
  6. Long term storage, installation, operation, and start-up procedures including lubrication requirements.
  7. Total weight of the equipment including the weight of the single largest item.
  8. O&M manuals as described herein.
  9. Complete list of deviations from the drawings and specifications.
  10. Letter from manufacturer certifying that proposed equipment is approved for use as shown on the drawings and specified herein.
  11. A certified installation list and start-up date for the manufacturers' equipment currently operating in United States installations.
- D. In the event that it is impossible to conform to certain details of the specifications due to different manufacturing techniques, describe completely all nonconforming aspects.
- E. Upon completion of the installation of each unit, the results of the field and acceptance tests as specified under this section of the specification shall be submitted to the Engineer.
- F. Furnish written certification from the manufacturer's representative of the proper installation and operation of each component.
- 1.07 OPERATIONS AND MAINTENANCE MANUALS (four sets):
- A. The manufacturer shall be responsible for supplying written instructions, which shall be sufficiently comprehensive to enable the operator to operate and maintain the equipment and all associated equipment supplied by the manufacturer. Said instructions shall assume that the operator is familiar with equipment, motors, piping, and valves, but that he has not previously operated and/or maintained the exact equipment supplied.
- B. These instructions shall be prepared as a systems manual applicable solely to the equipment supplied by the manufacturer to these specifications, and shall include those



devices and equipment supplied by him. However, items of equipment for which the manufacturer has made mounting or other provisions, but which he has not supplied, may be excluded from these instructions.

- C. Operation and maintenance instructions shall be specific to the equipment supplied in accordance with these specifications. Instruction manuals applicable to many different configurations and pumps, and which require the operator to selectively read portions of the instructions shall not be acceptable.
- D. Submit operations and maintenance manuals for the equipment, within 30 days of shop drawing approval.
- E. Manuals shall include but are not limited to the following:
  - 1. Complete operations and maintenance information for the specific equipment.
  - 2. Name, address, and telephone number of the nearest competent service representative who can furnish parts and technical service.
  - 3. Complete parts list including the manufacturer's reference and ordering numbers, including any required maintenance items or tools.
  - 4. Descriptive literature, including illustrations, covering the operational features of the equipment, specific for the particular installation, with all inapplicable information omitted or marked out.
  - 5. Unit weight, moment, rotational and torsion loads.
  - 6. Operating, maintenance and trouble shooting information.
  - 7. Complete connection, interconnecting and assembly diagrams.
  - 8. Approved Shop Drawings.
  - 9. Recommended Spare Parts List.
- F. Manuals shall also include the following:
  - 1. Instructions for all adjustments, which must be performed at initial startup of the equipment, adjustments which must be performed after the replacement of control system components, and adjustments which must be performed in the course of preventive maintenance as specified by the manufacturer.
  - 2. Instructions for the adjustment, calibration, and testing of selected electronic components or assemblies, normally considered replaceable by the manufacturer, whose performance is not ascertainable by visual inspection.

3. Service instructions for major components not manufactured by the manufacturer but which are supplied by him in accordance with these specifications. Incorporation of literature produced by the actual component manufacturer will be acceptable.
  4. Electrical schematic diagram of the equipment packages as supplied, prepared in accordance with all applicable standards. Schematics shall show, to the extent of authorized repair, motor branch, control, and alarm system circuits, and interconnections among these circuits. Wire numbers shall be shown on the schematic. Schematic diagrams for electronic equipment, the detail parts of which are normally repairable by the operator, need not be included, and shall not be substituted for an overall schematic diagram. Partial schematics, block diagrams, and simplified schematics shall not be provided in lieu of an overall schematic diagram.
- G. The manuals shall be reviewed by the Engineer for completeness; those that are deemed inadequate shall be returned for correction.
  - H. Operation and maintenance instructions which are limited to a collection of component manufacturer literature without overall package instructions will not be acceptable.
  - I. Refer to SECTION 01760 – Operations and Maintenance Manuals for additional information.
- 1.08 DELIVERY, STORAGE, AND HANDLING:
- A. The equipment, materials and spare parts shall be shipped complete and ready for installation except where partial disassembly is required by transportation regulations, is recommended by the manufacturer, or for protection of components.
  - B. All necessary location drawings and templates required to install the equipment in concrete, masonry, etc., shall be furnished and delivered to the site by the manufacturer of the equipment furnished under this Section, for installation under other Sections of the specifications. Delivery of these items shall be as required by the overall construction schedule.
  - C. Deliver to Site. The Contractor shall deliver and unload the equipment and properly store and maintain the equipment as required until installation.
  - D. Units temporarily stored shall have covered and taped ends for protection. Equipment damaged or bent during storage, shipment or unloading shall be replaced at no additional cost to the Owner.
  - E. The manufacturer shall properly store and support equipment. Protect all exposed surfaces. Keep records of the storage parameters and the dates that storage procedures were performed.

- F. Store motors in buildings or trailers, which have a concrete or wooden floor, a roof and fully closed walls on all sides. Protect the equipment from being contaminated by dust, dirt, vibration, ultra violet radiation and moisture.
  - G. Provide suitable temporary leads for motor space heaters, if space heaters are deemed necessary.
  - H. Spare parts shall be packed in containers bearing labels clearly designating contents and pieces of equipment for which intended. The containers shall be suitable for long-term storage by the Owner. Spare parts shall be delivered to the site at the same time as the basic equipment and turned over to the Owner after completion of work.
  - I. Fabricated assemblies shall be shipped in the largest sections permitted by carrier regulations and shall be properly match-marked for ease of field erection.
  - J. The manufacturer shall recommend and confirm all storage arrangements.
- 1.09 WARRANTY STATEMENT:

The manufacturer's warranties from defects shall contain a provision that the manufacturer shall repair or replace any defects, to the satisfaction of and at no additional cost to the Owner, for a period of twenty four (24) months, from the date of project Substantial Completion. The warranty information shall be provided in writing from the manufacturer in the submittal and shall be revised upon Substantial Completion to incorporate the date of the project Substantial Completion.

## PART 2 - PRODUCTS

### 2.01 PUMPS:

- A. Pumps shall be submersible type, single stage, centrifugal pumps, as indicated on the Drawings and specified herein. Each pump shall be capable of pumping continuously at the conditions indicated.
- B. Pump Casings shall be made of high tensile close-grained cast iron, ASTM 48 Class 30.
- C. Each pump shall be arranged to automatically clamp the pump discharge to the discharge connection when lowered along guides.
- D. Discharge connection shall be cast iron, rigidly bolted to floor with stainless steel cinch anchors; machined to receive yoke and face of the pump discharge; discharge connection also shall hold the lower ends of the guides.
- E. Shaft seals shall consist of two mechanical seals mounted in tandem, with an oil chamber between the seals. The rotating faces of the seals shall be carbon or tungsten carbide and the stationary faces shall be ceramic or tungsten carbide.
- F. Submersible motor windings shall be open type with moisture resistant Class H insulation designed for Class 1, Division 1, Group C and D installations (explosive). Winding

housing shall be filled with a clean dielectric oil air for cooling windings and seals and lubricating bearings.

- G. Each motor shall be protected from excessive temperature by a built-in automatic overload protection. The heat sensor thermostats embedded in the motor windings shall open when the temperature in motor rises to over 220°F and automatically reset when the temperature drops to safe limit. The overload shall be connected in series with the starter coil so that the starter is tripped if the overload opens. The motor starter shall be equipped with overload relays so all normal overloads are protected by external heater block.
- H. Motors shall be of sufficient horsepower for operation anywhere on the pump head-capacity curve without overloading, with a 1.15 service factor based on the nameplate rating.
- I. Motor ball bearings shall be designed for minimum B-10 life of 50,000 hours for all operating points.
- J. Power and Control Cables: Each pump shall be furnished with sufficient flexible power and control cable to reach from the pump to the electrical enclosure indicated. A minimum of 30 feet of cable shall be provided. Cable leads shall be epoxy sealed at the motor connection. Where indicated on the drawings or noted in this specification the pump power cords shall have a male end Class 1, Division 2 rated inline connector for portable connection to a Class 1, Division 2 rated fix mounted connector to allow the pumps to be quickly and efficiently routed around. Class 1, Division 2 rated inline connectors shall be as manufactured by the Meltric Corporation, Franklin, WI or approved equal.
- K. Design each pump shaft with ample provision to compensate for pump thrust and for overhung load on impeller. Shafts shall be stainless steel.
- L. A replaceable double wear ring system shall be provided. The wear rings shall be of the peripheral design requiring no axial adjustment. The rings shall be press fit into the pump case and into the impeller. The rings shall be constructed of 420 heat treated stainless steel, 400-500 BHN. The two rings shall have a minimum of 50 BHN difference between them. The impeller shall be of heavy section Cast Iron with the two-port design. Impellers will have back vanes to reduce axial thrust and lower the stuffing box pressure. Internal vane edges shall be well rounded to present smooth flow. Impeller shall have a straight non-tapered bore, be dynamically balanced, keyed to the shaft and further secured with a stainless steel washer and a stainless steel impeller lock screw. The impeller shall be fixed at location with no expected or required adjustment.
- M. Provide moisture sensing probes in the oil filled seal chamber and temperature sensing probes in the motor windings. Associated alarms and lockouts shall also be provided.
- N. A 316 stainless steel-welded lifting chain shall be provided for each pump. Ropes and lift-out cables shall not be accepted. Lifting eyes shall be provided every four feet on the chain. A stainless steel hook shall be mounted inside the wetwell or process tank to hang the chain on when it is not in use.

2.02 PUMP IMPELLERS:

- A. The impeller shall be of heavy section Cast Iron with the two-port design. Impellers shall be provided with back vanes to reduce axial thrust and lower the stuffing box pressure. Internal vane edges shall be well rounded to present smooth flow. Impeller shall have a straight non-tapered bore, be dynamically balanced, keyed to the shaft and further secured with a stainless-steel washer and a stainless steel impeller lock screw. The impeller shall be fixed at location with no expected or required adjustment. The pumps shall be capable of passing a minimum 3-inch compressible sphere, throughout the entire body of the pump and impeller.
- B. Provide one spare impeller per pump.

2.03 PUMPS AND MOTORS SCHEDULE:

- A. The following submersible pumps shall be furnished and installed under this section:

Submersible Pump	Flow (gpm)	Total Dynamic Head (ft)	Pumps Online	Max Motor HP	Max Motor Speed (RPM)	Minimum Wire to Water Efficiency	Discharge Size (in)
P-1 and P-2	400	56	1	10.5	1,800	60%	4"

\* The contractor shall field verify all pipe lengths and heads based on actual field conditions

- B. Adequate tolerances in the listed capacity, head and efficiency values have been included. No deviation below the listed parameters will be permitted.
- C. SERVICE CONDITIONS:

Pumps P-1 through P-2 are submersible wastewater pumps. Pumps P-1 through P-2 are interchangeable and configured in a standard duplex configuration. The pumps shall alternate from primary, to backup as specified. Pump P-1 or P-2 shall work to transfer wastewater from the influent pumping station wetwell to the force main. The first point shown is the normal working point and the second point shown is the maximum pumping capacity.

2.04 MATERIALS:

- A. Iron Castings, Shapes and Bars: ASTM A48 of suitable class for intended purpose.
- B. Other Materials: Applicable ASTM specifications unless otherwise specified.

2.05 LIFT-OUT SYSTEMS:

- A. The slide rail assembly system shall be self-sealing with a simple up and down motion required to remove and reinstall pumps in the basin.
- B. The slide rail system shall be adjustable so that perfect vertical alignment can be obtained.
- C. A pump slide rail assembly shall be supplied for each pump by the pump manufacturer and shall consist of Type 304 stainless steel upper guide rail brackets and pump guide rail assemblies of AISI Type 304 stainless steel structural tee sections. The stationary and movable parts of the discharge coupling assemblies shall be epoxy coated cast iron. The upper guide rail brackets shall be affixed to the concrete structure and shall be positioned over the upper end of the stainless steel guide rails while the discharge base elbow positions the lower end of the guide rails.
- D. Each stainless steel rail shall support the pump at a distance of approximately four inches from the concrete floor to provide unrestricted flow of material into the pump. Each cast iron movable fitting, when in position, shall be held against the stationary fitting by the construction of the stainless steel rail, aligning the movable fitting to the base elbow for proper sealing of the two surfaces under pressure.
- E. Each pump shall be fitted with a 316 stainless steel lifting chain for pump installation and removal. The chain shall have a minimum breaking strength of 2,000 pounds, or a minimum safety factor of 2.5 whichever is greater.
- F. Intermediate supports shall be provided for the discharge piping and for the pump slide rail brackets as indicated on the drawings. Supports shall be fabricated of Type 304 stainless steel with Type 316 stainless steel anchor bolts and fasteners.
- G. All fastening hardware, including anchor bolts, shall be AISI Type 316 stainless steel.
- H. Pump slide rail assemblies shall be manufactured by the same manufacturer as the submersible wastewater pumps. Lift-out systems comprised of guide wires shall not be acceptable.

#### 2.06 ALUMINUM ACCESS HATCHES:

- K. Aluminum access hatches shall be sized so that the pumping units may be removed and replaced, as shown on the drawings. Installation shall be in accordance with manufacturer's instructions. Manufacturer shall guarantee against defects in material or workmanship for a period of five years.

#### 2.07 PAINTING AND SURFACE PREPARATION:

- A. The components of the pumps shall be thoroughly cleaned to remove mill scale, dirt, rust, grease, and other foreign matter. Motors, casings, receivers and other items customarily finished at the shop shall be given coats of paint filler and enamel or other approved treatment customary with the manufacturer.

- B. Ferrous surfaces obviously not to be painted shall be given a shop coat of grease or other suitable rust-resistant coating.
- C. Pumping units and appurtenances shall receive factory finish paint in accordance with the manufacture's standard paint for wastewater applications. Paint shall be suitable for submergence in typical municipal wastewater with temperatures as low as 4 degrees Celsius. Submit descriptive information and catalog cuts of the surface preparation and paint with the shop drawings. Frame mounting systems and appurtenances shall receive surface preparation and shop prime and finish paint per the manufacturer's recommendations. Finish paint to be applied in the field shall be provided by the manufacturer and applied by the Contractor.
- D. All paint shall be as manufactured by Tnemec and shall be in accordance with all State and Federal regulations, which govern paint content (VOC's, etc.).
- E. Stainless steel surfaces shall not be painted.
- F. Refer to Section 09900 for field painting requirements.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Installation of the pump packages and related appurtenances shall be performed in accordance with all written instructions furnished by the manufacturer.
  - B. After installation, Contractor shall clean all surfaces damaged in shipment or installation and shall touch up in the field with the same materials as original coatings.

3.02 MANUFACTURER'S REPRESENTATIVE SERVICES:

- A. Manufacturer shall provide the necessary on-site services for each submersible wastewater pumping unit that is provided hereunder to include:
  - 1. Observation of installation
  - 2. Certification of proper installation
  - 3. Alignment and adjustment as necessary
  - 4. Startup and testing
  - 5. Certify for use and start of warranty
- B. The services of a factory-trained manufacturer's representative shall be provided as specified herein.
- C. Services to be provided:

The service representative shall be responsible for complete component inspection on site after delivery and shall assist in the correct assembly of the components for a minimum period of one (1) eight-hour day. (Note: It is anticipated that all units will be installed, tested, and made operational at the same time, requiring a minimum of one (1) and potential as many as two (2) separate site visits by the manufacturer's representative for installation).

1. For inspection and check out of erected equipment – One (1) eight - hour day.
  2. For start-up services and supervision – One (1) eight - hour day.
  3. For complete instruction of the operating personnel – One (1) eight - hour day.
- D. The minimum period of time herein specified does not relieve the manufacturer from providing sufficient time to satisfactorily complete the required service functions.
- E. The manufacturer's representative shall certify in writing that each submersible wastewater pumping unit has been properly installed.
- F. The Owner reserves the right to videotape the instruction of the operating personnel for future use in training.
- G. The submersible wastewater pumping units shall be assembled and installed in strict accordance with the manufacturer's recommendations and as approved by the Engineer.
- H. Checkout and testing shall be as described in Section 01750, EQUIPMENT CHECKOUT AND TESTING, and as described below.
- 3.03 FIELD ACCEPTANCE TESTS:
- A. After installation of the equipment and after completion of the services of the manufacturer's representative the Contractor shall operate each unit to demonstrate its ability to pump without excessive vibration, motor overloading, or overheating. Each pump shall be operated for a sufficient period of time to permit thorough observation of all pump components.
  - B. Start-up and testing shall be conducted in accordance with Section 01752, STARTUP AND TESTING.
  - C. Notify Engineer in writing at least three days in advance of the tests. If testing cannot be conducted because of scheduling, unavailable service personnel, etc., the Engineer's fees for a second visit shall be paid by the Contractor.
  - D. All defects or defective equipment shall be corrected or replaced promptly at the Contractor's expense.
  - E. All final adjustments necessary to place the equipment in satisfactory working order shall be made prior to the tests.



- F. If sufficient sewage is not available for the test, the Contractor shall provide water for testing. All labor and materials necessary for the test shall be furnished by the Contractor.
- G. After installation, all piping shall be tested for tightness in an approved manner. Should leaks be found, faulty joints shall be repaired, even to the extent of disassembling and remaking the joint, and all defective pipe and fittings shall be removed and replaced in a manner satisfactory to the Engineer.

3.04 SPARE PARTS:

- A. Provide a list of all spare and replacement parts and locations where they are available and can be purchased.
- B. At a minimum the submersible wastewater pumping manufacturer shall provide the following spare parts:
  - a. One complete set of any and all special tools required.
  - b. One (1) complete set of gaskets required for the pump, for each pump.
  - c. One (1) complete set of wearing rings for the impeller and pump casing, for each pump.
  - d. One impeller key, washer and lock screw.
  - e. Two (2) semi open enclosed impellers.
  - f. One (1) mechanical seal repair kit.
  - g. One (1) backup mechanical float.
- C. The submersible wastewater pumping manufacturer shall also provide all other spare parts as recommended and as itemized in the operations and maintenance manual, for each submersible wastewater pump unit installed and ancillary system component installed.

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 11\11304-Submersible WW Pumping Equipment.docx

SECTION 13410

INSTRUMENTATION AND CONTROL - GENERAL

PART 1 - GENERAL

- A. Scope of work to be supplied by the Instrumentation and Controls (I&C) Supplier includes the pump station control panel (PCP), field instrumentation and integration of all field equipment, instruments and control devices to provide a fully functioning control system for the pump station.
- B. The Owner shall provide a SCADA panel for monitoring and radio hardware for remote communication. The I&C Supplier shall coordinate with the Owner's Integrator to ensure all the new equipment, instrumentation and controls are integrated with the SCADA Panel. For reference and coordination, an I/O list for the SCADA Panel is provided in Section 13430 Attachment 1.
- C. The General Contractor shall coordinate with the subcontractors to ensure all building system alarms are integrated into the Owner-supplied SCADA Panel including generator controls and monitoring, smoke/heat and security devices, mechanical ventilation alarms and other power monitoring.
- D. Related Work Specified Elsewhere
1. Section 11304 - Submersible Pumping Equipment
  2. Section 13420 - Field Instruments and Equipment
  3. Section 13430 - Control Panels
  4. Electrical - Division 16.
- E. Related Work by Others
1. All conduit, cable, and wiring, for power, controls, and communications shall be furnished and installed by the Electrical Contractor. The Electrical Contractor shall mount and power the control panels.
  2. Owner shall provide the SCADA Panel, radio hardware and antenna for remote communications. Owner shall provide all programming and configuration services associated with the Owner-supplied equipment.
- F. Demonstration and final Engineer-witnessed testing
1. Testing requirements are given later in sub-section 3.02 START-UP AND TESTING.

1.02 QUALITY ASSURANCE:

- A. All materials provided under this Contract shall be equal in quality, appearance and performance to that specified herein and shall be subject to the approval of the Engineer. Verify the availability of all materials proposed to be used in the

execution of the work prior to submitting same for the Engineer's approval. The discontinuance of production of any material or product after approval has been granted shall not relieve the I & C Supplier from furnishing an Engineer-approved alternate of comparable quality and design without additional cost.

- B. Materials and equipment furnished under this Contract shall be standard products of manufacturers regularly engaged in manufacture of such products and shall be manufacturer's latest standard design that complies with Specification requirements. Products shall essentially duplicate material and equipment that have been in satisfactory local use at least three years.
- C. The I & C Supplier shall have supplied comparable systems to those specified herein and shall maintain engineering and service departments capable of designing and maintaining these systems. Provide, for a period of twelve (12) months from the date of final acceptance of the work, all necessary supervision, labor, materials, and equipment, in order to correct any defects in any system due to faulty materials, equipment, installation methods, or workmanship and consequent damage resulting from such defects. This work shall be scheduled during normal working hours and at the convenience of the Owner.
- D. Instrumentation and Control System Supplier
1. The I & C Supplier's attention is directed to the fact that the instrumentation and controls are an integrated system and as such, shall be furnished by one supplier, who shall provide all of the equipment and appurtenances regardless of manufacture, and be responsible to the Owner for satisfactory operation of the entire system. Substitutions on functions specified will not be acceptable.
  2. The Owner has standardized on pump station control panel design and fabrication at recently upgraded stations. The existing panels have been provided by Control Systems of CT, Inc.
  3. Acceptable Instrumentation Suppliers include:
    - a. Control Systems of CT, Inc.
    - b. Or, approved equal.
  4. I & C Suppliers other than those listed above shall submit two copies of qualifications to the Engineer for review 7 days prior to bid opening. The I & C Supplier shall have at least 10 years' experience in the supply of custom control systems, instrumentation, control panels, configuration and calibration of instrumentation,. Provide a statement of qualifications including at least 10 similar sewer pump station instrumentation and control system installations completed in the last 5 years. Include system Owner name and contact information, description of the project and value of system completed.
  5. The I & C Supplier may be provided certain items by others for inclusion within his Control Panels. This shall include, but not be limited to, instrumentation/controls specified to be provided with the equipment of

other systems.

### 1.03 SUBMITTALS

#### A. Shop Drawings and Samples

1. Submit Shop Drawings in accordance with Section 01330 Submittals and as indicated herein.
2. Shop Drawings shall be thoroughly checked by the I & C Supplier for compliance with the Contract Documents. Verify that all equipment and materials proposed to be furnished will fit into available space and maintain specified clearances, and that all equipment is compatible with the system operation. Provide complete equipment panel layout drawings, equipment catalog cuts, schematic wiring diagrams, point to point wiring diagrams for all devices and sub-systems sending/receiving signals to/from the panels and PLCs in the Control System.
3. Shop Drawings Shall Consist of:
  - a. Project name and location
  - b. I & C Supplier name and contact information
  - c. Index Sheet - Listing the equipment being submitted using equipment designations, tag identification, and/or symbols, indicated on the Contract Documents together with the proposed manufacturer, style/type and catalog number.
  - d. Instrumentation bill of materials, manufacturer cut sheets with product selection, installation manuals and information detailing all accessory items, mounting kits, and appurtenances.
  - e. Manufacturer's scale or dimensioned drawings along with standard catalog number.
  - f. Drawings of panel layouts including interior and exterior components keyed to a bill of materials.
  - g. Product information and cut sheets for all control system components with selected models clearly identified.
  - h. A system architecture drawing showing the complete Control System topology, including communications and redundancy where applicable.
  - i. Wiring diagrams shall be provided showing the interfacing between field hardware, panel terminations, control devices and other panels including the SCADA Panel provided by Owner.

- #### B.
- Maintain properly documented and witnessed test and checkout reports, described later in Section 3.02. Submit these reports to the Engineer. Test reports shall indicate each control panel component tested and checked, with initials or signature, and listing of any problems encountered. Each new or modified I/O point shall be tested from instrument in the field through to the PCP hand switches and panel mount interfaces and through the SCADA Panel provided by Owner. Provide the following submittals described in Section 3.02:

1. Factory test reports and panel certifications
  2. I & C Supplier testing and checkout reports
  3. Start-up checklist and procedure
  4. Final start-up schedule and request for Engineer witnessed testing
- C. Upon completion of the work and before request for final payment, deliver to the Engineer in electronic PDF format and three (3) bound sets of full and complete directions pertaining to the operation and maintenance of all equipment and systems installed under this Contract. These directions shall be typewritten on 8-1/2" x 11" sheets neatly bound with index tabs, and shall be accompanied by plans, diagrams, etc., of the work installed, parts lists, etc., necessary for the guidance of the Owner in operating, altering or repairing the installation. Operational descriptions shall include custom functional descriptions of the control panel, list of hard-coded timers and set points, list of user-settable timers, control set points, alarm set points, and description of enable/disable functions. The descriptions shall describe how to operate in automatic and manual modes, where applicable.
- D. Provide the Owner with a list of local service departments of duly authorized distributors of materials and equipment of the type installed, which will stock the manufacturer's standard parts, etc.
- E. At the completion of the installation, provide reproducible Record Drawings electronically on computer disk accessible in AutoCAD. Also provide three (3) printed sets of each full-size Drawing indicating the final configuration of all systems as they were installed. Symbols, equipment designations, etc., shall be consistent with the Contract Documents. Provide exact locations of all work which has been concealed in concrete, masonry or underground. Final payment of at least 5% of the value of the work described herein will not be released until as-built drawings and documents have been received.

1.04 DELIVERY, STORAGE AND HANDLING:

- A. Coordinate material and equipment delivery with the project schedule. Notify the Engineer immediately, in writing, if material or equipment delivery will adversely affect the project schedule, include documentation from equipment suppliers indicating the revised delivery dates and the reason for the delay.
- B. Coordinate delivery of equipment directly to other vendors where instrumentation supplied under this section must be installed in panels supplied in other specification sections.
- C. Exercise care during loading, transporting, unloading and handling of materials to prevent damage.
- D. Check for defective or damaged materials, and for incomplete equipment shipments within seven (7) days after equipment delivery to the project site.

- E. Store materials and equipment on the construction site in enclosures or under protective covering in order to assure that materials and equipment are kept undamaged, clean and dry.
- F. Replace or repair, to the satisfaction of the Engineer, all materials and equipment that are defective or that have been damaged during installation, at no additional cost to the Owner.

1.05 WARRANTY:

- A. The entire Instrumentation and Control System, including configuration and programming of devices shall be warranted for one year from substantial completion of the system, as defined in Division 1. The warranty shall include the immediate (within 24 hours) response to emergency calls affecting treatment plant operations including problems and questions regarding equipment, software, and programming.
- B. Warranty shall be in accordance with Division 1.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

- A. All instrumentation and control shall be installed in accordance with state and local building and electrical codes, general instrumentation practices, and manufacturer's requirements. All equipment shall be fully tested and calibrated. All instrumentation shall operate in accordance with the design intent. Provide documented record drawings. The Engineer shall review all instrumentation and control at the time of startup, and all corrections made by the I & C Supplier as required.
- B. The ranges and field connections shall be verified by the Engineer and instrumentation system integrator during the submittal process.
- C. The control panels shall be completely factory assembled and tested. Do not ship the panel to the site until the Owner has approved the completed panel. The I & C Supplier shall provide all equipment from other divisions as required to make a complete system.
- E. Coordinate temporary controls as needed to meet the sequencing requirements of the of General Contractor.

3.02 START-UP AND TESTING:

- A. In accordance with Specification Division 1.

- B. The Owner will assume no liability or responsibility for any portions of the installation under this Contract until they are demonstrated and accepted in writing. Final demonstrations shall be made only after the Engineer is satisfied that the work has been completed in accordance with the intent of the Contract Documents.
- C. After the Instrumentation and Control System is completed, the I & C Supplier shall request that the Engineer witness a demonstration of the total system operation. If any system or piece of equipment within a system fails to function properly, rectify such defects or inadequacies and make a final demonstration.
- D. All demonstrations shall be scheduled at the convenience of the Engineer and the Owner and shall be scheduled with at least five (5) days written notice.
- E. Start-up of individual control sub-systems may be required prior to start-up of the overall Instrumentation and Control System including the Owner-supplied SCADA Panel. The I & C Supplier shall integrate all individual sub-control systems into a site-wide complete system to achieve final start-up. The I & C Supplier shall perform their own testing and check out in the field to confirm each input and output connected to instrumentation and other devices.
- F. The I&C Supplier shall submit their testing and checkout report to the Engineer with final start-up schedule and request for Engineer witnessed testing. A start-up checklist and procedure shall be prepared and submitted to the Engineer for approval prior to final Engineer witnessed testing and start-up.
- G. The I & C Supplier shall coordinate the work of the system manufacturer's service personnel as necessary. This shall include the installation, interconnection, testing, and calibration of the instruments, and the scheduling of the manufacturer's service personnel.
- H. The I & C Supplier shall perform factory testing and checkout of each panel prior to delivery. Submit factory test reports and panel certifications.

### 3.03 TRAINING:

- A. Provide the services of authorized manufacturers' representatives to instruct the Owner's representatives in the proper operation and basic trouble-shooting of each instrument, control panel and device installed under this Contract.
- B. Instrumentation training shall be conducted by a qualified manufacturer's representative or person certified by the manufacturer in training of the equipment. This training shall be conducted when all instrumentation is installed, calibrated, and after installation has been certified by the manufacturer's representative.
- C. Operator training
1. Operator Training shall be provided for a minimum of two (2), 4-hour training sessions (not including travel time) for the overall instrumentation

and control system.

2. Training shall be documented in the Operation and Maintenance Manual.
- D. The I & C Supplier shall provide complete documentation for all systems prior to training.
- E. All training and instructions shall be scheduled at the convenience of the Engineer and the Owner and shall be scheduled with at least five (5) days written notice.

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 13\13410 - General I&C.docx

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**



SECTION 13420

FIELD INSTRUMENTS AND EQUIPMENT

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK:

Supply field instruments and equipment as shown on the Drawings and indicated herein.

1.02 SUBMITTALS TO THE ENGINEER:

In accordance with Sections 01330.

1.03 TESTING AND START-UP:

In accordance with Section 13410.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. All of the equipment shall be the manufacturer's latest proven design. Specifications and drawings call attention to certain features, but do not purport to cover all details entering into the design of the instrumentation system. The completed system and the equipment furnished by the contractor shall be compatible with the functions required.
- B. Components shall be finished to the manufacturer's standard for the service intended unless otherwise indicated in the specifications or on the drawings.
- C. All electrical components of the system shall operate on 120-volt, single-phase, 60-Hertz current, or 24vdc except as otherwise noted in the specifications.
- D. All controls for electrically operated or motor-driven equipment shall be completed, including all necessary auxiliary relays, so as to require only wiring and connections to the equipment control circuit. All contacts for control of motor-operated or electrically operated equipment shall be rated not less than 10 amperes on 120 volts unless otherwise specified herein.
- E. All motor-operated or electrically operated equipment shall have separate 120-volt power and control circuits, and optionally 208v 3 phase, 120v 1 phase, and 480v 3 phase, as required.
- F. Control wiring for externally operated motors shall be No. 12 AWG, minimum and in accordance with Division 16.

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

- G. All necessary fuses or switches required by the instrumentation manufacturer for his equipment shall be provided with the equipment. All instruments requiring an external power supply shall have a labeled ON-OFF switch.
- H. Provide all required piping, connections, hangers, supports, etc. required for the Instrumentation and equipment, unless specified to be provided by Others.
- I. The Drawings and Specifications indicate the energy sources that will be provided. Any other devices necessary to obtain proper operation of the instrument system from these energy sources shall be furnished with the instrumentation.
- J. Instrumentation equipment supplier shall provide and install all instrument cable as needed between instrumentation system equipment components, unless otherwise indicated.
- K. Nameplates shall be attached to all field-installed units.
- L. All field-mounted instrumentation utilizing 4-20 mA signals shall be furnished with an appropriately sized local surge arrester at each end of the line. The surge arrester shall be adequate for the intended function and shall be by a nationally recognized manufacturer with a minimum of 3-years experience in the manufacturer of such devices. Submit selected model and backup information for review and acceptance by the Engineer. Surge arrester shall be manufactured by Transtector, Phoenix Contact, or equal.
- M. Instrumentation shall be installed per instrumentation construction standards and details, manufacturers recommended practices in accordance with the process mechanical and electrical drawings and specifications. Instrumentation shall be suitable for the application and the environment. Equipment shall be pre-calibrated. Provide all field calibration as required to verify correct operation. Review calibration ranges during shop drawing submittal with Engineer. All instrumentation shall be factory calibrated, bench checked, and field calibrated in accordance with ISA Standards and Practices. Equipment shall be suitable for use with the process fluid, when applicable.

## 2.02 FLOW MEASURING DEVICES (FE/FIT):

### A. Magnetic Flow Meter and Indicating Transmitter

1. Provide magnetic tube type flow meter and transmitter as indicated on the Drawings and herein specified. The flow meters will be hardwired to the indicator, and the isolated PLC.
2. Completely obstruction-less design with stainless steel or Hastelloy C4 electrodes and electrode access ports.
3. Internal power source

4. Constructed of non-magnetic steel (316ss or Hastelloy C22) with class 150 ANSI flange connections. Provide unit with NBR or Ebonite hard rubber liner suitable for use with domestic wastewater.
5. In general, enclosure shall be NEMA 4X rated, paint finish and corrosion resistant. Provide NEMA 6P rated enclosures for areas where immersion may occur, and as required on Drawings. Provide NEMA 7 rated enclosures where explosion proof electrical housing is noted on the Drawings.
6. Accuracy of plus or minus 1% of actual flow.
7. Supply a spool piece with the same flange to flange dimensions as the magnetic flow meter to replace the meter during maintenance, unless installed with bypass piping configuration.
8. Supply stainless steel grounding rings or alternate grounding method recommended by the manufacturer for the specific installation, application and materials of construction.
9. The flow transmitter shall be located as shown on the Drawings, remote from the meter and wall-mounted. Supply vendor cable from the meter to the transmitter of sufficient length for installation location.
10. Unit shall be capable of bi-directional flow and shall display flow rate and flow total.
11. The transmitter output shall be converted to a 4-20 mA flow rate signal.
12. The signal converter or indicating transmitter furnished with a local LED indicator shall be calibrated to read in gpm. See Schedule below for range.
13. Schedule of Flowmeters:

<u>TAG ID</u>	<u>SIZE</u>	<u>RANGE</u>	<u>RATING</u>
FE/FIT-130	6-INCH	0-500 GPM	NEMA 6P (meter) NEMA 4X (remote indicator)

14. Magnetic flow meter and indicator shall be manufactured by Krohne, Siemens, Rosemount, Badger or Endress & Hauser.

B. Air Flow Measurement Station – Pitot Tube Type (at EF and SF)

1. Air flow measuring stations shall be of the multiple averaging pitot, static pressure sensor type, with all total pressure sensors distributed for equal-area averaging of flows. They shall be of unitary (spool-piece) construction, of not less than 16-gauge aluminum with flanged duct connections. Flow-straightening vanes shall be incorporated into the

structure. Internal pitot and static sensor shall be constructed of copper to ASTM B88 standards. Instrument connections shall be 1/2" NPT Female. Mounting hardware shall not penetrate the sensor assembly. All surfaces shall be phenolic coated

- a. Accuracy: +/- 2% to 6000 feet per minute (+/- 0.5% at 2000 feet per minute)
  - b. Temperature: Maximum operating 400 degrees F
  - c. Pressure: Maximum operating, 6-in. w.c.
  - d. Pressure Drop: Less than 0.13 in. w.c. at 2000 feet per minute with 3/8" cell
  - e. Flow Strengthening Vanes: 3/8"aluminum hexagon cell
  - f. Maximum Design Flow: 6000 feet per minute
  - g. Casing: 16-gauge galvanized sheet metal Length: 12-in. overall
  - h. Pitot and Static Sensors: rigid copper, hard drawn, to ANSI H 23.1 and ASTM B88 standards
  - i. Internal Fittings: copper, to ANSI B16.22 standards
  - j. Process Connections: 1/2-in. NPT
2. The air flow measurement station shall include:
- a. local indication of air flow
  - b. NO FLOW/LOW FLOW alarm indicating light
  - c. NO FLOW/LOW FLOW audible alarm
  - d. Alarm output to the SCADA Panel to indicate mechanical fault and no flow/low flow when fan is called to run.
  - e. Power supply as indicated on the drawings 24 VDC from SCADA panel.

### 2.03 LEVEL MEASURING DEVICES:

#### A. Submersible Level Sensor/Transducer and Transmitter (LE/LT)

1. The level instrument shall be a looped power sealed submersible level transmitter, complete with lightning protection at each end. Instrument shall meet the following specifications:
  - a. Wetted materials: 316SS housing, polyurethane cable
  - b. Accuracy: +/- 0.25% full scale
  - c. Temperature rating: 0-175 degree F
  - d. Pressure rating: minimum 200% full scale measurement range
  - e. Output: 4-20 mA DC 2-wire
  - f. Approvals: intrinsically safe for Class 1 Div 2 Group D
  - g. Connections: 1/2" NPT for cable conduit
2. The transducer shall be pre-calibrated to range required by the application and installation location. The instrument shall measure level above the transducer position in the wetwell, referenced to atmospheric pressure. Depth measurement units shall be feet and inches.
3. The sensor shall be equipped with adjustable zero and span.

4. The transducer shall be passive powered from external 24 VDC, 4 to 20 mA DC power supply in control panel [suitable for up to 200 feet length 2c#16TWS, provide calculation for power supply].
5. The transducer shall be mounted at elevation indicated on the Drawings with a stilling well consisting of 6-inch diameter 304SS support flange, 316SS cable hanger and stainless mesh support grip.
6. Provide lightning protection at field junction box and at main control panel by Transtector. Verify installation depth prior to ordering and calibrating level transmitter. Supply with appropriate lengths of vendor cable.
7. For wastewater applications, the transducer shall be vented with vent tube and desiccant filter.
8. Schedule of Submersible Level Transducers:

<u>TAG ID</u>	<u>RANGE</u>	<u>RATING</u>
LE/LT-100	0-10 FT	Class 1 Div1, Group D

9. The transducer shall be Model PBLX manufactured by Dwyer, or equal. Provide vent desiccant filter and mounting accessories.
10. Transducer shall be suspended by a separate stainless steel support cable.

B. Level Float Switch (LS)

1. Provide float switch according to the following criteria:
  - a. Non-mercury switch type liquid level displacement sensor.
  - b. Rated for Class 1 Div 1 Group D hazardous location.
  - c. Electrical cable length as required for each level switch with 24 inches for future field adjustment.
2. Provide chain and anchor kit to stabilize and secure the float switches in each location shown on the Drawings. Chain shall be 3/16" min Type 316SS in domestic wastewater applications, PVC coated in acid/alkali applications. Shackles and cable clips shall be 1/4" min Type 304 SS in domestic wastewater applications. Anchor shall be PVC coated 15 lb minimum weight.
3. Schedule of Level Switches for Backup Pump Control:

<u>TAG ID</u>	<u>LOCATION</u>	<u>HEIGHT</u>
LSL-110	Wetwell	0.75 FT

LSH-120

Wetwell

4.5 FT

- 4. Float switches shall be Series 2900 B8 by Conery Manufacturing Inc. or equal for domestic wastewater applications.

C. Station Flood Level Sensor (LS)

- 1. Provide level switch according to the following criteria:

- a. Non-mercury switch type liquid level displacement sensor.
- b. Suspended from a bracket by its own cable.
- c. Electrical cable length as required for each level switch with 24 inches for future field adjustment.

- 2. Schedule of Station Flood Level Sensors:

<u>TAG ID</u>	<u>LOCATION</u>	<u>HEIGHT</u>
LS-140	Valve/Flowmeter Vault	6-inch above vault floor

- 3. Float switches shall be, Model LS-10 by Gems, or approved equal.

2.04 TEMPERATURE SWITCH:

- A. Temperature switch shall be installed in the pump station adjacent to the SCADA panel. When the temperature in the pump station is below an Operator selectable low temperature, a low temperature alarm shall be initiated. When the temperature in the pump station is above an Operator selectable high temperature, a high temperature alarm shall be initiated.
- B. Temperature switches shall have the following specifications: corrosion resistant body, field adjustable single setpoint, adjustable deadband, NEMA 4X, two dry isolated Form C contacts 10 amp rating.

- C. Schedule of Temperature Switches:

<u>TAG ID</u>	<u>DESCRIPTION</u>	<u>LOCATION</u>
TSL-1	Low Building Temperature	Wall-mount adjacent to SCADA Panel
TSH-2	High Building Temperature	Wall-mount adjacent to SCADA Panel

- D. Temperature switch shall be manufactured by Ashcroft, Dwyer, Dayton, Omega or equal.

2.05 PRESSURE MEASURING DEVICES:

- A. Pressure Transducer and Indicating Transmitters (PE/PIT)

1. Provide transducer and remote mounted indicating transmitter according to the following criteria:
  - a. Output signal shall be 4-20 mA dc.
  - b. Transmitter 4-20 mA output shall be fully adjustable over a 15:1 range.
  - c. Accuracy shall be 0.1 percent of span.
  - d. Instrument body shall be 316 stainless steel.
  - e. Instrument shall be suitable for use with domestic wastewater. Provide sanitary style unit with pipe mounting kit and accessories.
  - f. Zero adjustment shall be possible without removing the cover.
  - g. Pressure transducer mechanism shall be protected by a gasketed, weatherproof enclosure providing environmental protection NEMA 6P suitable for locations prone to flooding. All electrical connections shall be NEMA 6P rated and IP68 rated.
  - h. Wetted materials shall be 316SS or Hastelloy C.
  - i. Pressure transducers shall be supplied with sanitary seal and diaphragm, same make as the transducer.
  - j. Pressure transducers shall be manufactured by Foxboro, Rosemount, Endress & Hauser, Wika or approved equal.
2. Provide remote loop-powered digital field indicator and transmitter:
  - a. The indicator accuracy shall be +1 percent of maximum scale.
  - b. Indication shall be a uniform scale with range as specified.
  - c. Transmitter shall be wall-mounted remotely in the operations room adjacent to the SCADA Panel. The transmitter shall accept 4-20 mA pressure signal input from PT-135 and shall retransmit signal to the SCADA control panel with an accuracy of 0.05% of full-scale signal range.
  - d. Transmitter shall receive 24 VDC external loop power from SCADA Panel and shall provide 2-wire loop powered signal connection to the transducer in the valve vault.
  - e. Transmitter shall be housed in NEMA 4 enclosure.

- f. Provide loop-powered indicating transmitter Model PD6603 as manufactured by Precision Digital, Model RIA 14 by Endress & Hauser, or approved equal.
- 3. Provide one hand-held terminal/communicator device to enable the operator, locally at each transmitter, to perform calibration, zeroing, configuration selection for signal output mode (e.g., linear), and selection of engineering units for display and other transmitter configuration functions. In lieu of the hand-held device, if available as an option from the manufacturer, each transmitter may be furnished with an integral display with pushbuttons to enable transmitter electronics programming, configuration, and testing functions.
- 4. Schedule of Pressure Transducer/Transmitters:

<u>TAG ID</u>	<u>RANGE</u>	<u>RATING</u>
PE/PT-135	0-50 psi	NEMA 6P

2.06 INSTRUMENT WIRING REQUIREMENTS:

- 1. See Division 16 for field wiring specifications.
- 2. See Section 13430 for wiring within control panels and instrument enclosures.
- 3. Vendor cables shall be provided with instruments where noted and installed by Electrical Contractor.

2.07 SPARE PARTS AND TEST EQUIPMENT:

- A. The Contractor shall provide the manufacturer's standard spare parts kit, with each part packed in a container and labeled.
- B. Provide the following:
  - 1. Manufacturer spare parts kit for each instrument
  - 2. One-year supply of recommended maintenance items such as filters, test kits, etc.
  - 3. One (1) spare pressure transducer
  - 4. Two (2) spare float level switches

PART 3 - EXECUTION

3.01 GENERAL:

- A. All instrumentation shall be installed in accordance with state and local building and electrical codes, general instrumentation practices, and manufacturer's requirements. All equipment shall be fully tested and calibrated. All instrumentation shall operate in accordance with the design intent. Provide documented record drawings. The Engineer



shall review all instrumentation and controls at the time of startup, and all corrections made by the Contractor as required.

- B. The ranges and field connections shall be verified by the Engineer and instrumentation system integrator during the submittal process.
- C. The Contractor shall plan and execute the installation so that the facility will be able to meet its discharge permit at all times. Submit a plan prior to construction.

### 3.02 START-UP AND TESTING:

- A. In accordance with Specification Division 1 and Section 11000.
- B. A start-up checklist and procedure for the Instrumentation shall be prepared and submitted to the Engineer for approval prior to final start-up.
- C. Operator training shall be provided for a minimum of two hours for each new instrument (not including travel time).
- D. The system integrator shall provide complete documentation for all systems prior to Owner/Engineer witness testing.

### 3.03 WARRANTY:

- A. All Instrumentation shall be warranted for one year from final acceptance of the system. The warranty shall include the immediate (within 24 hours) response to emergency calls affecting treatment plant operations including problems and questions regarding equipment, software, and programming.
- B. Warranty shall be in accordance with Division 1 and Section 11000.

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 13\13420.docx

## SECTION 13430

### CONTROL PANELS

#### PART 1 – GENERAL

##### 1.01 DESCRIPTION OF WORK

Fabricate panels as described herein and integrate into the Owner's instrumentation and control system as described in Section 13410. All new panel components shall be furnished and installed in accordance with these specifications and applicable standards and codes. See Section 13410 for the Supplier qualification requirements. Pump panel shall be supplied by Controls System of CT, Inc. or pre-approved equal.

The Owner's Integrator will provide SCADA Panel for installation by the Contractor. The I&C Supplier shall coordinate integration of signals from the Pump Control Panel to the SCADA Panel. For reference and coordination, see the SCADA Panel I/O list provided in Attachment 1 to this specification.

##### 1.02 CONTROL STRATEGY

- A. Pumps shall operate on a lead/lag basis as controlled by the duplex controller.
- B. In the automatic mode, the duplex pump controller shall receive stop and start commands based upon the level in the station wet well as sensed by the submersible pressure/level transmitter (L F-100).
- C. A back-up float system shall be utilized in the event of submersible pressure transmitter failure.
- D. Pump(s) shall not be allowed to operate on high temperature and shall automatically switch to the other pump. Pump(s) shall alternate on pump failure and seal failure when a failure condition is detected and the pumps are in the automatic mode. The failed pump shall become the lag pump on future cycles until the failure condition is corrected.
- E. Pumps shall automatically alternate and exercise uniformly. Each motor shall be able to be manually selected for Lead operation or fully automatic alternation on each call-for cycle.
- F. All electronic controls shall be bypassed (including delays) when the Man-Off-Auto switches are in the Manual or Off positions to allow motor control even in the event of a circuit failure.
- G. Provide variable delays for Power-On, Pump Failure and Improper Sequence Pump Off delays.
- H. Level inputs shall be optically isolated and intrinsic safe.
- I. Field adjustable motor failure delays shall be provided in the range of five (5) seconds to eight (8) minutes. Upon motor failure, the remaining functional motor shall be made Lead until the failure is corrected and manually reset. The failed motor shall only be called to operate at the lag pump operating level.
- J. Individual, adjustable power-on delays shall also be supplied which delay pump start during initial startup or after a power failure. In the event that both motors are called

for at the same time, there shall be a minimum of five (5) seconds between motor starts and stops. Motor failure, seal failure and high level alarms will flash the associated red pilot lights. All setpoints shall be approved by the Project Engineer.

- K. The following signals shall be output from the PCP to the SCADA Panel provided by the Owner:
  - a. Pump Running (each pump)
  - b. Pump Fault – seal fail (each pump)
  - c. Pump Fault – motor temp high (each pump)
  - d. Wetwell Level LIT-100
  - e. LT-100 transducer fault
  - f. Wetwell high float LSH-120
  - g. Wetwell low float LSL-110
  - h. Lead/Lag Position of each pump
  - i. HOA position – not in AUTO (each pump)
  - j. Panel Power Fail

### 1.03 RELATED WORK

- A. Section 11304 – Submersible Pumping Equipment
- B. Section 13410 – Instrumentation and Control – General
- C. Section 13420 – Field Instrumentation
- D. Division 16 - Electrical

### 1.04 SUBMITTALS TO THE ENGINEER

In accordance with Section 13410.

### 1.05 TESTING AND START UP

In accordance with Section 13410.

### 1.06 SUPPLIERS FIELD SERVICES

- A. The services of a qualified representative of the selected Control Panel supplier shall be provided to inspect the completed installation, suggest all adjustments necessary to place the system in proper operation, and instruct operating personnel in the care and operation of the equipment furnished. A minimum of one (1) day and one (1) trip start-up service and training operating personnel shall be included. The services shall be furnished by the **Contractor** as a part of the work included under this section of the specifications.
- B. The Control Panel supplier shall show satisfactory evidence that he maintains, a fully equipped factory organization capable of furnishing adequate service for the equipment furnished, included replacement parts. Suppliers employing outside organizations for field services shall not be considered.
- C. Additional requirements for supplier qualifications are listed in Section 13410.

## PART 2 – PRODUCTS

### 2.01 GENERAL:

- A. Control Panel materials and fabrication methods must conform to underwriter Laboratories specification section UL 508A, and applicable referenced specifications noted therein.
- B. Control panels shall be furnished and installed in accordance with methods described in Division 16, and as indicated on the Drawings and in the Specifications. All transducers, converters, terminals, fuses, transformers, relays, signal transmitters, power supply connections and other miscellaneous equipment required to make a complete system shall be furnished and installed in the control panels. All wiring into and out of the control panel shall be terminated on terminal blocks.
- C. Panel components including power supplies, switches, relays, instrumentation, etc. supplied by the various equipment manufacturers, but indicated to be installed within panels furnished by the I & C Supplier, shall be furnished to the I & C Supplier for incorporation into his panels. I & C Supplier shall install these items within his panel and shall produce a complete, functional, pre-wired system for installation requiring only external power and instrumentation connections. The General Contractor shall coordinate this requirement and shall ensure that equipment manufacturers provide all necessary installation instructions and requirements to the I & C Supplier.
- D. Provide all required connections, mounting accessories, supports, etc. required for the installation of the Control Panels unless specified to be provided by Others.
- E. Each alarm-actuating circuit shall contain a simple means for disconnecting the alarm function during normal maintenance or standby of the equipment which actuates the alarm.
- F. All panel indicators, panel meters, and recorders shall be by a common manufacturer and shall be of the same manufacturer and type as specified herein.
- G. All panels, and panel mounted instruments and control devices shall have identifying nameplates in accordance with Division 16. Equal quality nameplates shall be attached to all field-installed units.

### 2.02 COMPONENTS - GENERAL

- A. Control Panel enclosures shall consist of fully welded body with door extending the full width of the panel to provide full access to the panel-mounted components. The door shall be of formed sheet metal and shall be equipped with quarter-turn latches and 180° hinges.
- B. Control panel enclosures shall be constructed of a minimum 14-gauge painted white steel. Seams shall be continuously welded and ground smooth. Provide an internal 3-point latch and padlocking powerglide handle to assure security and allowing convenient access. Door shall be removable by pulling a steel continuous hinge pin. Large, double-door enclosures shall come complete with twelve-inch (12") painted

white steel floor stands welded to the enclosure. Enclosure(s) shall be rated NEMA 3R and be manufactured by Hoffman, Stahlin or approved equal.

- C. The control panel sizes, where indicated, are minimum sizes and the supplier shall size all control panels with at least 50% excess interior space available for future expansion, ease of maintenance and orderliness.
- D. For Painted Steel Enclosures, following fabrication, the panel and its component parts shall be degreased, bonderized, sprayed with two base coats, a rust inhibitor and a regular alkyd primer, and finished with an air-dry enamel of a color selected by the Engineer.
- E. All instruments and accessories shall be mounted, wired or piped to terminal strips or bulkhead fittings which shall be properly identified to provide ease of field connection.
- F. The exterior and interior components of all control panels shall be "finger-safe" and free from the danger of electrical shock when in normal operating position, unless otherwise specified herein and clearly labeled with warnings.
- G. All pump controls, interlocks, contacts, relays, power supplies and other miscellaneous equipment required to make a complete system in accordance with the intent of this section of the specifications shall be furnished and installed in the control panel. The components shall be industrial rated, heavy duty.
- H. Power for panels shall be from the distribution panel as shown on the Electrical Drawings.
- I. All H-O-A switches and push button switches shall be through-door flush mounted and sealed in accordance with respective equipment and control panel manufacturers recommendations.
- J. Din-Rail shall be heavy duty steel intended for industrial control panel use.
- K. Wire ducts shall be self-extinguishing rigid PVC heavy duty industrial grade.
- L. Miscellaneous Hand Switches (HS):
  1. Hand switches shall be heavy duty, oil tight type with removable contact blocks and bat type lever operators.
  2. Contact rating shall be 10 ampere, continuous current at 120-volt alternating current.
  3. Selectors shall be provided with chrome-plated metal or anodized aluminum mounting rings.
  4. Cutler Hammer 10250T, Honeywell, or equal.
- M. Miscellaneous Push Button Switches:
  1. Reset Switch shall clear all alarm indicators. If alarm condition persists, alarm indicator shall re-illuminate.
  2. Reset button shall be heavy duty, oil tight, red LED operator, similar to hand switches.
- N. Indicating Lights shall be LED technology with push-to-test feature. Indicating light housing shall be heavy duty, oil-tight type with removable contact blocks.
- O. Duplex receptacles shall be ground fault circuit interrupt type with industrial grade cast aluminum housing box and cover.

## 2.03 SCADA CONTROL PANEL:

### A. TO BE PROVIDED BY OWNER

- B. Contractor shall install panel to be supplied by the Owner's Integrator. The Contractor shall power the panel and install instrument cable and conduit. Termination of control wiring within the panel shall be by the Owner's Integrator. I&C Supplier shall coordinate integration of the PCP with the SCADA Control Panel to ensure all PCP outputs required for monitoring are functional.

#### 2.04 PUMP CONTROL PANEL (PCP)

- A. In general, provide the following components:
1. NEMA 3R enclosure – painted steel
  2. Arc Flash Compliant Fabrication and Installation (See Division 16 for Electrical Code Requirements and Grounding)
  3. Motor Starters for each pump
  4. Main Through Door Disconnect.
  5. Individual disconnects for each pump motor starter.
  6. Surge Protection (on incoming panel power and analog field signal)
  7. 120VAC control circuit with breaker
  8. GFCI duplex receptacle
  9. Wetwell Level Indicating Transmitter
  10. Indicating lights for Pump Run Status
  11. Hand Switches and Pushbuttons noted below
  12. Interior ceiling mounted light with switch
  13. Panel Power White Indicating Light
  14. All other components required to obtain the functionality described herein and in Section 13410 and to meet all codes and regulations.
- B. ELECTRIC SERVICES: The panel shall be designed for on-site voltages as noted on Drawings, 3 phase, 60 Hertz power. The Contractor shall verify the site voltage with the servicing power company. If site voltage differs that that indicated it shall be the responsibility of the Contractor to make appropriate changes in his bid. The Contractor shall verify what type of transformer bank is being supplied and the transformer connections (open-delta, open-wye, delta, wye, high-leg delta, etc.). This information shall be given to the pump supplier and control panel supplier. Control Panel shall be NEMA 3R rated, painted white steel.
- C. NORMAL MAIN BREAKER: Provide a properly sized Normal Main Breaker, as shown on the drawings. The Actual Normal Main Breaker size may differ from that indicated on the drawings dependent upon the actual motor horsepower being furnished. The actual horsepower may differ from that indicated on drawings. In addition, provide a through the door mounted operator (DMO) on the interior deadfront. The operator shall prevent the deadfront from being opened while the breaker is in the "ON" position.
- D. POWER DISTRIBUTION BLOCKS: Provide properly sized Power Distribution Block(s) (PDB), as required for the control panel. Power distribution blocks shall be UL Listed and rated for the voltage and ampere rating as required; manufactured

by Marathon, Square D, or approved equal. Provide necessary lugs for service entrance neutral.

- E. SERVICE ENTRANCE SURGE PROTECTION DEVICE: Provide a service entrance rated Type 2, AC power distribution Surge Protection Device (SPD-1), per Component Specifications, designed to protect all types of loads fed from the distribution panels, branch panels and/or individual equipment panels. Units shall be UL listed and shall bear a UL label. Surge Protection Device shall be rated for 120kA per phase and 60kA per mode. Unit shall be internally fused and have a 15-year replacement warranty.
- F. PHASE MONITOR: Provide a service entrance Power Monitor (PM), per Component Specifications. Power monitor shall constantly monitor the three-phase voltages to detect harmful power line conditions, caused by single-phasing, low voltage, phase reversal, and voltage unbalance. When a harmful condition is detected, no three-phase motors shall be allowed to operate. Phase monitor shall be protected by 1-Amp, 240-Volt fuses on the primary side.
- G. PUMPS NO. 1 & NO. 2: Provide a properly sized combination circuit breaker with lock out tag out provisions on each pump circuit breaker and NEMA rated motor starter for type and size required by the servicing power company and for the motor horsepower being furnished. The actual horsepower may differ than that indicated on drawing. In addition, provide the following additional equipment and controls.
1. The pumps shall be controlled by a duplex pump controller, per specifications. The controller shall be capable of operating with float switches or a level controller with dry contact outputs for All-Stop, Lead Start and Lag Start during normal operation. In the automatic mode, the duplex pump controller shall receive stop and start commands from the level meter/controller, as described below, based upon the level in the station wetwell as sensed by a submersible transducer. Back-up float switches shall be utilized in the event of a submersible pressure level transmitter failure and activate the common alarm light. The duplex pump controller shall be a standard, catalogued product of a water and wastewater automation equipment manufacturer regularly engaged in the design and manufacture of such equipment for a period of at least fifteen (15) years. The duplex controller shall perform all control functions as specified herein and shall be UL recognized.
  2. The duplex pump controller shall have the following indicators and controls for each pump:
    - a. Manual-Off-Automatic selector switch for Pump No.1
    - b. Manual-Off-Automatic selector switch for Pump No.2
    - c. Pump 1 / Pump 2 – Lead / Lag Selector Switch
    - d. Green “Pump 1 Running” pilot light
    - e. Green “Pump 2 Running” pilot light
    - f. Red “Pump 1 Failure” pilot light

- g. Red "Pump 2 Failure" pilot light
  - h. Red "High Water" pilot light
  - i. Red "Low Water" pilot light
3. The float switch shall be a direct acting switch and contain a single pole mercury switch, which actuates when the longitudinal axis of the float is horizontal and deactuates when the liquid level falls 1-inch below the actuation elevation. The following float switches shall be provided in Section 13420 for alarm and control points:
- a. High Level Alarm – All Start
  - b. Low Level - All Stop

Backup float switches shall be set at one foot above normal level inputs from the level meter/controller. Float switches shall be set at levels per Engineer's direction or as noted on the Drawings.

4. Provide input indicator and test module with improper input sequence indicator and controls, per Specifications, to interface with the float inputs. Controller shall be UL Recognized for use in industrial control panels. Device shall have the following indicators and controls.
- a. Four (5) LED indicators: One for each of the following Stop, Lead Start, Lag Start, High Level and Improper Sequence.
  - b. Four (4) "Test" pushbuttons to test each pump level control input.
  - c. One (1) "Reset" pushbutton.
5. Provide a Motor Monitor for each motor furnished (MM-1 and MM-2) and properly sized Current Transformers (CT), per specifications. The Motor Monitor shall provide a positive run signal to the duplex pump controller, monitor proper motor running conditions, indicate motor running time, and indicate motor full load running amperes. A TRUE motor failure shall be generated from the motor monitor(s) and duplex pump controller. In addition, motor monitor shall come complete with either high or low amperes set point for the motor. In the event of low amperes, the motor shall be failed and not be allowed to operate until the failure is acknowledged.

## 2.05 INSTRUMENTATION AND CONTROL WIRING REQUIREMENTS:

- A. All control wiring (120 or 24 volt, AC or DC) conductors shall be insulated for 600 volts, unless otherwise noted, and shall be No. 14 AWG minimum size, or larger if so indicated on the Drawings. Conductors shall be 98 percent copper, stranded, heat and moisture resistant and thermal plastic insulated. Acceptable Manufacturers: Okonite, Southwire, Pirelli, or equal.



- B. All instrumentation control cables (4-20 mA signal) referred to on the Drawings as twisted shielded pairs (TWS), shall be individually shielded twisted pairs, No. 16 AWG, stranded conductors of tinned copper with polyethylene insulation and aluminum - polyester shielding. Control cable shall be rated 600 volt and shall be UL listed with 100% shield coverage. Belden, Okonite, or equal.
- C. RTD wiring shall be 600V triads 3C#16TWS with stranded copper drain wires, material to match the characteristics of the specific RTD.
- D. Three conductor shielded cable for use with remote potentiometers for varying motor speeds etc. Cable shall be polyethylene insulated, No.16 AWG stranded conductors cabled with BELDFOIL aluminum-polyester shield, 18 AWG stranded tinned copper drain wire and chrome vinyl jacket. Cable 600V shall have 100% shield coverage and shall be Belden, Okonite, or equal.
- E. Non-metallic sheathed cable (600 Volt), type NM and NMC/UF, shall have copper conductors as specified in this section. Cables shall conform to U.L. Standard 719, Federal Specification J-C-30A and Article 336 of the National Electrical Code. Acceptable Manufacturers: Southwire, U.S. Wire & Cable, or equal.

#### 2.06 PUMP CONTROL PANEL (PCP) COMPONENTS SPECIFICATIONS:

- A. SERVICE ENTRANCE SURGE PROTECTION DEVICE: The Surge Protection Device (SPD) shall be mounted in the control panel(s) adjacent to the Main Breaker. The SPD is connected to the main bus in the panel with conductors of size and of no greater length than indicated in the Surge Protection Device manufacturer's installation instructions. SPD shall be a Type 2 device ideal for distribution panels, branch panels and critical loads.
  1. SPD shall provide transient voltage surge suppression and electrical high frequency noise filtering. Unit is designed for parallel connection to the main bus. SPD unit uses selenium cells and metal oxide varistors to achieve its performance. Products using gas tubes, spark gaps, silicon avalanche diodes or other components, which under failed conditions would cause system failure, are not acceptable.
  2. Manufacturer qualifications: The product of a manufacturer engaged in the commercial design and manufacture of the type of product described herein for a minimum five (5) years.
  3. Standards: Product complies with the requirements of the following:
    - a. cUL
    - b. CE Compliant
    - c. UL 1449 3<sup>rd</sup> Edition
    - d. UL 1283 Listed
    - e. NEMA LS1 Compliance

4. Operating Voltage: 120/240 volts, 1-phase, 3-wire + ground  
120/240 volts, 3-phase, 4-wire + ground
5. Maximum Continuous Operating Voltage (MCOV): greater than 115 percent of nominal voltage for all products. All suppression filter systems comply with NEMA LS 1.
6. Frequency: Operating frequency range of 47 – 64 Hertz.
7. Protection Modes: all phases – phase to ground; all phases – phase to neutral; all phases – phase to phase; and neutral to ground.
8. Rated Single Pulse Surge Current Capacity: at rated voltage, no less than:
  - a. 120,000 A Line to Line
  - b. 60,000 A Line to Neutral
  - c. 60,000 A Line to Ground
  - d. 60,000 A Neutral to Ground
9. Tested Single Pulse Surge Current Capacity: Filter system is designed to withstand a single pulse surge current up to 150 percent of the design rating and tested at an independent test laboratory. In the absence of testing facilities capable of such testing, testing of individual components or sub-assemblies within a mode is accepted by ANSI C62.41-1991; the testing includes a Category C1 surge test followed by a second Category C1 test. The test results demonstrate the unit does not degrade by more than 10 percent from the initial test.
10. Clamping Voltage: Suppression filter system clamping voltages are in compliance NEMA LS1-1992.
11. High Frequency Filter: EMI-RFI noise rejection or attenuation values comply with test and evaluation procedures of NEMA LS1-1992.
12. Overcurrent Protection: Unit includes coordinated UL 489 or UL 198 listed or recognized overcurrent protection devices; if fuses are used unit incorporates non-encapsulated, field replaceable fuses.
13. Documentation: Provide product data including equipment manual, electrical and mechanical drawings indicated dimensions weights, mounting provisions, connection details and layout diagram, certified tests of UL1449 Listing/Clamp Voltages and NEMA LS1 compliance, certified single pulse surge current capacity testing, and minimum repetitive surge current capacity testing.

14. Status Indicators: Unit has long-life, solid state, externally visible status indicators that monitor the on-line status of each phase of the unit.

15. Warranty: 15-years Unlimited Free Replacement for service entrance Surge Protection Device.

16. Service entrance Surge Protection Device system shall be equal to Surge Suppression Inc. model SSMA121S1 or SSMA123S1 for service entrance.

B. PHASE FAILURE/UNBALANCE/UNDER VOLTAGE/REVERSAL RELAY: Phase monitor shall be designed to protect 3-phase motors regardless of size and for use with 200 – 240 or 425 – 485 VAC, 50 to 60 Hz motors to prevent damage. The unit shall constantly monitors the three phase voltages to detect harmful power line conditions, caused by single phasing, low voltage, phase reversal and voltage unbalance. When a harmful condition is detected, an output relay is deactivated after a trip delay. The output relay shall reactivate after power line conditions return to an acceptable level for the specified Restart Delay. The trip delay shall prevent nuisance tripping due to rapidly fluctuating power line conditions. Phase monitor shall have the following features and functions.

1. Under Voltage:
  - Trip: -15% of setting for 230V (-10% for 480V)
  - Reset: -12% of setting for 230V (-8% for 480V)
2. Over Voltage:
  - Trip: -15% of setting for 230V (-10% for 480V)
  - Reset: -12% of setting for 230V (-8% for 480V)
3. Phase Unbalance:
  - Trip: 7% with 5 second trip delay
  - 15% with 1 second trip delay
  - Reset: 6%
4. Trip Delay: 5 seconds (delay is reduced to 1 second if Phase Unbalance is 15% or greater)
5. Reset Delay: 2 seconds standard (5-60 seconds optional)
6. Voltage Range: 200V to 240V or 425V to 525V
7. Output Rating: 10A resistive @ 240VAC  
6A resistive @ 240VAC
8. Operating Temp: -40°C to +50°C, -38°F to +122°F
9. Storage Temp: -45°C to +85°C, -47°F to +185°F
10. Enclosure: Lexan, surface mount
11. UL and cUL listed

C. CONTROL POWER SURGE PROTECTION DEVICE (SPD): The surge protection device shall be mounted in the control panel in series with the control power circuit. Provide a single-phase, in-line series AC power line surge protector with the following features:

1. Rated voltage shall be 120 VAC @ 60Hz.

2. Current rating shall be 20 Amps @ 40°C.
3. The protection circuitry shall automatically reset after the transient has passed.
4. Protection modes shall be: Line to Neutral, Line to Ground, and Neutral to Ground.
5. Provide three (3) Green LED indicators to indicate protection status of each mode when power is present (L-N, L-G, N-G).
6. Varistors with integral thermally activated elements shall be used to open in the event of overheating due to the abnormal overvoltage, limited current conditions outlined in UL1449. The lower inductance of the varistors shall result in improved clamping performance to fast overvoltage transients.
7. Metal Oxide Varistors (MOV) shall have cured, flame retardant epoxy polymer coating meeting UL94V-0 requirements.
8. Electromagnetic Interference (EMI) filtration shall be incorporated into the unit to dampen unwanted signals from the protected side of the unit.
9. Operating temperature shall be -40 to +70°C.
10. Screw terminals shall be provided for all wiring.
11. Maximum continuous operating VAC shall be 115% of rated line voltage.

D. DUPLEX PUMP CONTROLLER: Provide a Duplex Pump Controller including the following features.

1. Panel door-mount indicators and operators (for each pump)
  - a. Manual-Off-Automatic selector switch
  - b. Green "Pump Running" pilot light
  - c. Red "Pump Failure" pilot light
  - d. Red "Pump Seal Failure" pilot light (if required)
2. A Pump NO. 1 LEAD – ALTERNATE – Pump NO. 2 LEAD sequence selector switch to select either pump as lead pump or to select that the pumps alternate as lead pump on each call for cycle.
3. Signal inputs for stop, lead pump start, lag pump start, and high/low alarm. The sensors shall be optically isolated and operate on 24V DC with a maximum current of 16mA for intrinsic safety.
4. Pilot light indicators for each signal input described above, as well as, Pump No. 1 and No. 2 running inputs.
5. The controller shall operate a pump based upon various combinations of signal inputs. Normal operation shall operate pumps in the following automatic sequence:

With no signal inputs activated and both pumps off, a stop input activation shall not cause a pump to operate. With a stop input activated and a lead start input activated, the controller shall start a single pump that pump shall operate until the lead start and stop inputs are deactivated. With both the stop and lead start

inputs activated and one pump operating, a lag start input being activated shall operate the second pump. Both pumps shall operate until the lag start, lead start, and stop inputs are deactivated.

In the event an input device(s) fails to activate the controller shall operate as follows:

With a stop input device failure, the controller shall operate a single pump based upon the status of the lead start input and a field adjustable short cycle delay. The short cycle delay shall keep the pump operating after the start input deactivates for the delay time setting. If the stop input device fails to activate, the controller shall operate one pump as described above with the lag start input starting the second pump. Both pumps shall operate until both start inputs are deactivated and the individual pump short cycle delays have expired. In the event both the stop and lead start inputs fail to operate, the controller shall operate both pumps based upon the status of the lag start input and the individual pump short cycle delay timers. Both pumps shall operate until the lag start input is deactivated and the individual pump short cycle delays have expired. If all input devices fail except the high/low alarm input, the controller shall operate both pumps based upon the status of the high/low alarm input and the individual pump short cycle delay timers. Both pumps shall operate until the high/low alarm input is deactivated and the individual pump short cycle delays have expired.

6. A field adjustable failure time delay for each pump, in the range of 5 seconds to 62 minutes, to start the lag pump at the lead pump start point if the lead pump fails or if the lead pump selector switch is placed in the off position. If a pump fails, the remaining functional pump shall remain the lead pump on future cycles. The failed pump shall only be called to operate at the lag pump operating point. Normal pump alternation shall resume when the failure condition is corrected and the pump has been reset.
7. Soft stop feature to require the pumps to stop three (3) seconds apart during the condition that both pumps are running when signaled to stop. Soft start feature to require the pumps to start three (3) seconds apart during conditions that the lead and lag pumps are called for simultaneously.
8. Individual field adjustable time controls to delay starting each pump in the automatic mode after power failure or during initial startup.
9. Pump failure, pump seal failure, and high/low alarm red pilot lights shall flash when activated. Provide field selectable controls to allow the seal failure indicator to burn steady when activated.
10. Manual override inputs for each pump, which can be used to manually override the duplex controls', pump outputs when the controls are in the

Automatic mode. Inputs shall be provided to start or stop each pump from a remote location.

11. Provide a selectable improper sequence alarm to activate the common alarm in the event the control inputs are activated in the wrong order. The proper order shall be Stop, Lead Start, and Lag Start. The High water alarm shall not be included in the improper sequence test. Provide a selectable Lag Stop Level control to allow the lag pump to stop based upon the status of the lead start level input.
  12. Provide automatic pump alternation on pump failure and seal failure when a failure condition is detected and the pumps are in the automatic mode. The failed pump shall be made the lag pump on future cycles until the failure condition is corrected. Pump failure shall require manual reset to clear the failure condition and the seal failure condition shall clear when the failure condition clears. Provide field selectable controls to allow the seal failure condition to not automatically alternate the pumps.
  13. An exterior alarm light output that would flash the light brightly during any common alarm condition that includes pump failure, seal failure, improper sequence, and high water alarm. The output shall allow the light to dim glow under normal conditions to indicate that power is on and the lamp is good. A normally open common alarm output contact shall be energized by these alarm conditions. Provide selectable controls to prevent the seal failure input from activating the common alarm output and alarm light.
- E. FLOAT TEST: Provide input indicator and test module with improper input sequence indicator and controls. The following controls and equipment shall be supplied.
1. Four deadfront panel mounted input pilot light indicators: One for each of the following level control points Stop, Lead Start, Lag Start and High Level alarm.
  2. Four deadfront panel mounted pushbuttons to test each pump level control input.
  3. Automatic input sequence monitoring, such that if the inputs do not occur in proper order (stop, lead start and lag start); a red pilot light indicator shall be activated.
  4. If stop input fails, followed by lead input activation, lead pump shall operate and continue until lead pump input is removed and a field adjustable time delay has expired.
  5. If stop input fails, followed by lead and lag input activation, both motors shall operate and continue until their respective input is removed and an individual

field adjustable time delay for each pump has expired.

6. If stop, lead and lag inputs fail, followed by high level input activation, both motors shall operate and continue until the high level input is removed and a field adjustable time delay for each pump has expired.
7. Improper sequence activation shall also activate the common external alarm controls.
8. Improper sequence alarm shall require reset button activation to remove the alarm light.

F. **MOTOR MONITOR:** Provide an electronic solid state Motor Monitor powered by 120 volt AC that will accept a zero (0) to five (5) amp input signal condition the signal to perform ON/OFF or OPEN/CLOSE discrete dry type setpoint contact conditions based on the input signal value. The Motor Monitor shall have the following features.

1. Provide an LCD readout meter providing field adjustable scales of 0-25.0, 0-50.0, 0-100.0, 0-250, 0-500 and 0-1000 to accurately indicate the motor full load current using the 0-5 amp input signal.
2. The Monitor shall be capable of displaying motor total running time up to 99,999.9 hours and be provided with reset capability from the rear of the monitor. The display shall include a non-volatile EEPROM memory backup that does not require battery backup during power failure.
3. Provide two (2) separate field adjustable setpoints, each with discrete, isolated sealed SPDT relay output contacts. The setting of each setpoint shall be adjustable throughout the complete signal range from the front of the Monitor. Each set point shall be provided with a field adjustable "ON" and "OFF" time delay, adjustable from zero (0) to fifteen (15) seconds. The actual setting of each setpoint shall be able to be displayed on the LCD readout at any time. An LED indicator shall be provided for each setpoint and shall operate as follows:
  - a. Setpoint No. 1: When setpoint is timing, the indicator shall burn amber. After timing period and current is at or above setpoint, indicator shall burn green.
  - b. Setpoint No. 2: When set point is timing, the indicator shall burn amber. After set timing period and current is at or above setpoint, indicator shall burn red.

G. **CURRENT TRANSFORMER:** Current transformers insulation class shall be 0.6 KV BIL, 10 KV Full Wave. They shall be manufactured to meet the requirements

of UL1244 and have a minimum accuracy of 60Hz of 2%. Current transformers shall be provided with brass stud terminals and mounting bracket.

- H. CONTROL RELAYS: Provide a SnapTrack channel mounted relay board with LED status indicator and individual quick-connect terminals. The SnapTrack can be optionally snapped to a DIN rail. The indicator LED shall turn on when the relay is energized. The terminals shall be of the fixed screw cage clamp type, rated for at least 10 amps at 250 Volts. Tubular screw clamp types will not be accepted. The relay shall be rated for 10 amps. Surge suppression shall be provided on the coil side of the relay. The board shall include built-in transient protection across the coil. DC powered versions shall include a built-in diode across the coil to protect external devices from coil surges. The relay and connectors shall be UL approved.
- I. LEVEL INDICATOR AND METER/CONTROLLER: Provide an electronic, solid-state, proportional Level Meter/Controller that will accept a four (4) to twenty (20) mA or a one (1) to five (5) volt DC signal. In addition, condition the signal to provide a valid basis for control and then perform ON/OFF or OPEN/CLOSE discrete dry type set point contact conditions based on the input value of the analog input signal. The Level Meter/Controller shall have the following features.
1. Provided with a 3.5 digit LED (or LCD if required) readout meter in feet of water. The display shall be capable of being calibrated from the front of the unit and have a maximum display of 1999, with a decimal point that is user selectable.
  2. The display zero indication shall be able to be offset anywhere within the range of the meter, with a minimum range of 60 counts.
  3. Provide six (6) separate setpoints each with discrete, isolated sealed SPDT relay output contacts.
  4. Provide excitation voltage to drive a transducer/transmitter and condition its output signal to provide a continuous display of level.
  5. The setpoints shall be field adjustable to operate on rising above or falling below the setpoint.
  6. An LED indicator shall be provided for each setpoint to indicate when it is activated.
  7. The actual setting of each setpoint shall be able to be displayed on the digital readout at any time.
  8. The setting of each setpoint shall be adjustable throughout the complete signal range from the front of the meter/controller.
  9. Provide a means of manually ramping the meter/controller, up and down, throughout its complete signal range, to test the operation of the setpoints.



10. The meter/controller shall come complete with a four (4) to twenty (20) mA, or a one (1) to five (5) volt DC output signal for additional monitoring and control devices.
11. Provide a signal failure relay option with two relays, to energize when the input signal goes above 20 mA or below 4 mA. The relays can energize on both high/low conditions or one can energize on high failure and the other on low failure. In addition, either relay may be set to 'flash' on and off during the failure condition. This failure alarm shall also energize a front panel flashing LED alarm indicator.

- J. ANALOG SIGNAL LINE FILTER: Provide a analog signal line filter with a fast-acting design to protect data and communications equipment from transient voltage surges and induced voltages. The filter shall be a low-impedance, two-stage hybrid design with a first stage consisting of a heavy-duty energy handling gas discharge tube having a breakdown voltage rating between 200 and 350 volts. Impulse breakdown at 100 volts per microsecond shall equal 100 volts. A filter capacitor shall be connected across the lines, rated a 1kv. The second stage shall consist of two current limiting resistors, a fast-acting solid-state transient voltage surge absorber from each line to ground to protect each line up to a maximum continuous voltage of 30V AC or 38V DC with a 50 nanosecond response time. In addition, a separate bi-directional transient voltage surge absorber rated at 1500W @ 33V DC, which is connected across the two lines, for maximum protection. Integral wiring terminal blocks shall be included for both line and equipment sides of the filter. The filter shall be mountable directly on the panel backplate or be able to use track mounting if required.

#### 2.07 SPARE PARTS AND TEST EQUIPMENT:

- A. The Contractor shall furnish the manufacturer's standard spare parts kit, with each part packed in a container and labeled.
1. Spare Control Board for PCP
  2. Spare PLC CPU for SCADA Panel
  3. Spare Power Supply – one of each type in each panel
  4. (10) each type fuse
  5. (2) each type control relay

### PART 3 - EXECUTION

#### 3.01 GENERAL:

- A. All controls shall be installed in accordance with state and local building and electrical codes, general instrumentation practices, and manufacturer's requirements. All equipment shall be fully tested and calibrated. Provide documented record drawings. The Engineer shall review all instrumentation and controls at the time of startup, and all corrections made by Contractor as required.

- B. The ranges and field connections shall be verified by the Engineer and instrumentation system integrator during the submittal process.
- C. The Contractor shall plan and execute the installation of the new control panel and disconnection of the old control panel so that the Owner will be able to provide safe potable drinking water and fire protection at all times. Submit a plan prior to construction.
- D. The control panels shall be completely factory assembled and tested. Do not ship the panel to the site until the Owner has approved the completed panel. The contractor shall provide all equipment from other divisions as required to make a complete system.
- E. Field Services shall be provided by the Supplier's qualified representative to certify that installation, checkout, test and start-up the panel. Training shall be provided by the Supplier's qualified representative.

3.02 WARRANTY:

- A. The entire Control Panel and its components, including software and programming shall be warranted for one year from final acceptance of the system. The warranty shall include the immediate (within 24 hours) response to emergency calls affecting treatment plant operations including problems and questions regarding equipment, software, and programming.

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHWPC\13\00262 New Haven HMGP\4 Working Documents\4.2 Specifications\Division 13\13430 - Control Panels.docx

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

**GNHWPCA Fort Hale Pump Station I/O List**

**New Haven, CT**

**PROJECT NO. 2190262**

**DATE: 11/04/19**

\\wse03.local\WSE\Projects\CT\GNHWPCA\2190262 New Haven HMGP\4 Working

Documents\4.0 Construction\Drawings\2190262 ATTACHMENT 4 - I/O List

**FORT HALE PUMP STATION - SCADA PANEL (supplied by OWNER)**

TAG NO	DESCRIPTION	DI	DO	AI	AO	Notes
LE/LT-100	Wetwell Level			1		submersible pressure to PCP then to SCADA panel
LSL-110	Low Wetwell Level	1				backup float to PCP then to SCADA
LSH-120	High Wetwell Level	1				backup float to PCP then to SCADA
LA-100	Transducer failure alarm	1				if available (or internal out of range)
FE/FIT-130	Pump Station Discharge FlowMeter			1		magmeter Nema 6P, vendor cable from FE to FIT, 4-20 to SCADA
PE/PT/PIT-135	Pump Station Discharge Pressure			1		NEMA 6P PE/PT to PIT Level 2 to SCADA panel, loop power
P-1	Pump No. 1 Running	1				from PCP to SCADA
P-1	Pump No. 1 Seal Fail	1				From pump to PCP to SCADA
P-1	Pump No. 1 Motor Temp High	1				From Pump to PCP to SCADA
P-2	Pump No. 2 Running	1				from PCP to SCADA
P-2	Pump No. 2 Seal Fail	1				From pump to PCP to SCADA
P-2	Pump No. 2 Motor Temp High	1				From Pump to PCP to SCADA
HS-110-1	Pump No. 1 HOA in AUTO	1				from PCP to SCADA
HS-110-2	Pump No. 2 HOA in AUTO	1				from PCP to SCADA
HS-120	Lead Selector Switch (AUTO/P1/P2) in AUTO	2				from PCP to SCADA
SP-1	Valve Vault Sump Pump Running	1				sump pump motor starter to SCADA
LSH-140	Valve Vault Flood	1				LSH to SCADA
ATS-1	Automatic Transfer Switch NORMAL position	1				to SCADA
ATS-1	Automatic Transfer Switch EMERGENCY position	1				to SCADA
GEN-1	Generator Running Status	1				to SCADA
GEN-1	Generator Fault	1				to SCADA
LSL-201	Generator Fuel Tank Low Level Alarm	1				to SCADA
LSH-202	Generator Fuel Tank Leak Alarm	1				to SCADA
PF-1	Power Failure	1				in panel
MECH-1	Mechanical Ventilation System Alarm (EF)	1				to SCADA (common from air flow and motor starter)
MECH-2	Mechanical Ventilation System Alarm (SF)	1				to SCADA (common from air flow and motor starter)
TSL-1	Low Building Temperature Alarm	1				adjacent to panel, wall mount switch
TSH-2	High Building Temperature Alarm	1				adjacent to panel, wall mount switch

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

**FORT HALE PUMP STATION - SCADA PANEL (supplied by OWNER)**

TAG NO	DESCRIPTION	DI	DO	AI	AO	Notes
FA-1	Fire/Smoke Alarm	1				from FACP to SCADA Panel
XS-121	Intrusion Alarm	1				from SACP to SCADA Panel
PB-1	Alarm Reset	1				in panel
PF-2	UPS Fault	1				in panel
SSA-1	Surge Suppressor Trip Alarm	1				in panel
COMM-1	Communications Fault (Amber Indicating Light)		1			our standard - not in east haven design
PLC-1	PLC Fault (Red Indicating Light)		1			our standard - not in east haven design
AL-1	Common Alarm Light (Amber)		1			our standard - not in east haven design
<b>TOTALS</b>		<b>33</b>	<b>3</b>	<b>5</b>		

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

SECTION 15110

VALVES AND APPURTENANCES

PART 1 - GENERAL

1.01 WORK INCLUDED:

The Contractor shall furnish and install valves and appurtenances as indicated on the drawings and in the specifications and as herein specified, including all labor, material, equipment and incidentals required.

1.02 RELATED WORK:

- A. Section 09900, PAINTING
- B. Section 15140, DUCTILE IRON PROCESS PIPE AND FITTINGS
- C. Section 15145, Piping and Equipment Layout and Coordination Drawings

1.03 QUALITY ASSURANCE:

- A. Insofar as possible, valves shall be the product of one manufacturer who has had long experience in the design of valves and whose products have proven reliable in service in similar installations over a reasonable period of years. The valves shall be designed so that parts subjected to wear may be easily replaced and shall be constructed of wear-resistant materials.

1.04 REFERENCES:

- A. The following standards form a part of this specification, as referenced:

American National Standards Institute (ANSI)

ANSI B16.1 Cast Iron Pipe Flanges and Flanged Fittings, Class 125.

ANSI B16.10 Standard Face-to-Face and End-to-End Dimensions of Ferrous Valves.

American Water Works Associations (AWWA)

AWWA C500 Gate Valves for Ordinary Water Works Service.

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

Federal Specifications (FS)

FS	WW-V-54C	Amendment 1, Type I or II, Class A for Valve Gate, Bronze (125, 150 and 200 lb., Screwed, Flanged Solder - End, for Land Use).
FS	WW-V-51D	Valve, Bronze, Angle, Check and Globe 125, 150 and 200 Pound Screwed, Flanged or Solder-End (For Land Use)
FS	WW-V-35C	Valve, Ball
FS	TT-V-51F	Varnish, Asphalt

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Submit to the Engineer for review, six (6) sets of complete shop drawings plus operating and maintenance instructions for each item furnished.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. All hand wheels, operating nuts and key stops shall be turned counterclockwise to open the valves. Handwheels shall be of ample size and shall have an arrow and the word "open" cast thereon to indicate the direction of opening.
- B. Valves to be buried shall be designed for buried service and shall be provided with gate boxes and tee handle operating wrenches in the number and lengths necessary to permit operation of all valves by operator of average height, working in normal standing positions. At least two (2) of each type, size and length of wrench shall be provided, unless otherwise stated below. Operating nuts for use with tee handle operating wrenches shall be 2-inches square, and conform to the appropriate AWWA Standard.
- C. Where indicated on the drawings or necessary due to location, size, or inaccessibility, geared or chain wheel operators shall be furnished with the valves. Such operators shall be designed to have adequate strength for use with the valves with which they are supplied.
- D. As indicated on the drawings, certain valves or gates require floorstands and/or bench-stands.
- E. Unless otherwise specified in the specifications or on the drawings, all flanged valves shall conform to ASA Specification B16.1 and ANSI Specification B16.10.
- F. It shall be the Contractor's responsibility to make the valve or gate manufacturer aware of the type of service to which the valve or gate will be subjected and the nature of the

materials (i.e. sewage, sludge, chemicals, etc.) which it will handle, and to make sure that all materials used in the manufacture of the valve or gate are suitable for the use intended.

- G. All anchor bolts and embedded items for complete installation or mounting, holding down or supporting of equipment to be furnished under this section, including necessary location drawings and templates required to install the items in concrete, masonry, etc., shall be furnished and delivered to the site by the manufacturer of the equipment furnished under this section, for installation under other sections of these specifications. Delivery of the items shall be as required by the overall construction schedule.
- H. These specifications direct attention to certain features but do not purport to cover all details entering into the design of the equipment. All parts shall be so designed and proportioned as to have liberal strength, stability, and stiffness, and to be especially adapted for the work done.

## 2.02 GATE VALVES:

- A. Unless otherwise specified or approved, all gate valves larger than 3-inches in diameter shall be iron body, bronze mounted, solid wedge gate valves, with mechanical joint or flanged ends, as indicated on the drawings or herein specified, and shall conform to applicable section of AWWA Standard C500. These valves shall be designed for a working water pressure of at least 175 psi for sizes up to 12-inches in diameter and at least 150 psi for sizes 14-inch and larger in diameter.
- B. Buried valves shall be inside screw, non-rising stem with mechanical joint ends. All exposed valves shall be O.S. and Y, except that where indicated on the drawings or where limited operating room requires, exposed valves shall be non-rising stem with handwheel. All exposed valves 3-inches and larger shall be flanged unless otherwise shown on the drawings. Bronze gate rings shall be fitted into grooves of dovetail or similar shape in the gates. Body seat rings shall be threaded, bronze and screwed into the body.
- C. Stuffing box follower bolts shall be of steel and the nuts shall be of bronze.
- D. O-ring stuffing boxes may be used.
- E. The design and machining of the valves shall be such as to permit packing the valves without undue leakage while they are wide open and in service.
- F. Valves shall be made by The William Powell Co., Cincinnati, OH; Crane Co., Chicago, IL; Jenkins Bros., New York, NY; or approved equal.

## 2.03 AIR CUSHIONED SWING CHECK VALVES:

- A. Unless otherwise specified, all check valves 3-inches and larger shall be 175 lb. W.O.G., flanged, iron body, air cushioned swing type, check valves with bolted covers and equipped with levers and counter-weights. The valve body shall be cast iron per AWWA C508 having integral (not wafer) flanges. The seat shall be centrifugally cast with an O-ring seal and shall be locked in place with stainless steel lock screws and be field

replaceable without the use of special tools. The shaft shall be single and continuous stainless steel, extending both sides of the body with a lever and weight, using an air cushion cylinder side mounted.

- B. The air cushion cylinder shall be constructed of corrosion-resistant material and the piston shall be totally enclosed within the cylinder and not open at one end. The cushion cylinder assembly shall be externally attached to either or both sides of the valve body and shall permit adjustability to cushion the closure of the valve. Cushioning shall be air trapped in the cushion cylinder which shall be fitted with a one way adjustable control check valve to cushion disc contact to the seat at the shut-off point. The bottom cylinder head shall be swivel mounted and not rigid to follow the change of force angles as the lever raises or lowers to open or close the check valve.
- C. The check valve shall prevent backflow of the media on normal pump shut-off or power failure, and shall be water tight. The disc shall be cast iron utilizing a double clevis connected to a ductile iron disc arm.
- D. Check valves shall be furnished with outboard mounted limit switches. Where so indicated or required, check valves shall be of a type suitable for mounting in a vertical position. Insofar as possible check valves in pipelines carrying sewage or sludge shall be installed horizontally. When installed in vertical applications, the disc arm assembly shall be suspended from a stainless steel shaft which shall pass through a seal retainer on both sides of the valve body. All vertically installed check valves shall be provided with a manual flushing connection (1" S.S. hose connection, piping and ball valve) on top of the valve swing (liquid side) to flush the contents off the swing.
- E. The valve component materials of construction and ASTM certifications shall be as follows:

<u>Component</u>	<u>Materials of Construction</u>	<u>ASTM Specification</u>
Body, Cover, Disc	Cast Iron	ASTM A126 GR.B
Disc Arm	Ductile Iron	ASTM A536
Seat	Stainless Steel	ASTM A276
Disc seat	Buna-N or Metal	To suit
Cylinder	Corrosion-Resistant Material	Commercial

- F. Check valves shall be manufactured by M & H Valve and Fittings Co., Anniston, AL; Clow Valve Co., Bensenville, IL; or DeZurik, Inc. Sartell, MN.

2.04 PLUG VALVES:

- A. Plug valves shall be of the non-lubricated rectangular port; eccentric type with neoprene faced plugs and shall be furnished with flanged joint ends. Flanged valves shall be faced and drilled to ANSI B 16.1 Class 125. Valve bodies and plugs shall made be of ASTM A 126, Class B cast-iron. All exposed nuts, bolts, springs, washers, etc., shall be zinc



plated. Resilient plug facings shall be neoprene suitable for use with sewage. Valves shall be furnished with corrosion resistant seats, which comply with AWWA Standard C507 and with AWWA Standard C504. Valve shaft seals shall comply with AWWA Standard C507, and with AWWA C504 and shall be replaceable without valve or gear disassembly.

- B. Valves shall provide drip-tight shutoff up to the full pressure rating.
- C. All valves shall be hydrostatically pressure tested at 175 psi by the manufacturer.
- D. All valves shall be 100% full port design.
- E. All valves shall be provided with gear actuators and either handwheels or chainwheels, depending upon the mounting height. All valves mounted at six (6) feet or higher above the floor shall be provided with gear actuators and chainwheels. All gear actuators shall be provided with an indicator plate, which shall indicate valve position throughout the operating range. An adjustable stop shall be provided to provide field adjustment of closure.
- F. Where indicated on the Contract Drawings or requested by the Engineer, plug valves shall be furnished with bevel gear nut actuators for use with a hand-held electric driver specified elsewhere.
- G. Where indicated on the Contract Drawings or requested by the Engineer, plug valves shall include a valve stem extension constructed of painted steel. Valve stem extensions shall be of the length required as indicated on the Contract Drawings. Intermediate valve supports and hardware required for mounting of the extension shall be provided by the installing contractor. Valve stem extensions shall be suitable for use with the valve actuators specified herein.
- H. Plug valves shall be as manufactured by DeZurik Water Controls, Sartell, MN; Clow Valve Company, Oskaloosa, IA, Kennedy Valve, Elmira, NY, or approved equal.

## 2.05 HANGERS AND SUPPORTS

- A. The Contractor shall furnish and install all supporting devices necessary or required to support all valves and appurtenances in a safe, firm and substantial manner at the locations indicated or as required in a manner to prevent the loads of valves and appurtenances from being carried on pumps, pipes or other equipment.
- B. Plug valves in horizontal pipelines shall be installed with shaft in horizontal position so that with valve in open position the plug is located in the upper part of the valve body. The valves shall be oriented so that with valve in closed position; the plug is at the upstream end of the valve.

- C. Install hangers and supporting devices necessary or required to hold all valves and appurtenances in a safe, firm and substantial manner at the positions indicated or as required and in a manner to prevent the loads of valves and appurtenances from being carried on pumps or other equipment.
- D. All valves shall be furnished with a stainless-steel saddle support for installation. The flange of the saddle support shall have a drilling conforming to ANSI B16.1 Class 125/ANSI B16.5 Class 150 standards. The saddle support shall be inserted into the valve sleeve during installation. The sleeve shall be fastened to the valve body with the flange of the saddle support.

2.06 PRESSURE GAUGE ASSEMBLIES:

- A. Each pump assembly shall be provided with a complete pressure gauge assembly on both the inlet and discharge of the unit, regardless of whether they are shown on the drawings or not. Pressure gauge assemblies shall be provided as shown on the Contract Drawings.
- B. Gauges shall incorporate minimum 4-inch dials with 304 stainless steel case and crimped ring with vent plug, acrylic window, glycerin filled, 1/2-inch NPT 316 stainless steel connection lower mount and bourdon tube, ASME B40.1 Grade 1A +/- 1.0% accuracy full scale, white dial with black print, black pointer, 0 to 60 PSI range (oil filled) for pump discharge gauges, and 0-30 inches vacuum/0-30 psi pressure combination gauges for the pump suction gauges. Gauges shall be as manufactured by Wika, model 40-213.53-2L or equivalent.
- C. Gauges shall be mounted to diaphragm seal, with silicone fill between instrument and seal. All gauge assemblies shall be pressure tested and calibrated. Seals shall be Zavoda W516-03SS diaphragm seal, clean out design, 1/4-inch NPT plated steel instrument housing, 1/2-inch NPT 316 stainless steel process housing, 316 stainless steel welded diaphragm element, 1/4-inch NPT flushing connection, silicone fill.

2.07 SHOP PAINTING:

- A. Before exposure to the weather and after thorough cleaning to remove all rust, dirt, grease and other foreign matter, the valves, floor stands, and appurtenances shall be painted in the shop as specified below.
- B. Ferrous surfaces which will be submerged shall be cleaned by sandblasting to remove all foreign matter.
- C. Interior surfaces of all valves, the exterior surfaces of buried or submerged valves and gates, and miscellaneous piping appurtenances shall be given a shop finish of an asphalt varnish conforming to Federal Specification TT-V-51c, for Varnish, Asphalt.
- D. After thorough cleaning, exterior surfaces of various parts of valves and miscellaneous piping appurtenances exposed within the building shall be given one shop coat of an

approved rust-inhibitive primer compatible with the field coats and applied in accordance with the instructions of the paint manufacturer.

- E. Ferrous surfaces obviously not to be painted shall be given a shop coat of grease or other suitable rust-resistant coating.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

All valves shall be carefully erected and supported in their respective positions free from all distortion and strain. Care shall be taken to prevent damage or injury to the valves or appurtenances during handling and installation. All material shall be carefully inspected for defects in workmanship and materials, all debris and foreign material cleaned out of valve openings and seats, all operating mechanisms operated to check their proper functioning, and all nuts and bolts checked for tightness. Valves and other equipment which do not operate easily or are otherwise defective shall be repaired or replaced at the Contractor's expense.

#### 3.02 FIELD PAINTING:

Field painting of valves shall be in accordance with Section 09900, PAINTING.

END OF SECTION

\\wse03.local\WSE\Projects\CT\GNHW\2190262 - New Haven HMGP\4 Working Documents\4.2 Specifications\Division 15\15110 - Process Valves for Sewer.docx

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 15140

PROCESS PIPE AND FITTINGS

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section covers furnishing, laying, jointing, and testing of process pipe within the pump station, including fittings, special castings and appurtenant work, as indicated on the drawings and as specified.

1.02 QUALITY ASSURANCE:

- A. All pipe and fittings shall be inspected and tested at the foundry as required by the standard specifications to which the material is manufactured.
- B. The Owner reserves the right to have any or all pipe, fittings, and special castings inspected and/or tested by an independent service at either the manufacturer's plant or elsewhere. Such inspection and/or tests shall be at the Owner's expense.

1.03 REFERENCES:

The following standards form a part of this specification and indicate the minimum standards required:

American National Standards Institute (ANSI)

ANSI A21.4 Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water

ANSI A21.10 Ductile-Iron and Gray-Iron Fittings, 3-inches through 48-inches, for Water and Other Liquids

ANSI A21.11 Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

ANSI A21.15 Flanged Ductile-Iron Pipe with Threaded Flanges

ANSI A21.50 Thickness Design of Ductile-Iron Pipe

ANSI A21.51 Ductile-Iron Pipe, Centrifugally Cast in Metal or Sand-Lined Molds for Water or Other Liquids

ANSI A21.53 Ductile-Iron Compact Fittings, 3 inch Through 16 inch., for Water and Other Liquids.

American Water Works Association (AWWA)

AWWA C606 Standard for Grooved and Shouldered Joints

AWWA C651 Standard for Disinfecting Water Mains

American Society for Testing and Materials (ASTM)

ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated (Galvanized) Welded and Seamless

ASTM A307 Low-Carbon Steel, Externally and Internally Threaded Standard Fasteners

1.04 SUBMITTALS:

- A. Submit shop drawings and product data as specified in the General Conditions and Section 01330 of the Contract Documents.
- B. Pipe support design calculations stamped and approved by a Professional Engineer registered in the state of Connecticut.

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE:

- A. All ductile iron pipe shall be designed in accordance with ANSI A21.50 and shall be manufactured in accordance with ANSI A21.51.
- B. Pipe for use with sleeve type couplings shall be as specified above except that the ends shall be plain (without bells or heads). The ends shall be cast or machined at right angles to the axis.
- C. Pipe for use with grooved type couplings shall have ends grooved in accordance with AWWA C606.
- D. Pipe thickness class, unless otherwise indicated:
  - 1. Minimum thickness class shall be Class 53 for use with threaded flanges.
  - 2. For grooved couplings, minimum thickness class shall be Class 53 for pipe smaller than 18-inches and Class 56 for pipe 18-inches and larger.
- E. Machined surfaces shall be cleaned and coated with a suitable rust-preventative coating at the shop immediately after being machined.

- F. The inside of pipe and fittings shall be given a cement lining and bituminous seal coat in accordance with ANSI A21.4. The thickness of lining shall be double that specified in the above referenced specification.
- G. The outside of pipe and fittings within structures shall not be coated with the bituminous coating, but shall be thoroughly cleaned as recommended by the coating manufacturer and given one shop coat of 69-1211 H.B. Epoxoline II primer made by Tnemec Company, Inc.;

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

Multiprime made by Pittsburgh Plate Glass Co., Pittsburgh, PA; Recoatable Epoxy Primer B67H5/R5 made by Sherwin-Williams Company; or an approved equal product.

2.02 JOINTS:

- A. Flanged joints shall conform to ANSI A21.15 except that special drilling or tapping shall be provided as necessary to ensure correct alignment and bolting.
- B. Flanged pipe shall use long-hub flanges which shall be screwed on tight at the foundry by machine before they are faced and drilled.

2.03 FITTINGS:

- A. Fittings shall conform to the requirements of ANSI A21.10 and shall be of a pressure classification at least equal to that of the pipe with which they are used.
- B. Flanged fittings shall be faced and drilled in accordance with ANSI A21.10 except that special drilling or tapping shall be provided as necessary to ensure correct alignment and bolting.
- C. Provide ductile-iron grooved-end fittings conforming to ANSI A21.10 for center-to-face dimensions.
  - 1. End preparation for grooved ends conforming to AWWA C606 for flexible or rigid joints as required by type of joint.
  - 2. Minimum wall thickness of grooved fittings 12-inch and smaller conforming to ANSI A21.53.
  - 3. Minimum wall thickness of grooved fittings larger than 12-inch conforming to ANSI A21.10.
- D. Fittings shall be provided with standard bosses where so indicated.

2.04 SLEEVE TYPE COUPLINGS:

- A. To ensure correct fitting of pipe and couplings, all flexible couplings and accessories shall be furnished by the supplier of the pipe and shall be of a pressure rating at least equal to that of the pipeline in which they are to be installed.
- B. Flexible couplings shall be Style 38 by Dresser Mfg. Div., Bradford, PA; Style 441 Smith-Blair, Inc., San Francisco, CA; R.H. Baker & Co., Inc., Huntington Park, CA; Clow Corporation, Rochester, NY; or approved equal products.
- C. All couplings shall be furnished with the pipe stop removed.

- D. Couplings shall be provided with gaskets of a composition suitable for exposure to the liquid within the pipe.

2.05 GROOVED COUPLINGS:

- A. Couplings shall conform to AWWA C606.
- B. Minimum pipe wall thickness shall be as specified under "Pipe For Use With Couplings."
- C. Unless otherwise indicated, when grooved couplings are used, joint to be of rigid type with pipe grooves cut to bring pipe ends together. Beam strength of joint shall be equal to or greater than that of flanged joint. Flexible type joint to be used only as specified or indicated.
- D. Where grooved couplings are indicated to provide for expansion or flexibility, cut pipe grooves to provide necessary expansion or flexibility.

2.06 WALL PENETRATIONS:

A. RESTRAINED:

1. Where restrained wall penetrations are called for on the drawings, wall pipe castings with integral water stops shall be used. Outside surfaces of castings to be encased in concrete shall not be painted or coated.
2. OMNI\*SLEEVE as manufactured by OMNI\*SLEEVE, Cream Ridge, NJ, or approved equal shall be an accepted alternate when installed with retainer (tie) rods.
3. Wall sleeves with mechanical seals only will not be allowed in lieu of castings.

B. NON-RESTRAINED:

Where non-restrained wall penetrations are called for on the drawings, mechanical seals shall fill the space between the process pipe and the pipe sleeve to create a water tight seal. Mechanical seal shall be Link-Seal by Thunderline Corporation, Wayne, Michigan; Sure Seal by International Piping Systems, Inc., Saugus, Massachusetts; OMNI\*SLEEVE, by OMNI\*SLEEVE of Cream Ridge, NJ; or approved equal.

2.07 FILLING RINGS:

The Contractor shall provide suitable filling rings where the layout of the flanged piping is such as to necessitate their use. In materials, workmanship, facing and drilling, such rings shall conform to the 125-lb. ANSI Standard. Filling rings shall be of suitable length with



nonparallel faces and corresponding drilling if necessary, to ensure correct assembly of the adjoining piping or equipment.

2.08 GASKETS, BOLTS, AND NUTS:

- A. For flanged joints, gaskets shall be a minimum of 1/8-inch thick full face gaskets.
- B. Gaskets shall be of a composition suitable for exposure to the liquid within the pipe.
- C. Flanged joints shall be either made with bolts, bolt studs with a nut on each end, or studs with nuts where the flange is tapped. The number and size of bolts shall conform to the same ANSI Standard as the flanges. Bolts and nuts shall, except as otherwise specified or noted on the drawings, be heavy hex Grade B conforming to ASTM A307. Bolt studs and studs shall be of the same quality as machine bolts.

2.09 JOINT RESTRAINT:

- A. Where indicated or necessary to prevent joints or flexible couplings from pulling apart under pressure, suitable socket pipe clamps, tierods, and bridles shall be provided. Bridles and tierods shall be at least 3/4-inch diameter except where they replace flange bolts of smaller size, in which case they shall be fitted with a nut on each side of the pair of flanges. The socket clamps and tierods or bridles shall be coated with an approved primer paint after assembly, or, if necessary, prior to assembly.

PART 3 - EXECUTION

3.01 HANDLING AND CUTTING PIPE

- A. Any pipe or fitting which has a damaged lining, scratched or marred machine surface, and/or abrasion of the pipe coating or lining shall be rejected and removed from the job site.
- B. Any fitting showing a crack and any fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.
- C. In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portions, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used may be perfectly sound. The cut shall be made in the sound barrel at a point at least 12-inches from the visible limits of the crack.
- D. Except as otherwise approved, all cutting shall be done with a machine suitable for cutting ductile iron pipe. Hydraulic squeeze cutters are not acceptable. Travel type cutters or rotary

type abrasive saws may be used. All cut ends shall be examined for possible cracks caused by cutting.

- E. The Contractor's attention is directed to the fact that damage to the lining of pipe or fittings will render them unfit for use; he shall use the utmost care in handling and installing lined

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

and coated pipe and fittings to prevent damage. Protective guards shall not be removed until the pipe is to be installed.

- F. Lined and coated pipe and fittings shall be assembled and installed with approved packing or gaskets of the type recommended by the pipe manufacturer for the particular lining used.
- G. Castings to be encased in masonry or concrete shall be accurately set with the bolt holes, if any, carefully aligned. OMNI\*SLEEVE shall be installed per manufacturer's instructions.
- H. Immediately prior to being set, castings shall be thoroughly cleaned of all rust, scale and other foreign matter.

### 3.02 INSTALLING PIPE AND FITTINGS:

- A. No defective pipe or fittings shall be laid or placed in the piping and any piece discovered to be defective after having been laid or placed shall be removed and replaced by a sound and satisfactory piece.
- B. Pipes and fittings shall be subjected to a careful inspection and a hammer test just before being installed.
- C. Before the pieces are assembled, rust-preventive coatings shall be removed from machined surfaces. Pipe ends, sockets, sleeves, housings, and gaskets shall be thoroughly cleaned and all burrs and other defects shall be carefully smoothed.
- D. Each pipe and fitting shall be cleared of all debris, dirt, etc., before being laid and shall be kept clean until accepted in the completed work.
- E. Flanged joints shall be made up tight, care being taken to prevent undue strain upon pump nozzles, valves, and other pieces of equipment.
- F. Pipe and fittings shall be laid accurately to the lines and grades indicated on the drawings or as required by the Engineer. Care shall be taken to ensure good alignment both horizontally and vertically.
- G. Castings to be encased in masonry shall be accurately set with the bolt holes, if any, carefully aligned.
- H. Immediately prior to being set, castings shall be thoroughly cleaned of all rust, scale and other foreign material.

### 3.03 ASSEMBLING SLEEVE TYPE COUPLINGS:

- A. Prior to the installation of flexible couplings, the pipe ends shall be cleaned thoroughly for a distance of 8-inches. Soapy water may be used as a gasket lubricant. A follower and gasket, in that order, shall be slipped over each pipe to a distance of about 6-inches from the end, and the middle ring shall be placed on the already laid pipe and until it is properly

centered over the joint. The other pipe end shall be inserted into the middle ring and brought to proper position in relation to the pipe already laid. The gaskets and followers shall then be pressed evenly and firmly into the middle ring flares.

- B. After the bolts have been inserted and all nuts have been made up finger tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint, preferably by use of a torque wrench of the appropriate size and torque for the bolts.
- C. The correct torque as indicated by a torque wrench shall not exceed 90 foot-pounds.

#### 3.04 ASSEMBLING GROOVED COUPLINGS

- A. Clean grooves and other parts.
- B. Coat ends of pipe and outside of gasket with soft soap or silicone and slip gasket over one pipe end.
- C. Bring pipes to correct position and center gasket over pipe ends with lips against pipe.
- D. Place housing section, insert bolts and tighten nuts until housing sections are in metal-to-metal contact.
- E. If grooves must be cut in the field, the equipment used shall be as recommended by the coupling manufacturer. Finished grooves shall comply with AWWA C606.

#### 3.05 PIPING SUPPORT:

- A. The Contractor shall furnish and install all supports necessary to hold the piping and appurtenances in a firm, substantial manner at the lines and grades indicated on the drawings or specified. Pipe supports shall be furnished with one shop coat of rust inhibitive primer.
- B. All pipe and appurtenances connected to equipment shall be supported in such a manner as to prevent any strain being imposed on the equipment. When manufacturers have indicated requirements that piping loads shall not be transmitted to their equipment, the Contractor shall submit a certification from the manufacturer stating that such requirements have been complied with.
- C. Piping within buildings shall be adequately supported from floors, walls, ceilings or beams. Supports from the floor shall be by approved saddle stands, or suitable concrete piers as indicated or approved. Pipe saddles shall be shaped to fit the pipe with which they will be used and shall be capable of screw adjustment. Brick and concrete piers shall conform accurately to the bottom one-third to one-half of the pipe. Piping along walls shall be supported by approved wall brackets with attached pipe rolls or saddles or by wall brackets with adjustable hanger rods. For piping supported from the ceiling, approved rod hangers of

a type capable of screw adjustment after erection of the piping and with suitable adjustable concrete inserts or beam clamps shall be used.

3.06 TAPPED CONNECTIONS:

- A. Tapped connections in pipe and fittings shall be made so as to provide a watertight joint and adequate strength against pullout. The maximum size of taps in pipe or fittings without bosses shall not exceed that listed in the appropriate table of the Appendix to the ANSI A21.51, based on 3 full threads for ductile iron.
- B. Where the size of the connection exceeds that given above, a boss shall be provided on the pipe barrel and the tap shall be made in the flat part of the intersection of the run and branch of a tee or cross, or the connection shall be made by means of a tapped tee, branch fitting and tapped plug or reducing flange, or tapping tee and tapping valve, all as indicated or approved.
- C. All drilling and tapping of ductile iron pipe shall be done normal to the longitudinal axis of the pipe; fittings shall be drilled and tapped similarly, as appropriate. Drilling and tapping shall be done only by skilled mechanics. Tools used shall be adapted to the work and in good condition so as to produce good, clean-cut threads of the correct size, pitch, and taper.

3.07 PRESSURE AND LEAKAGE TESTS:

- A. Prior to the pressure and leakage tests, the piping shall be thoroughly cleaned of all dirt, dust, oil, grease and other foreign material. This work shall be done with care to avoid damage to linings and coating.
- B. Except as otherwise required by the Engineer, all pipelines shall be given combined pressure and leakage tests in sections of approved length. The Contractor shall furnish and install suitable temporary testing plugs or caps; all necessary pressure pumps, pipe connections, meters, gates, and other necessary equipment; and all labor required. The Owner or Engineer may monitor the tests using their own gages.
- C. Subject to approval and provided that the tests are made within a reasonable time considering the progress of the project as a whole, and the need to put the section into service, the Contractor may make the tests when he desires.
- D. The section of pipe to be tested shall be filled with water of approved quality, and all air shall be expelled from the pipe. If hydrants and blowoffs are not available at high points for releasing air, the Contractor shall make the necessary taps at such points, including required excavation and backfilling, and shall plug said holes after completion of the test.
- E. The section under test shall be maintained full of water for 24 hours prior to the combined pressure and leakage test being applied.
- F. The pressure and leakage test shall consist of first raising the water pressure (based on the elevation of the lowest point of the section under test, corrected to the gage location) to a pressure in pounds per square inch numerically equal to the pressure rating of the pipe. If

the Contractor cannot achieve the specified pressure and maintain it for a period of one hour, the section shall be considered as having failed to pass the pressure test.

- G. Following or during the pressure test, the Contractor shall conduct a leakage test by metering the flow of water into the pipe while maintaining pressure equal to the pressure rating of the pipe. If the average leakage during a two-hour period exceeds a rate of 11.6 gallons per inch of diameter per 24 hours per mile of pipeline, the section shall be considered as having failed the leakage test.
- H. If the section fails to pass the pressure and leakage test, the Contractor shall do everything necessary to locate, uncover, and repair or replace the defective pipe, fitting, or joint, all at his own expense and without extension of time for completion of the work. Additional tests and repairs shall be made until the section passes the specified test.
- I. If, in the judgment of the Engineer, it is impracticable to exactly follow the foregoing procedure, modifications in the procedure may be made as required and approved. The Contractor will still be responsible for providing a line which satisfies the above leakage and pressure requirements.

END OF SECTION

Document2

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 15145

PIPING AND EQUIPMENT LAYOUT AND COORDINATION DRAWINGS

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This section covers the preparation and implementation of piping and equipment layout and coordination drawings as required for coordination of construction disciplines as specified herein.
- B. The Contractor shall furnish all labor, materials, tools and equipment necessary to prepare piping and equipment layout and coordination drawings for implementation by the construction team. The Contractor shall develop and prepare piping and equipment layout and coordination drawings for each individual construction location/project area/equipment component. The actual quantity of piping and equipment layout and coordination drawings shall be as required.

1.02 RELATED WORK:

- A. DIVISION 11 – EQUIPMENT
- B. DIVISION 13 – SPECIAL CONSTRUCTION
- C. DIVISION 15 – MECHANICAL
- D. DIVISION 16 – ELECTRICAL

1.03 SUBMITTALS. IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Six (6) sets of plan and profile layout and coordination shop drawings shall be furnished for review.

1.04 REQUIREMENT FOR DETAILED LAYOUT AND COORDINATION DRAWINGS:

- A. The Contractor shall develop and provide detailed scaled equipment, piping and coordination drawings. All equipment, piping and valves shall be laid to scale by the Contractor based on actual field conditions, approved equipment and construction discipline coordination. The Contractor shall submit the scaled layout and coordination drawings for review by the Engineer prior to the purchasing of any equipment, coring penetration or routing piping and or mechanical equipment to confirm there are no conflicts and the proposed mechanical equipment and piping will fit within the allotted space. A copy of the layout shall be maintained and updated in the field by the Contractors site superintendent/foreman.

- B. The Contractor shall not scale distances and dimensions from the drawings. The Contractor shall utilize existing/proposed field dimensions, the approved shop drawings and the equipment and piping layout drawings developed for layout of the proposed work and coordination of the different construction disciplines.
- C. The mechanical, equipment, piping and electrical layouts provided in the contract documents are diagrammatic in nature. The Contractor shall field verify and coordinate all dimensions with the actual equipment supplied, the existing conditions and all Federal, State and Local code requirements. The work of the various trades shall be coordinated by the Contractor to avoid interference and to secure maximum head room and working space. The Contractor shall pay particular attention to congested spaces inside and outside of structures. The Contractor shall develop "Interference Drawings", defined as drawings embodying the actual approved/purchased equipment, existing and proposed structures as well as the work of the multiple trades (electrical, mechanical, instrumentation, etc.) involved on the project. The "Interference Drawings" shall be developed and provided by the Contractor at no additional cost to the Owner.
- D. All bends in piping which shall be inaccessible after construction (i.e. below concrete slabs) shall have a maximum bend of 45 degrees. The contractor shall substitute bends and provide additional bends as necessary for inaccessible piping at no additional cost to the owner.
- E. It is the responsibility of the Contractor to provide a complete and functional system as shown and described in the Contract Documents. The determination of complete and functional system shall be at the sole discretion of the Engineer. Complete and functional systems shall meet the approval of the Engineer based on the actual field conditions. It is not the intent of the Contract Drawings to portray every detail of the required work and or system. The Contractor shall provide the equipment, piping, coordination and system complete so that when assembled and installed they shall operate and perform as shown and described in the Contract Documents.

## PART 2 - PRODUCTS

NOT USED

## PART 3 - EXECUTION

NOT USED

END OF SECTION



SECTION 16010

ELECTRICAL WORK - GENERAL PROVISIONS

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. The work covered by this section of the specifications consists of furnishing all labor, equipment, appliances, materials and incidentals in connection with the installation of the complete electrical systems as herein specified and as shown on the drawings.
- B. It is not the intent that the drawings shall show every junction box, conduit, wire, fitting, device, accessory, etc., but the Contractor shall be required to furnish without additional expense all transportation, labor and materials necessary to complete the electrical systems in accordance with the best practice of the trade.
- C. Unless otherwise specified, materials of the same classifications, used for the same purpose shall be the product of the same manufacturer.
- D. The work shall include furnishing and installing the following items:
1. Underground Secondary Services
  2. Transformers
  3. Grounding System
  4. Panelboards
  5. Motor Disconnect Devices
  6. Raceways
  7. Feeder and Branch Circuit Conductors
  8. Pull and Junction Boxes
  9. Generator and Transfer Switch
  10. Hangers and Supports
  11. Solderless Lugs and Connectors
  12. Conduit and wire for equipment and controls furnished under other divisions of the specifications, when shown on the electrical plans, with the exception of the instrumentation low voltage signal wiring.

E. Electric Service and Metering

The power company serving this project is Eversource.

1. Arrangements shall be made with the power company for obtaining service. All cost for overhead line extensions and work required for these services including metering cost shall be obtained from the power company. The Contractor shall include in his bid and shall pay this money to the power company. All work involving the service and metering shall be as approved by the power company.

F. Interpretation of Drawings

1. The Drawings are diagrammatic only and are not intended to show exact locations of outlets and conduit runs.
2. All three-phase circuits shall be run in separate conduits unless otherwise shown on the Drawings.
3. Any work installed contrary to Contract Documents, or without approval by the Engineer, shall be changed or replaced as required by the Engineer and no extra compensation will be allowed the Contractor for making these changes.
4. The locations of equipment and similar devices shown on the Drawings are approximate only. Exact locations shall be as approved by the Engineer during construction. The Contractor shall obtain in the field all information relevant to the placing of electrical work and in case of any interference with other work, shall proceed as required by the Engineer and shall furnish all labor and materials necessary to complete the work in an approved manner.
5. The number of conductors shown on the Drawings are not necessarily the correct number required. As many conductors as are required in each case shall be installed.
6. The ratings of motors and other electrically operated devices together with the size shown for their branch circuit conductors and conduits are approximate only and are indicative of the probable power requirements insofar as can be determined in advance of the purchase of equipment. The ratings shown for motor branch circuit protective devices are the maximum ratings permitted. Lower ratings may be used where approved as being proper for the dynamic characteristics of the motor and its connected load.
7. Unless otherwise specified, all conduits, wires, and cables and the support systems for the conduits and cables that are required to make the electrical connections to equipment shall be furnished and installed. All

connections to equipment shall be made as shown, specified, and required and in accordance with the approved shop and setting drawings.

8. The Contractor shall verify, in the field, all measurements necessary for his work and shall assume responsibility for their accuracy.

#### 1.02 LOCAL CONDITIONS:

- A. The Contractor shall provide and place all sleeves for conduits penetrating walls, etc. The Contractor shall locate all necessary slots for his work and these shall be formed before concrete is poured.
- B. All cutting and patching shall be done in a thoroughly workmanlike manner.
- C. Before submitting proposals, the Contractor is expected to inspect the site and survey the conditions to be encountered in the performance of the work. Failure to familiarize himself with the conditions shall not relieve the Contractor's responsibility for full completion of the work in accordance with the provisions of the Contract.

#### 1.03 PERMITS AND INSPECTION:

- A. Permits, fees and notices shall be in accordance with the General Conditions.
- B. All work shall meet or exceed the latest requirements of all national, state, county, municipal and other authorities exercising jurisdiction over electrical construction at this project.
- C. All required permit and inspection certificates shall be obtained, paid for, and given to the Owner at the completion of the work.

#### 1.04 CODES AND STANDARDS:

- A. Unless indicated or specified otherwise, materials and workmanship shall conform with the latest editions of the following codes, standards and specifications.
  1. National Electrical Code (NEC)
  2. National Bureau of Standards Handbook H-30 National Electrical Safety Code
  3. State and Local Codes, and all other authorities having jurisdiction
  4. Underwriter's Laboratories, Inc. (UL)
  5. American National Standards Institute, Inc.
  6. Institute of Electrical and Electronic Engineers (IEEE)

7. National Electrical Manufacturers Association (NEMA)
8. National Board of Fire Underwriters
9. International Municipal Signal Association (IMSA)
10. Insulated Power Cable Engineers Associated Specifications
11. American Society for Testing Materials Specifications

1.05 REVIEW OF MATERIALS:

- A. Material and Equipment Schedules. As soon as practicable and within thirty days after the date of notice to proceed and before commencement of installation of any materials or equipment, the Contractor shall submit to the Engineer six (6) complete Brochures for approval of materials and equipment to be incorporated in the work. The list shall include manufacturer's name, catalog numbers, cuts, diagrams, drawings, and such other descriptive data as may be required. No consideration will be given to a partial submittal from time to time. Approval of materials will be based on manufacturer's published ratings. Any materials and equipment listed that are not in accordance with the specification requirements will be rejected.
- B. Substitutions: Substitution of material or equipment shall be in accordance with the General Conditions.
- C. Shop Drawings. Shop drawings shall be submitted to the Engineer for review in accordance with the Division 1. Shop drawings shall be submitted for, but not limited to the following:
  1. Panelboards
  2. Transformers
  3. Wire and Cable
  4. Contactors
  5. Hangers and Supports
  6. Disconnect Switches
  7. Fuses
  8. Circuit Breakers
  9. Raceways
  10. Generator and transfer switch

- D. Submit the following information with all equipment shop drawings.
1. Manufacturer's certified scale drawings, cuts, or catalogs, including installation details and manufacturer's name.
  2. Manufacturer's specifications, including certified performance characteristics and capacity ratings.
  3. Electrical wiring diagrams and controls, where applicable.
  4. Certificate of compliance with Code, where applicable.
- E. Equipment shop drawings and wiring diagrams must be prepared specifically for this installation. Standard factory wiring diagrams with a revision marked in ink for this installation will be accepted.
- F. All control and wiring diagrams shall be complete with the following description:
1. Sequence of operation
  2. Sequence of interlocking
  3. Operation of alarms
  4. Legend
  5. Wiring Numbers
- G. All equipment shop drawings shall be properly identified and indicate the Article number of the specifications or the Drawing number which applies to the submitted item.
- H. Shop drawings for the items listed above shall be submitted for approval in accordance with the preceding paragraphs. The Engineer, however, reserves the right to require submittal of shop drawings on any other material or equipment to be installed under this Section not specifically listed above.

1.06 MINOR DEVIATIONS:

- A. The work as shown on the drawings is diagrammatic and is intended to show the work included and the arrangement of the various systems.
- B. It is not intended that the accompanying plans and specifications cover every detail of the required installation. Furnish and install equipment, materials and labor as shown or specified, as are usually furnished, or as are needed to make a complete and satisfactory operating installation, whether mentioned or not, omitting only those items which are specifically excluded.

- C. Locations and mounting heights of equipment and/or devices as shown are approximately correct. The Engineer reserves the right to relocate any equipment or device prior to actual installation at no extra cost to the Owner.
- D. No deviation from layout shall be made without written approval from the Engineer.

1.07 TEMPORARY LIGHT AND POWER:

- A. The Contractor shall provide temporary light and power and pay all energy charges as described in Division 1.

1.08 ELECTRICAL REFERENCE SYMBOLS:

- A. Symbols shown on the drawings shall approximate location of fixtures, outlet boxes, and conduit runs, and other equipment, unless otherwise detailed. The exact location shall be governed by structural conditions and obstructions. This is not to be construed to permit redesigning systems. All outlets shall be interconnected as shown on the drawings. Locate and install all boxes and equipment where they will be readily accessible.

1.09 PHASE IDENTIFICATION:

- A. The entire system of wiring shall be phased by color code as follows:
  - 1. Wires No. 6 AWG and smaller shall have a continuous colored outer covering.
  - 2. Wires larger than No. 6 AWG shall be identified at all points of termination by gummed tape, plastic tape, etc., applied to the wire.
  - 3. Bus bars in motor control centers and panelboards shall be properly identified by color as herein specified.
  - 4. Code colors for 120/208 volt systems shall be:
    - a. Phase A - Black
    - b. Phase B - Red
    - c. Phase C - Blue
  - 5. Code colors for 277/480 volt systems shall be:
    - a. Phase A - Brown
    - b. Phase B - Orange
    - c. Phase C - Yellow

6. Neutral wires shall be white or grey.
7. Equipment ground wires shall be green.
8. The same colors shall be used for the same phases throughout the entire project.

#### 1.10 PROTECTION AND CLEANING OF EQUIPMENT:

- A. All electrical equipment, upon receipt, shall be adequately stored and protected from damage.
- B. After installation, all electrical equipment shall be protected to prevent damage during the construction period. Openings in conduits and boxes shall be closed to prevent entrance of foreign materials.
- C. The interior of boxes and cabinets shall be left clean. Exposed surfaces shall be cleaned and plate surfaces polished.

#### 1.11 OPERATION AND MAINTENANCE MANUALS:

- A. The Contractor shall furnish the Owner with four (4) copies of complete operating and maintenance manuals. Manuals shall include all equipment, maintenance instruction, parts list, warranties, schematic diagrams of control systems, and lubrication charts.
- B. Manuals shall contain only that information which specifically applies to this project, and all unrelated material shall be deleted. During the instruction period, herein specified, this manual shall be used and explained. Each copy of manual shall be clearly indexed and include a directory of all subcontractors and maintenance contractors, indicate the area of their responsibility, and list the name and telephone numbers of the responsible member of each organization. This material shall have a clear plastic protective shield over each sheet of data.
- C. Each manual shall be bound in an expandable plastic covered hard bound binder. Binders shall be three (3) straight post type. Ring type binders will be acceptable. The manual's front cover and side cover shall be stamped "Operation and Maintenance Manual -- Electrical Systems" along with the project title.

#### 1.12 OPERATING AND MAINTENANCE INSTRUCTIONS:

- A. A competent Engineer shall be provided by the Contractor to instruct operating personnel in the operation and maintenance of equipment and systems.

#### 1.13 SPARE PARTS DATA:

- A. The Contractor shall furnish a complete list of recommended spare parts and supplies for the equipment furnished with current unit prices and source of supply.

1.14 TESTS:

- A. The Electrical Contractor shall perform all tests at the completion of the work and the results furnished to the Owner and Engineer in writing. Tests shall include, but not be limited to: all systems test free of shorts or grounds, proper neutral connections, ground system resistance, secondary voltages at main distribution panel, power panels and lighting panels, all lighting fixtures with lamps in place for 10 hours.
- B. Upon completion of all work, the Electrical Contractor shall furnish, in duplicate, certificates of inspections from all inspectors and authorities having jurisdiction, notarized letters from the manufacturers stating that authorized Factory Engineers or agents have inspected and tested the installation of their respective systems and found same to be in satisfactory operating condition.
- C. Furnish all labor, material, instruments, supplies and services and bear all costs for the accomplishment of the tests.

1.15 GUARANTEE:

- A. The Contractor shall guarantee equipment and performance of the installation and equipment in accordance with the GENERAL CONDITIONS.
- B. Lamps shall be furnished and installed in each lighting fixture as soon as fixtures are properly hung. Replace all lamps that fail within ninety (90) days after final acceptance at no additional cost. If the Contractor fails to replace lamps during the guarantee period, after a second request the Owner may replace lamps and back-charge Contractor.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. The materials used in all systems shall be new, unused and as hereinafter specified. All materials where not specified shall be of the very best of their respective kinds. Samples of materials or manufacturer's specification shall be submitted for approval as required by the Engineer.
- B. Materials and equipment used shall be U.L. listed wherever such approved materials and equipment is available.
- C. Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by water. If any apparatus has been damaged, such damage shall be repaired by the Contractor at his cost and



expense. If any apparatus has been subject to possible damage by water, it shall be thoroughly dried out and put through such special tests as required by the Engineer, at the cost and expense of the Contractor, or shall be replaced by the Contractor at his own expense.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

- NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY
- A. All work shall be executed in full accordance with the National Electrical Code and local rulings. Should any work be performed contrary to said rulings, ordinances and regulations, this Contractor shall bear full responsibility for such violations and assume all costs arising therefrom.
  - B. Load Balance. Check the load balance on the phases of the various systems and reconnect where necessary as approved by the Engineer to provide equal division of the loads between the phases of the various systems.
  - C. Before starting the work, confer with all other trades relative to the location of pipes, ducts, and apparatus or fixtures to be installed by them and select locations for the work which will avoid possible conflicts with the work of other trades involved. All differences or conflicting conditions concerning the work shall be called to the attention of the Engineer for adjustment before starting work. For such work performed or materials installed in violation of the above clause the work shall be readjusted to the complete satisfaction of the Engineer at the sole expense of the Electrical Subcontractor.
  - D. A concrete housekeeping pad shall be furnished and installed for all floor-mounted equipment. The pad shall be 4-inches high and sized to extend 4-inches beyond the equipment. The pad shall be poured dead level and the top scored from front to back on 18-inch centers with a parting tool. All edges shall be finished with an edging tool. The Contractor should refer to Division 3, Cast-In-Place Concrete for additional requirements.
  - E. Cleanup
    1. This Contractor shall cooperate with other workmen and with the General Contractor in the daily removal of debris from the work site.
    2. This Contractor shall leave "broom clean" all areas where he has interrupted or completed his work.
    3. He shall cooperate with the General Contractor in good housekeeping procedures.
    4. At the completion of his work, prior to the final inspection, this Contractor shall clean all devices, plates, fixtures, glassware, switches, cabinets,

exposed conduits, fittings, etc. and shall have the premises in a thoroughly clean condition.

END OF SECTION

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

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.

1.02 SUMMARY:

- A. This Section includes the following:
  1. Electricity-metering components.
  2. Concrete equipment bases.
  3. Cutting and patching for electrical construction.
  4. Touch-up Paint

1.03 SUBMITTALS:

- A. Product Data: For electricity-metering equipment.
- B. Shop Drawings: Dimensioned plans and sections or elevation layouts of electricity-metering equipment.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

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 NFPA 70.

1.05 COORDINATION:

- A. Coordinate inserts, sleeves, and openings with general construction work and arrange in structure during progress of construction to facilitate the electrical installations that follow.

1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the structure.
- C. Coordinate electrical service connections to components furnished by utility companies.
  1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
  2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.
- D. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

## PART 2 - PRODUCTS

### 2.01 SUPPORTING DEVICES:

- A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.
- B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
- C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch diameter slotted holes at a maximum of 2-inches o.c. in webs.
- D. Slotted-Steel Channel Supports: Comply with Division 5 Section "Metal Fabrications" for slotted channel framing.
  1. Channel Thickness: Selected to suit structural loading.
  2. Fittings and Accessories: Products of the same manufacturer as channel supports.
- E. Nonmetallic Channel and Angle Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch diameter holes at a maximum of 8-inches o.c. in at least one surface.
  1. Fittings and Accessories: Products of the same manufacturer as channels and angles.
  2. Fittings and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
- F. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

- G. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- H. Expansion Anchors: Carbon-steel wedge or sleeve type.
- I. Toggle Bolts: All-steel springhead type.
- J. Powder-Driven Threaded Studs: Heat-treated steel.

2.02 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING:

- A. Current-Transformer Cabinets: Comply with requirements of electrical power utility company.
- B. Meter Sockets: Comply with requirements of electrical power utility company.

2.03 CONCRETE BASES:

- A. Concrete Forms and Reinforcement Materials: As specified in Division 3 Section "Cast-in-Place Concrete."
- B. Concrete: Compressive strength as specified in Division 3 Section "Cast-in-Place Concrete."

2.04 TOUCHUP PAINT:

- A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.
- B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.01 ELECTRICAL EQUIPMENT INSTALLATION:

- A. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- B. Right of Way: Give to raceways and piping systems installed at a required slope.

3.02 ELECTRICAL SUPPORTING DEVICE APPLICATION:

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

- B. Dry Locations: Steel materials.
- C. Support Clamps for PVC Raceways: Click-type clamp system.
- D. Selection of Supports: Comply with manufacturer's written instructions.
- E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb design load.

### 3.03 SUPPORT INSTALLATION:

- A. Install support devices to securely and permanently fasten and support electrical components.
- B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
- C. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
- D. Simultaneously install vertical conductor supports with conductors.
- E. Install sleeves for cable and raceway penetrations of concrete walls unless core-drilled holes are used. Install sleeves during erection of concrete structures.

### 3.04 UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT:

- A. Install equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

### 3.05 CONCRETE BASES:

- A. Construct concrete bases of dimensions indicated, but not less than 4-inches larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

### 3.06 CUTTING AND PATCHING:

- A. Cut, channel, chase, and drill walls and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

- B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces.

3.07 FIELD QUALITY CONTROL:

- A. Inspect installed components for damage and faulty work, including the following:
  1. Supporting devices for electrical components.
  2. Electricity-metering components.
  3. Concrete bases.
  4. Cutting and patching for electrical construction.
  5. Touchup painting.

3.08 REFINISHING AND TOUCHUP PAINTING:

- A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 9 Section "Painting."
  1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
  2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
  3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.09 CLEANING AND PROTECTION:

- A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
- B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 16060

GROUNDING AND BONDING

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.

1.02 SUMMARY:

- A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.03 SUBMITTALS:

- A. Product Data: For each type of product indicated.
- B. Product Data: For the following:
  - 1. Ground rods.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- D. Field Test Reports: Submit written test reports to 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.

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.
  - 1. Comply with UL 467



## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS:

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Grounding Conductors, Cables, Connectors, and Rods:
    - a. Apache Grounding/Erico Inc.
    - b. Chance/Hubbell.
    - c. Copperweld Corp.
    - d. Kearney/Cooper Power Systems.
    - e. O-Z/Gedney Co.; a business of the EGS Electrical Group.
    - f. Raco, Inc.; Division of Hubbell.
    - g. Superior Grounding Systems, Inc.
    - h. Thomas & Betts, Electrical.

### 2.02 GROUNDING CONDUCTORS:

- A. For insulated conductors, comply with Division 16 Section "Conductors and Cables."
- B. Material: copper.
- C. Equipment Grounding Conductors: Insulated with green-colored insulation.
- D. Grounding Electrode Conductors: Stranded cable.
- E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- F. Bare Copper Conductors: Comply with the following:
1. Solid Conductors: ASTM B 3.
  2. Assembly of Stranded Conductors: ASTM B 8.
  3. Tinned Conductors: ASTM B 33.
- G. Copper Bonding Conductors: As follows:
1. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
  2. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8-inches wide and 1/16-inch thick.
  3. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8-inches wide and 1/16-inch thick.
- H. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.03 CONNECTOR PRODUCTS:

- A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.
- B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.
- C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.04 GROUNDING ELECTRODES:

- A. Ground Rods: Copper-clad steel.

PART 3 - EXECUTION

3.01 APPLICATION:

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone and similar materials.
- B. In raceways, use insulated equipment grounding conductors.
- C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.
- D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.
- E. Grounding Bus: Install in electrical cabinet.
  - 1. Use insulated spacer; space 1-inch from wall and support from wall 6-inches above finished floor, unless otherwise indicated.
- F. Underground Grounding Conductors: Use copper conductor, No. 2/0 AWG minimum. Bury at least 24-inches below grade or bury 12-inches above duct bank when installed as part of the duct bank.

3.02 EQUIPMENT GROUNDING CONDUCTORS:

- A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
- B. Install equipment grounding conductors in all feeders and circuits.

- C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC:
  - 1. Feeders and branch circuits.
  - 2. Lighting circuits.
  - 3. Receptacle circuits.
  - 4. Single-phase motor and appliance branch circuits.
  - 5. Three-phase motor and appliance branch circuits.
  - 6. Flexible raceway runs.
- D. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

### 3.03 INSTALLATION:

- A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
  - 1. Drive ground rods until tops are 2-inches below finished floor or final grade, unless otherwise indicated.
  - 2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.
- B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

### 3.04 CONNECTIONS:

- A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
  - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
  - 2. Make connections with clean, bare metal at points of contact.
  - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.

4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
  5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
- E. Tighten screws and bolts for grounding and bonding 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.
- F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
- G. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

### 3.05 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING:

- A. Duct Banks: Install a grounding conductor with at least 50 percent ampacity of the largest phase conductor in the duct bank.

### 3.06 FIELD QUALITY CONTROL:

- A. Testing: Perform the following field quality-control testing:
1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
  - a. Equipment Rated 500 kVA and Less: 10 ohms.
4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

## SECTION 16075

### ELECTRICAL IDENTIFICATION

#### 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.

##### 1.02 SUMMARY:

- A. This Section includes electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.

##### 1.03 SUBMITTALS:

- A. Product Data: For each electrical identification product indicated.
- B. Schedule of Nomenclature: An index of electrical equipment and system components used in identification signs and labels.
- C. Samples: For each type of label and sign to illustrate color, lettering style, and graphic features of identification product.

##### 1.04 QUALITY ASSURANCE:

- A. Comply with ANSI C2.
- B. Comply with NFPA 70.
- C. Comply with ANSI A13.1 and NFPA 70 for color-coding.

#### PART 2 - PRODUCTS

##### 2.01 RACEWAY AND CABLE LABELS:

- A. Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

1. Color: Black letters on orange field.
  2. Legend: Indicates voltage and service.
- B. Adhesive Labels: Preprinted, flexible, self-adhesive vinyl with legend overlaminated with a clear, weather- and chemical-resistant coating.
- C. Pre-tensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the line it identifies and arranged to stay in place by pre-tensioned gripping action when placed in position.
- D. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1- to 2-inches wide.
- E. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.
1. Not less than 6-inches wide by 4 mils thick.
  2. Compounded for permanent direct-burial service.
  3. Embedded continuous metallic strip or core.
  4. Printed legend indicating type of underground line.
- F. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- G. Aluminum, Wraparound Marker Bands: Bands cut from 0.014-inch thick aluminum sheet, with stamped or embossed legend, and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.
- H. Plasticized Card-Stock Tags: Vinyl cloth with preprinted and field-printed legends. Orange background unless otherwise indicated, with eyelet for fastener.
- I. Aluminum-Faced, Card-Stock Tags: Weather-resistant, 18-point minimum card stock faced on both sides with embossable aluminum sheet, 0.002-inch thick, laminated with moisture-resistant acrylic adhesive, punched for fasteners, and preprinted with legends to suit each application.
- J. Brass or Aluminum Tags: 2- by 2- by 0.05-inch metal tags with stamped legend, punched for fastener.
- 2.02 NAMEPLATES AND SIGNS:
- A. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.
- B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16-inch thick for signs up to 20 sq. in. and 1/8-inch thick for larger sizes.
1. Engraved legend with black letters on white face.

2. Punched or drilled for mechanical fasteners.
- C. Baked-Enamel Signs for Interior Use: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.
  - D. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.
  - E. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

### 2.03 MISCELLANEOUS IDENTIFICATION PRODUCTS:

- A. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties.
  1. Minimum Width: 3/16- inch.
  2. Tensile Strength: 50 lb. minimum.
  3. Temperature Range: Minus 40 to plus 185 deg F.
  4. Color: According to color-coding.
- B. Paint: Formulated for the type of surface and intended use.
  1. Primer for Galvanized Metal: Single-component acrylic vehicle formulated for galvanized surfaces.
  2. Primer for Concrete Masonry Units: Heavy-duty-resin block filler.
  3. Primer for Concrete: Clear, alkali-resistant, binder-type sealer.
  4. Enamel: Silicone-alkyd or alkyd urethane as recommended by primer manufacturer.

## PART 3 - EXECUTION

### 3.01 INSTALLATION:

- A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.



- C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before applying.
- E. Install painted identification according to manufacturer's written instructions and as follows:
1. Clean surfaces of dust, loose material, and oily films before painting.
  2. Prime surfaces using type of primer specified for surface.
  3. Apply one intermediate and one finish coat of enamel.
- F. Color Banding Raceways and Exposed Cables: Band exposed and accessible raceways of the systems listed below:
1. Bands: Pre-tensioned, wraparound plastic sleeves, colored adhesive tape; or a combination of both. Make each color band 2-inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
  2. Band Locations: At changes in direction and penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
  3. Apply the following colors to the systems listed below:
    - a. Security System: Blue and yellow.
    - b. Mechanical and Electrical Supervisory System: Green and blue.
    - c. Telecommunication System: Green and yellow.
- G. Caution Labels for Indoor Boxes and Enclosures for Power: Install pressure-sensitive, self-adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover.
- H. Circuit Identification Labels on Boxes: Install labels externally.
1. Exposed Boxes: Pressure-sensitive, self-adhesive plastic label on cover.
  2. Labeling Legend: Permanent, waterproof listing of panel and circuit number or equivalent.
- I. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 6- to 8-inches below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16-inches overall, use a single line marker. Install line marker for underground wiring, both direct-buried cables and cables in raceway.
- J. Power-Circuit Identification: Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in vaults, pull and junction boxes, manholes, and switchboard rooms.

1. Legend: 1/4-inch steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
2. Tag Fasteners: Nylon cable ties.
3. Band Fasteners: Integral ears.

K. Apply identification to conductors as follows:

1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.
2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.
3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

L. Apply warning, caution, and instruction signs as follows:

1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
2. Emergency Operation: Install engraved laminated signs with white legend on red background with minimum 3/8 inch high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

M. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch high lettering on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:

1. Panelboards, electrical cabinets, and enclosures.
2. Standby system boxes and enclosures.
3. Disconnect switches.
4. Enclosed circuit breakers.
5. Power transfer equipment.
6. Contactors.
7. Remote-controlled switches.
8. Control devices.
9. Transformers.
10. Power-generating units.

END OF SECTION

SECTION 16123

CONDUCTORS AND CABLES

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.

1.02 SUMMARY:

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.03 SUBMITTALS:

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.

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 NFPA 70.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

## 2.02 CONDUCTORS AND CABLES:

### A. Available Manufacturers:

1. Alcan Aluminum Corporation; Alcan Cable Div.
2. American Insulated Wire Corp.; a Leviton Company.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.
6. Or equal.

B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

C. Conductor Material: Copper complying with NEMA WC 5; solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.

D. Conductor Insulation Types: Type THHN-THWN complying with NEMA WC 5.

## 2.03 CONNECTORS AND SPLICES:

### A. Available Manufacturers:

1. AFC Cable Systems, Inc.
2. AMP Incorporated/Tyco International.
3. Hubbell/Anderson.
4. O-Z/Gedney; EGS Electrical Group LLC.
5. 3M Company, Electrical Products Division.
6. Or equal.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

## PART 3 - EXECUTION

### 3.01 CONDUCTOR AND INSULATION APPLICATIONS:

- A. Service Entrance: Type XHHW, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Exposed Branch Circuits: Type THHN-THWN, single conductors in raceway.

10/28/19

- D. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- E. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.02 INSTALLATION:

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.
- E. Support cables according to Division 16 Section "Basic Electrical Materials and Methods."
- F. Identify and color-code conductors and cables according to Division 16 Section "Electrical Identification."

3.03 CONNECTIONS:

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
  - 1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 12-inches of slack.

3.04 FIELD QUALITY CONTROL:

- A. Testing: Perform the following field quality-control testing:
  - 1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
  - 2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

B. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**

SECTION 16130

RACEWAYS AND BOXES

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.

1.02 SUMMARY:

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
  - 1. Division 16 Section "Basic Electrical Materials and Methods" for supports, anchors, and identification products.

1.03 DEFINITIONS:

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. FMC: Flexible metal conduit.
- D. IMC: Intermediate metal conduit.
- E. LFMC: Liquidtight flexible metal conduit.
- F. LFNC: Liquidtight flexible nonmetallic conduit.
- G. RNC: Rigid nonmetallic conduit.

1.04 SUBMITTALS:

- A. Product Data: For surface raceways, wireways and fittings, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: Show fabrication and installation details of components for raceways, fittings, boxes, enclosures, and cabinets.

10/28/19

- C. Shop Drawings: Signed and sealed by a qualified professional engineer.
  - 1. Design Calculations: Calculate requirements for selecting seismic restraints.
  - 2. Detail assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- D. Coordination Drawings: cabinet layout plans drawn to scale and coordinating penetrations. Show the following:
  - 1. Method of attaching hangers to structure.

1.05 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 NFPA 70.

1.06 COORDINATION:

- A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.02 METAL CONDUIT AND TUBING:

- A. Available Manufacturers:



1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Anamet Electrical, Inc.; Anaconda Metal Hose.
4. Electri-Flex Co.
5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
6. O-Z Gedney; Unit of General Signal.
7. Wheatland Tube Co.
8. Or equal.

B. Rigid Steel Conduit: ANSI C80.1.

C. Aluminum Rigid Conduit: ANSI C80.5.

D. IMC: ANSI C80.6.

E. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.

F. Plastic-Coated IMC and Fittings: NEMA RN 1.

G. EMT and Fittings: ANSI C80.3.

1. Fittings: Set-screw or compression type.

H. FMC: Aluminum.

I. LFMC: Flexible steel conduit with PVC jacket.

J. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

#### 2.03 NONMETALLIC CONDUIT AND TUBING:

A. Available Manufacturers:

1. American International.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corp.
4. Cantex Inc.
5. Electri-Flex Co.
6. RACO; Division of Hubbell, Inc.
7. Spiralduect, Inc./AFC Cable Systems, Inc.
8. Thomas & Betts Corporation.
9. Or equal.

B. ENT: NEMA TC 13.

C. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.

D. ENT and RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

E. LFNC: UL 1660.

## 2.04 BOXES, ENCLOSURES, AND CABINETS:

### A. Available Manufacturers:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. Emerson/General Signal; Appleton Electric Company.
3. Erickson Electrical Equipment Co.
4. Hoffman.
5. Hubbell, Inc.; Killark Electric Manufacturing Co.
6. O-Z/Gedney; Unit of General Signal.
7. RACO; Division of Hubbell, Inc.
8. Thomas & Betts Corporation.
9. Or equal.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

D. Cast-Metal Pull and Junction Boxes: NEMA FB 1 cast aluminum with gasketed cover.

E. Hinged-Cover Enclosures: NEMA 250, Type 1 with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic finished inside with radio-frequency-resistant paint.

2.05 Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment. **FACTORY FINISHES:**

A. Finish: For raceway, enclosures, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.

B. Finish: For raceway, enclosures, or cabinet components, provide manufacturer's standard paint applied to factory-assembled surface raceways, enclosures, and cabinets before shipping.

## PART 3 - EXECUTION

### 3.01 RACEWAY APPLICATION:

10/28/19

A. Outdoors:

1. Exposed: Rigid steel.
2. Concealed: Rigid steel.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 4X.

B. Indoors:

1. Exposed: Rigid steel.
2. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
3. Damp or Wet Locations: Rigid steel conduit.
4. Boxes and Enclosures: NEMA 250, Type 4X.

C. Minimum Raceway Size: 1/2-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits embedded in or in contact with concrete.

3.02 INSTALLATION:

- A. Keep raceways at least 6-inches away from heat generating equipment.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."
- D. Install temporary closures to prevent foreign matter from entering raceways.

- E. Protect stub-ups from damage where conduits rise through concrete slabs. Arrange so curved portions of bends are not visible above the finished slab.
- F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- G. Join raceways with fittings designed and approved for that purpose and make joints tight.
1. Use insulating bushings to protect conductors.
- H. Tighten set screws of threadless fittings with suitable tools.
- I. Terminations:
1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
  2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 1- inches of slack at each end of pull wire.
- K. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
- L. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  2. Where otherwise required by NFPA 70.
- M. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6-inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

- N. Flexible Connections: Use maximum of 72-inches of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
- O. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- P. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.03 PROTECTION:

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
  - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.04 CLEANING:

- A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 16131

CABINETS AND ENCLOSURES

PART 1 GENERAL

1.01 SUMMARY:

- A. Section includes hinged cover enclosures, cabinets, terminal blocks, and accessories.
- B. Related Sections:
  - 1. Section 16060 - Grounding and Bonding.
  - 2. Section 16130 - Raceway and Boxes.

1.02 REFERENCES:

- A. National Electrical Manufacturers Association:
  - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
  - 2. NEMA ICS 4 - Industrial Control and Systems: Terminal Blocks.

1.03 SUBMITTALS:

- A. Section 01330 – Submittals: Submittal procedures.
- B. Product Data: Submit manufacturer's standard data for enclosures, cabinets, and terminal blocks.
- C. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.04 QUALIFICATIONS:

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

1.05 EXTRA MATERIALS:

- A. Furnish two of each key.

10/28/19

16131-1

## PART 2 PRODUCTS

### 2.01 HINGED COVER ENCLOSURES:

- A. Manufacturers:
  - 1. Hoffman
  - 2. Carlon Electrical Products.
  - 3. Hubbell Wiring Devices.
  - 4. Or Equal.
- B. Construction: NEMA 250, Type 4X stainless steel enclosure.
- C. Covers: Continuous hinge, held closed by flush latch operable by screwdriver.
- D. Furnish interior plywood panel for mounting terminal blocks and electrical components; finish with white enamel.
- E. Enclosure Finish: Manufacturer's standard enamel.

### 2.02 CABINETS:

- A. Manufacturers:
  - 1. Hoffman
  - 2. Carlon Electrical Products.
  - 3. Hubbell Wiring Devices.
  - 4. Or Equal.
- B. Boxes: Galvanized steel with removable end walls.
- C. Box Size: As shown on plans.
- D. Backboard: Furnish 3/4-inch inch thick plywood backboard for mounting terminal blocks. Paint matte white.
- E. Fronts: Steel, flush type with screw cover front, door with concealed hinge, and flush lock keyed to match branch circuit panelboard. Finish with gray baked enamel.
- F. Furnish metal barriers to form separate compartments wiring of different systems and voltages.

- G. Furnish accessory feet for free-standing equipment.

PART 2 - EXECUTION

3.01 INSTALLATION:

- A. Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner.
- B. Install cabinet fronts plumb.

3.02 CLEANING:

- A. Final cleaning.
- B. Clean electrical parts to remove conductive and harmful materials.
- C. Remove dirt and debris from enclosure.
- D. Clean finishes and touch up damage.

END OF SECTION

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY



SECTION 16231

PACKAGED ENGINE GENERATORS

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.

1.02 SUMMARY:

- A. This Section includes packaged diesel-engine generator sets with the following features and accessories:
  - 1. Battery charger.
  - 2. Engine-generator set.
  - 3. Muffler.
  - 4. Exhaust piping external to set.
  - 5. Starting battery.
- B. Related Sections include the following:
  - 1. Division 16 Section "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.

1.03 DEFINITIONS:

- A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.
- B. Steady-State Voltage Modulation: The uniform cyclical variation of voltage within the operational bandwidth, expressed in Hertz or cycles per second.

1.04 SUBMITTALS:

- A. Product Data: Include the following:
  - 1. Data on features, components, accessories ratings, and performance.
  - 2. Thermal damage curve for generator.

10/28/19

3. Time-current characteristic curves for generator protective device.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
  2. Design Calculations: Signed and sealed by a qualified professional engineer. Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
  3. Vibration Isolation Base Details: Signed and sealed by a qualified professional engineer. Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include base weights.
  4. Wiring Diagrams: Power, signal, and control wiring.
- C. Welding certificates.
- D. Manufacturer Seismic Qualification Certification: Submit certification that engine-generator set, batteries, battery racks, accessories, and components will withstand seismic forces defined in Division 16 Section "Seismic Controls for Electrical Work." Include the following:
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- E. Qualification Data: For manufacturer.
- F. Certified summary of prototype-unit test report.
- G. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
- H. Certified Summary of Performance Tests: Demonstrate compliance with specified requirement to meet performance criteria for sensitive loads.
- I. Test Reports:

1. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
2. Report of sound generation.
3. Report of exhaust emissions showing compliance with applicable regulations.
4. Field quality-control test reports.

J. Certification of Torsional Vibration Compatibility: Comply with NFPA 110.

K. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Manuals," include the following:

1. List of tools and replacement items recommended to be stored at the Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.

L. Warranty: Special warranty specified in this Section.

#### 1.05 QUALITY ASSURANCE:

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Maintenance Proximity: Not more than four hours' normal travel time from Installer's place of business to Project site.
2. Engineering Responsibility: Preparation of data for vibration isolators and seismic restraints of engine skid mounts, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies like those indicated for this Project.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 200 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of packaged generator sets and are based on the specific system indicated.

E. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX for welding exhaust and cooling system piping.

F. 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.

- G. Comply with NFPA 37.
- H. Comply with NFPA 70.
- I. Comply with NFPA 99.
- J. Comply with NFPA 110 requirements for Level 2 emergency power supply system.
- K. Engine Exhaust Emissions: Comply with applicable state and local government requirements.
- L. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

1.06 COORDINATION:

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

1.07 WARRANTY:

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Five years from date of Substantial Completion.

1.08 MAINTENANCE SERVICE:

- A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include quarterly exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Maintenance agreements shall include parts and supplies as used in manufacture and installation of original equipment.

1.09 EXTRA MATERIALS:

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: One for every 10 of each type and rating, but not less than one of each.
2. Indicator Lamps: Two for every six of each type used, but not less than two of each.
3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS:

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Caterpillar; Engine Div.
2. Generac Power Systems, Inc.
3. Kohler Co; Generator Division.
4. MagneTek, Inc.
5. Onan Corp./Cummins Power Generation; Industrial Business Group.
6. Spectrum Detroit Diesel.
7. Taylor Power Systems.
8. Or equal.

### 2.02 ENGINE-GENERATOR SET

- A. Packaged engine-generator set shall be a coordinated assembly of compatible components.
- B. Power Output Ratings: Nominal ratings as indicated, with capacity as required to operate as a unit as evidenced by records of prototype testing.
- C. Output Connections: Three phase, four wire.
- D. Safety Standard: Comply with ASME B15.1.
- E. Nameplates: Each major system component shall be equipped with a nameplate to identify manufacturer's name and address, and model and serial number of components.
- F. Fabricate engine-generator-set mounting frame and attachment of components to resist generator-set movement during a seismic event when generator-set mounting frame is anchored to building structure.
- G. Mounting Frame: Adequate strength and rigidity to maintain alignment of mounted components without depending on concrete foundation. Mounting frame shall be free from sharp edges and corners and shall have lifting attachments arranged for lifting with slings without damaging components.

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.

#### 2.03 GENERATOR-SET PERFORMANCE:

- A. Steady-State Voltage Operational Bandwidth: 4 percent of rated output voltage from no load to full load.
- B. Steady-State Voltage Modulation Frequency: Less than 1 Hz.
- C. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
- D. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
- E. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
- F. Transient Frequency Performance: Less than 5 percent variation for a 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
- G. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. The telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
- H. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, the system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
- I. Start Time: Comply with NFPA 110, Type 10, system requirements.

#### 2.04 SERVICE CONDITIONS:

- A. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
  1. Ambient Temperature: 5 to 40 deg C.
  2. Relative Humidity: 0 to 95 percent.
  3. Altitude: Sea level to 1000 feet (300 m).

2.05 ENGINE:

- A. Rated Engine Speed: 1800 rpm.
- B. Fuel: Diesel
- C. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm (11.4 m/s).
- D. Lubrication System: The following items are mounted on engine or skid:
  - 1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
  - 2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
  - 3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.
- E. Engine Fuel System:
  - 1. Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions.
  - 2. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.
- F. Coolant Jacket Heater: Electric immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 2 equipment for heater capacity.
- G. Governor: Mechanical.

2.06 ENGINE COOLING SYSTEM:

- A. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
- B. Description: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.
- C. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
- D. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

- E. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.
  - 1. Rating: 50-psig (345-kPa) maximum working pressure with coolant at 180 deg F (82 deg C), and noncollapsible under vacuum.
  - 2. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.
- F. Coolant piping external to engine-generator set. Use ASTM B 88, Type L (ASTM B 88M, Type B) copper tubing with brazed joints, sized as recommended by engine manufacturer. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation and joint construction.

#### 2.07 FUEL SUPPLY SYSTEM:

- A. Base-Mounted Fuel Oil Tank: Factory installed and piped, complying with UL 142 fuel oil tank. Features include the following:
  - 1. Tank level indicator.
  - 2. Capacity: Fuel for 72 hours' continuous operation at 100 percent rated power output.
  - 3. Vandal-resistant fill cap.
  - 4. Containment Provisions: Provide double wall containment at a minimum, All containment provisions shall comply with requirements of authorities having jurisdiction.

#### 2.08 ENGINE EXHAUST SYSTEM:

- B. Muffler: Critical type, sized as recommended by engine manufacturer; sound level measured at a distance of 10 feet (3 m) from exhaust discharge shall be 85 dBA or less.
- C. Condensate Drain for Muffler: Schedule 40, black steel pipe connected to muffler drain outlet through a petcock.
- D. Connection from Engine to Exhaust System: Flexible section of corrugated stainless-steel pipe.
- E. Connection from Exhaust Pipe to Muffler: Stainless-steel expansion joint with liner.
- F. Exhaust Piping External to Engine: ASTM A 53/A 53M, Schedule 40, welded, black steel, with welded joints and fittings.
- G. Engine block heater factory installed. Comply with NFPA 110 requirements for Level 2 equipment for heater capacity.

#### 2.09 COMBUSTION-AIR INTAKE:

10/28/19



- A. Description: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

## 2.10 STARTING SYSTEM:

- A. Description: 24-V electric, with negative ground and including the following items:

1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Environmental Conditions" Paragraph in "Service Conditions" Article.
2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
3. Cranking Cycle: As required by NFPA 110 for system level specified.
4. Battery: Adequate capacity within ambient temperature range specified in "Environmental Conditions" Paragraph in "Service Conditions" Article to provide specified cranking cycle at least twice without recharging.
5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 10 deg F regardless of external ambient temperature within range specified in "Environmental Conditions" Paragraph in "Service Conditions" Article. Include accessories required to support and fasten batteries in place.
7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35A minimum continuous rating.
8. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features:
  - a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
  - b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg C to plus 60 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
  - c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
  - d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
  - e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery

charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.

## 2.11 CONTROL AND MONITORING:

- A. Functional Description: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of the generator set. When mode-selector switch is switched to the on position, the generator set starts. The off position of the same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down the generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down the generator set.
- B. Functional Description: Switching on-off switch on the generator control panel to the on position starts the generator set. The off position of the same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down the generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down the generator set.
- C. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration.
- D. Indicating and protective devices and controls shall include those required by NFPA 110 for a Level 2 system and the following:
- E. Indicating and Protective Devices and Controls:
1. AC voltmeter.
  2. AC ammeter.
  3. AC frequency meter.
  4. DC voltmeter (alternator battery charging).
  5. Engine-coolant temperature gage.
  6. Engine lubricating-oil pressure gage.
  7. Running-time meter.
  8. Ammeter-voltmeter, phase-selector switch(es).
  9. Generator-voltage adjusting rheostat.
  10. Start-stop switch.
  11. Overspeed shutdown device.
  12. Coolant high-temperature shutdown device.
  13. Coolant low-level shutdown device.
  14. Oil low-pressure shutdown device.
  15. Fuel tank derangement alarm.
  16. Fuel tank high-level shutdown of fuel supply alarm.
  17. Generator overload.

- F. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.
- G. Connection to Data Link: A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication is reserved for connections for data-link transmission of indications to remote data terminals. Data system connections to terminals are covered in Division 16 Section "Electrical Power Monitoring and Control."
- H. Common Remote Audible Alarm: Comply with NFPA 110 requirements for Level 2 systems. Include necessary contacts and terminals in control and monitoring panel.
- I. Common Remote Audible Alarm: Signal the occurrence of any events listed below without differentiating between event types. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset.
1. Engine high-temperature shutdown.
  2. Lube-oil low-pressure shutdown.
  3. Overspeed shutdown.
  4. Remote emergency-stop shutdown.
  5. Engine high-temperature prealarm.
  6. Lube-oil low-pressure prealarm.
  7. Fuel tank, low-fuel level.
  8. Low coolant level.
  9. Overcrank shutdown.
  10. Coolant low-temperature alarm.
  11. Control switch not in auto position.
  12. Battery-charge malfunction alarm.
  13. Battery low-voltage alarm.
- J. Remote Alarm Annunciator: Comply with NFPA 99. Labeled LED shall identify each alarm event. Common audible signal shall sound for alarm conditions. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.
- K. Auxiliary contacts NO/NC for tie in to building exhaust fan and louver control.

## 2.12 GENERATOR OVERCURRENT AND FAULT PROTECTION:

- A. Generator Circuit Breaker: Molded-case, thermal-magnetic type; 100 percent rated; complying with NEMA AB 1 and UL 489.
1. Tripping Characteristic: Designed specifically for generator protection.
  2. Trip Rating: Matched to generator rating.

3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
  4. Mounting: Adjacent to or integrated with control and monitoring panel.
- B. Generator Circuit Breaker: Molded-case, electronic-trip type; 100 percent rated; complying with UL 489.
1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
  2. Trip Settings: Matched to generator thermal damage curve as closely as possible.
  3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
  4. Mounting: Adjacent to or integrated with control and monitoring panel.
- C. Generator Protector: Microprocessor-based unit that continuously monitors current level in each phase of generator output, integrates generator heating effect over time, and predicts when thermal damage of the alternator will occur. When signaled by the protector or other generator-set protective devices, a shunt trip device in the generator disconnect switch shall open the switch to disconnect the generator from the load circuits. Protector shall perform the following functions:
1. Initiates a generator overload alarm when the generator has operated at an overload equivalent to 110 percent of full rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms.
  2. Under single or three-phase fault conditions, regulates the generator to 300 percent of rated full-load current for up to 10 seconds.
  3. As the overcurrent heating effect on the generator approaches the thermal damage point of the unit, the protector switches the excitation system off, opens the generator disconnect device, and shuts down the generator set.
  4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.
- D. Ground-Fault Indication: Comply with NFPA 70, Article 700-7(d). Integrate ground-fault alarm indication with other generator-set alarm indications.

#### 2.13 GENERATOR, EXCITER, AND VOLTAGE REGULATOR:

- A. Comply with NEMA MG 1 and specified performance requirements.
- B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.
- C. Electrical Insulation: Class H or Class F.
- D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.

- E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.
- F. Excitation shall use no slip or collector rings, or brushes, and shall be arranged to sustain generator output under short-circuit conditions as specified.
- G. Enclosure: Dripproof.
- H. Instrument Transformers: Mounted within generator enclosure.
- I. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified.
  - 1. Adjusting rheostat on control and monitoring panel shall provide plus or minus 5 percent adjustment of output-voltage operating band.
- J. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.
- K. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.
- L. Subtransient Reactance: 12 percent, maximum.

2.14 FINISHES:

- A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard enamel over corrosion-resistant pretreatment and compatible standard primer.

2.15 SOURCE QUALITY CONTROL:

- A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.
  - 1. Tests: Comply with NFPA 110, Level 1 energy converters in Paragraphs 3.2.1, 3.2.1.1, and 3.2.1.2.
  - 2. Generator Tests: Comply with IEEE 115.
  - 3. Components and Accessories: Items furnished with installed unit that are not identical to those on tested prototype shall have been factory tested to demonstrate compatibility and reliability.

## PART 3 - EXECUTION

### 3.01 EXAMINATION:

- A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.
- B. Examine roughing-in of piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 CONCRETE BASES:

- A. Coordinate size and location of concrete bases. Verify structural requirements with structural engineer.
- B. Concrete base is specified in specified in Division 3.

### 3.03 INSTALLATION:

- A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with MPPA-110.
- B. Install packaged engine generators level on concrete base.
  - 1. Vibration Isolation: Mount packaged engine generators on restrained spring isolators.
- C. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.
- D. Install exhaust-system piping. Extend to point of termination outside structure. Size piping according to manufacturer's written instructions.
  - 1. Install condensate drain piping for engine exhaust system. Extend drain piping from low points of exhaust system and from muffler to condensate traps and to point of disposition.
  - 2. Support exhaust piping and muffler with pipe hangers spaced a maximum of 20-foot horizontally and at each floor vertically.
- E. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

### 3.04 CONNECTIONS:

- A. Piping installation requirements are specified in Division 15 Sections. Drawings indicate general arrangement of piping and specialties. The following are specific connection requirements:
  - 1. Install fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.
  - 2. Connect cooling-system water supply and drain piping to diesel-engine heat exchangers. Install flexible connectors at connections to engine generator and remote radiator.
  - 3. Connect fuel piping to engines with a gate valve and union.
    - a. Diesel storage tanks, tank accessories, piping, valves, and specialties for fuel systems.
  - 4. Connect exhaust-system piping to engines.
- B. Ground equipment according to Division 16 Section "Grounding and Bonding."
- C. Connect wiring according to Division 16 Section "Conductors and Cables."
- D. 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. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
  - 1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Sections 7.15.2.1 and 7.22.1 (except for vibration baseline test). Certify compliance with test parameters.
  - 2. Perform tests recommended by manufacturer.
  - 3. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, the following:
    - a. Single-step full-load pickup test.
  - 4. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.

- a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
  - b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
  - c. Verify acceptance of charge for each element of the battery after discharge.
  - d. Verify that measurements are within manufacturer's specifications.
5. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
  6. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.
  7. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg. Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.
  8. Exhaust Emissions Test: Comply with applicable government test criteria.
  9. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases and verify that performance is as specified.
  10. Harmonic-Content Tests: Measure harmonic content of output voltage under 25 percent and at 100 percent of rated linear load. Verify that harmonic content is within specified limits.
  11. Noise Level Tests: Measure A-weighted level of noise emanating from generator-set installation, including engine exhaust and cooling-air intake and discharge, at four locations on the property line, and compare measured levels with required values.
- C. Coordinate tests with tests for transfer switches and run them concurrently.
  - D. Test instruments shall have been calibrated within the last 12 months, traceable to standards of the National Institute for Standards and Technology, and adequate for making positive observation of test results. Make calibration records available for examination on request.
  - E. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
  - H. Remove and replace malfunctioning units and reinspect as specified above.



- I. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
- J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.06 STARTUP SERVICE:

- A. Engage a factory-authorized service representative to perform startup service.
- B. Inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.
- C. Complete installation and startup checks according to manufacturer's written instructions.

3.07 DEMONSTRATION:

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators. Refer to Division 1 Section "Project Closeout".
  - 1. Coordinate this training with that for transfer switches.

END OF SECTION

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 16414  
AUTOMATIC TRANSFER SWITCHES

PART 1 – GENERAL

1.01 GENERAL PROVISIONS:

- A. Requirements of general conditions of this Specification apply to work of this Section. Attention is directed to other Divisions of this Specification which affect the work of this Section. All applicable paragraphs of sections that apply, whether specifically referred to or not, shall be considered as part of this Section.

1.02 SCOPE:

- A. Furnish and install the automatic transfer switches to automatically transfer between the normal and emergency power source.

1.03 APPLICABLE STANDARDS:

- A. The automatic transfer switches covered by these specifications shall be designed, tested, and assembled in strict accordance with all applicable standards of ANSI, UL, IEEE and NEMA.

1.04 SUBMITTALS:

- A. Manufacturer shall submit shop drawings for review, which shall include the following, as a minimum:
  1. Descriptive literature
  2. Plan, elevation, side, and front view arrangement drawings, including overall dimension, weights and clearances, as well as mounting or anchoring requirements and conduit entrance locations.
  3. Schematic diagrams.
  4. Wiring diagrams.
  5. Accessory list.

PART 2- PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

- A. Transfer switch shall be as provided by the generator manufacturer.

2.02 CONSTRUCTION:

A. General

1. The automatic transfer switch shall be furnished as shown on the drawings. Voltage and continuous current ratings and number of poles shall be as shown.
2. On 3 phase, 4 wire Systems, utilizing ground fault protection, a true 4 pole switch shall be supplied with all four poles mounted on a common shaft. The continuous current rating and the closing and withstand rating of the fourth pole shall be identical to the rating of the main poles.
3. The transfer switch shall be mounted in a NEMA 1 enclosure, unless otherwise indicated. Enclosures shall be fabricated from 12 gauge steel. The enclosure shall be sized to exceed minimum wire bending space required by UL 1008.
4. The transfer switch shall be equipped with an internal welded steel pocket, housing an operations and maintenance manual.
5. The transfer switch shall be top and bottom accessible.
6. The main contacts shall be capable of being replaced without removing the main power cables.
7. The main contacts shall be visible for inspection without any major disassembly of the transfer switch.
8. All bolted bus connections shall have Belleville compression type washers.
9. When a solid neutral is required, a fully rated bus bar with required AL-CU neutral lugs shall be provided.
10. Control components and wiring shall be front accessible. All control wires shall be multi-conductor 18 gauge 600 volt SIS switchboard type point to point harness. All control wire terminations shall be identified with tubular sleeve-type markers.
11. The switch shall be equipped with 90 degrees C rated copper/aluminum solderless mechanical type lugs.
12. The complete transfer switch assembly shall be factory tested to ensure proper operation and compliance with the specification requirements. A copy of the factory test report shall be available upon request.

B. Automatic Transfer Switch

1. The transfer switch shall be double throw, actuated by two electric operators momentarily energized, and connected to the transfer mechanism by a simple over center type linkage. Minimum transfer time shall be 400 milliseconds.
2. The normal and emergency contacts shall be positively interlocked mechanically and electrically to prevent simultaneous closing. Main contacts shall be mechanically locked in both the normal and emergency positions without the use of hooks, latches, magnets, or springs, and shall be silver-tungston alloy. Separate arcing contacts with magnetic blowouts shall be provided on all transfer switches. Interlocked, molded case circuit breakers or contactors are not acceptable.

3. The transfer switch shall be equipped with a safe external manual operator, designed to prevent injury to operating personnel. The manual operator shall provide the same contact to contact transfer speed as the electrical operator to prevent a flashover from switching the main contacts slowly. The external manual operator shall be safely operated from outside of the transfer switch enclosure while the enclosure door is closed.

C. Automatic Transfer Switch Controls

1. The transfer switch shall be equipped with a microprocessor based control system, to provide all the operational functions of the automatic transfer switch. The controller shall have two asynchronous serial ports. The controller shall have a real time clock with Nicad battery back-up.
2. The CPU shall be equipped with self diagnostics which perform periodic checks of the memory I/O and communication circuits, with a watchdog/power fail circuit
3. The controller shall use industry standard open architecture communication protocol for high speed serial communications via multidrop connection to other controllers and to a master terminal with up to 4000 ft of cable, or further, with the addition of a communication repeater. The serial communication port shall be RS422/485 compatible.
4. The serial communication port shall allow interface to either the manufacturer's or the owner's furnished remote supervisory control.
5. The controller shall have password protection required to limit access to qualified and authorized personnel.
6. The controller shall include a 20 character, LCD display, with a keypad, which allows access to the system.
7. The controller shall include three phase over/under voltage, over/under frequency, phase sequence detection and phase differential monitoring on both normal and emergency sources.
8. The controller shall be capable of storing the following records in memory for access either locally or remotely:
  - a. Number of hours transfer switch is in the emergency position (total since record reset).
  - b. Number of hours emergency power is available (total since record reset).
  - c. Total transfer in either direction (total since record reset).
  - d. Date, time, and description of the last four source failures.
  - e. Date of the last exercise period.
  - f. Date of record reset.

D. Sequence of Operation

1. When the voltage on any phase of the normal source drops below 80% or increases to 120%, or frequency drops below 90%, or increase to 110%, or 20% voltage differential between phases occurs, after a programmable time delay period of 0-9999 seconds factory set at 3 seconds to allow for

momentary dips, the engine starting contacts shall close to start the generating plant.

2. The transfer switch shall transfer to emergency when the generating plant has reached specified voltage and frequency on all phases.
3. After restoration of normal power on all phases to a preset value of at least 90% to 110% of rated voltage, and at least 95% to 105% of rated frequency, and voltage differential is below 20%, an adjustable time delay period of 0-9999 seconds (factory set at 300 seconds) shall delay retransfer to allow stabilization of normal power. If the emergency power source should fail during this time delay period, the switch shall automatically return to the normal source.
4. After retransfer to normal, the engine generator shall be allowed to operate at no load for a programmable period of 0-9999 seconds, factory set at 300 seconds.

E. Automatic Transfer Switch Accessories

1. Programmable three phase sensing of the normal source set to pickup at 90% and dropout at 80% of rated voltage and overvoltage to pickup at 120% and dropout out at 110% of rated voltage. Programmable frequency pickup at 95% and dropout at 90% and over frequency to pickup at 110% and dropout at 105% of rated frequency. Programmable voltage differential between phases set at 20%, and phase sequence monitoring.
2. Programmable three phase sensing of the emergency source set to pickup at 90% and dropout at 80% of rated voltage and overvoltage to pickup at 120% and dropout out at 110% of rated voltage programmable frequency pickup at 95% and dropout at 90% and over frequency to pickup at 110% and dropout at 105% of rated frequency. Programmable voltage differential between phases set at 20%, and phase sequence monitoring.
3. Time delay for override of momentary normal source power outages (delays engine start signal and transfer switch operation). Programmable 0-9999 seconds. Factory set at 3 seconds, if not otherwise specified.
4. Time delay to control contact transition time on transfer to either source. Programmable 0-9999 seconds, factory set at 3 seconds.
5. Time delay on retransfer to normal, programmable 0-9999 seconds, factory set at 300 seconds if not otherwise specified, with overrun to provide programmable 0-9999 second time delay, factory set at 300 seconds, unloaded engine operation after retransfer to normal.
6. Time delay on transfer to emergency, programmable 0-9999 seconds, factory set at 3 seconds.
7. A maintained type load test switch shall be included to simulate a normal power failure, keypad initiated.
8. A remote type load test switch shall be included to simulate a normal power failure, remote switch initiated.
9. A time delay bypass on retransfer to normal shall be included. Keypad initiated.

10. Contact, rated 10 Amps 30 volts DC, to close on failure of normal source to initiate engine starting.
11. Contact, rated 10 Amps 30 volts DC, to open on failure of normal source for customer functions.
12. Light emitting diodes shall be mounted on the microprocessor panel to indicate: switch is in normal position, switch is in emergency position and controller is running.
13. A plant exerciser shall be provided with (10) 7 day events, programmable for any day of the week and (24) calendar events, programmable for any month/day, to automatically exercise generating plant programmable in one minute increments. Also include selection of either "no load" (switch will not transfer) or "load" (switch will transfer) exercise period. Keypad initiated.
14. Provision to select either "no commit" or "commit" to transfer operation in the event of a normal power failure shall be included. In the "no commit position," the load will transfer to the emergency position unless normal power returns before the emergency source has reach 90% of it's rated values (switch will remain in normal). In the "commit position" the load will transfer to the emergency position after any normal power failure. Keypad initiated.
15. Two auxiliary contacts rated 10 Amp 120 volts AC (for switches 100 to 800 amps) 15 amp, 120 volts AC (for switches 1000 to 4000 amps), shall be mounted on the main shaft, one closed on normal, the other closed on emergency. Both contacts will be wired to a terminal strip for ease of customer connections.
16. A three phase digital LCD voltage readout, with 1% accuracy shall display all three separate phase to phase voltages simultaneously, for both the normal and emergency source.
17. A digital LCD frequency readout with 1% accuracy shall display frequency for both normal and emergency source.
18. An LCD readout shall display normal source and emergency source availability.

- F. The following accessories shall be available by simple activation, via the key pad, if required.
1. Include (2) time delay contacts that open simultaneously just (milliseconds) prior to transfer in either direction. These contacts close after a time delay upon transfer. Programmable 0-9999 seconds after transfer.
  2. A block transfer function shall be included, energized from a 24VDC signal from the generator control switchgear, to allow transfer to emergency.
  3. A load shed function shall be included, energized from a 24VDC signal from the generator control switchgear, to disconnect the load from the emergency source when an overload condition occurs.

4. A peak shave function shall be included, energized from a 24VDC signal from the generator control switchgear. This function will start the emergency generator and transfer the ATS to the emergency source reducing the utility supply to the building. After the peak shave signal is removed, the transfer switch will retransfer to the normal supply, bypassing the retransfer time delay.

G. Approval

1. As a condition of approval, the manufacturer of the automatic transfer switches shall verify that their switches are listed by Underwriters Laboratories, Inc., Standard UL-1008 with 3 cycle short circuit closing and withstand as follows:

RMS Symmetrical Amperes 480 VAC

<u>Amperes</u>	<u>Closing and Withstand</u>	<u>Current Limiting Fuse Rating</u>
100-400	42,000	200,000
600-800	65,000	200,000

2. During the 3 cycle closing and withstand tests, there shall be no contact welding or damage. The 3 cycle tests shall be performed without the use of current limiting fuses. The test shall verify that contacts separation has not occurred, and there is contact continuity across all phases. Test procedures shall be in accordance with UL-1008, and testing shall be certified by Underwriters' Laboratories, Inc.
3. When conducting temperature rise tests to UL-1008, the manufacturer shall include post-endurance temperature rise tests to verify the ability of the transfer switch to carry full rated current after completing the overload and endurance tests.
4. The microprocessor controller shall meet the following requirements:
  - Storage conditions - 25 degrees C to 85 degrees C
  - Operation conditions - 20 degrees C to 70 degrees C ambient
  - Humidity 0 to 99% relative humidity, noncondensing
  - Capable of withstanding infinite power interruptions
  - Surge withstand per ANSI/IEEE C-37.90A-1978
5. Manufacturer shall provide copies of test reports upon request.

H. Manufacturer

1. The transfer switch manufacturer shall employ a nationwide factory-direct, field service organization, available on a 24-hour a day, 365 days a year, call basis.
2. The manufacture shall include an 800 telephone number, for field service contact, affixed to each enclosure.

3. The manufacturer shall maintain records of each transfer switch, by serial number, for a minimum 20 years.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

- A. Automatic Transfer Switches shall be provided with adequate lifting means for ease of installation of wall or floor mounted enclosures.
- B. Provide access and working space as indicated or as required.

#### 3.02 ADJUSTMENTS:

- A. Tighten assembled bolted connections with appropriate tools to manufacturer's torque recommendations prior to first energization.

END OF SECTION

**NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY**



SECTION 16442

PANELBOARD

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.

1.02 SUMMARY:

- A. This Section includes load centers and panelboards, overcurrent protective devices, and associated auxiliary equipment rated 600 V and less for the following types:
  - 1. Lighting and appliance branch-circuit panelboards.
  - 2. Distribution panelboards.
- B. Related Sections include the following:
  - 1. Division 16 Sections

1.03 DEFINITIONS:

- A. GFCI: Ground-fault circuit interrupter.
- B. SPDT: Single pole, double throw.
- C. TVSS: Transient voltage surge suppressor.

1.04 SUBMITTALS:

- A. Product Data: For each type of panelboard, overcurrent protective device, TVSS device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
  - 1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
    - a. Enclosure types and details for types other than NEMA 250, Type 1.
    - b. Bus configuration, current, and voltage ratings.
    - c. Short-circuit current rating of panelboards and overcurrent protective devices.
    - d. UL listing for series rating of installed devices.

- e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - 2. Wiring Diagrams: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.
  - C. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in "Quality Assurance" Article.
  - D. 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.
  - E. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.
  - F. Maintenance Data: For panelboards and components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Project Closeout," include the following:
    - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
- 1.05 QUALITY ASSURANCE:
- A. Testing Agency Qualifications: Testing agency that is a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.
  - B. 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.
  - C. Comply with NEMA PB 1.
  - D. Comply with NFPA 70.
- 1.06 COORDINATION:
- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.07 EXTRA MATERIALS:

- A. Keys: Six spares of each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
    - a. Eaton Corp.; Cutler-Hammer Products.
    - b. General Electric Co.; Electrical Distribution & Control Div.
    - c. Siemens Energy & Automation, Inc.
    - d. Square D Co.
    - e. Or approved equal.

2.02 FABRICATION AND FEATURES:

- A. Enclosures: Flush and/or surface mounted cabinets as indicated on plans. NEMA PB 1, Type 1, to meet environmental conditions at installed location.
  - 1. Outdoor Locations: NEMA 250, Type 3R.
  - 2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4X.
  - 3. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.
- B. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush mounted fronts, overlap box.
- C. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
- D. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
- E. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard door.
- F. Bus: Hard-drawn copper, 98 percent conductivity.
- G. Main and Neutral Lugs: Compression or Mechanical type suitable for use with conductor material.
- H. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

- I. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.
- J. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.
- K. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
- L. Gutter Barrier: Arrange to isolate individual panel sections.

2.03 PANELBOARD SHORT-CIRCUIT RATING:

- A. UL label indicating series-connected rating with integral or remote upstream devices. Include size and type of upstream device allowable, branch devices allowable, and UL series-connected short-circuit rating.
- B. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.04 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS:

- A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- B. Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.05 DISTRIBUTION PANELBOARDS:

- A. Doors: Front mounted, except omit in fused-switch panelboards; secured with vault-type latch with tumbler lock, keyed alike.
- B. Main Overcurrent Protective Devices: Circuit breaker.
- C. Branch overcurrent protective devices shall be one of the following:
  1. For Circuit-Breaker Frame Sizes 125 A and smaller: plug in or Bolt-on circuit breakers.

2.06 OVERCURRENT PROTECTIVE DEVICES:

- A. Molded-Case Circuit-Breaker Features and Accessories. Standard frame sizes, trip ratings, and number of poles.
  1. Lugs: Mechanical or Compression style, suitable for number, size, trip ratings, and material of conductors.
  2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

#### 2.07 ACCESSORY COMPONENTS AND FEATURES:

- A. Accessory Set: Tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Portable Test Set: To test functions of solid-state trip devices without removal from panelboard.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

- A. Install panelboards and accessories according to NFPA 70-1.
- B. Comply with mounting and anchoring requirements specified in Division 16 Sections
- C. Mounting Heights: Top of trim 74 inches above finished floor, unless otherwise indicated.
- D. Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- E. Circuit Directory: Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- F. Install filler plates in unused spaces.
- G. Provision for Future Circuits at Flush Panelboards: Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future
- H. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

#### 3.02 IDENTIFICATION:

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Basic Electrical Materials and Methods."

- B. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

### 3.03 CONNECTIONS:

- A. Install equipment grounding connections for panelboards with ground continuity to main electrical ground bus.
- B. 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.

### 3.04 FIELD QUALITY CONTROL:

- A. Prepare for acceptance tests as follows:
  - 1. Test continuity of each circuit.
- B. Testing: After installing panelboards 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.
- C. Balancing Loads: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes as follows:
  - 1. Measure as directed during period of normal system loading.
  - 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data-processing, computing, transmitting, and receiving equipment.
  - 3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
  - 4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

### 3.05 ADJUSTING:

- A. Set field-adjustable switches and circuit-breaker trip ranges.

3.06 CLEANING:

- A. On completion of installation, inspect interior and exterior of panelboards. 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.

END OF SECTION

NOT FOR BIDDING PURPOSES  
REFERENCE COPY ONLY

SECTION 16510

INTERIOR LIGHTING

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.

1.02 SUMMARY:

- A. This Section includes the following:

- 1. Interior lighting fixtures with lamps and drivers.
- 2. Lighting fixtures mounted on exterior building surfaces.
- 3. Emergency lighting units.
- 4. Exit signs.

1.03 SUBMITTALS:

- A. Product Data: For each type of lighting fixture scheduled, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

- 1. Physical description of fixture, including dimensions and verification of indicated parameters.
- 2. Emergency lighting unit, battery and charger.
- 3. LED and high-intensity-discharge ballasts.
- 4. Lamps.

- B. Shop Drawings: Show details of nonstandard or custom fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.

- C. Wiring Diagrams: Power, signal, and control wiring.

- D. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Closeout Procedures," include the following:

- 1. Catalog data for each fixture. Include the diffuser, drivers, and lamps installed in that fixture.

- E. Warranties: Special warranties specified in this Section.



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 NFPA 70.
- C. FMG Compliance: Fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard.
- D. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.05 COORDINATION:

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.06 WARRANTY:

- A. Special Warranty for Emergency Lighting Unit Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 5 years from date of Substantial Completion. Full warranty shall apply for first year and prorated warranty for the remaining nine years.

EXTRA MATERIALS:

- B. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Lamps: 1 for every 10 or less of each type and rating installed. Furnish at least one of each type.
  - 2. Plastic Diffusers and Lenses: 1 for every 10 or less of each type and rating installed. Furnish at least one of each type.
  - 3. Battery and Charger Data: One total for each emergency lighting unit type.
  - 4. Ballasts: 1 for every 100 or less of each type and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

## 2.02 FIXTURES AND COMPONENTS, GENERAL:

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. LED Luminaires: Comply with UL 1598. Test according to IESNA LM-79 and LM-80 as applicable.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit re-lamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position.

F. Plastic Diffusers, Covers, and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

a. Lens Thickness: At least 0.125 inch minimum unless different thickness is scheduled.

b. UV stabilized.

2. Glass: Annealed crystal glass, unless otherwise indicated.

## 2.03 EXIT SIGNS:

A. General: Comply with UL 924; for sign colors and lettering size, comply with authorities having jurisdiction.

B. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

1. Battery: Sealed, maintenance-free, nickel-cadmium type with special warranty.

2. Charger: Fully automatic, solid-state type with sealed transfer relay.

3. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

2.04 EMERGENCY LIGHTING UNITS:

- A. General: Self-contained units complying with UL 924.
1. Battery: Sealed, maintenance-free, Nickel-cadmium type with minimum 10-year nominal life and warranty.
  2. Charger: Fully automatic, solid-state type with sealed transfer relay.
  3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
  4. Wire Guard: Where indicated, heavy-chrome-plated wire guard protects lamp heads or fixtures.
  5. Integral Time-Delay Relay: Holds unit on for fixed interval when power is restored after an outage; time delay permits high intensity-discharge lamps to restrike and develop adequate output.

2.06 LED LAMPS:

- A. Manufacturers: Subject to compliance with requirements, provide one of the following products:
1. Cree.
  2. Nichia.
  3. Lumileds.
- B. Provide tight binning to maintain Kelvin temperature between +/-100 K. Indoor lighting to be 3500 K unless noted otherwise.

2.07 LED LUMINAIRES

- A. Provide luminaires complete with drivers compatible with control type.
- B. Provide LM 79 and LM 80 reports with luminaire submittal.
- C. Provide full IES photometric files with fixture submittal and run photometric calculations if fixture is other than base spec.

2.08 DRIVERS FOR LED LAMPS:

- A. Description: Electronic driver designed for applicable fixture(s) and load indicated by LED lamps. Driver shall be designed for full light output unless dimmer or bi-level control is indicated.
1. Input Voltage Range: 120-277, +/-10%.

2. Output Current: 0.35A dc.
3. Input Frequency: 50/60 Hz.
4. Power Factor: >90% at full load.
5. THD: <20% at full load.
6. Case temperature rated for -40 deg C through +80 deg C.
7. Overheat protection, self-limited short-circuit protection and overload protected.
8. Primary fused.

#### 2.09 FIXTURE SUPPORT COMPONENTS:

- A. Comply with Division 16 Section "Basic Electrical Materials and Methods" for channel- and angle-iron supports, and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated, 12 gage.
- E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.
- F. Rod Hangers: 3/16-inch- minimum diameter, cadmium-plated, threaded steel rod.
- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.
- H. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

#### 2.10 FINISHES:

- A. Coordinate this Article with the Interior Lighting Fixture Schedule or details.
- B. Fixtures: Manufacturers' standard, unless otherwise indicated.
  1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
  2. Metallic Finish: Corrosion resistant.

#### 2.11 SOURCE QUALITY CONTROL:

- A. Factory test fixtures with ballasts and lamps; certify results for electrical ratings and photometric data.

## PART 3 - EXECUTION

### 3.01 INSTALLATION;

- A. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Suspended Fixture Support: As follows:
  - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
  - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
  - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
  - 4. Continuous Rows: Suspend from cable.
- C. Adjust amiable fixtures to provide required light intensities.

### 3.02 CONNECTIONS:

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### 3.03 FIELD QUALITY CONTROL:

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Verify normal operation of each fixture after installation.
- C. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify normal transfer to battery power source and retransfer to normal.
- D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.
- E. Corroded Fixtures: During warranty period, replace fixtures that show any signs of corrosion.

END OF SECTION