ADDENDUM NO. 1

TO

BIDDING AND CONTRACT REQUIREMENTS AND SPECIFICATIONS

FOR

LOW LIFT PUMP STATION UPGRADE

ROCHESTER, NH

BID NO. 18-19

2/1/2018

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ADDENDUM NO. 1

TO

BIDDING AND CONTRACT REQUIREMENTS AND SPECIFICATIONS
FOR
LOW LIFT PUMP STATION UPGRADE
ROCHESTER, NH
BID NO. 18-19

This Addendum amends and/or supplements the Bid Documents as indicated below. Only these items alter the Bid Documents; any conflicting oral discussions or responses are hereby declared null and void.

GENERAL PROJECT AND DOCUMENTS CLARIFICATIONS

1. The bid opening date has changed to February 15, 2018 at 2:30 PM. Bids are due at the Purchasing Office before 2:15 PM on February 15, 2018.

2. Bids shall be addressed and submitted to the City of Rochester Purchasing Office, Rochester City Hall, 31 Wakefield Street, Rochester, New Hampshire, 03867.

3. There is no pre-bid meeting planned, contact Ian Rohrbacher at the WTP for a site visit.

4. If interested, please contact Karl Duffield at Karl.duffield@rochesternh.net for a link to a virtual walk through of the low lift pump station.

5. The Davis Bacon Wage Rate schedule has changed. The revised version is included in the "Section D - Federal Provisions, Rules, Regulations and Forms" attached to this Addendum.

6. Unit Costs for Bid Items 2 and 3 have been changed to allowances.

7. Services supplied under Bid item 4 shall be supplied by the City's integrator Wilson Controls at the specified allowance cost. Effort related to the Contractor's coordination efforts with the integrator shall be considered incidental to Bid Item 1.

SPECIFICATIONS

1. **Section 13440: ADD** the following paragraph immediately after paragraph 1.1.B.1.h.:

    i. Provide OPC software with license or as free software as required for connection to the Vacuum Prime System Control Panel (refer to Section 11307). Provide SCADA integration as described in Section 13441 and the following:
        i. System operation status (i.e. Pump 1 ON, Pump 2 Hand, Duplex Program Enabled, Auto Operation Disabled, etc.)
        ii. Running hours for each pump
        iii. Vacuum level
        iv. Low vacuum alarm
        v. Vacuum receiver flooded alarm
        vi. Pump start failure alarm

2. **Section 15088: ADD** the following paragraph immediately after paragraph 2.1.E.3.c:

    F. Dismantling Joints:
        1. All pumps shall be fitted with restrained flexible dismantling joints to allow pump disconnection for service or replacement.
        2. Materials:
            a. Flanged Spool: AWWA C207Class F Steel Ring.
            b. End Ring and Body: Ductile Iron.
            c. Wedge Section Gaskets: Rubber compounded for water and sewer service.
            d. Bolts and Nuts: ASTM A588 HSLA bolt material.
            e. Tie Rods: ASTM A193 Grade B7 High Tensile Steel.
            f. Coatings: Fusion bonded epoxy, NSF 61 certified.
        3. Joints shall have a minimum 2-inch assembly adjustment.
        4. Acceptable Manufactures:
            a. Romac Industries - Style DJ400
            b. Smith Blair - Style 913
            c. Or equivalent

THE FOLLOWING SPECIFICATIONS HAVE BEEN MODIFIED AND ARE REPLACED IN FULL. REMOVE PREVIOUS SPECIFICATIONS AND REPLACE.

	Table of Content
Section A	Bidding Requirements
Section D	Federal Provisions, Rules, Regulations and Forms
01150A	Measurement and Payment
11307	Vacuum Prime System
11312	Horizontal Centrifugal Pumps
15063	Copper Pipe & Fittings – Interior Applications
16000	Electrical

THE FOLLOWING ARE NEW SPECIFICATIONS TO BE ADDED.

02115	Stripping and Stockpiling Topsoil
02200	Earthwork
02270	Temporary Erosion Control
02485	Loaming & Seeding
02510A	Cement Concrete Sidewalks
02641	Corporation Stops
02650	Buried Utility Markings
03305	Concrete Testing
04200	Unit Masonry
07200	Fire Stopping
07900	Joint Sealers
11000	Equipment General
15092	Pipe Sleeves & Seals
15094	Prefabricated Pipe Hangers and Supports
15180	Pipe and Equipment
15400	Plumbing – General
15401	Plumbing Piping Specialties
15423	Electric Water Heater

DRAWINGS

3. **ADD** Figure G-1. This figure updates the Drawing Index on the drawing cover sheet to include two new drawings; C-1 and C-2

4. **ADD** the following plan sheets (attached) to the Project Drawings:
   a) 13614 – C-1 - This plan includes work outside of the building including installation of a 2-inch water service and extension of the existing concrete entrance walk.
   b) 13614 – C-2 – Erosion Control Notes and Details

5. **REMOVE** and **REPLACE** Drawing PR-1. A tepid water heating system has been added for the emergency eyewash system.

6. **ADD** Figure PR-1. This figure updates information on Drawing PR-2 regarding the removal, storage and reinstallation of the existing louver in the chemical room.

7. **ADD** Figure PR-1. This figure updates information on Drawing PR-2 regarding the removal, storage and reinstallation of the existing louver in the chemical room.

8. On Drawing E-8, **ADD** the words "SEE NOTE 1" under the remarks column of the Conduit and Wire Schedule for conduit P1, P2, and P3.

9. On Drawing E-8, **ADD** the following Note: "Note 1. Motors are supplied with shaft grounding rings. Provide appropriate grounding of the shaft grounding rings as required by the manufacturer."

10. On Drawing E-8, **ADD** conduit P10 to the Conduit and Wire Schedule: P10, Conduit: ¾", Conductor: 3#12,1#GND, From: Vacuum Priming System Control Panel, To: Vacuum Pump".

QUESTIONS

1. Q: On Drawing PR-2, cross section 1 shows eccentric reducers on the discharge side of the existing pumps and cross section 3 shows concentric reducers on the discharge of the pumps of the new pumps, have the pump connection points changed to require this change?

   A: The replacement pump connection points have changed from the existing pump. The concentric reducers on the proposed plan account for this change.

2. Q: Does existing flow meter remain after new system is operating or will it be removed?

   A: The existing flow meter will remain in place.

3. Q: Are "or equals" for the chemical feed and/or horizontal split case pumps acceptable?

   A: Chemical feed pumps and split case pumps shall be as specified.

4. Q: The pump spec calls out 40 HP pumps while the one-line calls out 60 HP. Which is correct?

   A: Pumps shall be 60 HP. Specification 11312 has been modified to reflect this change.

5. Q: Is the underground conduit between the WTP and the pump station existing?

   A: Yes, the underground conduit between the WTP and the pump station is existing. New conduit will need to be provided within the building to extend the conduit to their respective locations.

6. Q: Will we need to "tooth-in" the jambs on the masonry infill beneath the new louver?

   A: No, contractor will **not** need to tooth in where infilling existing openings. They will need to tooth in for cutting in new openings like the new door.

This Addendum consists of 243 pages, which includes this Addendum document (5 pages); Revised and Additional Specifications (233 pages); and Addendum Figure No. G1 and Addendum Figure PR1, Revised Drawing PR-1, Additional Drawings C-1 and C-2 (5 pages).

END OF ADDENDUM NO. 1

Attachments follow.

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15423	Electric Water Heaters

DIVISION 16 – ELECTRICAL

16000	Electrical

END OF SECTION

ADVERTISEMENT FOR BIDS

City of Rochester
Owner

31 Wakefield Street, Rochester, NH 03867
Address

Separate sealed BIDS for the construction of

Low Lift Pump Station Upgrades – Bid# 18-19

will be received by The City of Rochester

at the office of Rochester Purchasing Office, City Hall, 31 Wakefield Street, Rochester, New Hampshire

until 2:15 PM , (Daylight Savings Time) February 15 , 2018 and then at said office publicly opened and read aloud.

1. Completion time for the project will be calculated as calendar days from the date specified in the "Notice to Proceed" as follows:

   180 calendar days for substantial completion.

   210 calendar days for final completion.

   Liquidated damages will be in the amount of $ 500 for each calendar day of delay from the date established for substantial completion, and $ 500 for each calendar day of delay from the date established for final completion.

2. Each General Bid shall be accompanied by a Bid Security in the amount of 5% of the Total Bid Price.

3. The successful Bidder must furnish 100% Performance and Payment Bonds, and will be required to execute the Contract Agreement within 10 days following notification of the acceptance of his Bid.

4. Any contract or contracts awarded under this Advertisement for Bids are expected to be funded in whole or in part by:
   - A loan from the NH DWSRF

5. The successful Bidder on this work is required to comply with the President's Executive Order No. 11246 entitled "Equal Employment Opportunity" as amended by Executive Order 11375,

and amendments or supplements thereto, and as supplemented in Department of Labor Regulations (41 CFR Part 60). The requirements for bidders and contractors under this order are explained in the Information for Bidders**.**

6. Utilization of Minority and Women's Business Enterprises (MBEs and WBEs)
   The successful Bidder on this work must demonstrate compliance with the U.S. Environmental Protection Agency's MBE/WBE policy in order to be deemed a responsible bidder. The requirements for bidders and contractors covered by this policy are explained in the Information for Bidders.

7. The successful Bidder on this work is subject to U.S. Department of Labor's Davis Bacon wage provisions.

8. The successful bidder on this work is subject to the "American Iron and Steel (AIS)" requirements of the CWSRF and DWSRF programs.

9. No Bidder may withdraw a Bid within 60 days after the actual date of opening thereof.

The CONTRACT DOCUMENTS may be examined at the following locations:

1. Rochester Public Works Department, 45 Old Dover Road Rochester, NH 03867
2. Wright-Pierce Online Plan Room (www.wright-pierce.com/projects.aspx)

Electronic Copies of the Contract Documents shall be obtained by emailing Angie Gray at angie.gray@rochesternh.net. Interested parties will be furnished one PDF download set of Bidding Documents at a cost of $50 per download.

To be considered a responsive Bidder, the Contractor shall request plans from Owner through the Rochester Purchasing Office and be on record as purchasing a set of plans. The Bid will not be awarded to a Bidder unless a record for the request at least one set of plans and specifications exists in the Rochester Purchasing Office. To meet this requirement and to establish the record of request, a prospective Bidder must obtain plans and specifications using the name that is to appear in the Bid Documents.

INFORMATION FOR BIDDERS

BIDS will be received by City of Rochester

(herein called the "OWNER"), at Rochester Purchasing Office, City Hall, 31 Wakefield Street, Rochester, New Hampshire

until 2:15 PM February 8, 2018 and then at said office publicly opened and read aloud.

Each BID must be submitted in a sealed envelope, addressed to:

City of Rochester, Purchasing Office at 31 Wakefield Street, Rochester, NH 03867

Each sealed envelope containing a BID must be plainly marked on the outside as BID

for Low Lift Pump Station Upgrades – Bid# 18-19 and the envelope should bear on the outside the BIDDER's name, address, and license number if applicable and the name of the project for which the BID is submitted. If forwarded by mail, the sealed envelope containing the BID must be enclosed in another envelope addressed to the OWNER at

Rochester Purchasing Office, City Hall, Rochester, NH 03867

All BIDS must be made on the required BID form. All blank spaces for BID prices must be filled in, in ink or typewritten, and the BID form must be fully completed and executed when submitted. Only one copy of the BID form is required.

The OWNER may waive any informalities or minor defects or reject any and all 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 shall not be considered. No BIDDER may withdraw a BID within 60 days after the actual date of the opening thereof. Should there be reasons why the contract cannot be awarded within the specified period, the time may be extended by mutual agreement between the OWNER and the BIDDER.

BIDDERS must satisfy themselves of the accuracy of the estimated quantities in the BID SCHEDULE by examination of the site and a review of the drawings and specifications including ADDENDA. After BIDS have been submitted, the BIDDER shall not assert that there was a misunderstanding concerning the quantities of WORK or of the nature of the WORK to be done.

The OWNER shall provide to BIDDERS prior to BIDDING, all information which is pertinent to, and delineates and describes, the land owned and rights-of-way acquired or to be acquired.

The CONTRACT DOCUMENTS contain the provisions required for the construction of the PROJECT. Information obtained from an officer, agent, or employee of the OWNER or any other person shall not affect the risks or obligations assumed by the CONTRACTOR or relieve him from fulfilling any of the conditions of the contract.

Each BID must be accompanied by a BID BOND payable to the OWNER in the amount of five percent (5%) of the total amount of the BID. As soon as the BID prices have been compared, the OWNER will return the BONDS of all except the three lowest responsive BIDDERS. When the AGREEMENT is executed, the bonds of the two remaining unsuccessful BIDDERS will be returned. The BID BOND of the successful BIDDER will be retained until the PAYMENT BOND and PERFORMANCE BOND have been executed and approved, after which it will be returned. A certified check may be used in lieu of a BID BOND.

A PERFORMANCE BOND and a PAYMENT BOND, each in the amount of 100 percent of the CONTRACT PRICE, with a corporate surety approved by the OWNER, will be required for the faithful performance of the contract.

Attorneys-in-fact who sign BID BONDS or PAYMENT BONDS and PERFORMANCE BONDS must file with each BOND a certified and effective dated copy of their power of attorney.

The party to whom the contract is awarded will be required to execute the AGREEMENT and obtain the PERFORMANCE BOND and PAYMENT BOND within ten (10) calendar days from the date when NOTICE OF AWARD is delivered to the BIDDER. The NOTICE OF AWARD shall be accompanied by the necessary AGREEMENT and BOND forms. In case of failure of the BIDDER to execute the AGREEMENT, the OWNER may at his option consider the BIDDER in default, in which case the BID BOND accompanying the proposal shall become the property of the OWNER.

The OWNER within ten (10) days of receipt of acceptable PAYMENT BOND, PERFORMANCE BOND and AGREEMENT signed by the party to whom the AGREEMENT was awarded shall sign the AGREEMENT and return to such party an executed duplicate of the AGREEMENT. Should the OWNER not execute the AGREEMENT within such period, the BIDDER may by WRITTEN NOTICE withdraw his signed AGREEMENT. Such notice of withdrawal shall be effective upon receipt of the notice by the OWNER.

The NOTICE TO PROCEED shall be issued within ten (10) days of the execution of the AGREEMENT by the OWNER. Should there be reasons why the NOTICE TO PROCEED cannot be issued within such period, the time may be extended by mutual agreement between the OWNER and CONTRACTOR. If the NOTICE TO PROCEED has not been issued within the ten (10) day period or within the period mutually agreed upon, the CONTRACTOR may terminate the AGREEMENT without further liability on the part of either party.

The OWNER may make such investigations as OWNER deems necessary to determine the ability of the BIDDER to perform the WORK, and the BIDDER shall furnish to the OWNER all such information and data for this purpose as the OWNER may request. The OWNER reserves the right to reject any BID if the evidence submitted by, or investigation of, such BIDDER fails to satisfy the OWNER that such BIDDER is properly qualified to carry out the obligations of the AGREEMENT and to complete the WORK contemplated therein.

A conditional or qualified BID will <u>not</u> be accepted.

Award will be made to the lowest responsive and responsible BIDDER.

All applicable laws, ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the PROJECT shall apply to the contract throughout.

Each BIDDER is responsible for inspecting the site and for reading and being thoroughly familiar with the CONTRACT DOCUMENTS. The failure or omission of any BIDDER to complete any of the foregoing shall in no way relieve any BIDDER from any obligation in respect to his BID.

Further, the BIDDER agrees to abide by the requirements under Executive Order No. 11246, as amended, including specifically the provisions of the equal opportunity clause set forth in the GENERAL CONDITIONS.

The low BIDDER shall supply the names and addresses of major material SUPPLIERS and SUBCONTRACTORS when requested to do so by the OWNER.

MANUFACTURERS EXPERIENCE

Wherever it may be written that an equipment manufacturer must have a specified period of experience with his product, equipment which does not meet the specified experience period can be considered if the equipment supplier or manufacturer is willing to provide a bond or cash deposit for the duration of the specified time period which will guarantee replacement of that equipment in the event of failure.

SRF PROJECT SIGN

The Contractor shall construct a sign in accordance with the Standard Detail included in these specifications. The sign shall be erected in a location selected by the Engineer or Owner in coordination with NHDES. The Contractor shall maintain the sign throughout the duration of the contract.

SAFETY AND HEALTH REGULATIONS

This project is subject to all of the Safety and Health Regulations (CFR 29 Part 1926 and all subsequent amendments) as promulgated by the U.S. Department of Labor on June 24, 1974. Contractors shall comply with the requirements of these regulations.

NON-DISCRIMINATION IN EMPLOYMENT

Contracts for work under this proposal obligate the contractors and sub-contractors not to discriminate in employment practices.

Bidders shall, if requested, submit a compliance report concerning their employment practices and policies in order to maintain their eligibility to receive the award of contract.

Successful bidders shall, if requested, submit a list of all subcontractors who will perform work on the project, and written signed statements from authorized agents of labor pools with which they will or may deal for employees on the work together with supporting information to the effect that such labor pools' practices and policies are in conformity with Executive Order No. 11246; that they will affirmatively cooperate in or offer no hindrance to the recruitment, employment, and equal treatment of employees seeking employment and performing work under the contract or, a certification as to what efforts have been made to secure such statements when such agents or labor pools have failed or refused to furnish them prior to award of the contract.

Successful bidders must be prepared to comply in all respects with the contract provisions regarding non-discrimination.

DAVIS BACON WAGE RATES

This project is funded in whole or in part by a loan available through NHDES's Clean Water and/or Drinking Water SRF programs, and hence is subject to federal Davis Bacon wage provisions.

All laborers and mechanics employed by contractors or subcontractors on this project shall be paid wages at rates not less than those prevailing on projects of a character similar in the locality as determined by the U.S. Department of Labor (DOL) in accordance with Subchapter IV of Chapter 31 of Title 40, United States Code.

If the applicable wage determination does not provide a rate for a classification of work to be performed, the needed classification and wage rate must be added in conformance to the contract wage determination after contract award.

A copy of the applicable DOL wage determination(s) is included in Attachment B in PART D-FEDERAL PROVISIONS, RULES, REGULATIONS AND FORMS in these project documents.

Bidders shall refer to the above-referenced PART D for additional information on Davis Bacon requirements.

AMERICAN IRON AND STEEL (AIS) PROVISIONS

The successful bidder on this work is subject to the "American Iron and Steel (AIS)" requirements of the CWSRF and DWSRF programs, which require the use of iron and steel products that are produced in the United States.

The BIDDER'S AMERICAN IRON AND STEEL ACKNOWLEDGEMENT shall be completed and signed by each Bidder, and included with each bid. Additionally, CONTRACTOR shall certify and document to OWNER with each Application for Payment, and upon completion of the project that all iron and steel goods subject to this provision have been produced in the United States.

Bidders shall refer to PART D - FEDERAL PROVISIONS, RULES, REGULATIONS AND FORMS for additional information and guidance on AIS requirements.

STATE INSPECTION

Work performed on this project shall be subject to inspection by representatives of the NH Department of Environmental Services. Such inspection shall in no sense make the State Government a party to this contract, unless said Government is also the Owner, and will in no way interfere with the rights of either party hereunder.

Representatives of the State of New Hampshire Department of Environmental Services shall be given Right of Access to all portions of the proposed work, including but not limited to, actual work site, storage yards, offsite manufacturing and fabricating location and job records.

COPIES OF THE CONTRACT

There shall be multiple executed copies of the Contract to be distributed as follows:

a) One (1) copy each to the Owner, Engineer, and Contractor.
b) Two (2) copies to the NH Department of Environmental Services CWSRF program (if applicable)
c) One (1) copy to the NH Department of Environmental Services DWSRF program (if applicable).
d) Additional copies as required for other federal or state agencies contributing to or participating in project costs

NON-RESIDENT CONTRACTORS

The successful bidder, if a corporation established under laws other than the State of New Hampshire, shall file, at the time of the execution of the contract, with the Owner, notice of the name of its resident attorney, appointed as required by the laws of the State of New Hampshire.

The successful bidder, if not a resident of New Hampshire, and not a corporation, shall file, at the time of execution of the contract, with the Owner a written appointment of a resident of the state of New Hampshire, having an office or place of business therein, to be his true and lawful attorney upon whom all lawful processes in any actions or proceedings against him may be served; and in such writing, which shall set forth said attorney's place of residence, shall agree that any lawful process against him which is served on said attorney shall be of the same legal force and validity as if served on him and that the authority shall continue in force so long as any liability remains outstanding against him in New Hampshire.

The power of attorney shall be filed in the office of the Secretary of State if required, and copies certified by the Secretary shall be sufficient evidence thereof. Such appointment shall continue in force until revoked by an instrument in writing, designating in a like manner some other person upon whom such processes may be served, which instrument shall be filed in the manner provided herein for the original appointment.

A Non-resident Contractor shall be deemed to be:

a) A person who is not a resident of the State of New Hampshire.
b) Any partnership that has no member thereof resident of the State of New Hampshire.
c) Any corporation established under laws other than those of the State of New Hampshire.

DBE RULE PROGRAM REQUIREMENTS (MBEs and WBEs)

Bidders on this project are required to demonstrate compliance with the United States Environmental Protection Agency's MBE/WBE rules in order to be deemed responsive. The existing Fair Share Goals are .77% MBE and 6.22% WBE. The MBE/WBE documentation, DBE Subcontractor Utilization Form and DBE Subcontractor Performance Forms (EPA Forms 6100-4 and 6100-3), shall be submitted with the bid.

The requirements for bidders and contractors are as follows:

State Revolving Fund loan recipients **and their contractors** must comply with the following DBE Rule requirements throughout the SRF loan project period:

1) Fair share objectives (MBE/WBE goals);
2) Good Faith Efforts;
3) Annual Reporting of MBE/WBE accomplishments;
4) Contract Administration Requirements;
5) Bidders List Requirements; and
6) Record Keeping.

Bidders shall refer to PART D - FEDERAL PROVISIONS, RULES, REGULATIONS AND FORMS for additional information on MBE/WBE requirements.

BIDDERS QUALIFICATIONS

No award will be made to any Bidder who cannot meet all of the following requirements:

A. He shall not have defaulted nor turned the work over to the bonding company on any contract within three years prior to the bid date.
B. He shall maintain a permanent place of business.
C. He shall have adequate personnel and equipment to perform the work expeditiously.
D. He shall have suitable financial status to meet obligations incidental to the work.
E. He shall have appropriate technical experience satisfactory to the Engineer and the Division in the class of work involved.
F. He shall be registered with the Secretary of State to transact business in New Hampshire.
G. He shall have performed to the satisfaction of the Engineer and the Division on previous contracts of a similar nature.
H. He shall not have failed to complete previous contracts on time, including approved time extensions.

SUSPENSION AND DEBARMENT

The Contractor shall not knowingly award a subcontract to any entity which has been debarred or suspended by the federal government. The Contractor shall compare the names of its proposed subcontractors against the searchable list in the federal "System For Award Management (SAM)" database, which can be found at https://www.sam.gov/portal/public/SAM.

WITHDRAWAL OF BIDS

Prior to Bid Opening, bids may be withdrawn upon written or telegraphic request of the Bidder provided confirmation of any telegraphic withdrawal over the signature of the Bidder is placed in the mail and postmarked prior to the time set for Bid Opening. Bid documents and security of any Bidder withdrawing his bid in accordance with the foregoing conditions will be returned.

BID

Proposal of _____ (hereinafter called "BIDDER"), organized and existing under the laws of the State of _____ doing business as _____
(Corporation, Partnership, Individual)

To the City of Rochester (hereinafter called "OWNER").

In compliance with your Advertisement for Bids, BIDDER hereby proposes to perform all WORK For the construction of LOW LIFT PUMP STATION UPGRADES in strict accordance with the CONTRACT DOCUMENTS, within the time set forth therein, and at the prices stated below.

By submission of this BID, each BIDDER certifies, and in the case of a joint BID each party thereto certifies as to his own organization, that this BID has been arrived at independently, without consultation, communication, or agreement as to any matter relating to the BID with any other BIDDER or with any competitor.

BIDDER hereby agrees to commence WORK under this contract on or before a date to be specified in the NOTICE TO PROCEED and to complete the PROJECT within:

180 consecutive calendar days for substantial completion.

210 consecutive calendar days for final completion.

Liquidated damages will be in the amount of $ 500 for each calendar day of delay from the date established for substantial completion and $ 500 for each calendar day of delay from the date established for final completion, as provided in Section 18 of the General Conditions.

BIDDER acknowledges receipt of the following ADDENDUM:

_____

_____

_____

The Bidder shall state below what works of a similar character to that of the proposed contract he has performed, and provide such references as will enable the Owner to judge his experience, skill, and business standing.

All questions must be answered and the data given must be clear and comprehensive. This statement must be notarized. If necessary, add separate sheets.

1. Name of Bidder.

2. Permanent Main Office address.

3. When organized?

4. Where incorporated?

5. Is bidder registered with the Secretary of the State to do business in New Hampshire?

6. For how many years has your firm engaged in the contracting business under its present name? Also state names and dates of previous firm names, if any.

7. Contracts on hand. (Schedule these, showing gross amount of each contract and the approximate anticipated dates of completion.)

8. General character of work performed by your company.

9. Have you ever failed to complete any work awarded you in the scheduled contract time, including approved time extensions? ___(Yes) __(No).
If so, where and why?

10. Have you ever defaulted on a contract? ___(Yes) __(No).
If so, where and why?

11. Have you ever had liquidated damages assessed on a contract? _____(Yes) ____(No).
If so, where and why?

12. List the more important contracts recently executed by your company, stating approximate cost for each, and the month and year completed.

13. List your major equipment <u>available for this contract</u>.

14. List your key personnel such as Project Superintendent and foreman available for this contract.

15. List any subcontractors whom you would expect to use for the following (unless this work is to be done by your own organization):

a. Civil Engineering
b. Utility Installation
c. Other work

16. With what banks do you conduct business?

Do you grant the Engineer permission to contact this (these) institutions? ___(Yes) ___(No)

NOTE: Bidders may be required to furnish their latest financial statement as part of the award process.

Respectfully submitted:

_____	_____
Signature	Address
_____	_____
Title	Date

_____ Being duly sworn, deposes and says that he is

_____ of _____
(Name of Organization)

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

Sworn to before me this _____ day of _____ , 20 _____

_____
Notary Public

My commission expires _____

(Seal - If BID is by Corporation)

ATTEST: _____

BIDDER agrees to perform all the work described in the CONTRACT DOCUMENTS for the following unit prices or lump sum:

NOTE: BIDS shall include sales tax and all other applicable taxes and fees.

BID SCHEDULE

Item No.	Quantity	Brief Description of Item with Unit Bid Price in Words	Unit Bid In Figures	Amount In Figures
1	Lump Sum	Low Lift Pump Station Improvements The Sum of $_____ _____ Per Lump Sum	$_____	$_____
2		Additional Concrete The Sum of $_____ _____ Per Allowance	$ 10,000	$ 10,000
3		Additional Miscellaneous Steel and Iron Work The Sum of $_____ _____ Per Allowance	$ 10,000	$ 10,000
4		Integration Services The Sum of $_____ _____ Per Allowance	$ 1,000	$ $1,000

* Indeterminate quantities assumed for comparison of bids. Quantities are not guaranteed. Payment will be based on actual quantities constructed.

SUBTOTAL (BASE BID): Total of Items 1 through 4 above.

_____ ($_____)

_____ (use figures)

(use words)

ALTERNATE A

Item No.	Quantity	Brief Description of Item with Unit Bid Price in Words	Unit Bid In Figures	Amount In Figures
1	Lump Sum	Vacuum Priming System The Sum of $_____ _____ Per Lump Sum	$_____	$_____

TOTAL: Total of Items 1-4 and Alternate A.

_____ ($_____)
(use words) (use figures)

The BIDDER hereby certifies, by checking the boxes below, that the following documents are included with this bid proposal

- DBE Subcontractor Utilization Form (EPA Form 6100-4)
- DBE Subcontractor Performance Forms (EPA Form 6100-3) **Submit one form for each DBE subcontractor**
- Bidder's **American Iron and Steel** acknowledgement

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____

_____ as Principal, and

_____ as Surety, are hereby

held and firmly bound unto _____ as OWNER

in the penal sum of _____

for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors and assigns.

Signed, this _____ day of _____

The Condition of the above obligation is such that whereas the Principal has submitted to

_____

a certain BID, attached hereto and hereby made a part hereof to enter into a contract in writing, for the _____

_____

_____

NOW, THEREFORE,

(a) If said BID shall be rejected, or

(b) If said BID shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (Properly completed in accordance with said BID) and shall furnish a BOND for faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said BID, then this obligation shall be void, otherwise, the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

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

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

_____
Principal

By: _____

_____
Surety

By: _____

IMPORTANT-Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state of New Hampshire.

D. FEDERAL PROVISIONS, RULES, REGULATIONS AND FORMS

CWSRF/DWSRF
January 2017

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* Denotes items to be completed by successful bidder and incorporated in executed contract

Pertinent Federal Acts

The Contractor shall comply with the regulations of the Davis-Bacon Act, Executive Order 11246 (Federal Equal Employment Opportunity), the Contract Work Hours Standards Act, the Consolidated Appropriations Act, 2014, the Consolidated and Further Continuing Appropriations Act, 2015, the Consolidated Appropriations Act 2016, the Water Resources Reform and Development Act of 2014 (Use American Iron and Steel), and Title X of the Clean Air Act Amendments of 1990 (Disadvantage Business Enterprise), and any amendments or modifications thereto, and shall cause appropriate provisions to be inserted in subcontracts to ensure compliance therewith by all Subcontractors subject thereto.

Forms

The following forms are to be used in conjunction with these federal provisions (copies are attached):

- Contractor's Payroll Certification and American Iron and Steel Certification
- Notice to Labor Unions or Other Organizations of Workers (Nondiscrimination in Employment)
- Certification of Non-segregated Facilities
- DBE Subcontractor Participation Form (EPA Form 6100-2)
- DBE Subcontractor Performance Form (EPA Form 6100-3)
- DBE Subcontractor Utilization Form (EPA Form 6100-4)
- DBE Bidders List
- AIS Manufacturer Certification
- AIS Bidders Acknowledgement
- AIS DE MINIMIS Tracking Form
- AIS Project Certification (to be submitted at substantial completion)

Links for more Information

- U.S.DOL Prevailing Wage Resources Book - http://www.dol.gov/whd/recovery/pwrb/toc.htm
- U.S. DOL General Wage Determinations - http://www.wdol.gov
- U.S. DOL Certified Payroll Form WH-347 - http://www.dol.gov/whd/forms/wh347.pdf
- WH-1321 "Employee Rights Under the Davis-Bacon Act" poster - http://www.dol.gov/whd/regs/compliance/posters/davis.htm
- EPA's DBE Resources - http://www.epa.gov/osbp/dbe_team.htm
- NHDOT Certified Disadvantaged Business Enterprise (DBE) Directory- http://www.nh.gov/dot/org/administration/ofc/documents/dbe-directory.pdf
- EPA American Iron and Steel (AIS) Requirement - Guidance and Questions and Answers website:
  American Iron and Steel Requirement Guidance, March 20, 2014;
  AIS Q&A Part 1, Valves & Hydrants, May 30, 2014
  AIS Q&A Part 2, Products, Projects and Process, September 10, 2014
  AIS Q&A Part 3, Plans & specification dates, Refinancing & Coatings, March 16, 2015
  https://www.epa.gov/cwsrf/american-iron-and-steel-requirement-guidance-and-questions-and-answers
- AIS Approved National Waivers - http://www.epa.gov/cwsrf/american-iron-and-steel-requirement-approved-national-waivers-0

CONTRACTOR'S PAYROLL CERTIFICATION
AND
AMERICAN IRON AND STEEL CERTIFICATION

(To be submitted with each application for payment)

Name of Contractor: _____

Address of Contractor: _____

Project Name: _____

Project Number: _____

Project Location: _____

Payment Application No.: _____

Payment App. End Date: _____

I hereby certify that all of the contract requirements as specified under the Labor Standards Provision for Federal and Federally Assisted Contracts have been complied with by the above named Contractor, and by each Subcontractor employing Laborers or Mechanics at the site of the work, or there is an honest dispute with respect to the required provisions.

I hereby certify that the "American Iron and Steel" provisions of P.L. 113-76, "Consolidated Appropriation Act, 2014", the "Consolidated and Further Continuing Appropriations Act, 2015", P.L. 114-113, the "Consolidated Appropriations Act, 2016"; and/or the "Water Resources Reform and Development Act of 2014" ("Acts") as applicable, have been met, and that all iron and steel used in the project named above have been produced in the United States in a manner that complies with American Iron and Steel Requirements, and/or that applicable EPA-approved waivers have been obtained to comply with American Iron and Steel requirements.

CONTRACTOR: _____
Name of Responsible Official

_____
Title

_____
Signature

_____
Date

NOTICE TO LABOR UNIONS OR OTHER ORGANIZATIONS OF WORKERS

NONDISCRIMINATION IN EMPLOYMENT

To: _____
(Name of union or organization of workers)

The undersigned currently holds contract(s) with _____
(Name of Applicant)

_____ involving funds or credit of the U.S. Government or (a) subcontract(s) with a prime contractor holding such contract(s).

You are advised that under the provisions of the above contract(s) or subcontract(s) and in accordance with Executive Order 11246, dated September 24, 1965, Executive Order 13665 dated April 8, 2014 and Executive Order 13672 dated July 21, 2014, the undersigned is obliged not to discriminate against any employee or applicant for employment because of race, color, religion, national origin, sexual orientation or gender identity. This obligation not to discriminate in employment includes, but is not limited to, the following:

HIRING, PLACEMENT, UPGRADING, TRANSFER, OR DEMOTION RECRUITMENT, ADVERTISING, OR SOLICITATION FOR EMPLOYMENT TRAINING DURING EMPLOYMENT, RATES OF PAY OR OTHER FORMS OF COMPENSATION, SELECTION FOR TRAINING INCLUDING APPRENTICESHIP, LAYOFF, OR TERMINATION.

COPIES OF THIS NOTICE WILL BE POSTED BY THE UNDERSIGNED IN CONSPICUOUS PLACES AVAILABLE TO EMPLOYEES OR APPLICANTS FOR EMPLOYMENT.

_____

_____

_____

C/S/ _____
(Contractor or Subcontractor)

_____
Date

This document must be completed by the successful bidder and bound in the executed contract

Equal Employment Opportunity Requirements
(Executive Order 11246, as amended)

The Contractor shall comply with the equal opportunity requirements of Executive Order 11246, as amended, and as supplemented by 41 CFR Part 60, including the Equal Opportunity Clause at 41 CFR Part 60-1.4(b), and specific affirmative active obligations required by the Standard Federal Equal Employment Opportunity Construction Contract Specifications, as set forth in 41 CFR Part 60-4.

A. Equal Opportunity Clause (41 CFR Part 60-1.4(b))

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

1. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

2. The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

3. The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

4. The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

5. The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

6. The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

7. In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

8. The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: *Provided,* however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

B. Federal Equal Employment Opportunity Construction Contract Specifications (41 CFR Part 60-4.3)

1. As used in these specifications:

   a. “Covered area” means the geographical area described in the solicitation from which this contract resulted;

   b. “Director” means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;

   c. “Employer identification number” means the Federal Social Security number used on the employer’s Quarterly Federal Tax Return, U.S. Treasury Department Form 941.

   d. “Minority” includes:

      (i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);

      (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);

(iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands); and

(iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the Contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $10,000.00 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7a through p of these specifications. The Goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered Construction Contractors performing construction work in geographical areas where they do not have a Federal or federally-assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the *Federal Register* in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

   a. Ensure and maintain a working environment free of harassment, intimidation and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

   b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organization responses.

   c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefore, along with whatever additional actions the Contractor may have taken.

   d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligation.

   e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.

   f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

   g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foremen,

etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to an discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students, and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment-related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are non-segregated, except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through p of these Specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that

the concrete benefits of the program are reflected in the Contractor's minority and female work force participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).

10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The Contractor shall designate a responsible official to monitor all employment-related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, Contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon application of other laws which establish different standards of compliance or upon the application of requirements

for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

ENVIRONMENTAL PROTECTION AGENCY

OFFICE OF WATER PROGRAMS OPERATIONS

CERTIFICATION OF NONSEGREGATED FACILITIES

(Applicable to federally assisted construction contracts and related subcontracts exceeding $10,000 which are not exempt from the Equal Opportunity clause.*)

The federally assisted construction contractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained.

The federally assisted construction contractor certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained.

The federally assisted construction contractor agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract.

As used in this certification, the term "segregated facilities" means any waiting rooms, work area, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise.

The federally assisted construction contractor agrees that (except where he had obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause, and that he will retain such certification in his files.

Signature Date

Name and Title of Signer (Please Type)

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

***This document must be completed by the successful bidder and bound in the executed contract.**

DBE Rule- Program Requirements

Purpose

The Environmental Protection Agency (EPA) rule titled "Participation by Disadvantaged Business Enterprises in United States Environmental Protection Agency Programs", at 40 CFR Part 33 (DBE Rule), sets forth an EPA program that serves the compelling government interest to increase and encourage the utilization and participation of Disadvantaged Business Enterprises (DBEs) in procurements funded by EPA assistance agreements. Because the New Hampshire State Revolving Fund (SRF) Loan Programs receive funding from EPA, the DBE rule requirements apply to all SRF funded projects.

State Revolving Fund loan recipients **and their contractors** must comply with the following DBE Rule requirements throughout the SRF loan project period:

1. Fair share objectives (Minority Business Enterprise/Women's Business Enterprise (MBE/WBE) goals);
2. Good Faith Efforts;
3. Annual Reporting of MBE/WBE accomplishments;
4. Contract Administration Requirements;
5. Bidders List Requirements; and
6. Other Reporting

The NHDES SRF programs must ensure that contracts and subcontracts that are funded with SRF loans comply with these federal requirements and must report to EPA on DBE accomplishments.

1. Fair Share Objectives (MBE/WBE goals)

A fair share objective is an objective expressing the percentage of MBE or WBE utilization expected absent the effects of discrimination. It is based on the capacity and availability of qualified, certified MBEs and WBEs in the relevant geographic market for the procurement categories of construction, equipment, services, and supplies compared to the number of all qualified entities in the same market for the same procurement categories, adjusted, as appropriate, to reflect the level of MBE and WBE participation expected absent the effects of discrimination. A fair share objective is not a quota.

Current Fair Share Objectives/Goals:

The current Fair Share Objectives/Goals are 0.77% for MBEs and 6.22% for WBEs.

2. Good Faith Efforts

The Contractor shall make the following good faith efforts whenever procuring construction, equipment, services and supplies:

(a) Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities; including placing DBEs on solicitation lists and soliciting them whenever they are potential sources.

(b) Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that

encourages and facilitates participation by DBEs in the competitive process. This includes, whenever possible, posting solicitation for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date.

(c) Consider in the contracting process whether firms competing for large contracts could be contracted with DBEs. This will include dividing total requirements when economically feasible into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.

(d) Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.

(e) Use the services and assistance of the Small Business Administration and the Minority Business Development Agency of the U. S. Department of Commerce.

Contractor shall maintain all records documenting Contractor's compliance with the requirements of 40 CFR Part 33, including documentation of Contractor's good faith efforts. Such records shall be provided to Owner upon request.

3. Annual Reporting of MBE/WBE Accomplishments

The Owner is required to report MBE/WBE utilization accomplishments to NHDES by October 15 of each year. The Contractor shall keep records of its MBE/WBE utilization, and prepare periodic reports in a timely manner as requested by the Owner to allow the Owner to complete and submit the required annual MBE/WBE reports to NHDES by the October 15 deadline. Contractor's utilization reports shall include the following for all MBE/WBE costs incurred in the reporting period (i.e., the October 1 through September 30 federal fiscal year):

(a) Name, address and telephone number of MBE/WBE
(b) Business enterprise status (MBE or WBE)
(c) Dollar value of cost(s) (Amount(s) paid to MBE/WBE in reporting period)
(d) Date(s) of cost(s) (Date(s) of payment(s) to MBE/WBE, mm/dd/yyyy)
(e) Type of product or services (Construction/Supplies/Services/Equipment)

Note that only costs incurred with certified MBE/WBE's are counted as MBE/WBE accomplishments.

{NOTE TO ENGINEER
This annual reporting requirement may not apply if the total funding budgeted for the project does not exceed $150,000. Contact NHDES for guidance if you think this reporting requirement may not apply to your project}

4. Contract Administration Requirements

The Contractor shall:

(a) Pay all subcontractors for satisfactory performance no more than 30 days from the prime contractor's receipt of payment from the loan recipient.
(b) Notify Owner in writing prior to the termination of any DBE subcontractor for Contractor's convenience.

(c) Employ the good faith efforts when soliciting a replacement subcontractor if a DBE subcontractor fails to complete work under the subcontract for any reason.
(d) Employ the good faith efforts even if the prime contractor has achieved its fair share objective
(e) Comply with the following term and condition, as required by 40 CFR, Section 33.106:

The contractor shall not discriminate on the basis of race, color, national origin or sex in the performance of this contract. The contractor shall carry out applicable requirements of 40 CFR Part 33 in the award and administration of contracts awarded under EPA financial assistance agreements. Failure by the contractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract or other legally available remedies. (Appendix A to 40 CFR Part 33—Term and Condition)

5. Bidders List Requirements

The Owner is required to maintain a bidders list in accordance with 40 CFR Section 33.501, and the Contractor shall provide bidders list information to the Owner for Owner's use in complying with this requirement. The Contractor shall maintain a Bidders List, which must include all firms that bid or quote on subcontracts under this Contract, including both MBE/WBEs and non-MBE/WBEs.

The Bidders List shall include the following information for all subcontractors who submit bids or quotes for subcontract work:

(a) Entity's name with point of contact;
(b) Entity's mailing address, telephone number, and e-mail address;
(c) The procurement on which the entity bid or quoted, and when; and
(d) Entity's status as an MBE/WBE or non-MBE/WBE.

6. Other Reporting

(a) DBE Subcontractor Performance and Utilization Forms

The Bidder shall submit with its bid completed DBE Subcontractor Performance Forms (EPA Form 6100-3), and DBE Subcontractor Utilization Form (EPA Form 6100-4). The Owner is required to submit these forms to NHDES when requesting authorization to award the construction contract.

(b) Bidders List Reporting

The Contractor shall provide the updated Bidders List to the Owner periodically upon Owner's request, and at project substantial completion.

United States Environmental Protection Agency

OMB Control No: 2090-0030
Approved: 8/13/2013
Approval Expires: 8/31/2015

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Participation Form

An EPA Financial Assistance Agreement Recipient must require its prime contractors to provide this form to its DBE subcontractors. This form gives a DBE[1] subcontractor[2] the opportunity to describe work received and/or report any concerns regarding the EPA-funded project (e.g., in areas such as termination by prime contractor, late payments, etc.). The DBE subcontractor can, as an option, complete and submit this form to the EPA DBE Coordinator at any time during the project period of performance.

Subcontractor Name		Project Name
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact
Address		
Telephone No.		Email Address
Prime Contractor Name		Issuing/Funding Entity:

Contract Item Number	Description of Work Received from the Prime Contractor Involving Construction, Services , Equipment or Supplies	Amount Received by Prime Contractor

[1] A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

[2] Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

United States Environmental Protection Agency

OMB Control No: 2090-0030
Approved: 8/13/2013
Approval Expires: 8/31/2015

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Participation Form

Please use the space below to report any concerns regarding the above EPA-funded project:

Subcontractor Signature	Print Name
Title	**Date**

United States Environmental Protection Agency

OMB Control No: 2090-0030
Approved: 8/13/2013
Approval Expires: 8/31/2015

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Performance Form

This form is intended to capture the DBE[1] subcontractor's[2] description of work to be performed and the price of the work submitted to the prime contractor. An EPA Financial Assistance Agreement Recipient must require its prime contractor to have its DBE subcontractors complete this form and include all completed forms in the prime contractors bid or proposal package.

Subcontractor Name	Project Name	
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact
Address		
Telephone No.	Email Address	
Prime Contractor Name	Issuing/Funding Entity:	

Contract Item Number	Description of Work Submitted to the Prime Contractor Involving Construction, Services , Equipment or Supplies	Price of Work Submitted to the Prime Contractor
DBE Certified By: ◯ DOT ◯ SBA ◯ Other: _____	Meets/ exceeds EPA certification standards? ◯ YES ◯ NO ◯ Unknown	

[1] A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

[2] Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

United States Environmental Protection Agency

OMB Control No: 2090-0030
Approved: 8/13/2013
Approval Expires: 8/31/2015

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Performance Form

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature	Print Name
Title	**Date**

Subcontractor Signature	Print Name
Title	**Date**

United States Environmental Protection Agency

OMB Control No: 2090-0030
Approved: 8/13/2013
Approval Expires: 8/31/2015

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Utilization Form

This form is intended to capture the prime contractor's actual and/or anticipated use of identified certified DBE[1] subcontractors[2] and the estimated dollar amount of each subcontract. An EPA Financial Assistance Agreement Recipient must require its prime contractors to complete this form and include it in the bid or proposal package. Prime contractors should also maintain a copy of this form on file.

Prime Contractor Name		Project Name
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact
Address		
Telephone No.		Email Address
Issuing/Funding Entity:		

I have identified potential DBE certified subcontractors	○ YES	◉ NO
If yes, please complete the table below. If no, please explain:		

Subcontractor Name/ Company Name	Company Address/ Phone/ Email	Est. Dollar Amt	Currently DBE Certified?

Continue on back if needed

[1] A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

[2] Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

United States Environmental Protection Agency

OMB Control No: 2090-0030
Approved: 8/13/2013
Approval Expires: 8/31/2015

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Utilization Form

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature	Print Name
Title	**Date**

D-6.10
New Hampshire State Revolving Fund
BIDDERS LIST

The Contractor shall maintain and submit to the Owner a bidders list, which the Owner will use for compliance with the recordkeeping requirements of 40 CFR § 33.501. The list must include information regarding all entities that bid or quote on subcontracts under this Contract, including both MBEs/WBEs and non-MBEs/WBEs. Projects funded by loan(s) of $250,000 or less may be exempt from the requirement to maintain a bidders list [reference 40 CFR § 33.501(c)].

Completed form must be submitted periodically upon request by the Owner, and the final list must be submitted at substantial completion of the project.

Firm Name, Contact, & Address	Phone/ E-mail/Fax	Contract Item No. and Description of Work to be Performed	Bid or Quote Date	Entity Status as Certified MBE/WBE?
Name & Contact	*Phone*			YES ¨ WBE; or ¨ MBE
Address	*E-mail*			
City State Zip	*Fax (optional)*			¨ NO
Name & Contact	*Phone*			YES ¨ WBE; or ¨ MBE
Address	*E-mail*			
City State Zip	*Fax (optional)*			¨ NO
Name & Contact	*Phone*			YES ¨ WBE; or ¨ MBE
Address	*E-mail*			
City State Zip	*Fax (optional)*			¨ NO
Name & Contact	*Phone*			YES ¨ WBE; or ¨ MBE
Address	*E-mail*			
City State Zip	*Fax (optional)*			¨ NO
Name & Contact	*Phone*			YES ¨ WBE; or ¨ MBE
Address	*E-mail*			
City State Zip	*Fax (optional)*			¨ NO

American Iron and Steel

Public Law 113-76, the "Consolidated Appropriations Act, 2014"; Public Law 113-235, the "Consolidated and Further Continuing Appropriations Act, 2015", P.L. 114-113, the "Consolidated Appropriations Act, 2016"; and the "Water Resources Reform and Development Act of 2014" ("Acts") include "American Iron and Steel (AIS)" requirements for the Clean Water and Drinking Water State Revolving Fund (SRF) programs. Under these Acts, all Clean Water and Drinking Water SRF funded construction, alteration, maintenance, or repair of public water systems or treatment works projects must use iron and steel products that are produced in the United States.

1. EPA AIS GUIDANCE

EPA's State Revolving Fund American Iron and Steel Requirement website includes detailed information on American Iron and Steel requirements and waivers. The website address is as follows:

https://www.epa.gov/cwsrf/state-revolving-fund-american-iron-and-steel-ais-requirement

The paragraphs in *italics* below are excerpts from the EPA AIS guidance available at the EPA website. Words in plain text and within [brackets] are subtitles or clarifications added by NHDES.

(a) Iron and Steel Products [reference EPA guidance dated 3-20-2014, Question 11]

An iron or steel product is one of the following made primarily of iron or steel that is permanently incorporated into the project:

- *Lined or unlined pipes and fittings;*
- *Manhole covers;*
- *Municipal castings (defined in more detail below);*
- *Hydrants;*
- *Tanks:*
- *Flanges;*
- *Pipe clamps and restraints;*
- *Valves;*
- *Structural steel(defined in more detail below)*
- *Reinforced precast concrete; and*
- *Construction materials (defined in more detail below).*

(b) Permanently Incorporated into the Project [EPA guidance dated 3-20-14, Question 18]

Only items on the above list made primarily of iron or steel, permanently incorporated into the project must be produced in the US. For example, trench boxes, scaffolding or equipment, which are removed from the project site upon completion of the project, are not required to be made of U.S. Iron or Steel.

(c) Primarily Iron or Steel [EPA guidance dated 3-20-2014, Question 12]
Primarily iron or steel places constraints on the list of products above. For one of the listed products to be considered subject to the AIS requirements, it must be made of greater than 50% iron or steel, measured by cost. The cost should be based on the material costs. [See example at EPA guidance dated 3-20-2014, Question 13]

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(d) If a product is composed of more than 50% iron or steel, but is not listed in the above list of items, must the item be produced in the US? Alternatively, must the iron or steel in such a product be produced in the US? [EPA guidance dated 3-20-2014, Question 14]

The answer to both question is no. Only items on the above list must be produced in the US. Additionally, the iron or steel in a non-listed item can be sourced from outside the US.

(e) Steel [EPA guidance dated 3-20-2014, Question 15]

Steel means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements. Metallic elements such as chromium, nickel, molybdenum, manganese, and silicon may be added during the melting of steel for the purpose of enhancing properties such as corrosion resistance, hardness, or strength. The definition of steel covers carbon steel, alloy steel, stainless steel, tool steel and other specialty steels.

(f) Production in the United States [EPA guidance dated 3-20-2014, Question 16]

Production in the United States of the iron or steel products used in the project requires that all manufacturing processes[*****]*, including application of coatings, must take place in the United States, with the exception of metallurgical processes involving refinement of steel additives. All manufacturing processes includes processes such as melting, refining, forming, rolling, drawing, finishing, fabricating and coating*[******]*. Further, if a domestic iron and steel product is taken out of the US for any part of the manufacturing process, it becomes foreign source material. However, raw materials such as iron ore, limestone and iron and steel scrap are not covered by the AIS requirement, and the material(s), if any, being applied as a coating are similarly not covered. Non-iron or steel components of an iron and steel product may come from non-US sources. For example, for products such as valves and hydrants, the individual non-iron and steel components do not have to be of domestic origin.*

***** [Assembly and all other steps in the manufacturing process must take place in the US, except metallurgical processes involving refinement of steel additives [EPA guidance dated 3-20-2014, Question 23]. See the additional exception below for application of exterior coating.]

****** **External Coatings Applied Outside of the United States** [EPA guidance dated 3-16-2015, Q/A No. 6]

Any coating processes that are applied to the external surface of iron and steel components that would otherwise be AIS compliant would not disqualify the product from meeting the AIS requirements regardless of where the coating processes occur, provided that final assembly of the product occurs in the United States.

The exemption above only applies to coatings on the external surface of iron and steel components. It does not apply to coatings or linings on internal surfaces of iron and steel products, such as the lining of lined pipes. All manufacturing processes for lined pipes, including the application of pipe lining, must occur in the United States for the product to be compliant with AIS requirements.

(g) Municipal Castings [EPA guidance dated 3-20-2014, Question 19]

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Municipal castings are cast iron or steel infrastructure products that are melted and cast. They typically provide access, protection, or housing for components incorporated into utility owned drinking water, storm water, wastewater, and surface infrastructure. They are typically made of grey or ductile iron, or steel. Examples of municipal castings are:

Access Hatches;
Ballast Screen;
Benches (Iron or Steel);
Bollards;
Cast Bases;
Cast Iron Hinged Hatches, Square and Rectangular;
Cast Iron Riser Rings;
Catch Basin Inlet;
Cleanout/Monument Boxes;
Construction Covers and Frames;
Curb and Corner Guards;
Curb Openings;
Detectable Warning Plates;
Downspout Shoes (Boot, Inlet);
Drainage Grates, Frames and Curb Inlets;
Inlets;
Junction Boxes;
Lampposts;
Manhole Covers, Rings and Frames, Risers;
Meter Boxes;
Service Boxes;
Steel Hinged Hatches, Square and Rectangular;
Steel Riser Rings;
Trash receptacles;
Tree Grates;
Tree Guards;
Trench Grates; and
Valve Boxes, Covers and Risers.

(h) Structural Steel [EPA guidance dated 3-20-2014, Question 20]

Structural steel is rolled flanged shapes, having at least one dimension of their cross-section three inches or greater, which are used in the construction of bridges, buildings, ships, railroad rolling stock, and for numerous other constructional purposes. Such shapes are designated as wide-flange shapes, standard I-beams, channels, angles, tees and zees. Other shapes include H-piles, sheet piling, tie plates, cross ties, and those for other special purposes.

(i) Construction Materials [EPA guidance dated 3-20-2014, Question 21]

Construction materials are those articles, materials, or supplies made primarily of iron and steel, that are permanently incorporated into the project, not including mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered "structural steel". This includes, but is not limited to, the following products: wire rod, bar, angles, concrete reinforcing bar, wire, wire cloth, wire rope and cables, tubing, framing, joists,

trusses, fasteners (i.e., nuts and bolts), welding rods, decking, grating, railings, stairs, access ramps, fire escapes, ladders, wall panels, dome structures, roofing, ductwork, surface drains, cable hanging systems, manhole steps, fencing and fence tubing, guardrails, doors, and stationary screens.

[As noted above, ductwork is considered a "construction material" and must comply with the AIS requirements. Steel dampers, grilles and registers that are a permanently incorporated part of the ductwork are also subject to the AIS requirements.]

(j) Construction Materials (Additional Guidance) [EPA guidance dated 9-10-2014, Q/A No. 10]

The AIS requirements include a list of specifically covered products, one of which is construction materials, a broad category of potential products. For construction materials, EPA's AIS guidance includes a set of example items that it considers construction materials composed primarily of iron and steel and covered by the Act. This example list in the guidance is not an all-inclusive list of potential construction materials. However, the guidance also includes a list of items that EPA specifically does not consider construction materials, generally those of electrical or complex-mechanical nature. If a product is similar to the ones in the non-construction material list (and it is also not specifically listed by the Act), it is not a construction material. For all other items specifically included in the Act, coverage is generally self-evident.

(k) Items that are not Construction Materials [From EPA guidance dated 3-20-2014, Question 22]

Mechanical and electrical components, equipment and systems are not considered construction materials. Mechanical equipment is typically that which has motorized parts and/or is powered by a motor. Electrical equipment is typically any machine powered by electricity and includes components that are part of the electrical distribution system.

The following examples (including their appurtenances necessary for their intended use and operation) are NOT considered construction materials: pumps, motors, gear reducers, drives (including variable frequency drives (VFDs)), electric/pneumatic/manual accessories used to operate valves (such as electric valve actuators), mixers, gates (i.e., common sluice and slide gates), motorized screens (such as traveling screens), blowers/aeration equipment [+]*, compressors, meters* [++]*), sensors, controls and switches, supervisory control and data acquisition (SCADA), membrane bioreactor systems, membrane filtration systems, filters, clarifiers and clarifier mechanisms, rakes, grinders, disinfection systems, presses (including belt presses), conveyors, cranes, HVAC (excluding ductwork), water heaters, heat exchangers, generators, cabinetry and housings (such as electrical boxes/enclosures), lighting fixtures, electrical conduit, emergency life systems, metal office furniture, shelving, laboratory equipment, analytical instrumentation, and dewatering equipment.*

[+] [From EPA guidance dated 9-10-2014, Q/A No. 19 on aerators]
Aerators, similar to pumps, are mechanical equipment that do not need to meet the AIS requirements. "Blowers/aeration equipment, compressors" are listed in EPA's guidance as non-construction materials.

[++] [From EPA guidance dated 9-10-2014, Q/A No. 14 on meters]

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"Meters" includes any type of meter, including: flow meters, wholesale meters, and water meters/service connections

(l) Assembled Products [EPA guidance dated 9-10-2014, Q/A No. 11]

AIS requirements only apply to the final product as delivered to the work site and incorporated into the project. Other assemblies, such as a pumping assembly or a reverse osmosis package plant, are distinct products not listed and do not need to be made in the U.S. or composed of all U.S. parts. Therefore, for the case of a non-covered product used in a larger non-domestic assembly, the components, even if specifically listed in the Consolidated Appropriations Act, do not have to be domestically produced.

(m) Sluice and Slide Gates are not Valves, and are not Subject to AIS [EPA guidance dated 9-10-2014, Q/A No. 20]

Valves are products that are generally encased / enclosed with a body, bonnet, and stem. Examples include enclosed butterfly, ball, globe, piston, check, wedge, and gate valves. Furthermore, "gates" (meaning sluice, slide or weir gates) are listed in EPA's guidance as non-construction materials.

(n) Gate Valves are Subject to AIS [EPA guidance dated 5-30-2014, Q/A No. 4]

Valves are specifically listed in the Consolidated Appropriations Act of 2014 as an "iron and steel product" and therefore, absent a waiver, must be produced in the U.S. to be in compliance with the requirement if they are "primarily" iron and steel. Gates as referenced in the EPA March 20, 2014 guidance refer only to common sluice and slide gates, and not to gate valves.

(o) Reinforced Precast Concrete [EPA guidance dated 3-20-2014, Question 24]

While reinforced precast concrete may not be at least 50% iron or steel, in this particular case, the reinforcing bar and wire must be produced in the US and meet the same standards as for any other iron or steel product. Additionally, the casting of the concrete product must take place in the US. The cement and other raw materials used in concrete production are not required to be of domestic origin.

If the reinforced concrete is cast at the construction site, the reinforcing bar and wire are considered to be a construction material and must be produced in the US.

(p) Pre-stressed Concrete Cylinder Pipe [EPA guidance dated 9-10-2014, Q/A No. 2]

Pre-stressed concrete cylinder pipe (PCCP) or other similar concrete cylinder pipes would be comparable to pre-cast concrete which is specifically listed in the Consolidated Appropriations Act of 2014 as a product subject to the AIS requirement

(q) Valves and Actuators [From EPA Q/A guidance dated 5-30-2014, Q/A No. 2]

Valves and actuators, while often purchased and shipped together, are two unique products that are manufactured separately and typically attached together during the final step of the process. Valves are included in the definition of "iron and steel products" in the AIS requirement. Actuators,

whether manual, electric, hydraulic or pneumatic, are not listed as an "iron and steel product" under the AIS requirement of the Consolidated Appropriations Act of 2014, nor are they considered construction materials. Therefore, they do not need to be domestically produced in the U.S. in order to comply with the requirement.

(r) Electric Powered Motor Operated Valves [EPA guidance dated 5-30-2014, Q/A No. 3]

Electric powered motor operated valves are not excluded based on the valve being motorized equipment. The actuator, a motor that controls the valve, is considered a separate product, which is not listed as an "iron and steel product" under the AIS requirement of the Consolidated Appropriations Act of 2014, nor is it considered a construction material. Therefore, the actuator does not need to be domestically produced in the U.S. in order to comply with the requirement. See Q2 for further clarification.

(s) Tanks Used on Filtration Systems [EPA guidance dated 9-10-2014, Q/A No. 4]

Tanks that are specifically designed to be filters, or as parts of a filtration system, do not have to be domestically produced because these parts are no longer simply tanks, even if the filter media has not been installed and will be installed at the project site, as is customary to do for shipping purposes. These parts have only one purpose which is to be housing for filters and cannot be used in another fashion.

(t) Flanged Pipe [EPA guidance dated 9-10-2014, Q/A No. 5]

While the Consolidated Appropriations Act of 2014 does not specifically mention flanged pipe, since it does mention both pipe and flanges, both products would need to be domestically produced. Therefore, flanged pipe would also need to be domestically produced.

(u) Couplings, Expansion Joints, and other Similar Pipe Connectors [EPA guidance dated 9-10-2014, Q/A No. 6]

These products would be considered specialty fittings, due to their additional functionality, but still categorized under the larger "fitting" categorization. Fittings are defined as a material that joins pipes together or connects to a pipe (AWWA, The Drinking Water Dictionary, 2000). Therefore, these products must comply with the AIS requirements and be produced domestically.

(v) Saddles and tapping Sleeves [From EPA guidance dated 9-10-2014, Q/A No. 7]

These products are necessary for pipe repair, to tap a water main, or to install a service or house connection. Therefore, they are included under the larger "pipe restraint" category which is a specifically identified product subject to the domestic preference in the Consolidated Appropriations Act of 2014.

(w) Reused Items (i.e., existing pipe fittings, used storage tanks, reusing existing valves) [EPA guidance dated 9-10-14, Q/A No. 8]

The AIS guidance does not address reuse of items. Reuse of items that would otherwise be covered by AIS is acceptable provided that the item(s) was originally purchased prior to January 17, 2014, the reused item(s) is not substantially altered from original form/function, and any restoration work

that may be required does not include the replacement or addition of foreign iron or steel replacement parts. EPA recommends keeping a log of these reused items by including them on the assistance recipient's de minimis list, and stating therein that these items are reused products. The donation of new items (such as a manufacturer waiving cost for certain delivered items because of concerns regarding the origin of a new product) is not, however, considered reuse.

2. CERTIFICATION

The Contractor, through its subcontractors, suppliers and manufacturers shall provide to the Owner written certification that all AIS materials provided for the project comply with the AIS requirements of the SRF programs, Manufacturer certification letters must include the following:

- The name of the manufacturer;
- SRF project name and location;
- A description of the product or item being delivered;
- A statement that the product is in compliance with the American Iron and Steel requirement as mandated in EPA's SRF programs;
- The location of the manufacturing facility where the product or process took place (not its headquarters, and more specific than "USA"); and
- A signature by a manufacturer's responsible party.

EPA AIS guidance dated March 20, 2014 contains additional guidance on manufacturer certifications. A sample certification letter is included below.

3. DE MINIMIS WAIVER

EPA's April 15, 2014 Nationwide Waiver for De Minimis incidental AIS components is included below, and is available for use on this project. Contractors who wish to use this waiver must consult with the Owner when determining the items to be covered by this waiver, and shall retain and provide to the Owner relevant documentation (i.e., invoices) for those items for the Owner's project files. The Contractor shall summarize in reports to the Owner: the types and/or categories of items to which this waiver is applied; the total cost of incidental components covered by the waiver for each type or category (including copies of invoices); and the calculations by which Contractor determined the total cost of materials used in and incorporated into the project. **The Contractor shall include a complete and up-to-date De Minimis Report in each application for payment.** The Contractor shall also provide the report to the Owner upon request.

(a) Fasteners under the De Minimis Waiver [EPA guidance dated 9-10-14, Q/A No. 1]

There is no broad exemption for fasteners from the American Iron and Steel (AIS) requirements. Significant fasteners used in SRF projects are not subject to the de minimis waiver for projects and must comply with the AIS requirements. Significant fasteners include fasteners produced to industry standards (e.g., ASTM standards) and/or project specifications, special ordered or those of high value. When bulk purchase of unknown-origin fasteners that are of incidental use and small value are used on a project, they may fall under the national de minimis waiver for projects. The list of potential items could be varied, such as big-box/hardware-store-variety screws, nails, and staples. The key characteristics of the items that may qualify for the de minimis waiver would be items that are incidental to the project purpose (such as drywall screws) and not significant in value or purpose (such

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as common nails or brads). See the following: http://water.epa.gov/grants_funding/upload/Deminimis-Waiver-04-15-14.pdf.

4. INSTALLATION

All iron and steel products, as defined herein, shall be produced in the United States in accordance with the American Iron and Steel requirements of the Clean Water and Drinking Water State Revolving Fund programs. If a potentially non-compliant product is installed in the permanent work, the Contractor will be required to remove the non-domestic item from the project.

D-7.9

American Iron and Steel

American Iron and Steel Manufacturer Certification

Date _____

Manufacturer Name _____

Manufacturer Address _____

City, State Zip _____

Project Name _____

1. Complete (a) or (b) below as applicable

   (a) **Step Certification:** I, _____ (Authorized Manufacturer Representative) hereby certify that the _____(melting, bending, coating, galvanizing, cutting, etc.) process for _____(manufacturing or fabricating) the following products and/or materials shipped or provided for the subject project is in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

   Item, Products and/or Material_____
   Item, Products and/or Material_____
   Item, Products and/or Material_____

   Such process took place at the following location: _____

   (b) **Certification by the Final Manufacturer**: I, _____ (Authorized Manufacturer Representative), certify that the following products and/or materials shipped/provided to the subject project are in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

   Item, Products and/or Materials_____
   Item, Products and/or Materials_____
   Item, Products and/or Materials_____

   Such process took place at the following location(s): _____
   _____

Additionally, if any of the above compliance statements change while providing material to this project _____(Manufacturer) will immediately notify _____ (Contractor) and the _____(Owner).

_____ _____
(Signature of Authorized Manufacturer Representative) (Date)

D-7.10

American Iron and Steel

Required Subcontract and Purchase Agreement Language

The Contractor shall include in all contracts and purchase agreements for this project the following American Iron and Steel contract language:

"_____ (Subcontractor/Supplier) acknowledges to and for the benefit of the _____ (Owner) and the State of New Hampshire (State) that it understands the goods and service under this contract or purchase agreement (Agreement) are being funded with monies that are subject to statutory requirements commonly known as "American Iron and Steel;" (P.L. 113-76, Consolidated Appropriation Act, 2014, Water Resources Reform and Development Act of 2014, the Consolidated and Further Continuing Appropriations Act, 2015 and P.L. 114-113, the Consolidated Appropriations Act, 2016) 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 under this contract or Agreement. The Subcontractor/Supplier hereby represents and warrants to and for the benefit of the Owner and the State that (a) the Subcontractor/Supplier 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 Subcontractor/Supplier 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 Owner or the State."

D-7.11

American Iron and Steel

BIDDER'S AMERICAN IRON AND STEEL ACKNOWLEDGEMENT

Instructions: This acknowledgement form must be completed and signed by the Bidder's authorized representative, and conveyed to Owner with bid submittal.

Project Name: _____

City/Town/Entity: _____

Bidder Name: _____

Bidder Address: _____

With submittal of this Bid, the Bidder acknowledges to and for the benefit of the Owner and the State of New Hampshire (State) that it understands that this project is subject to the "American Iron and Steel (AIS)" requirement of P.L. 113-76, Consolidated Appropriation Act, 2014, Water Resources Reform and Development Act of 2014, the Consolidated and Further Continuing Appropriations Act, 2015, and/or P.L. 114-113, the Consolidated Appropriations Act, 2016 that requires all of the iron and steel used in the project be produced in the United States ("American Iron and Steel Requirement") including all iron and steel goods provided by the Bidder pursuant to this Bid.

The Bidder hereby presents and warrants to and for the benefit of the Owner and State that (a) the Bidder 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 Bidder will provide any further verified information, certification or assurance of compliance with this Acknowledgement, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Owner or the State

Notwithstanding any other provision of the Contract Documents, any failure to comply with this Acknowledgement by the Bidder shall permit the Owner or State to recover as damages against the Bidder any loss, expense, or cost (including without limitation attorney's fees) incurred by the Owner 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 Owner).

Additionally, The Bidder hereby acknowledges that Bidder must include in all contracts and purchase agreements for this project the following American Iron and Steel contract language:

"_____ (Subcontractor/Supplier) acknowledges to and for the benefit of the _____ (Owner) and the State of New Hampshire (State) that it understands the goods and service under this contract or purchase agreement (Agreement) are being funded with monies that are subject to statutory requirements commonly known as "American Iron and Steel;" (P.L. 113-76, Consolidated Appropriation Act, 2014, Water Resources Reform and Development Act of 2014, the Consolidated and Further Continuing Appropriations Act, 2015 and/or P.L. 114-113, the Consolidated Appropriations Act, 2016) 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 under this contract or Agreement. The Subcontractor/Supplier hereby represents and warrants to and for the benefit of the Owner and the State that (a) the Subcontractor/Supplier 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 Subcontractor/Supplier 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 Owner or the State.

_____ _____

(Signature of Certifying Bidder Representative) **(Date)**

American Iron and Steel

DE MINIMIS WAIVER

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF WATER

DECISION MEMORANDUM

SUBJECT: De Minimis Waiver of Section 436 of P.L. 113-76, Consolidated Appropriations Act (CAA), 2014

FROM: Nancy K. Stoner
Acting Assistant Administrator

The EPA is hereby granting a nationwide waiver pursuant to the "American Iron and Steel (AIS)" requirements of P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), section 436 under the authority of Section 436(b)(1) (public interest waiver) for de minimis incidental components of eligible water infrastructure projects. This action permits the use of products when they occur in de minimis incidental components of such projects funded by the Act that may otherwise be prohibited under section 436(a). Funds used for such de minimis incidental components cumulatively may comprise no more than a total of 5 percent of the total cost of the materials used in and incorporated into a project; the cost of an individual item may not exceed 1 percent of the total cost of the materials used in and incorporated into a project.

P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel" (AIS) requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use specific domestic iron and steel products that are produced in the United States if the project is funded through an assistance agreement executed beginning January 17, 2014 (enactment of the Act), through the end of Fiscal Year 2014, unless the agency determines it necessary to waive this requirement based on findings set forth in Section 436(b). The Act states, "[the requirements] shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency…finds that— (1) applying subsection (a) would be inconsistent with the public interest" 436(b)(1).

In implementing section 436 of the Act, the EPA must ensure that the section's requirements are applied consistent with congressional intent in adopting this section and in the broader context of the purposes, objectives, and other provisions applicable to projects funded under the SRF. Water infrastructure projects typically contain a relatively small number of high-cost components incorporated into the project. In bid solicitations for a project, these high-cost components are generally described in detail via project specific technical specifications. For these major components, utility owners and their contractors are generally familiar with the conditions of availability, the potential alternatives for each detailed specification, the approximate cost, and the country of manufacture of the available components.

American Iron and Steel

Every water infrastructure project also involves the use of thousands of miscellaneous, generally low-cost components that are essential for, but incidental to, the construction and are incorporated into the physical structure of the project. For many of these incidental components, the country of manufacture and the availability of alternatives is not always readily or reasonably identifiable prior to procurement in the normal course of business; for other incidental components, the country of manufacture may be known but the miscellaneous character in conjunction with the low cost, individually and (in total) as typically procured in bulk, mark them as properly incidental. Examples of incidental components could include small washers, screws, fasteners (i.e., nuts and bolts), miscellaneous wire, corner bead, ancillary tube, etc. Examples of items that are clearly not incidental include significant process fittings (i.e., tees, elbows, flanges, and brackets), distribution system fittings and valves, force main valves, pipes for sewer collection and/or water distribution, treatment and storage tanks, large structural support structures, etc.

The EPA undertook multiple inquiries to identify the approximate scope of de minimis incidental components within water infrastructure projects during the implementation of the American Reinvestment and Recovery Act (ARRA) and its requirements (Buy American provisions, specifically). The inquiries and research conducted in 2009 applies suitably for the case today. In 2009, the EPA consulted informally with many major associations representing equipment manufacturers and suppliers, construction contractors, consulting engineers, and water and wastewater utilities, and performed targeted interviews with several well-established water infrastructure contractors and firms who work in a variety of project sizes, and regional and demographic settings to ask the following questions:

- What percentage of total project costs were consumables or incidental costs?
- What percentage of materials costs were consumables or incidental costs?
- Did these percentages vary by type of project (drinking water vs. wastewater treatment plant vs. pipe)?

The responses were consistent across the variety of settings and project types, and indicated that the percentage of total costs for drinking water or wastewater infrastructure projects represented by these incidental components is generally not in excess of 5 percent of the total cost of the materials used in and incorporated into a project. In drafting this waiver, the EPA has considered the de minimis proportion of project costs generally represented by each individual type of these incidental components within the many types of such components comprising those percentages, the fact that these types of incidental components are obtained by contractors in many different ways from many different sources, and the disproportionate cost and delay that would be imposed on projects if the EPA did not issue this waiver.

Assistance recipients who wish to use this waiver should in consultation with their contractors determine the items to be covered by this waiver and must retain relevant documentation (i.e., invoices) as to those items in their project files.

American Iron and Steel

If you have any questions concerning the contents of this memorandum, please contact Timothy Connor, Chemical Engineer, Municipal Support Division, at connor.timothy@epa.gov or (202) 566-1059 or Kirsten Anderer, Environmental Engineer, Drinking Water Protection Division, at anderer.kirsten@epa.gov or (202) 564-3134.

Issued on: APR 15 2014

Approved by:

Nancy K. Stoner
Acting Assistant Administrator

American Iron and Steel

AMERICAN IRON AND STEEL DE MINIMIS TRACKING REPORT
(To be submitted with each application for payment)
NH DEPARTMENT OF ENVIRONMENTAL SERVICES
CLEAN WATER STATE REVOLVING FUND (CWSRF)
DRINKING WATER STATE REVOLVING FUND (DWSRF)

Contractors who wish to use the AIS De Minimis waiver must consult with the Owner when determining the items to be covered by this waiver, and shall retain and provide to the Owner relevant documentation (i.e., invoices) for those items. The Contractor shall summarize in reports to the Owner the types and/or categories of items to which this waiver is applied; the total cost of incidental components covered by the waiver for each type or category (including copies of invoices); and the calculations by which Contractor determined the total cost of materials used in and incorporated into the project. **The Contractor shall include a complete and up-to-date De Minimis Tracking Report in each application for payment.** The Contractor shall also provide the report to the Owner upon request.

Owner: _____ Project Name: _____

Contractor: _____ CWSRF/DWSRF Project #:_____

1. Has Contractor purchased or used AIS materials that will be covered under this waiver? ☐ yes ☐ no *(If "yes, continue to box 2. If "no", sign below in box 3.)*

NOTE: The De Minimis waiver is only applicable to the cost of materials incorporated into the project. Do not include other project costs (labor, installation costs, etc.) in the "Total Cost of Materials". The cost of a material must include delivery to the site and any applicable tax. Contractor must provide sufficient documentation to support all costs included in this calculation.

2. Total cost of materials used in and incorporated into the project: _____ De Minimis 5% Limit :_____

Have all materials been delivered? ☐ yes ☐ no

Component Description	Country of Origin (if available)	Quantity (if applicable)	Cost per Unit (if applicable)	Component's Total Cost	How is Cost Documented?*

Total Cost of De Minimis Components **:

* Documentation must demonstrate confirmation of the components' actual costs (invoice, etc.).

** If approaching the 5% limit, contact NHDES immediately

3. Contractor Signature:_____ Title:_____

Printed Name:_____ Date:_____

D-7.16

American Iron and Steel

AMERICAN IRON AND STEEL PROJECT CERTIFICATION

NEW HAMPSHIRE CLEAN WATER STATE REVOLVING FUND (CWSRF) AND
DRINKING WATER STATE REVOLVING FUND (DWSRF)

Instructions

This certification must be completed and signed by the authorized representative of the Contractor, acknowledged by the authorized representative of the Owner, and submitted to the New Hampshire Department of Environmental Services **upon substantial completion** of the project.

Project Name: _____

City/Town/Entity: _____

Contractor Name: _____

Contractor Address: _____

Name/Title of Contractor Certifying Representative: _____

I hereby certify on behalf of the above named Contractor, (Please check one of the following and provide documentation as necessary)

☐ That the "American Iron and Steel" provisions of P.L. 113-76, Consolidated Appropriation Act, 2014, Water Resources Reform and Development Act, 2014, the Consolidated and Further Continuing Appropriations Act, 2015, and/or P.L. 114-113, the Consolidated Appropriations Act, 2016 (American Iron and Steel Requirement, AIS) **have been met** and that all iron and steel used in the project named above have been produced in the United States in a manner that complies with the American Iron And Steel Requirement.

OR

☐ That the "American Iron and Steel" provisions of P.L. 113-76, Consolidated Appropriation Act, 2014, Water Resources Reform and Development Act, 2014, the Consolidated and Further Continuing Appropriations Act, 2015, and/or P.L. 114-113, the Consolidated Appropriations Act, 2016 (American Iron and Steel Requirement, AIS) **were unable to be met**. Not all of the iron and steel used in the project named above have been produced in the United States. .
Items that do not meet AIS requirements are as follows:

_____

Attach all documentation including EPA approved waivers for all iron and steel that do not meet the Iron and Steel Requirement.

Signature of Certifying Contractor Representative: _____

Date: _____

Acknowledged by Authorized Owner Representative: _____

Date: _____

D-7.17
Attachment A
NH Department of Environmental Service
Federal Labor Standards Provisions
29 CFR 5.5(a)

DWSRF Rochester Low Lift Pump Station Upgrade

Davis Bacon Wage Rates

This project is funded in whole or in part by a loan available through NHDES Drinking Water SRF program, hence is subject to federal Davis Bacon wage provisions.

All laborers and mechanics employed by contractors or subcontractors on this project shall be paid wages at rates not less than those prevailing on projects of a character similar in the locality as determined by the U.S. Department of Labor (DOL) in accordance with Subchapter IV of Chapter 31 of Title 40, United States Code. The "**Building"** General Wage Decision (GWD) for Strafford County, NH43, publication date 1/5/2018 is applicable to this project.

If the applicable wage determination does not provide a rate for a classification of work to be performed, **the contractor** must request additional classifications and wage rates to be added in conformance to the contract wage determination after contract award.

Guidance for USDOL conformance procedures is available using the following link: https://www.dol.gov/whd/recovery/pwrb/Tab7.pdf

A copy of the applicable DOL wage determination is included in Attachment B in PART D- FEDERAL PROVISIONS, RULES, REGULATIONS AND FORMS in these project documents.

Bidders shall refer to the above-referenced PART D for additional information on Davis Bacon requirements.

Attachment A
NH Department of Environmental Service
Federal Labor Standards Provisions
29 CFR 5.5(a)

(1) Minimum Wage

(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.

Wage determinations may be obtained from the U.S. Department of Labor’s web site, www.wdol.gov.

(ii)(A) The Loan recipient, 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 Loan recipient(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 Loan recipient(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 Loan Recipient (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 Loan recipient(s), shall upon written request of the Contracting 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.

Attachment A
NH Department of Environmental Service
Federal Labor Standards Provisions
29 CFR 5.5(a)

(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 Loan recipient, 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 Loan recipient 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 Loan recipient(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 Loan recipient(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:

Attachment A
NH Department of Environmental Service
Federal Labor Standards Provisions
29 CFR 5.5(a)

(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 231 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.

Attachment A
NH Department of Environmental Service
Federal Labor Standards Provisions
29 CFR 5.5(a)

(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 by 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 Loan recipient(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 Loan recipient 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.

Attachment A
NH Department of Environmental Service
Federal Labor Standards Provisions
29 CFR 5.5(a)

(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 Loan recipient**,** upon written request of the Contracting 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 Prime Contractor shall insert a clause requiring that the 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 Prime Contractor shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the subcontractor for inspection, copying, or transcription by authorized representatives of NH DES and the Department of Labor, and the subcontractor will permit such representatives to interview employees during working hours on the job.

General Decision Number: NH180043 01/05/2018 NH43
Superseded General Decision Number: NH20170043
State: New Hampshire
Construction Type: Building
County: Strafford County in New Hampshire.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).
Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.35 for calendar year 2018 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.35 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2018. The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number Publication Date
0 01/05/2018
ASBE0006-014 09/01/2017

	Rates	Fringes	
ASBESTOS WORKER/HEAT & FROST INSULATOR.....	$ 36.87	27.35	
----------			BOIL0029-005 01/01/2017
	Rates	Fringes	
BOILERMAKER.....	$ 42.42	24.92	
----------			BRNH0003-001 05/01/2017
	Rates	Fringes	
BRICKLAYER.....	$ 34.32	20.54	
----------			ELEC0490-006 06/01/2016
	Rates	Fringes	
ELECTRICIAN (Includes Low Voltage Wiring and Alarm Installation).....	$ 28.00	18.94	
----------			ELEV0004-007 01/01/2017
	Rates	Fringes	
ELEVATOR MECHANIC.....	$ 55.86	31.585	

a. PAID HOLIDAYS: New Year's Day, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day, Christmas Day and the Friday after Thanksgiving.

b. VACATION: Employer contributes 8% of basic hourly rate for 5 years or more of service; 6% of basic hourly rate for 6 months to 5 years of service as vacation pay credit.

---------- IRON0007-038
09/16/2017

	Rates	Fringes
IRONWORKER, REINFORCING.....	$ 24.79	$21.79

---------- PLUM0131-004
06/01/2017

	Rates	Fringes
PIPEFITTER.....	$ 32.00	$21.66

---------- SUNH2015-009
06/16/2017

	Rates	Fringes
CARPENTER, Includes Acoustical Ceiling Installation, Drywall Hanging, Form Work, and Metal Stud Installation.....	$ 26.14	$12.05
CEMENT MASON/CONCRETE FINISHER...	$ 22.04	$9.70
DRYWALL FINISHER/TAPER.....	$ 24.80	$0.00
GLAZIER.....	$ 26.75	$3.48
IRONWORKER, STRUCTURAL.....	$ 24.16	$12.42
LABORER: Common or General.....	$ 17.92	$12.72
LABORER: Mason Tender - Brick...	$ 16.52	$4.74
OPERATOR: Backhoe/Excavator/Trackhoe.....	$ 24.02	$4.25
OPERATOR: Crane.....	$ 27.42	$3.83
OPERATOR: Loader.....	$ 22.25	$2.13
OPERATOR: Roller.....	$ 23.56	3.28
PAINTER (Brush and Roller).....	$ 17.13	$0.00

PAINTER: Spray.....	$ 22.99	$ 3.28
PLUMBER, Includes HVAC Pipe Installation.....	$ 24.60	$9.40
ROOFER.....	$ 19.55	$0.00
SHEET METAL WORKER, Includes HVAC Duct Installation.....	$ 24.88	$5.46
SPRINKLER FITTER (Fire Sprinklers).....	$ 31.29	$9.78
WATERPROOFER.....	$ 26.69	$0.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

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 clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier. Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.
A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based. ----------

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:
* an existing published wage determination

* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

SECTION 01150A

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. For lump sum items, payment shall be made to the Contractor in accordance with an accepted Progress Schedule and Schedule of Values on the basis of actual work completed.

B. For unit-price items, payment shall be based on the actual amount of work accepted and for the actual amount of materials in place, as shown by the final measurements.

1. All units of measurement shall be standard United States convention as applied to the specific items of work by tradition and as interpreted by the Engineer.
2. At the end of each day's work, the Contractor's Superintendent or other authorized representative of the Contractor shall meet with the Resident Project Representative and determine the quantities of unit price work accomplished and/or completed during the work day.
3. The Resident Project Representative will then prepare two "Daily Progress Reports" which shall be signed by both the Resident Project Representative and Contractor's Representative.
4. Once each month the Resident Project Representative will prepare two "Monthly Progress Summation" forms from the month's accumulation of "Daily Progress Reports" which shall also be signed by both the Resident Project Representative and Contractor's Representative.
5. These completed forms will provide the basis of the Engineer's monthly quantity estimate upon which payment will be made. Items not appearing on both the Daily Progress Reports and Monthly Progress Summation will not be included for payment. Items appearing on forms not properly signed by the Contractor will not be included for payment.
6. After the work is completed and before final payment is made there for, the Engineer will make final measurements to determine the quantities of various items of work accepted as the basis for final settlement.

1.2 SCOPE OF PAYMENT

A. Payments to the Contractor will be made for the actual quantities of the Contract items performed and accepted in accordance with the Contract Documents. Upon completion of the construction, if these actual quantities show either an increase or decrease from the quantities given in the Bid Form, the Contract unit prices will still prevail.

B. The Contractor shall accept compensation, as herein provided, in full payment for furnishing all materials, labor, tools, equipment, and incidentals necessary to the completed work and for performing all work contemplated and embraced by the Contract; also for all loss or damage arising from the nature of the Work, or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the Work and until its final acceptance by the Engineer, and

for all risks of every description connected with the prosecution of the work, except as provided herein, also for all expenses incurred in consequence of the suspension of the work as herein authorized.

C. The payment of any partial estimate or of any retained percentage except by and under the approved final invoice, in no way shall affect the obligation of the Contractor to repair or renew any defective parts of the construction or to be responsible for all damage due to such defects.

1.3 PAYMENT FOR INCREASED OR DECREASED QUANTITIES

A. When alterations in the quantities of work not requiring supplemental agreements, as hereinbefore provided for, are ordered and performed, the Contractor shall accept payment in full at the Contract price for the actual quantities of work done. No allowance will be made for anticipated profits. Increased or decreased work involving supplemental agreements will be paid for as stipulated in such agreements.

1.4 OMITTED ITEMS

A. Should any items contained in the bid form be found unnecessary for the proper completion of the work contracted, the Engineer may eliminate such items from the Contract, and such action shall in no way invalidate the Contract, and no allowance will be made for items so eliminated in making final payment to the Contractor.

1.5 PARTIAL PAYMENTS

A. Partial payments shall be made monthly as the work progresses. Partial payment shall be made subject to the provisions of the Supplemental and General Conditions. Contractor's Partial Payment Requests shall be submitted in two parts; one part for EPA/DEP grant eligible quantities and one part for non-eligible quantities. The breakdown of quantities will be determined by the Engineer.

1.6 PAYMENT FOR MATERIAL DELIVERED

A. When requested by the Contractor and at the discretion of the Owner, payment may be made for all or part of the value of acceptable, non-perishable materials and equipment which are to be incorporated into bid items, have not been used, and have been delivered to the construction site or placed in storage places acceptable to the Owner. Payment shall be subject to the provisions of the General and Supplementary Conditions.

B. No payment shall be made upon fuels, supplies, lumber, false work, or other materials, or on temporary structures or other work of any kind which are not a permanent part of the Contract.

1.7 FINAL PAYMENT

A. The Engineer will make, as soon as practicable after the entire completion of the project, a final quantity invoice of the amount of the Work performed and the value of such Work. Owner shall make final payments of the sum found due less retainages subject to the provisions of the General and Supplementary Conditions.

1.8 INCIDENTAL WORK

A. Incidental work items for which separate payment is not made include (but are not

limited to) the following items:

1. Clearing, grubbing and stripping
2. Dust control
3. Dewatering
4. Clean-up
5. Erosion control
6. Loam, seeding, grading, liming, fertilization, mulching and watering
7. Pipe bedding and backfill
8. Compaction testing of backfill
9. Restoration of property, and replacement of fences, curbs, structures, sign posts, guard rails, rock wall, mail boxes, traffic loop detectors and other minor items disturbed by the construction activities
10. Coordination with the Owner, Utilities and others, including related inspection cost (refer to Section 01050)
11. Utility crossings and relocations, unless payment is otherwise made
12. Traffic control plan and regulation
13. Project Signs
14. Routine flag person services
15. Trench boxes, steel and/or wood sheeting as required, including that left in place
16. Project record documents
17. Materials testing
18. Construction schedules, bonds, insurance, shop drawings, warranties, guarantees, certifications, and other submittals required by the Contract Documents
19. Repair and replacement of water lines under two inches in size, culverts, underdrains, rock lined drainage trenches in streets and other utilities damaged by construction activities and corresponding proper disposal of removed materials unless otherwise paid for
20. Cleaning, testing and disinfection of all water lines and appurtenances
21. Maintenance of all existing sewers flows and repair of existing sewer pipes
22. Final cleaning of sewers, force mains and storm drains
23. Final testing of manholes and sewers
24. Removal and disposal of existing sewer structures and pipe as and where indicated in the Drawings
25. Temporary utilities for construction and to maintain existing service during construction
26. Temporary utility services to buildings as required to maintain service during construction
27. Quality assurance testing
28. Temporary construction and other facilities not to be permanently incorporated into the Work necessary for construction sequencing and maintenance of operations
29. Weather protection
30. Permits not otherwise paid for or provided by the Owner

31. Visits to the Project site or elsewhere by personnel or agents of the Contractor, including manufacturer's representatives, as may be required
32. On-site and other facilities acceptable to Engineer for the storage of materials, supplies and equipment to be incorporated into the Work
33. Facilities start-up services required by the Contract Documents
34. Mobilization/demobilization
35. Test pits to determine existing utility locations and elevations, soils conditions, groundwater conditions, dewatering requirements and as required to complete the project
36. Engineer's temporary field office
37. Pipe markings
38. Pavement markings
39. Removal of existing pavement
40. Earthwork (except ledge)
41. Preconstruction photos and videos
42. Construction administration and insurance

1.9 DESCRIPTION OF PAY ITEMS

A. The following sections describe the measurement of and payment for the work to be done under the respective items listed in the Bid Form.

B. Each unit or lump sum price stated in the Bid Form shall constitute full compensation, as herein specified, for each item of the work completed.

Item No. 1 - Low Lift Pump Station Improvements

A. Method of Measurement: Low lift pump station upgrades shall be on a lump sum basis.

B. Basis of Payment: Payment of the lump sum price for Item 1 shall be full compensation for furnishing all labor, materials, tools and equipment required for upgrading of the Low lift pump station and water treatment plant facilities, complete as indicated on the Drawings and as specified and all its' appurtenances in its entirety, except that work included for payment under other items.

Item No. 2 - Additional Concrete

Should modifications in the structures be ordered, and should such modifications increase from that indicated on the drawings or specified, adjustment shall be made therefore under this item.

The quantity of concrete to be considered shall be the additional quantity deposited in place or that quantity omitted in accordance with the requirements of the Engineer except that no account shall be taken of concrete specified or used for backing up fittings in pipelines.

The quantities to be considered shall be cumulative, that is, an increase on any part of the work shall offset a decrease on any other part of the work, and the final adjustment shall be based on the net increase or decrease.

If an additional quantity of concrete is ordered, the Contractor shall be paid therefor under this Item.

Item No. 3 - Additional Miscellaneous Steel and Iron Work

The quantity of additional steel and ironworks to be considered under this Item shall be the additional quantity placed in accordance with the requirements of the Engineer.

The quantity to be considered shall be cumulative, that is, an increase on any part of the work shall offset a decrease on any other part of the work, and final adjustment shall be based on the net increase or decrease.

If an additional quantity of Miscellaneous Steel and Iron Work is required, the Contractor shall be paid therefor under this Item.

Item No. 4 - Integration Services

A. Method of Measurement: PLC programming and SCADA integration shall be paid as an allowance No mark up on this work is allowed. This work shall be completed by the Rochester Water Treatment Plant Integrator, Wilson Controls.

B. Basis of Payment: Payment of the allowance for Item 4 shall be full compensation for furnishing all labor, materials, tools and equipment required to re-program I/O and add I/O to the Programmable Logic Controllers for all new / replaced equipment and configure the SCADA screens plus historical trends for the filter system and chemicals, connect cable supplied under Item No. 1 and configure settings for the SCADA computer touchscreen display and all appurtenances in their entirety for completing the SCADA HMI Integration, except that work included for payment under other items.

BID ALTERNATE

(A) Vacuum Prime System

Payment of the lump sum price for Item A shall be full compensation for furnishing all labor, materials, tools and equipment required and for replacement of the vacuum prime system, complete as indicated on the Drawings and as specified and all its' appurtenances in its entirety, except that work included for payment under other items. Replacement of the existing vacuum prime valves and piping is included in the base bid as shown on the drawings.

END OF SECTION

SECTION 02115

STRIPPING AND STOCKPILING TOPSOIL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. Segregate topsoil approved by the Engineer prior to excavation, trenching and grading operations and stockpile it for use in the work.

B. Related Work Specified Elsewhere (When Applicable):
   1. Clearing, grading, and excavation are specified in the appropriate sections in this division.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Loam shall consist of friable loam of at least two percent decayed organic matter (humus), free of subsoil, and reasonably free of clay lumps, brush, roots, weeds, and other objectionable vegetation, stones and similar objects larger than one (1) inch in any dimension, litter and other materials unsuitable or harmful to plant growth. It shall contain no toxic materials.

B. The quality of the topsoil material to be used shall be subject to approval by the Engineer.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Remove topsoil from the areas that are likely to be disturbed as a result of construction operations to a depth based on the soil profile, as approved by the Engineer.

B. Remove topsoil from all designated areas prior to the performance of normal excavation.

3.2 STORAGE

A. Transport topsoil and deposit in storage piles convenient to the areas which are subsequently to receive the application of topsoil.

B. Stockpile topsoil separate from other excavated materials in areas approved by the Engineer.

C. Take all necessary precautions to prevent other excavated material and objectionable material from becoming intermixed with the topsoil before, during and after stripping and stockpiling operations.

D. Neatly trim and grade stockpiles to provide drainage from surfaces and to prevent depressions where water may become impounded.

E. Construct temporary erosion control devices for all stockpiled material, subject to the Engineer's approval.

F. All loam stripped and stockpiled shall be immediately seeded with 70% Domestic/30% Perennial Rye Grass.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Work described by this Section consists of all earthwork encountered and necessary for construction of the project as indicated in the Contract Documents, and includes but is not limited to the following:
   1. Excavation
   2. Backfilling and Filling
   3. Compaction
   4. Grading
   5. Providing soil material as necessary
   6. Disposal of excess suitable material and unsuitable materials

B. Related Work Specified Elsewhere: (When Applicable)
   1. The use of explosives is specified in the Supplementary Conditions section of this Contract, and in Division 1.
   2. Clearing and Grubbing, Dewatering, Temporary Erosion Control, Stripping and Stockpiling of Topsoil, are specified in the appropriate sections of this Division.
   3. Section 01400 - Quality Control.
   4. Pipe, fittings and valves are specified in Division 15 or 2.

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
   1. All work shall be performed and completed in accordance with all local, state and federal regulations.
   2. The General Contractor shall secure all other necessary permits unless otherwise indicated from, and furnish proof of acceptance by, the municipal and state departments having jurisdiction and shall pay for all such permits, except as specifically stated elsewhere in the Contract Documents.

B. Line and Grade:
   1. The Contractor shall establish the lines and grades in conformity with the Drawings and maintain same to properly perform the work.

C. Testing Methods:
   1. Gradation Analysis: Where a gradation is specified the testing shall be in accordance with ASTM C-117-90 and ASTM C-136-93 (or latest revision).
   2. Compaction Control:
      a. Unless otherwise indicated, wherever a percentage of compaction for backfill is indicated or specified, it shall be the in-place density divided by the maximum density and multiplied by 100. The maximum density shall be the density at optimum moisture as determined by ASTM Standard Methods of Test for Moisture-Density Relations of Soil Using

10-lb. Hammer and 18-in. Drop, Designation D-1557-91 (Modified Proctor), or latest revision, unless otherwise indicated.

b. The in-place density shall be determined in accordance with ASTM Standard Method of Test for Density of Soil in Place by the Sand Cone method, Designation D 1556-90, (or latest revision) or Nuclear method Designation D2922.

c. Wherever specifically indicated, maximum density at optimum moisture may be determined by ASTM Standard Methods of Test for Moisture Density Relations of Soils, ASTM D-698-91 (Standard Proctor).

d. An Independent Testing Laboratory will be retained by the Owner to conduct all laboratory and field soil sampling and testing, and to observe earth work and foundation construction activities. Laboratory testing will consist of sieve analyses, natural water content determinations, and compaction tests. Field testing will consist of in-place field density tests and determination of water contents.

1.3 SUBMITTALS

A. Collection of samples and testing of all materials for submittals shall be performed by the Independent Testing Laboratory and paid for by the Contractor until the materials are approved by the Owner or Engineer.

B. Submit test results in accordance with the procedure specified in the General and Supplementary Conditions.

C. Submit test results (including gradation analysis) and source location for all borrow material to be used at least 10 working days prior to its use on the site. Contractor shall identify and provide access to borrow sites.

D. Submit moisture density curve for each type of soil (on site or borrow material) to be used for embankment construction or fill beneath structures or pavement.

1.4 TESTS

The Independent Testing Laboratory shall conform to the following procedures and standards:

A. Submit test results in accordance with the procedure specified in the General and Supplementary Conditions.

B. All testing shall be performed by a qualified Independent Testing Laboratory acceptable to the Engineer and Contractor at the Owner's expense unless otherwise indicated (see Section 01400 - Quality Control).

C. Field density tests on embankment materials shall be as follows:

D. Tests shall be taken on every 200 cubic yards of embankment material.

E. Paved Areas and Building Slab Subgrade: Make at least one field density test of subgrade for every 2,000 sq. ft. of paved area or building slab, but in no case less than 3 tests. In each compacted fill layer, make one field density test for every 2,000 sq. ft. of overlaying building slab or paved area, but in no case less than 3 tests.

F. Trenches: Field density test in trenches shall be taken at 75 linear foot intervals on every third lift.

G. Foundation Wall Backfill: Take at least one (1) field density tests per lift per wall at locations and elevations as designated by the Engineer.

H. In addition to the above tests the Independent Testing Laboratory will perform

additional density tests at locations and times requested by the Engineer.

I. Additional density testing will be required by the Engineer if the Engineer is not satisfied with the apparent results of the Contractor's compaction operation.
   1. If the test results fail to meet the requirements of these specifications, the Contractor shall undertake whatever action is necessary, at no additional cost to the Owner, to obtain the required compaction. The cost of retesting will be paid by Owner. The cost of retesting will be determined by Engineer and Owner will invoice Contractor for this cost. If unpaid after 60 days, the invoice amount for retesting will be deducted from the Contract Price. No allowance will be considered for delays in the performance of the work.
   2. If the test results pass and meet the requirements of these Specifications, the cost of the testing service will be borne by the Owner, but no allowance will be considered for delays in the performance of the work.

1.5 JOB CONDITIONS

A. Site Information:
   1. Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that Owner and Engineer will not be responsible for interpretations or conclusions drawn there from by the Contractor. Data are made available for the convenience of Contractor.
   2. Additional test borings and other exploratory operations may be made by Contractor at no additional cost to Owner.

B. Existing Utilities and Structures:
   1. The locations of utilities and structures shown on the Drawings are approximate as determined from physical evidence on or above the surface of the ground and from information supplied by the utilities. The Engineer in no way warranties that these locations are correct. It shall be the responsibility of the Contractor to determine the actual locations of any utilities or structures within the project area.

PART 2 - PRODUCTS

2.1 SOIL MATERIAL

A. Aggregate Base: Shall be screened or crushed gravel of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. Type B Aggregate for base shall not contain particles of rock that will not pass the 4 inch square mesh sieve. The gradation of the part that passes a 3-inch sieve shall meet the following grading requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieves Type B Aggregate
1/2 inch	35-75
1/4 inch	25-60
No. 40	0-25
No. 200	0-5

B. Aggregate Leveling Course and Untreated Surface Course: Shall be screened or crushed gravel consisting of hard durable particles which are free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation of the material shall meet the grading requirements of the following table:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
1 inch	95-100
3/4 inch	90-100
No. 4	40-65
No. 10	10-45
No. 200	0-7

C. Blanket Drain Material: Shall be gravel of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. Blanket drain material shall not contain particles of rock which will not pass the 2-inch square mesh. The gradation of the part that passes a 2-inch sieve shall meet the following grading requirements:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
2 inch	100
1/4 inch	25-70
No. 40	0-30
No. 200	0-5

The blanket drain material shall have a permeability of 5x10-3 cm/sec. or faster. Permeability supersedes gradation requirements.

D. Common Borrow: Shall consist of approved material required for the construction of the work where designated. Common borrow shall be free from frozen material, perishable rubbish, peat, organic, and other unsuitable material.

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
6-inch	100
No. 200	0-5

Common borrow may be used for embankments unless otherwise indicated and provided that the material is at a moisture content suitable for compaction to the specified density. No rocks shall exceed 3/4 of the depth of the specified lift thickness.

E. Crushed Stone: Shall be a uniform material consisting of clean, hard, and durable particles or fragments, free from vegetable or other objectionable matter, containing angular pieces, as are those which come from a mechanical crusher. Gradation requirements shall be as follows:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
1-1/2 inch	100
1 inch	95-100
1/2 inch	25-60
No. 4	0-10

F. Screened Stone: Shall be a well graded stone consisting of clean, hard, and durable particles or fragments, free from vegetable or other objectionable matter, meeting the following gradation requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
1 inch	100
3/4 inch	90-100
3/8 inch	20-55
No. 4	0-10
No. 8	0-5

G. Select Fill (Structural Fill): Shall consist of well graded granular material free of

organic material, loam, wood, trash, snow, ice, frozen soil and other objectionable material and having no rocks with a maximum dimension of over 4 inches and meeting the following gradation requirements, except where it is used for pipe bedding in which case the maximum size shall be 2 inches.

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
4 inch	100
3 inch	90-100
¼ inch	25-90
No. 40	0-30
No. 200	0-5

H. Sand: Shall be well graded durable material free of organic matter and conform to the following gradation requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
3/8 inch	100
No. 4	95-100
No. 16	50-85
No. 50	10-30
No.100	2-10
No.200	0-5

Sand conforming to the requirement for fine aggregate in ASTM Standard Specifications for Concrete Aggregate, Designation C-33, will meet the above requirement.

I. Till Liner (Glacial Till): Shall consist of approved material required for the construction of the aerated lagoon's secondary liner where designated. The till liner material shall be free from frozen material, peat, trash, ice, organic and other objectionable material.

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
6 inch	100
No. 200	20-50

The till liner material shall have a permeability of 1 x 10-5 cm/sec. or slower. Permeability supersedes gradation requirements.

2.2 CONCRETE

A. If concrete is required for excess excavation, provide 3,000 psi concrete complying with requirements of Section 03300.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions under which excavating, backfilling, filling, compaction and grading are to be performed and notify the Engineer in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 EXCAVATION

A. General:
   1. Excavation consists of removal and disposal of all material encountered when establishing line and grade elevations required for execution of the work.
   2. The Contractor shall make excavations in such manner and to such widths as will give suitable room for building the structures or laying and jointing the piping; shall furnish and place all sheeting, bracing, and supports; shall do all cofferdamming, pumping, and draining; and shall render the bottom of the excavations firm, dry and acceptable in all respects.
   3. All excavation shall be classified as either earth or ledge.
      a. Earth Excavation shall consist of the removal, hauling and disposal of all earth materials encountered during excavation including but not limited to native soil or fill, pavement (bituminous or concrete), existing sewers and manholes, ashes, loam, clay, swamp muck, debris, soft or disintegrated rock or hard pan which can be removed with a backhoe, or a combination of such materials, and boulders that do not meet the definition of "Ledge" below.
      b. Ledge Excavation: Shall consist of the removal, hauling, and disposal of all ledge or rock encountered during excavation. "Ledge" and "rock" shall be defined as any natural compound, natural mixture that in the opinion of the Engineer can be removed from its existing position and state only by drilling and blasting, wedging, sledging, boring or breaking up with power operated tools. No boulder, ledge, slab, or other single piece of excavated material less than two cubic yards in total volume shall be considered to be rock unless, in the opinion of the Engineer it must be removed from its existing position by one of the methods mentioned above.
   4. The Contractor shall not have any right of property in any materials taken from any excavation. Do not remove any such materials from the construction site without the approval of the Engineer. This provision shall in no way relieve the Contractor of his obligations to remove and dispose of any material determined by the Engineer to be unsuitable for backfilling. The Contractor shall dispose of unsuitable and excess material in accordance with the applicable sections of the Contract Documents.

B. Additional Excavation: When excavation has reached required subgrade elevations, notify the Engineer and Resident Project Representative who will observe the conditions.
   1. If material unsuitable for the structure or paved area or pipeline (in the opinion of the Engineer) is found at or below the grade to which excavation would normally be carried in accordance with the Drawings and/or Specifications, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted select fill, screened stone, crushed stone, or concrete as directed by the Engineer.
   2. All excavated materials designated by the Engineer as unsuitable shall become the property of the Contractor and disposed of at locations in accordance with all State and local laws and the provisions of the Contract Documents.

C. Unauthorized Excavation: Shall consist of removal of materials beyond indicated subgrade elevations or dimensions without specific authorization of Engineer. Unauthorized excavation, as well as remedial work required by the Engineer shall be at the Contractor's expense. Remedial work required is as follows:
   1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation with select fill or screened stone compacted to 95%. Provide 12" minimum select fill or screened stone directly under footings. Concrete fill may be used to bring elevations to proper position, when acceptable to Engineer.
   2. If the bottom of a trench is excavated beyond the limits indicated, backfill the resulting void with thoroughly compacted screened stone, unless otherwise indicated.
   3. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Engineer.

D. Structural Excavation:
   1. Shall consist of the removal, hauling, disposal, of all material encountered in the excavation to permit proper installation of structures.
   2. Excavations for structures shall be carried to the lines and subgrades shown on the Drawings.
   3. Excavate areas large enough to provide suitable room for building the structures.
   4. The extent of open excavation shall be controlled by prevailing conditions subject to any limits designated by the Engineer.
   5. Provide, install, and maintain sheeting and bracing as necessary to support the sides of the excavation and to prevent any movement of earth which could diminish the width of the excavation or otherwise injure the work, adjacent structures, or persons and property in accordance with all state and OSHA safety standards.
   6. Erect suitable fences around structure excavation and other dangerous locations created by the work, at no additional cost to the Owner.
   7. Exposed subgrade surfaces shall remain undisturbed, protected, and maintained as uniform, plane areas and shape to receive the foundation components of the structure.

a. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10', and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.
b. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade and trim bottoms to required lines and grades to leave solid base to receive the structure.
c. If a structure is to be constructed within the embankment, the fill shall first be brought to a minimum of 3 feet above the base of the footing. A suitable excavation shall then be made as though the fill were undisturbed earth.

E. Trench Excavation: Shall consist of removal, hauling and disposal of all material encountered in the excavation to the widths and depths shown on the Drawings to permit proper installation of underground utilities.
1. Excavate trenches to the uniform width shown on the Drawings sufficiently wide to provide sufficient space for installation, backfilling, and compaction. Every effort should be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed and consolidated.
2. Trenches shall be excavated with approximately vertical sides between the elevation of the center of the pipe and an elevation one foot above the top of the pipe.
3. Grade bottoms of trenches as indicated for pipe and bedding to establish the indicated slopes and invert elevations, notching under pipe joints to provide solid bearing for the entire body of the pipe, where applicable.
4. If pipe is to be laid in embankments or other recently filled material, the material shall first be placed to the top of the fill or to a height of at least two feet above the top of the pipe, whichever is the lesser. Particular care shall be taken to ensure maximum consolidation of material under the pipe location. The pipe trench shall be excavated as though in undisturbed material.
5. Unless otherwise specifically directed or permitted by the Engineer, begin excavation at the low end of sewer and storm lines and proceed upgrade.
6. Perform excavation for force mains and water mains in a logical sequence.
7. The extent of open excavation shall be controlled by prevailing conditions subject to any limits prescribed by the Engineer.
8. As the excavation progresses, install such shoring and bracing necessary to prevent caving and sliding and to meet the requirements of the state and OSHA safety standards, as outlined in the appropriate section of this Specification.

F. Protection of Persons, Property and Utilities:
1. Barricade open excavations occurring as part of this work and post with warning lights in compliance with local and State regulations.
2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations. Exercise extreme caution and utilize sheeting, bracing, and whatever other precautionary measures that may be required.

3. Rules and regulations governing the respective utilities shall be observed in execution of all work. Active utilities and structures shall be adequately protected from damage, and removed or relocated only as indicated or specified. Inactive and abandoned utilities encountered in excavation and grading operations shall be removed, plugged or capped only with written authorization of the utility owner. Report in writing to the Engineer, the locations of such abandoned utilities. Extreme care shall be taken when performing work in the vicinity of existing utility lines, utilizing hand excavation in such areas, as far as practicable.
4. Repair, or have repaired, all damage to existing utilities, structures, lawns, other public and private property which results from construction operations, at no additional expense to the Owner, to the complete satisfaction of the Engineer, the utility, the property owner, and the Owner.

G. Use of Explosives:
1. Do not bring explosives onto site or use in work without prior written permission from authorities having jurisdiction. Contractor is solely responsible for handling, storage, and use of explosive materials when their use is permitted.
2. All blasting shall be performed in accordance with all pertinent provisions of the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc.

H. Stability of Excavations:
1. Slope sides of excavations to comply with all codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
2. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

I. Shoring and Bracing:
1. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross-braces, in good serviceable condition.
2. Provide trench shoring and bracing to comply with local codes and authorities having jurisdiction. Refer to Specification Section 02156.
3. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Install shoring and bracing as excavation progresses.

J. Material Storage:
1. Stockpile excavated materials which are satisfactory for use on the work until required for backfill or fill. Place, grade and shape stockpiles for proper drainage and protect with temporary seeding or other acceptable methods to control erosion.
2. Locate and retain soil materials away from edge of excavations.
3. Dispose of excess soil material and waste materials as herein specified.

K. Cold Weather Protection:
1. Protect excavation bottoms against freezing when atmospheric temperature is less than 35*F.
2. No frozen material shall be used as backfill or fill and no backfill shall be placed on frozen material.

L. Separation of Surface Material:
1. The Contractor shall remove only as much of any existing pavement as is necessary for the prosecution of the work.
2. Prior to excavation, existing pavement shall be cut where in the opinion of the Engineer it is necessary to prevent damage to the remaining road surface.
3. Where pavement is removed in large pieces, it shall be disposed of before proceeding with the excavation.
4. From areas within which excavations are to be made, loam and topsoil shall be carefully removed and separately stored to be used again as directed; or, if the Contractor prefers not to separate surface materials, he shall furnish, as directed, loam and topsoil at least equal in quantity and quality to that excavated.

3.3 BACKFILL AND FILL

A. General:
1. Backfilling shall consist of replacing material removed to permit installation of structures or utilities, as indicated in the Contract Documents.
2. Filling shall consist of placing material in areas to bring them up to grades indicated on the Drawings.
3. The Contractor shall provide and place all necessary backfill and fill material, in layers to the required grade elevations.
4. Backfill excavations as promptly as work permits, but not until completion of the following:
   a. Acceptance by Engineer of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
   b. Inspection, approval, and recording locations of underground utilities.
   c. Removal of concrete formwork.
   d. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Temporary sheet piling driven below bottom of structures shall be removed in manner to prevent settlement of the structure or utilities, or cut off and left in place if required.
   e. Removal of trash and debris.
   f. Permanent or temporary horizontal bracing is in place on horizontally supported walls.
   g. Density testing having results meeting requirements specified herein.
5. In general, and unless otherwise indicated, material used for backfill of trenches and excavations around structures shall be suitable excavated material which was removed in the course of making the construction excavation. Unless otherwise specified or allowed by the Engineer the backfill and fill shall be placed in layers not to exceed 8 inches in thickness.
6. All fill and backfill under structures and pavement, and adjacent to structures, shall be compacted crushed stone or select fill as specified or as indicated on the Drawings. The fill and backfill materials shall be placed in layers not exceeding 8 inches in thickness.
7. All structures (including manholes) shall be placed on a 6-inch mat of screened stone unless otherwise indicated.
8. Suitable excavated material shall meet the following requirements:
   a. Free from large clods, silt lumps or balls of clay.

b. Free from stones and rock fragments with larger than 12 inch max. dimension.
c. Free from organics, peat, etc.
d. Free from frozen material.

9. If sufficient suitable excavated material is not available from the excavations, and where indicated on the Drawings, the backfill material shall be select fill or common borrow, unless otherwise indicated, as required and as directed by the Engineer.
10. Do not backfill with, or on, frozen materials.
11. Remove, or otherwise treat as necessary, previously placed material that has frozen prior to placing backfill.
12. Do not mechanically or hand compact material that is, in the opinion of the Engineer, too wet.
13. Do not continue backfilling until the previously placed and new materials have dried sufficiently to permit proper compaction.
14. The nature of the backfill materials will govern the methods best suited for their placement and compaction. Compaction methods and required percent compaction is covered in Compaction section.
15. Before compaction, moisten or aerate each layer as necessary to provide a water content necessary to meet the required percentage of maximum dry density for each area classification specified.
16. Do not allow large masses of backfill material to be dropped into the excavation in such a manner that may damage pipes and structures.
17. Place material in a manner that will prevent stones and lumps from becoming nested.
18. Completely fill all voids between stones with fine material.
19. Do not place backfill on or against new concrete until it has attained sufficient strength to support loads without distortion, cracking, and other damage.
20. Deposit backfill and fill material evenly on all sides of structures to avoid unequal soil pressures.
21. Keep stones or rock fragments with a dimension greater than two inches at least one foot away from the pipe or structure during backfilling.
22. Leave sheeting in place when damage is likely to result from its withdrawal.
23. Completely fill voids left by the removal of sheeting with screened stone which is compacted thoroughly.

B. Pipe Bedding, Initial Backfill and Trench Backfill

1. Place bedding and backfill in layers of uniform thickness specified herein, and as shown on the Drawings.
2. Thoroughly compact each layer by means of a suitable vibrator or mechanical tamper.
3. Install pipe bedding and initial backfill in layers of uniform thickness not greater than eight (8) inches.
4. Deposit the remainder of the backfill in uniform layers not greater than eight inches.
5. Provide underground utility marking tape for new utility trenches as shown on the Drawings. Refer to Section 02650 – Buried Utility Markings.

6. Where soft silt and clay soils are encountered the trench shall be excavated six inches below the normal bedding and backfilled with 6-inches of compacted sand.
7. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and which are carried below the bottom of such footings, or which pass under wall footings. Place concrete to the level of the bottom of adjacent footings.
8. The following schedule lists the bedding materials for various types of pipe. Refer to the pipe trench detail for dimensional requirements.

BEDDING REQUIREMENTS

DI or Concrete Pipe	screened stone or select fill.
PVC or PE Pipe	screened stone.

9. The following schedule lists the initial backfill requirements for various types of pipes. Refer to the pipe trench detail for dimensional requirements.

INITIAL BACKFILL REQUIREMENTS

DI or Concrete, Pipe	Screened stone or select fill
PVC or PE Pipe	Screened stone

10. Special bedding and backfill requirements shown on the Drawings supersede requirements of this section.
11. Where pipes or structures pass through or under the impervious core of the lagoon embankments, bedding and backfill material shall consist of the impervious embankment material. Extra care should be given to properly and thoroughly compact the bedding material around the pipe.

C. Improper Backfill:
1. When excavation and trenches have been improperly backfilled, and when settlement occurs, reopen the excavation to the depth required, as directed by the Engineer.
2. Refill and compact the excavation or trench with suitable material and restore the surface to the required grade and condition.
3. Excavation, backfilling, and compacting work performed to correct improper backfilling shall be performed at no additional cost to the Owner.

D. Ground Surface Preparation:
1. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, scarify or break-up sloped surface steeper than 1 vertical to 4 horizontal.

2. When existing ground surface has a density less than that specified under "compaction" for the particular area classification, break up the ground surface, pulverize, moisture-condition to the optimum moisture content, and compact to required depth and percentage of maximum density.

3.4 COMPACTION

A. General:
   1. Control soil compaction during construction to provide not less than the minimum percentage of density specified for each area classification.

B. Percentage of Maximum Density Requirements:
   1. Compact soil to not less than the following percentages of maximum dry density determined in accordance with ASTM D1557 as indicated.
      a. Structures: Compact each layer of backfill or fill material below or adjacent to structures to at least 95% of maximum dry density (ASTM D1557).
      b. Off Traveled Way Areas: Compact each layer of backfill or fill material to at least 90% of maximum dry density (ASTM D1557).
      c. Walkways: Compact each layer of backfill or fill material to at least 93% of maximum dry density (ASTM D1557).
      d. Roadways, Drives and Paved Areas: Compact each layer of fill, subbase material, and base material to at least 95% of maximum dry density (ASTM D1557).
      e. Pipes: Compact bedding material and each layer of backfill to at least 90% maximum dry density (ASTM D1557). Where backfilling with excavated material, compact to native field density.
      f. Embankments: Compact each layer of embankment material to at least 95% of maximum dry density (ASTM D1557).

C. Moisture Control:
   1. Where subgrade or a layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, in quantities controlled to prevent free water appearing on surface during or subsequent to compaction operations.
   2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
   3. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory level.

D. Embankment Compaction:
   1. After each embankment layer has been spread to the required maximum 8-inch thickness and its moisture content has been adjusted as necessary, it shall be rolled with a sufficient number of passes to obtain the required compaction. One pass is defined as the required number of successive trips which by means of sufficient overlap will insure complete coverage and uniform compaction of an entire lift. Additional passes shall not be made until the previous pass has been completed.

2. When any section of an embankment sinks or weaves excessively under the roller or under hauling units and other equipment, it will be evident that the required degree of compaction is not being obtained and that a reduction in the moisture content is required. If at any place or time such sinking and weaving produces surface cracks which, in the judgment of the Engineer are of such character, amount, or extent to indicate an unfavorable condition, he will recommend operations on that part of the embankment to be suspended until such time as it shall have become sufficiently stabilized. The ideal condition of the embankment is that attained when the entire embankment below the surface being rolled is so firm and hard as to show only the slightest weaving and deflection as the roller passes.
3. If the moisture content is insufficient to obtain the required compaction, the rolling shall not proceed except with the written approval of the Engineer, and in that event, additional rolling shall be done to obtain the required compaction. If the moisture content is greater than the limit specified, the material of such water content may be removed and stockpiled for later use or the rolling shall be delayed until such time as the material has dried sufficiently so that the moisture content is within the specified limits. No adjustment in price will be made on account of any operation of the Contractor in removing and stockpiling, or in drying the materials or on account of delays occasioned thereby.
4. If because of insufficient overlap, too much or too little water, or other cause attributable to defective work, the compaction obtained over any area is less than that required, the condition shall be remedied, and if additional rollings are ordered, they will be done at no cost to the Owner. If the material itself is unsatisfactory or if additional rolling or other means fails to produce satisfactory results, the area in question shall be removed down to material of satisfactory density and the removal, replacement, and re-rolling shall be done by the Contractor, without additional compensation.
5. Material compaction by hand¬-operated equipment or power-driven tampers shall be spread in layers not more than 6 inches thick. The degree of compaction obtained by these tamping operations shall be equal in every respect to that secured by the rolling operation.

E. Compaction Methods: The Contractor may select any method of compaction that is suitable to compact the material to the required density.
1. General: Whatever method of compacting backfill is used, care shall be taken that stones and lumps shall not become nested and that all voids between stones shall be completely filled with fine material. All voids left by the removal of sheeting shall be completely backfilled with suitable materials and thoroughly compacted.
2. Tamping or Rolling: If the material is to be compacted by tamping or rolling, the material shall be deposited and spread in uniform, parallel layers not exceeding the uncompacted thicknesses specified. Before the next layer is placed, each layer shall be tamped as required so as to obtain a thoroughly compacted mass. Care shall be taken that the material close to the excavation side slopes, as well as in all other portions of the fill area, is thoroughly

compacted. When the excavation width and the depth to which backfill has been placed are sufficient to make it feasible, and it can be done effectively and without damage to the pipe or structure, backfill may, on approval, be compacted by the use of suitable rollers, tractors, or similar powered equipment instead of by tamping. For compaction by tamping or rolling, the rate at which backfilling material is deposited shall not exceed that permitted by the facilities for its spreading, leveling, and compacting as furnished by the Contractor.

F. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

3.5 GRADING:

A. General:
   1. Grading shall consist of that work necessary to bring all areas to the final grades.
   2. Uniformly grade areas within limits of work requiring grading, including adjacent transition areas.
   3. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

B. Grading Outside Building Lines:
   1. Grade areas adjacent to building to drain away from structures and to prevent ponding.
   2. Grade surfaces to be free from irregular surface changes, and as follows:
      a. Lawn or Unpaved Areas: Finish grade areas to receive topsoil to within not more than 1" above or below the required subgrade elevations.
      b. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 1/2" above or below the required subgrade elevation.
      c. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 3/8" above or below the required subgrade elevation.

C. Grading Surface of Fill Under Building Slabs:
   1. Grade surface to be smooth and even, free of voids, and compacted as specified, to the required elevation.
   2. Provide final grades within a tolerance of 1/2" when tested with a 10' straight edge.

D. Compaction:
   1. After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.

E. Protection of Graded Areas:
   1. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
   2. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

3.6 BASE COURSE AND LEVELING COURSE

A. General:
   1. Base course consists of placing the specified materials in layers to support a leveling course or paved surface, as indicated in the Drawings.

B. Grade Control:
   1. During construction, maintain lines and grades including crown and cross-slope of base course and leveling course.

C. Placing:
   1. Place base course on prepared subbase conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting base materials.
   2. Place leveling course on prepared base course, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compaction.

D. Shaping and Compacting:
   1. All layers of aggregate base course and leveling course shall be compacted to the required density immediately after placing. As soon as the compaction of any layer has been completed, the next layer shall be placed.
   2. The Contractor shall bear full responsibility for and make all necessary repairs to the base leveling courses and the subgrade until the full depth of the base leveling courses is placed and compacted. Repairs shall be made at no additional cost to the Owner.
   3. If the top of any layer of the aggregate base or leveling course becomes contaminated by degradation of the aggregate or addition of foreign materials, the contaminated material shall be removed and replaced with the specified material at the Contractor's expense.

END OF SECTION

SECTION 02270

TEMPORARY EROSION CONTROL (NEW HAMPSHIRE)

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. The work under this section shall include provision of all labor, equipment, materials and maintenance of temporary erosion control devices as specified herein, and as directed by the Engineer.
   2. Erosion control measures shall be provided as necessary to correct conditions that develop prior to the completion of permanent erosion control devices or as required to control erosion that occurs during normal construction operations.
   3. Construction operations shall comply with all federal, state and local regulations pertaining to erosion control.
   4. After awarded the Contract, prior to commencement of construction activities, meet with the Engineer to discuss erosion control requirements and develop a mutual understanding relative to details of erosion control.

B. Related Work Specified Elsewhere:
   1. Site work is specified in appropriate sections of this Division.

C. Design Criteria:
   1. Conduct all construction in a manner and sequence that causes the least practical disturbance of the physical environment.
   2. Stabilize disturbed earth surfaces in the shortest time and employ such temporary erosion control devices as may be necessary until such time as adequate soil stabilization has been achieved.

1.2 SUBMITTALS

A. The Contractor shall furnish the Engineer, in writing, his work plan giving proposed locations for storage of topsoil and excavated material before beginning construction. A schedule of work shall accompany the work plan. Acceptance of this plan will not relieve the Contractor of the responsibility of completion of the work as specified.

1.3 QUALITY ASSURANCE

A. All materials and methods of erosion control shall meet the guidelines established by the "Stormwater Management and Erosion and Sediment Control handbook for Urban and Developing Areas in New Hampshire" prepared by the New Hampshire Natural Resources Conservation Commission.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Baled Hay:
   1. At least 14" by 18" by 30" securely tied to form a firm bale, staked as necessary to hold the bale in place.

B. Sand Bags:
   1. Heavy cloth bags of approximately one cubic foot capacity filled with sand or gravel.

C. Mulches:
   1. Loose hay, straw, peat moss, wood chips, bark mulch, crushed stone, wood excelsior, or wood fiber cellulose.
   2. Type and use shall be as specified in "Stormwater Management and Erosion and Sediment Control Handbook for Urban and Developing Areas in New Hampshire" prepared by the NHDES, RECD, and the USDA Soil Conservation Service, herein after referred to as the NHSCH.

D. Mats and Nettings:
   1. Twisted Craft paper, yarn, jute, excelsior wood fiber mats, glass fiber and plastic film.
   2. Type and use shall be as specified in the NHSCH.

E. Permanent Seed:
   1. Conservation mix appropriate to the predominant soil conditions as specified in the NHSCH and subject to approval by the Engineer.

F. Temporary Seeding:
   1. Use species appropriate for soil conditions and season as specified in the NHSCH and subject to approval by the Engineer.

G. Water:
   1. The Contractor shall provide water and equipment to control dust, as directed by the Engineer.

H. Silt Fence:
   1. Silt Fence shall be one of the commercially available brands, meeting the following requirements:

Geotextile Mechanical Property	Test Method	Minimum Permissible Value
Grab Tensile Strength (both directions)	ASTM D-4632	124 pounds
Puncture Strength	ASTM D-4833	60 pounds
Apparent Opening Size	ASTM D-4751	#30
Flow Rate	ASTM D-4491	8 gal/min/ft^2

2.2 CONSTRUCTION REQUIREMENTS

A. Temporary Erosion Checks:
   1. Temporary erosion checks shall be constructed in ditches and other locations as necessary.
   2. Baled hay, sand bags or siltation fence may be used in an arrangement to fit local conditions.

B. Temporary Berms:
   1. Temporary barriers shall be constructed along the toe of embankments when necessary to prevent erosion and sedimentation.

C. Temporary Seeding:
   1. Areas to remain exposed for a time exceeding 3 weeks shall receive temporary seeding as indicated below:

Season	Seed	Rate
Summer (5/15 - 8/15)	Sudangrass	40 lbs/acre
Late Summer/Early Fall	Oats	80 lbs/acre
(8/15 - 9/15)	Annual Ryegrass	40 lbs/acre
Fall (9/15 - 10/1)	Winter Rye	112 lbs/acre
Winter (10/1 - 4/1)	Mulch w/Dormant Seed	80 lbs/acre*
Spring (4/1 - 7/1)	Oats	80 lbs/acre
	Annual Ryegrass	40 lbs/acre

* seed rate only

D. Silt Fence shall be supported by posts and installed per the manufacturer's recommendations.

E. Mulch All Areas Receiving Seeding:
   Use either wood cellulose fiber mulch (750 lbs/acre); or straw mulch with chemical tack (as per manufacturers specifications). Wetting for small areas may be permitted. Biodegradable netting is recommended in areas to be exposed to drainage flow.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Temporary Erosion Checks:
   1. Temporary erosion checks shall be constructed in ditches and at other locations designated by the Engineer. The Engineer may modify the Contractor's arrangement of silt fences, bales and bags to fit local conditions.
   2. Baled hay, silt fences, or sandbags, or some combination, may be used in other areas as necessary to inhibit soil erosion.
   3. Siltation fence shall be located and installed as shown on plans or as required to comply with all Federal, State and Local Regulations.

B. Maintenance:
   1. Erosion control features shall be installed prior to excavation wherever appropriate. Temporary erosion control features shall remain in place and shall be maintained until a satisfactory growth of grass is established. The Contractor shall be responsible for maintaining erosion control features throughout the life of the construction contract. Maintenance will include periodic inspections by the Owner or Engineer for effectiveness of location, installation and condition with corrective action taken by the Contractor as appropriate.

C. Removing and Disposing of Materials:
   1. When no longer needed, material and devices for temporary erosion control shall be removed and disposed of as approved by the Engineer.
   2. When removed, such devices may be reused in other locations provided they are in good condition and suitable to perform the erosion control for which they are intended.
   3. When dispersed over adjacent areas, the material shall be scattered to the extent that it causes no unsightly conditions nor creates future maintenance problems.

END OF SECTION

SECTION 02485

LOAMING & SEEDING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, place, and test topsoil, seed, lime, and fertilizer where shown on the drawings and protect and maintain seeded areas disturbed by construction work, as directed by the Engineer.

B. Related Work Specified Elsewhere (When Applicable): Earthwork, excavation, backfill, compaction, site grading and temporary erosion control are specified in the appropriate Sections of this Division.

1.2 SUBMITTALS AND TESTING

A. Seed:

1. Furnish the Engineer with duplicate signed copies of a statement from the vendor, certifying that each container of seed delivered to the project site is fully labeled in accordance with the Federal Seed Act and is at least equal to the specification requirements.
2. This certification shall appear in, or with, all copies of invoices for the seed.
3. The certification shall include the guaranteed percentages of purity, weed content and germination of the seed, and also the net weight and date of shipment. No seed may be sown until the Contractor has submitted the certificates and certificates have been approved.
4. Each lot of seed shall be subject to sampling and testing, at the discretion of the Engineer, in accordance with the latest rules and regulations under the Federal Seed Act.

B. Topsoil:

1. Inform the Engineer, within 30 days after the award of the Contract, of the sources from which the topsoil is to be furnished.
2. Obtain representative soil samples, taken from several locations in the area under consideration for topsoil removal, to the full stripping depth.
3. Have soil samples tested by an independent soils testing laboratory, approved by the Engineer, at the Contractor's expense.
4. Have soil samples tested for physical properties and pH (or lime requirement), for organic matter, available phosphoric acid, and available potash, in accordance with standard practices of soil testing.
5. Approval, by the Engineer, to use topsoil for the work will be dependent upon the results of the soils tests.

C. Lime & Fertilizer:

1. Furnish the Engineer with duplicate copies of invoices for all lime and fertilizer used on the project showing the total minimum carbonates and minimum percentages of the material furnished that pass the 90 and 20 mesh sieves and the grade furnished.

2. Each lot of lime and fertilizer shall be subject to sampling and testing at the discretion of the Engineer.
3. Sampling and testing shall be in accordance with the official methods of the Association of Official Agricultural Chemists.
4. Upon completion of the project, a final check may be made comparing the total quantities of fertilizer and lime used to the total area seeded. If the minimum rates of application have not been met, the Engineer may require the Contractor to distribute additional quantities of these materials to meet the minimum rates.

1.3 DELIVERY, STORAGE & HANDLING

A. Seed:
   1. Furnish all seed in sealed standard containers, unless exception is granted in writing by the Engineer.
   2. Containers shall be labeled in accordance with the United States Department of Agriculture's rules and regulations under the Federal Seed Act in effect at the time of purchase.

B. Fertilizer:
   1. Furnish all fertilizer in unopened original containers.
   2. Containers shall be labeled with the manufacturer's statement of analysis.

1.4 JOB CONDITIONS

A. Loam: Do not place or spread loam when the subgrade is frozen, excessively wet or dry, or in any condition otherwise detrimental, in the opinion of the Engineer, to the proposed planting or to proper grading.

B. Seeding:
   1. Planting Seasons: The recommended seeding time is from April 1 to September 15. The Contractor may seed at other times. Regardless of the time of seeding, the Contractor shall be responsible for each seeded area until it is accepted.
   2. Weather Conditions:
      a. Do not perform seeding work when weather conditions are such that beneficial results are not likely to be obtained, such as drought, excessive moisture, or high winds.
      b. Stop the seeding work when, in the opinion of the Engineer, weather conditions are not favorable.
      c. Resume the work only when, in the opinion of the Engineer, conditions become favorable, or when approved alternate or corrective measures and procedures are placed into effect.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Seed:
   1. Provide the grass seed mixture approved by the Engineer, having the following composition:
      a. Park Mixture:
         50 percent Creeping Red Fesque
         30 percent Kentucky Bluegrass

20 percent Annual Ryegrass

b. Roadside Mixture:

50 percent Creeping Red Fescue
15 percent Kentucky Bluegrass
5 percent White Clover
2 percent Red Top
3 percent Birdsfoot Trefoil
25 percent Annual Ryegrass

2. Do not use seed which has become wet, moldy, or otherwise damaged in transit or during storage.

B. Loam:
1. Fertile, friable, natural topsoil typical of the locality, without admixture of subsoil, refuse or other foreign materials and obtained from a well-drained site. Mixture of sand, silt, and clay particles in equal proportions.
2. Free of stumps, roots, heavy of stiff clay, stones larger than 1-inch in diameter, lumps, coarse sand, weeds, sticks, brush or other deleterious matter.
3. Not less than 4 percent nor more than 20 percent organic matter.
4. Topsoil depth shall be 4-inches, unless otherwise indicated.

C. Lime:
1. Provide lime which is ground limestone containing not less than 85% of total carbonate and of such fineness that 90% will pass a No. 20 sieve and 50% will pass a No. l00 sieve.
2. Coarser materials will be acceptable provided the specified rates of application are increased proportionately on the basis of quantities passing a No. l00 sieve. No additional payment will be made to the Contractor for the increased quantity.

D. Fertilizer:
1. Provide a commercial fertilizer approved by the Engineer.
2. Provide fertilizer containing the following minimum percentage of nutrients by weight:
l0% Available phosphoric acid
l0% Available potash
l0% Available nitrogen (75% of the nitrogen shall be organic)

PART 3 - EXECUTION

3.1 PREPARATION

A. Equipment:
1. Provide all equipment necessary for the proper preparation of the ground surface and for the handling and placing of all required materials.
2. Demonstrate to the Engineer that the equipment will apply materials at the specified rates.

B. Soil: Perform the following work prior to the application of lime, fertilizer or seed.
1. Scarify the subgrade to a depth of 2 inches to allow the bonding of the topsoil with the subsoil.
2. Apply topsoil to a depth of 4 inches or as directed on areas to be seeded.

3. Trim and rake the topsoil to true grades free from unsightly variations, humps, ridges or depressions.
4. Remove all objectionable material and form a finely pulverized seed bed.

3.2 PERFORMANCE

A. Grading:
   1. Grade the areas to be seeded as shown on the Drawings or as directed by the Engineer.
   2. Leave all surfaces in even and properly compacted condition.
   3. Maintain grades on the areas to be seeded in true and even conditions, including any necessary repairs to previously graded areas.

B. Placing Topsoil:
   1. Uniformly distribute and evenly spread topsoil on the designated areas.
   2. Spread the topsoil in such a manner that planting work can be performed with little additional soil preparation or tillage.
   3. Correct any irregularities in the surface resulting from topsoiling or other operations to prevent the formation of depressions where water may stand.
   4. Thoroughly till the topsoil to a depth of at least 3 inches by plowing, harrowing, or other approved method until the condition of the soil is acceptable to the Engineer. The surface shall be cleared of all debris and or stones one inch or more in diameter.

C. Placing Fertilizer:
   1. Distribute fertilizer uniformly at a rate determined by the soils test over the areas to be seeded.
   2. Incorporate fertilizer into the soil to a depth of at least 3 inches by discing, harrowing, or other methods acceptable to the Engineer.
   3. The incorporation of fertilizer may be a part of the tillage operation specified above.
   4. Distribution by means of an approved seed drill equipped to sow seed and distribute fertilizer at the same time will be acceptable.

D. Placing Lime:
   1. Uniformly distribute lime immediately following or simultaneously with the incorporation of fertilizer.
   2. Distribute lime at a rate determined from the pH test, to a depth of at least 3 inches by discing, harrowing, or other methods acceptable to the Engineer.

E. Seeding:
   1. Fine rake and level out any undulations or irregularities in the surface resulting from tillage, fertilizing, liming or other operations before starting seeding operations.
   2. Hydroseeding:
      a. Hydroseeding may be performed where approved and with equipment approved by the Engineer.
      b. Sow the seed over designated areas at a minimum rate of 5 pounds per 1000 square feet.
      c. Seed and fertilizing materials shall be kept thoroughly agitated in order to maintain a uniform suspension within the tank of the hydroseeder.

d. The spraying equipment must be designed and operated to distribute seed and fertilizing materials evenly and uniformly on the designated areas at the required rates.

3. Drill Seeding:
   a. Drill seeding may be performed with approved equipment having drills not more than 2 inches apart.
   b. Sow the seed uniformly over the designated areas to a depth of l/2 inch and at a rate of 5 pounds per l,000 square feet.
4. Broadcast Seeding:
   a. Broadcast seeding may be performed by equipment approved by the Engineer.
   b. Sow the seed uniformly over the designated areas at a rate of 5 pounds per l,000 square feet.
   c. Sow half the seed with the equipment moving in one direction and the remainder of the seed with the equipment moving at right angles to the first sowing.
   d. Cover the seed to an average depth of l/2 inch by means of a brush harrow, spike-tooth harrow, chain harrow, cultipacker, or other approved devices.
   e. Do not perform broadcast seeding work during windy weather.

F. Compacting:
1. Seeded areas must be raked lightly after sowing unless seeding is to be directly followed by application of an approved mulch.
2. Compact the entire area immediately after the seeding operations have been completed.
3. Compact by means of a cultipacker, roller, or other equipment approved by the Engineer weighing 60 to 90 pounds per linear foot of roller.
4. If the soil is of such type that a smooth or corrugated roller cannot be operated satisfactorily, use a pneumatic roller (not wobbly wheel) that has tires of sufficient size to obtain complete coverage of the soil.
5. When using a cultipacker or similar equipment, perform the final rolling at right angles to the prevailing slopes to prevent water erosion, or at right angles to the prevailing wind to prevent dust.

3.3 PROTECTION & MAINTENANCE

A. Protection:
1. Protect the seeded area against traffic or other use.
2. Erect barricades and place warning signs as needed.

B. Maintenance:
1. At the time of the first cutting, set mower blades two inches high. All lawns shall receive at least two mowings before acceptance. Coordinate schedule for mowing with Engineer.
2. Maintenance shall also include all temporary protection fences, barriers and signs and all other work incidental to proper maintenance.
3. Maintain grass areas until a full stand of grass is indicated, which will be a minimum of 45 days after all seeding work is completed, and shall not necessarily related to Substantial Completion of the General Contract.

4. Protection and maintenance of grass areas shall consist of watering, weeding, cutting, repair of any erosion and reseeding as necessary to establish a uniform stand for the specified grasses, and shall continue until Acceptance by the Engineer of the work of this section. It shall also include the furnishing and applying of such pesticides as are necessary to keep grass areas free of insects and disease. All pesticides shall be approved by Engineer prior to use.

3.4 ACCEPTANCE

A. At final acceptance of the project all areas shall have a close stand of grass with no weeds present and no bare spots greater than three inches (3") in diameter over greater than five percent (5%) of the overall seeded area.

END OF SECTION

SECTION 02510A

CEMENT CONCRETE SIDEWALKS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: This work shall consist of the construction of new cement concrete sidewalks and walkways in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the Drawings or established by the Contracting Officer.

B. Related Work Specified Elsewhere: (When Applicable) aggregate base and subbase, bituminous concrete paving and granite curbs are specified in the appropriate sections in this Division.

1.2 RELATED DOCUMENTS

A. State of New Hampshire Department of Transportation Standard Specifications for Road and Bridge Construction, 2002 or latest edition, herein after referred to as NHDOT Specifications.

1.3 QUALITY ASSURANCE

A. Materials: Use only materials furnished by a bulk cement concrete producer regularly engaged in the production of portland cement concrete.

B. Submittals: A certificate of compliance shall be furnished to the Contracting Officer that the materials supplied comply with the specification requirements.

PART 2 - EXECUTION

2.1 MATERIALS

A. The Portland cement concrete shall be Class "A" concrete and conform to the requirements of NHDOT Specifications Section 520.

B. The reinforcements, joint material and protective coating shall conform to the requirements of NHDOT Specifications Section 608.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavation shall be to the depth and width that will permit the installation and bracing of the forms. The foundation shall be shaped and compacted to a firm, even surface conforming to the section shown on the plans. All soft and yielding material shall be removed and replaced with acceptable material.

B. Base course materials shall conform to the requirements of NHDOT Specifications, Section 209.2.1.2.

3.2 FORMS

A. Forms shall be of wood or metal and shall extend for the full depth of the concrete.

All forms shall be true, free from warp and of sufficient strength to resist the pressure of the concrete without springing. Bracing and staking of forms shall be such that the forms remain in both horizontal and vertical alignment until their removal.

3.3 PLACING CONCRETE

A. The foundation shall be thoroughly moistened immediately prior to placing the concrete. The proportioning, mixing and placing of the concrete shall be in accordance with good construction practices, as stated in the requirements of the NHDOT specifications Section 520.3.

3.4 FINISHING

A. Concrete shall be finished by use of wood, or magnesium floats, by skilled concrete finishers. A fine-grained broom finish shall be applied.

B. All outside edges and expansion or construction joints shall be edged with an edging tool having a radius of ¼-inch. All crack control joints in sidewalks subject to foot traffic shall be edged with a jointing tool.

3.5 JOINTS

A. Construct transverse and longitudinal crack control joints by sawing, jointing tool or other approved method to a minimum depth of one third the slab thickness. If the jointing tool is not capable of constructing a joint to the correct depth, saw the joint to the correct depth.

B. Saw crack control joints as soon as concrete has hardened sufficiently to permit sawing without excessive raveling and before uncontrolled shrinkage cracking occurs, usually between four and twenty-four hours.

C. Crack control joints shall match existing joints and/or be spaced in accordance with NHDOT Specification Section 608.3.2.6..

D. Expansion joints shall match existing joints. Slabs shall be placed alternately and the joints coated with an approved bituminous material before placing the adjacent slab.

E. When a concrete sidewalk is constructed adjacent to a curb, building, retaining wall, light pole base or other fixed structure, a 1/4 inch thick premolded joint filler shall be used between the slab and the structure. Joint filler shall be installed for the full depth of the slab.

3.6 CURING

A. Concrete shall be cured for a minimum of 7 days. Curing compounds will not be allowed. Curing shall be by moist burlap or plastic sheets, or by other approved materials placed in close contact with the finished concrete as soon as the concrete has set sufficiently to avoid damage from the placement of the coverings. During the curing period, all traffic, both pedestrian and vehicular, shall be excluded. Vehicular traffic shall be excluded for such additional time as may be directed.

3.7 COATINGS

A. Protective coatings shall be applied in accordance with NHDOT Specification Section 534.3

END OF SECTION

SECTION 02642

CORPORATION STOPS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install corporation stops of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.

1.2 QUALITY ASSURANCE

A. All corporation stops shall be manufactured by one manufacturer.
B. Qualifications of Manufacturer: Products have proven reliable in similar installations over a reasonable number of years.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Constructed of “Lead free” brass in compliance with NSF 61 Annex G and Safe Drinking Water Act Section 1417. Lead free fittings shall contain less than 0.25% lead on a weighted average, and installed using flux and solder containing not more than 0.2% lead.
B. Outlet shall be copper pipe packed joint (CPPJ)
C. Inlet shall have AWWA (CC) standard thread.
D. Acceptable Manufacturers:
    1. Ford (F600)
    2. Red Head Mfg. Co.
    3. Or equivalent

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install at locations shown on the Drawings and as specified in accordance with manufacturer's instructions.
B. Check and adjust all corporation stops for smooth operation.

END OF SECTION

SECTION 02650

BURIED UTILITY MARKINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. This work shall consist of providing and installing utility line markings above all buried lines installed as part of this contract and replacing existing markings disturbed as part of this contract. Buried utilities are indicated on the Civil and Electrical Drawings.

B. Related Work Specified Elsewhere:
   1. Pipe, excavation, backfill, insulation are specified in the appropriate Sections in this Division.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials and color shall be in accordance with latest AASHTO specifications for pipe and utility marking.

B. Marking tape color shall be in accordance with latest American Public Works Association (APWA) Uniform Color Code and American National Standards Institute ANSI Standard Z535.1, Safety Color Code specifications for buried utility marking as noted in the Schedule below.
   1. Schedule

Marker Color	Buried Utility
Blue	Potable Water &Associated lines
Green	Sanitary Sewers, Storm Drain and other Drain lines
Orange	Telecommunication, signal, alarm
Purple	Reclaimed, Recycled, Irrigation Water and Slurry Lines
Red	Electric Power lines cables conduits and lighting cables
Yellow	Gas, Oil, Steam, Petroleum or Gaseous Material Lines

   2. Warning Information shall be in Black Letters with typical wording of:
      a. "CAUTION: BURIED (NAME OF UTILITY LINE) BELOW"

C. For ferrous pipe material use 0.004" minimum polyethylene film; 6" wide clearly marking type of buried utility.

D. For non-ferrous pipe material (e.g. Concrete, PVC, PE, etc.) use detection tape composite of polyethylene and metallic core 6" wide clearly marking type of buried utility.

E. Seton Identification Products, New Haven, CT, Utility Safeguard LLC or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Marking tape shall be installed over utility lines centerline and buried 24" below grade.

B. Markings damaged during opening of trench shall be reinstalled with 2' overlap at broken sections.

END OF SECTION

SECTION 03305

CONCRETE TESTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Concrete Testing
B. Watertightness (Leak) Testing

1.2 RELATED SECTIONS

A. Section 01340 - Submittals
B. Section 01400 - Quality Control
C. Section 03300 - Cast-In-Place Concrete

1.3 REFERENCES

A. ASTM C31/C31M-10 - Standard Practice for Making and Curing Concrete Test Specimens in the Field
B. ASTM C39/C39M-10 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
C. ASTM C42/C42M-10a - Standard Test Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
D. ASTM C172-10 - Practice for Sampling Freshly Mixed Concrete
E. ASTM C231-10 - Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
F. ASTM E329-11 - Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
G. ASTM C1602/C1602M-06 - Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
H. ACI 301-10 - Standard Specifications for Structural Concrete
I. ACI 350.1-01/350.1R-06 - Tightness Testing of Environmental Engineering Concrete Structures

1.4 QUALIFICATIONS

A. Independent Testing Laboratory shall conform to concrete testing requirements of ASTM E329.
B. Key personnel must be qualified and experienced in concrete quality assurance.
C. Perform concrete field quality control testing with personnel certi¬fied as an ACI Concrete Field Testing Technician, Grade 1 according to the American Concrete Institute (ACI).

1.5 SUBMITTALS

A. The Contractor shall be responsible for the submittals for review and acceptance by the Engineer at no additional cost to the Owner. Submittals shall include Independent Testing Laboratory's qualifications, all testing reports, etc.
B. Independent Testing Laboratory will submit one copy each of all test reports to each of the following: Engineer, Resident Project Representative, Contractor and concrete

supplier. Reports shall indicate the following information:

Project	Air content
Placement Location	Cure box min/max temps
Contractor	Cylinder Nos
Concrete supplier	Cylinder weights
Technician	Date of breaks
Date cast	Break type
Date picked up	Break load
Design strength	Break strength
Air temp	Truck Arrival Time
Concrete temp	Truck Unload Time
Initial slump	Lab/Field cured
Final slump	Cylinder size

C. Independent Testing Laboratory will submit reports within 5 days of testing or inspection.

D. Independent Testing Laboratory will telephone the Engineer within 24 hours if tests indicate deficiencies.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 CAST-IN-PLACE CONCRETE

A. An Independent Testing Laboratory, selected and paid for by the Owner and directed by the Engineer and/or Resident Project Representative, shall test and sample Class A concrete for strength, slump and air content as indicated herein.

B. The General Contractor shall notify the Independent Testing Laboratory of proposed upcoming concrete placements as follows.
   1. The General Contractor shall notify the Testing Laboratory of proposed concrete placements on a weekly basis.
   2. The General Contractor shall notify the Testing Laboratory of specific placements a minimum of 24 hours in advance.

C. Obtain 5 standard test cylinder samples measuring 6"Ø x 12" or 8 test cylinders measuring 4"Ø x 8" for each class of concrete placed in any one day at the following frequency:
   1. For each 100 cubic yards of placed concrete, or
   2. For each placement less than 100 cubic yards

D. Concrete cylinders shall be tested as follows:
   1. 6”Ø x 12” cylinders:
      a. Test 2 cylinders at 7 days; 2 cylinders at 28 days
      b. Hold one cylinder for later testing (if required)
   2. 4” Ø x 8” cylinders:
      a. Test 3 cylinders at 7 days; 3 cylinders at 28 days.
      b. Hold two cylinders for later testing (if required)

E. Perform slump tests and air entrainment tests at the project site on each truck and at each sampling. Perform slump and air entrainment tests before addition of High Range Water Reducer (when the high range water reducer is added on site) and slump

and air entrainment tests after addition of High Range Water Reducer (all concrete).

F. Sample concrete for testing of air and slump at the discharge end of the truck. When concrete is pumped, concrete taken for test cylinders shall be at the discharge end of the pump hose. All concrete sampled for testing shall be taken from the beginning of the concrete truck discharge. No concrete shall be placed until the testing is complete. All concrete sampled for casting of cylinders shall be taken from the middle third of the concrete truck discharge.

G. Perform strength, slump and air entrainment tests at other times when directed by the Resident Project Representative.

H. Additional testing and sampling required as a result of deficient results or improper curing shall be paid for by Owner. The cost of resampling and retesting will be determined by Engineer, and Owner will invoice Contractor for this cost. If unpaid after 60 days, this invoice amount will be deducted from the Contract Price.

I. Contractor shall provide and maintain an insulated, heated concrete cylinder curing box, 4 foot square minimum, with a min.-max. thermometer and maintain the temperature between 60*F and 80*F. Contractor to coordinate the location and specific details of the curing box with the Resident Project Representative and Independent Testing Laboratory.

J. Contractor shall provide access to the site at all times for the Independent Testing Laboratory Personnel.

3.2 ADDITIONAL TESTS

A. Independent Testing Laboratory shall provide additional testing of in-place concrete that does not comply with the requirements of the Contract Documents or is considered substandard as directed by Engineer. Additional tests may consist of non-destructive testing, cores drilled from the area in question or load tests. Costs of additional testing will be paid by Owner. The cost of the additional testing will be determined by Engineer and Owner will invoice Contractor for that cost. If unpaid after 60 days, the invoice amount will be deducted from the Contract Price.

B. When the concrete strength is substandard as defined in Specification 03300 Section 3.12 paragraph A, concrete core specimens shall be obtained and tested from the affected area. A minimum of Three (3) cores shall be taken for each sample in which the strength requirements were not met. The drilled cores shall be obtained and tested in conformance with ASTM C 42 “Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete”. Engineer will determine the size and location of the required core samples.

C. Field cured cylinders may be cast and tested by the Independent Testing Laboratory at the request of the Contractor. The costs of these tests shall be borne by the Contractor. If the field cured cylinders are cast and tested prior to 28-days to determine the in-place concrete strength in order to facilitate an accelerated schedule for subsequent concrete placements, or backfilling or leakage testing, the following criteria must be met:

1. The Contractor shall notify the Engineer and Independent Testing Laboratory 48 hours in advance of the concrete placement. The Engineer will determine at that point if the results of the field cured cylinders may be used to determine the in-place concrete strength. The Contractor shall notify the Engineer as to when the field cured cylinders will be tested and for what purpose.

2. A minimum of two 6"Ø x 12" cylinders or three 4"Ø x 8" cylinders shall be cast for each separate test the Contractor requests.
3. The field cured cylinders shall be left in the field and located such that they are exposed to the identical environmental conditions as the concrete structure. The cylinders shall remain at this location a minimum of 14 days prior to testing.
4. The Engineer shall determine if the strengths indicated by the field cured cylinder tests are adequate for their intended purpose.

3.3 PRECAST STRUCTURAL CONCRETE

A. Independent Testing Laboratory shall inspect precast plant(s) during first major casting of product for project at the request of the Engineer.
B. Notify Independent Testing Laboratory 72 hours in advance of first major casting.
C. Independent Testing Laboratory shall inspect batching and mixing equipment, storage of materials, placement of reinforcement of forms, mix design, concrete testing, concrete placement, curing, general quality control procedures.
D. Independent Testing Laboratory shall provide report to Engineer and Contractor within 5 days.

3.4 WATERTIGHTNESS (LEAKAGE) TESTS

A. Leakage tests shall be performed after the concrete structure has been in place for a minimum of 28 days and attained design strength for all liquid containing structures to determine integrity and water tightness of the structures. The structures that shall be tested are indicated on the Contract Drawings.
B. Install other equipment, e.g. stop gates, sluice gates, temporary bulkheads, and prior to leakage test.
C. Prior to damp proofing, installation of concrete fill, waterproofing and backfilling, all liquid-containing structures shall be filled with potable water furnished by the Contractor from a municipal water supply or meeting the requirements of ASTM C1602.
D. Every tank shall be tested individually (one at a time with the tank full and adjacent tanks empty) unless otherwise indicated on the Contract Drawings.
E. Refill the tanks to the maximum water elevation as required to account for absorption after 6 hours.
F. Close all valves and gates to the structure and measure the change in the water surface elevation for a 72 hour period and record leakage through gates and valves. Determine evaporation by floating an evaporation pan in structure during test period.
G. During test period, examine exposed portions of structure for dampness or leaks and record visible leaks or damp spots. Damp areas are defined as areas where moisture can be picked up on a dry hand**.**
H. All visible leaks and damp areas shall be repaired and eliminated by a method proposed by the Contractor and reviewed for information only by the Engineer. All repair material in contact with potable water shall be NSF Standard 61 approved. Repair of cracks shall be with the use of a pressure injection method. Use of surface applied overlays over the crack will not be permitted. All repairs to new concrete shall be at no additional cost to the Owner.
I. For leak tests of tanks that consist of a combination of new and existing walls, all repairs to leaks in the existing concrete shall be compensated under the bid item

"Concrete Crack Repairs" as specified in Section 03300.

J. Subsequent to the repairs and elimination of all visible leaks and damp areas, tanks shall be refilled as previously described.

K. The water elevation shall remain constant for a total of 72 hours with no visible leaks. Should a measurable liquid level drop exist (excluding evaporation and precipitation) at the end of the initial 72 hour period and no leaks are observed, the tank shall be refilled to the maximum water elevation, and the test repeated. If at the end of the second 72 hour test period, a measurable liquid level drop exists, all leaks shall be repaired and eliminated by a method proposed by the Contractor and reviewed by the Engineer.

L. All liquid containing structures shall be retested subsequent to repairs.

M. Additional tests and repairs will be performed until such time as the structures can demonstrate compliance with the testing requirements.

N. Test water shall be disposed of by a method proposed by the Contractor and reviewed by the Engineer with no exceptions taken. All methods of disposal shall be in accordance with all Local, State and federal regulations.

END OF SECTION

SECTION 04200

UNIT MASONRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Face Brick
B. Concrete Masonry Units
C. Masonry Unit Channel Bond Beam
D. Masonry Unit Lintel
E. "A" Blocks
F. Solid Concrete Masonry Units
G. Bullnosed Concrete Masonry Units
H. Split-rib Concrete Masonry Units
I. Split-face Concrete Masonry Units
J. Cavity Drainage Material for Exterior Wall Cavities
K. Mortar
L. Grout Fill for CMU Lintels/Bond Beams and Reinforced CMU Cores
M. Mortar Color and Admixtures
N. Reinforcement, Anchorage, and Accessories
O. Precast Concrete Lintels and Precast Concrete items in the Masonry Walls
P. Cast-in-Place Concrete Lintels
Q. Control Joints
R. Expansion Joint
S. Compressible Joint Filler
T. Accessories
U. Thru-wall Flashing and Accessories
V. Modifications and/or Repairs to Masonry

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 03300 - Cast-in-Place Concrete: Vertical and horizontal deformed bar reinforcing in masonry walls.
B. Section 08110 - Steel Doors and Frames: Placement of jamb anchors and grouting of steel frames.
C. Section 15092 - Pipe Sleeves and Seals

1.3 RELATED SECTIONS

A. Section 01050 - Coordination
B. Section 01340 - Submittals
C. Section 01400 - Quality Control
D. Section 01710 - Project Cleaning
E. Section 03300 - Concrete
F. Section 07270 - Firestopping
G. Section 07900 - Joint Sealers
H. Section 08110 - Steel Doors and Frames

I. Section 09900 - Painting
J. Division 15 - Mechanical
K. Division 16 - Electrical

1.4 REFERENCES

A. ASTM A82 - Cold-Drawn Steel Wire for Concrete Reinforcement
B. ASTM A153 - Specification for Zinc-Coating (Hot Dip) on Iron and Steel Hardware.
C. ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
D. ASTM A641 - Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
E. ASTM C62 - Building Brick
F. ASTM C67 - Sampling and Testing Brick and Structural Clay Tile
G. ASTM C05a - Hollow Load-Bearing Concrete Masonry Units
H. ASTM C91 - Masonry Cement
I. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortors
J. ASTM C140 - Sampling and Testing Concrete Masonry Units
K. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar
L. ASTM C150 - Portland Cement
M. ASTM C207 - Hydrated Lime for Masonry Purposes
N. ASTM C216 - Facing Brick
O. ASTM C270 - Mortar for Unit Masonry
P. ASTM C315 - Clay Flue Linings
Q. ASTM C404 - Standard Specification for Aggregates for Masonry Grout
R. ASTM C476 - Grout for Masonry
S. ASTM C1019 - Standard Method of Sampling and Testing Grout.
T. ASTM C1314 - Standard Test Method for Constructing and Testing Masonry Prisms Used to Determine Compliance with Specified Compressive Strength of Masonry
U. ASTM C1364 – Standard Specification for Architectural Cast Stone
V. ASTM D1056 - Expansion Joint
W. ASTM D2240 - Test Method for Rubber Property - Durameter Hardness
X. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
Y. ASTM E447 - Compressive Strength of Masonry Prisms.
Z. AC1 530 - Building Code Requirements for Concrete Masonry Structures
AA. AC1 530.1 Specification for Concrete Masonry Construction

1.5 SUBMITTALS

A. Submit product data for each item under provision of Section 01340.
B. UL Certification that the components meet the fire rating or UL system indicated on the Drawings.
C. Decorative Concrete Masonry Units - Color chart or color samples showing color range.
D. Face Brick - Color chart showing color, texture and extremes of color range.
E. Mason shall coordinate reinforcing steel layout for dowel placement in reinforced concrete foundation walls and masonry walls.
F. Cold Weather Construction Procedures as specified.

G. Hot Weather Construction Procedures as specified.
H. Mortar and Grout Mix Design.
I. Submit sieve analyses for mortar and grout aggregates taken within the last 3 months.
J. Contractor shall submit verification from the manufacturer that the concrete masonry units have been properly cured to obtain the design strength specified and have sufficiently stabilized so that the units will not shrink after installation or test results conducted by an independent laboratory verifying that the materials manufactured specifically for the project meet the specified requirements. Testing of units shall be at no additional expense to the Owner.
K. Submit masonry contractor's qualifications.

1.6 QUALITY ASSURANCE

A. All testing shall be conducted by an Independent Testing Laboratory retained and paid for by the Owner. Independent Testing Laboratory shall submit one copy each of all test reports to the Engineer, Resident Project Representative and Contractor.
B. Independent Testing Laboratory shall submit reports within 5 days of testing or inspection.
C. Independent Testing Laboratory shall telephone the Engineer, Resident Project Representative and Contractor within 24 hours if tests indicate deficiencies.
D. The Project Mason shall construct the prisms, grout, and mortar cubes for testing. General Contractor shall notify the testing laboratory 48 hours in advance of when samples will be made by the Project Mason.
F. A "set" of test samples shall be defined as all of the following:
    1. Three ungrouted prisms
    2. Four mortar cubes
    3. Four grout cubes
G. Construct one set of samples during the construction of the mock-up panel prior to construction for verification of conformance with the Contract Documents and quality control procedures
H. Construct one set of samples during construction for every 150 lineal feet of load bearing masonry wall for each floor of each building.
I. Construct a minimum of one set per building (in addition to the set completed for the mock-up panel) regardless of the lineal footage
J. Project Mason shall construct masonry prisms in accordance with ASTM C1314 unless otherwise indicated as follows:
    1. Prism dimensions shall be two units high x same thickness as wall construction with full mortar beds. The length of prisms shall be either:
        a. One individual block unit; or
        b. Reduced length formed by saw cutting the block such that a complete cell is used
    2. Masonry prisms shall be cured as follows:
        a. Build each prism in an opened, moisture-tight bag large enough to enclose and seal the completed prism. Construct prisms on a flat, level base. Min-max thermometers shall be placed in the bags

b. Do not disturb the prisms for 48 hours. The prisms shall be protected from freezing temperatures
c. After the initial 48-hour curing period the Independent Testing Laboratory shall transport the prisms to a temperature controlled space and cured between 60º F - 90º F. The prisms shall be maintained within the sealed bags until 48 hours prior to testing

K. Project Mason shall construct and cure mortar cubes in accordance with ASTM C109.
L. Project Mason shall construct and cure grout cubes in accordance with ASTM C1019.
M. Independent Testing Laboratory shall test masonry prisms, mortar cubes and grout cubes as follows:
1. Test masonry prisms in accordance with ASTM C1314.
2. Test one prism at 7 days. and one at 28 days. The spare prism may be used for an additional test or potential future test.
3. Test mortar cubes in accordance with ASTM C109.
4. Test one cube at 7 days and two cubes at 28 days. The spare cube may be used for an additional test or potential future test.
5. Test grout cubes in accordance with ASTM C1019
Test one cube at 7 days and two cubes at 28 days. The spare cube may be used for an additional test or potential future test.
N. Additional testing required as a result of deficient results shall be paid for by the Owner. Engineer will determine the cost of the retesting and the Owner will invoice Contractor for that cost. If unpaid after 60 days, the invoice amount will be deducted from the Contract Price.

1.7 QUALIFICATIONS
A. Masonry Subcontractor: Company specializing in performing the work of this Section with a minimum of five years of experience.

1.8 PRE-MASONRY CONFERENCE
A. Prior to commencing with work of this Section, a meeting shall be held at the project site with Masonry Contractor, General Contractor, Owner's Representative and independent testing laboratory. The General Contractor shall record discussions and agreements and furnish a copy to each participant. Provide at least ten working days advance notice to participants prior to convening conference.
B. The meeting shall be held after the mockup panel has been completed and the 7-day results or the first set of tests are available.

1.9 MOCK-UP
A. Provide mock-up of composite masonry under provisions of Section 01400.
B. Erect composite panel six feet long by four feet high, include specified mortar and accessories as listed.
1. Back-up CMU
2. Air Barrier
3. Reinforcing (cavity walls, vertical w/grouted cells, horizontal band beams).
4. Insulation

5. Control Joint
6. Thru-wall Flashing
7. Veneer (including all colors and types).
8. Weeps
9. Cavity Drainage

C. When accepted, mock-up will demonstrate minimum standard for the work and shall be maintained until the masonry work is completed. Mock-up may not remain as part of the work.

D. Refer to the Quality Assurance section above for samples required at the time of the mock-up panel construction.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Store cementitious materials off the ground, under cover and in a dry location.

B. Store aggregates such that grading and other required characteristics can be maintained and contamination avoided.

1.11 SEQUENCING AND SCHEDULING

A. Coordinate work under provisions of Section 01050.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Interior and Back-up Concrete Masonry Units: Normal weight hollow concrete masonry units, ASTM C90.

B. Decorative block units: ASTM C90, color(s) as selected by Engineer to the following design:
   1. Split rib, with (one) (two) (three) grooves.
   2. Split face design.
   3. Smooth face units.
   4. Decorative concrete masonry units shall contain the recommended amount of DRY-BLOCK Admixture as manufactured by Grace Construction Products, Arrmaplus by Euccid Chemical or equal.

C. Open top concrete masonry channel bond beam and lintel block: ASTM C90.

D. Bullnosed Concrete Masonry Units: ASTM C90, Grade N.

E. Solid Load Bearing Concrete Masonry Units: ASTM C90, Grade N.

F. Prism tests to ASTM-1314, fm'=1350 psi - inspected.

2.2 All units indicated for use in fire rated assemblies shall be tested and approved for the hour ratings indicated on the Drawings.BRICK UNITS

A. Face brick: ASTM C216, Type FBS, Grade SW, Modular 2-1/4 inches high x 7-7/8 inches long x 3-5/8 inches thick, color as selected by Engineer.

2.3 REINFORCEMENT AND ANCHORAGE

A. All masonry reinforcing shall be ASTM A153, hot dipped galvanized with a minimum thickness of 1.5 oz./ft. of wire and ASTM A123 for all other shapes.

B. Single wythe joint reinforcement: Ladder type; cold-drawn steel conforming to ASTM A82, nine (9) GA. side rods with nine gage cross ties.
C. Rectangular Wire Tie: 3/16-inch diameter wire with two-inch bends by length as shown on Drawings.
D. Vee wall ties: 3/16-inch diameter wire, size as shown on Drawings.
E. Column Anchors: 3/16-inch diameter wire, size as shown on Drawings.
F. Cavity wall joint reinforcement: Ladder type; cold-drawn steel conforming to ASTM A82, 9-gauge side rods and nine gage cross ties, prefabricated continuous joint reinforcement and adjustable tie system with 3/16-inch diameter wall tie eye sections welded on at 16 inches on center and 3/16-inch rectangular adjustable wall tie pintle sections.
G. Corrugated ties: Corrugated, 16 GA., 7/8-inch-wide, of sufficient length to penetrate at least four inches into masonry or three inches into the veneer.
H. Strap anchors: 1-1/2-inch-wide by 1/8-inch-thick by 24 inches long with 2-inch bends.
I. Deformed reinforcement shall be ASTM A615, Grade 60.
J. PTA Anchor (Partition Top Anchors) shall be model PTA #420 as manufactured by Hohmann and Barnard, Inc., Model 4301, as manufactured by Wire-Bond, or equal. Anchors shall have a 3/8-inch diameter rod, 12-gauge plate with a plastic insert tube and foam insert allowing for a minimum of ½" deflection.
K. Wall ties for masonry veneer backed by wood framing: 12 gauge offset strap with 3/16-inch diameter wire ties. Fasteners shall be stainless steel screws, size as recommended by the manufacturer.
L. Ties for masonry backed by concrete and for ends of masonry abutting vertical concrete surfaces shall be corrugated, dovetail anchors, 16 ga., one-inch-wide, of sufficient length to penetrate at least four inches into masonry or three inches into the veneer.
M. Rebar Positioner: Rebar positioner shall be nine gage hot dip galvanized, 1¼ “deep bends to diagonally lock into CMU cores.

2.4 ACCESSORIES

A. Preformed Control Joints: Rapid Control Joint Rubber Compound Durometer 70-80, ASTM D2240, Regular Tee as manufactured by Dur-O-Wal, Inc., Hohmann and Barnard, or equal.
B. Control Joint Filler: Closed cell neoprene; Type D/A 2015 ASTM D1056 as manufactured by Dur-O-Wal, Inc., Hohmann and Barnard, or equal.
C. Expansion Joint Filler: Cork Board by W.R. Grace, W.R. Meadows or equal, size as indicated on the Drawings.
D. Compressible Filler - Closed cell neoprene; Type D/A 2015 ASTM D2056 as manufactured by Dur-O-Wal, Inc., Hohmann and Barnard, or equal.
E. Building paper: 15-pound asphalt saturated felt.
F. Weep/Vents: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
    1. Available Products Include:
        a. Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents

b. Heckman Building Products Inc., No. 85 Cell Vent.
c. Hohmann & Barnard, Inc.; Quadro-Vent.

G. Cleaning solutions: Red Brick or Dark CMU - Sure Klean No. 101, light brick or Concrete Masonry Units - Sure Klean No. 600 as manufactured by ProSoCo, Inc., Hydrochemical Techniques, or equal.
Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity. Provide strips, full-depth of cavity and 10 inches high, with dovetail shaped notches 7 inches deep that prevent mesh from being clogged with mortar droppings; Mortar Net as manufactured by Mortar Net USA, Hohmann & Barnard, Inc., or equal.

I. Termination Bar: Flat stainless steel bar, 1/8-inch x 1 inch with 3/8" slotted holes at 8 inches on center, type 304 stainless steel, by Hohmann & Barnard, Wire-Bond or equal.

J. Drip Edge Flashing: Stainless steel drip plate, 3 inches wide, by Hohman and Barnard, Wirebond or equal.

2.5 MORTAR AND GROUT MATERIALS

A. Portland cement: ASTM C150, Type I or Type II, gray color.
B. Masonry Cement: ASTM C91, Type S.
C. Mortar aggregate: ASTM C144, standard masonry type.
D. Grout aggregate: ASTM C476, Fine Grout.
E. Hydrated lime: ASTM C207, Type S.

2.6 Water: Clean and potable.MORTAR COLOR AND ADMIXTURES

A. Pre-measured mineral pigment; color as selected by Engineer.
B. Mortar shall contain DRY-BLOCK II Admixture as manufactured by Grace Construction Products, Blocktite by Euclid Chemical, or equal.

2.7 MORTAR MIXES

A. Mortar shall be: ASTM C270, Type S with a minimum 28-day compressive strength of 1800 PSI.

2.8 GROUT MIXES

A. Grout for bond beams, lintels and reinforced CMU cores shall have 2000 PSI compressive strength at 28 days; mixed in accordance with ASTM C476 fine grout.

2.9 THRU-WALL FLASHING

A. Acceptable Manufacturers
1. York Manufacturing, Inc.; Multi-Flash 500
2. STS Coatings, Inc.; Gorilla Flash
3. Or equal.

B. Characteristics
1. Core: Copper core with fiberglass or polypropylene fabric laminated to both copper faces with non-asphalt adhesive. Copper type, ASTM B248-06: CDA Alloy 110, 060 temper.

2. Fabric: Fiberglass or polypropylene fabric; 5 oz laminated back face copper core with core weight and manufacturer identified on product with color coded laminate or printed on the material.
3. Size: Shall be as detailed on the Drawings from manufacturers available standard width rolls.
4. Polyether Sealant: Suggested manufacturers: York UniverSeal US-100, STS Coatings GreatSeal Lt-100, or equal.

2.10 PRECAST CONCRETE ITEMS

A. Precast concrete lintels shall be as detailed on the Drawings and as manufactured by Continental Cast Stone Manufacturing Inc., MGA Cast Stone, or equal.
B. Other precast concrete items shall be as shown on the Drawings and meet the following design criteria:
   1. Shall comply with ASTM C1364
   2. Concrete shall be 5000 PSI.
   3. Use Type I White or Type III Gray cement.
   4. Concrete shall be air entrained 4-6% and superplasticized.
   5. Reinforcement is ASTM 615, Grade 60.
   6. Color shall be as selected by the Owner.

2.11 CAST IRON CLEANOUT DOOR

A. Type R-4950 Type A Series medium duty as manufactured by Neenah Foundry Company.
B. Model No. 88 as manufactured by Vestal Manufacturing.
C. Or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.
B. Verify items provided by other sections of work are properly sized and located.
C. Verify that built-in items are in proper location, and ready for roughing into masonry work.
D. Request inspection of spaces to be grouted.
E. Beginning of installation means installer accepts existing conditions.

3.2 PREPARATION

A. Direct and coordinate placement of metal anchors supplied in other sections.
B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.
C. Install mortar and grout to requirements of the specific masonry sections.

D. Work grout into masonry cores to eliminate voids.
E. Do not displace reinforcement while placing grout. Reinforcement shall remain centered in the width of the cell.
F. Remove grout spaces of excess mortar.
G. Cover and protect the top of the masonry walls at the end of each work day and during inclement weather. Cover partially completed masonry when construction is not in progress.
    1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
    2. Where one wythe of multi wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
H. Stain Prevention: Prevent grout, mortar and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar and soil that come in contact with such masonry.
    1. Protect base of walls from rain-splashed mud and mortar splatter by covering spread on ground and over wall surface.
    2. Protect sills, ledges and projections from mortar droppings.
    3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
    4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.

3.3 MORTAR MIXING

A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C270:
    1. Proportions by volume for Portland cement-lime-sand mixture:
        a. 2 parts Portland cement
        b. 1 part hydrated lime
        c. 9 parts masonry sand
    2. Properties by volume for masonry cement - sand mixture:
        a. 2 parts masonry cement
        b. 6 parts masonry sand
B. Add mortar color in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.
C. Add DRY-BLOCK II Admixture to mortar for veneer. The sequence for mixing mortar containing DRY-BLOCK Mortar Admixture is:
    1. Add 2/3 of the water to the mixer.
    2. Add the admixture to the mixer.
    3. Add sand to the mixer.
    4. Add cement and lime to the mixer.
    5. Add additional water as necessary.
    6. Mix a minimum of 5 additional minutes after all materials have been added to the mixer.
D. Do not use anti-freeze compounds to lower the freezing point of mortar.
E. If water is lost by evaporation, retemper only within two hours of mixing.

F. Use mortar within two hours after mixing at temperatures of 80 degrees F, or 2½ hours at temperatures under 50 degrees F.
G. Use care when mixing to provide a consistent mixture.

3.4 GROUT MIXING

A. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476:
   1. Proportions by volume:
      a. 1 part Portland cement
      b. 1/10-part hydrated lime
      c. 3 parts sand
B. Do not use anti-freeze compounds to lower freezing point of grout.

3.5 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.
B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness to provide a neat, uniform appearance.
C. Lay concrete masonry units in running bond. Course one unit and one mortar joint to equal eight inches. Form concave mortar joints to provide a neat, uniform appearance where exposed to view; strike the joints within the cavity flush.
D. Lay brick units in running bond. Course three brick and three mortar joints to equal eight inches. Form concave mortar joints to provide a neat, uniform appearance.
E. Lay decorative units to coursing of one unit and one mortar joint to equal eight inches. Form concave mortar joints to provide a neat, uniform appearance.

3.6 PLACING AND BONDING

A. Lay hollow masonry units with face shell bedding on head and bed joints.
B. Lay solid load bearing chimney masonry units with full mortar bedding on head and bed joints.
C. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.
D. Remove excess mortar which has splashed or been smeared on finished surfaces with stiff bristle brushes as work progresses.
E. Place full mortar bed around each core that is to be grouted.
F. Interlock intersections and external corners.
G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
H. Perform jobsite cutting of masonry units with electrically operated carborundum saws to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges. Do not break units with hammers or other tools.
I. Isolate masonry partitions from vertical structural framing members with a control joint.
J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.
K. Install bullnose concrete masonry units at all external corners, doors and window jambs as detailed on Drawings.
L. Use Ivany or open top channel blocks for bond beams.

M. Use open top channel blocks for masonry lintels.

3.7 WEEPS AND VENTS

A. Install weep/vent products 24 inches on center horizontally at bottom of brick veneered walls.

3.8 Install weep/vent products 24 inches on center horizontally above all brick veneered wall openings with a minimum of two for every opening.CAVITY WALL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep holes.
B. Install cavity insulation on erected back-up masonry. Apply adhesive as recommended by the manufacturer. Cut insulation closely to all penetrations and seal.

3.9 JOINT REINFORCEMENT AND ANCHORAGES

A. Install horizontal joint reinforcement as shown on Drawings.
B. Place masonry joint reinforcement in first horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
C. Place joint reinforcement continuous in first joint below top of walls.
D. Lap joint reinforcement ends minimum six inches.
E. Embed anchors attached to structural steel members. Embed anchorages in every second block joint.
F. Install eye and pintle type reinforcing at cavity walls.
G. Install horizontal joint reinforcing at 16" on center at all interior masonry walls.
H. Reinforce wall intersections with strap anchors or prefabricated Tee joint reinforcing16 inches on center.
I. Install specified dovetail anchors for load bearing masonry abutting or backed by concrete surfaces, spacing the anchors not more than 16 inches on centers, vertically, and not more than 16 inches on centers, horizontally.
J. Install corrugated anchors at new non-load bearing interior masonry walls abutting concrete or existing masonry.

3.10 JOINT REINFORCEMENT AND ANCHORAGES - WOOD FRAMING WITH MASONRY VENEER

A. Screw wall tie straps to the studs with stainless steel screws.
B. Place wall ties at 16 inches on center vertically and horizontally.
C. Install wall ties above and below openings.
D. Install wall ties within eight (8) inches below the top of the wall.
E. Install wall ties on both sides of control joints in the veneer.

3.11 THRU-WALL FLASHING INSTALLATION

A. General:
    1. Install where indicated, specified, or required in accord with flashing manufacturer's written instructions and as follows. Base of exterior walls, exterior door heads, window heads and sills, horizontal control joints. Same bed

joint as weep hole, continuous, in accord with manufacturer's written instructions, other wall openings, other locations indicated.

2. Splicing to achieve flashing width is prohibited unless flashing detail requires material wider than normally manufactured.
3. Extend flashing 6" minimum, beyond opening, each side without stretching flashing material. Lap end joints 6" minimum; seal joints completely with specified flashing adhesive or tape. Fold flashing ends at end of openings or horizontal flashing terminations to form end dam.
4. Install flashing tight against backup wall and veneer shelf or steel lintel and set in a continuous layer of polyether sealant.
5. Top of flashing to be at least 2 inches above cavity drainage material and steel lintels.
6. Install drip edge flashing and hold bottom of thru wall flashing to be held back from face of veneer by ½ inch.
7. Set termination bar into a bead of sealant at top of flashing and fasten through top of flashing.
8. Fold ends of flashing at end of opening to form dam.
9. Inside corners: Folded, not cut: Make in industry accepted manner using outside corner and splice material or buy from manufacturer.
10. Outside corners: Make in industry accepted manner using outside corner and splice material or buy from manufacturer.
11. Patch minor punctures with tape or adhesive and material in accord with manufacturer's installation instructions.
12. Replace ripped, torn, or severely damaged flashing with new material.

3.12 LINTELS

A. Install loose steel lintels over openings as shown on Drawings.
B. Install precast concrete lintels over openings as shown on Drawings.
C. Install reinforced unit masonry lintels as shown on Drawings.
D. Install reinforced unit masonry lintels over openings exceeding 16 inches, where steel or precast concrete lintels are not scheduled. Provide reinforcing as required to span the opening.
E. Provide a minimum of a brick angle lintel at all openings in the brick veneer greater than 8 inches wide.
F. Use full length reinforcing bars only.
G. Support and secure reinforcing bars from displacement. Maintain position within ½ inch of dimensioned position.
H. Place and consolidate grout fill without displacing reinforcing.
I. See the Structural Drawings for the minimum bearing on each side of opening.
J. Use "A" type blocks to tie vertical reinforcing into the horizontal reinforcing at masonry lintels.
K. Allow masonry lintels to attain specified strength before removing temporary supports.

3.13 GROUTED COMPONENTS

A. Reinforce channel bond beam and lintel block with two bars, placed continuously, size as shown on the Drawings.
B. Lap splices in vertical reinforcing minimum 48 bar diameters.
C. Support and secure reinforcing bars from displacement. Vertical reinforcing shall be centered in the width of the core.
D. Place and consolidate grout fill without displacing reinforcing.
E. At bearing locations, fill masonry cores with grout for a minimum 24 inches either side of opening unless otherwise indicated on the drawings.
F. All cells to receive epoxy or expansion anchors shall be grouted solid.
G. Grouting:
    1. Request the Engineer to inspect the cells. Allow three days' advance notice of inspection.
        a. Provide cleanout opening no less than four inches high at the bottom of each cell to be grouted by cutting one face shell of masonry unit.
        b. Clean out masonry cells with high pressure water spray. Permit complete water drainage.
    2. After cleaning and cell inspection, seal openings with masonry units.
    3. Place grout into spaces. Maintain water content in grout to intended slump without aggregate segregation.
    4. **Limit grout lift to 48 inches, stop each lift at least one inch below the top of a masonry unit and rod for grout consolidation. Wait 30 to 60 minutes before placing next lift.**

3.14 PLACING REINFORCING STEEL

A. Mason shall coordinate dowel placement and coordinate vertical reinforcing splices for constructability.
B. Install reinforcing before laying masonry. Installation shall be done per the Masonry Reinforcing Shop Drawing marked "No Exceptions Taken".
C. Prior to placing grout, clean all reinforcement of loose, flaky rust; scale; grease; mortar; grout; or other coating which might destroy or reduce its bond with grout. The details of reinforcement shall conform to ACI 315. Do not bend or straighten reinforcing. Do not use bars with kinks or bends not shown on the Drawings. Placement of reinforcement shall be inspected by the Engineer prior to placing grout.
D. Position vertical bars accurately at the centerline of the reinforced wythe within a tolerance of 1/2 inch. Maintain a minimum clearance between the bars and masonry units of 1/2 inch and between parallel bars of one diameter of the reinforcement. Hold vertical reinforcing in place using metal supports, centering clips, spacers, or caging-devices located near the ends of each bar and at intermediate intervals of not more than 160 diameters of the reinforcement. Wire column and pilaster ties in position around the vertical steel, laying ties in mortar joints will not be permitted.
E. Stagger splices in adjacent bars. Lay bars a minimum of 48 diameters of the reinforcement or two feet whichever is greater. Welded or mechanical connections shall develop the full strength of the reinforcement.

F. Vertical reinforcing shall extend into the bond beam located at the top of the wall. The open top channel block shall be drilled to accommodate the vertical reinforcing.

3.15 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control and expansion joints. Stop control joint under the bond beam at the top of the wall. Rake and caulk the control joint at the top bond beam.
B. Joints shall extend through intermediate reinforcing and bond beams.
C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
D. Form control and expansion joints as detailed on Drawings.
E. Joints at tops of interior non-bearing masonry partitions and in other locations as shown on Drawings, install specified compressible filler, maintaining a 3/4-inch distance back to edges of filler from both faces of partition.

3.16 BUILT-IN WORK

A. As work progresses, build in metal door and glazed metal frames, wood nailing strips, plates and other items furnished by other sections.
B. Build in items plumb and level.
C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout or batt insulation as shown on the Drawings.
D. Do not build in organic materials subject to deterioration.

3.17 TOLERANCE

A. Maximum variation from alignment of columns and pilasters: 1/4 inch.
B. Maximum variation from unit to adjacent unit: 1/32 inch.
C. Maximum variation from plane of wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.
D. Maximum variation from plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
E. Maximum variation from level coursing: 1/8 inch in three feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.
F. Maximum variation of joint thickness: 1/8 inch in three feet.
G. Maximum variation from cross sectional thickness of walls: 1/4 inch.

3.18 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves, grounds and other penetrations. Coordinate with other sections of work to provide correct size, shape, and location.
B. Obtain Engineer approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.19 MODIFICATIONS OR REPAIRS TO MASONRY

A. Remove and replace all masonry units that are loose, chipped, broken, stained or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units; install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Demolition of existing masonry shall be done in a careful manner to minimize damage to adjacent masonry that is not affected by the work. Provide protection, barriers, dust screens, etc. to minimize disruption to interior spaces.
C. Rehabilitation and repointing of existing masonry in the areas indicated on the Drawings.
    1. Remove all weakened, damaged, or disintegrated mortar to sound mortar or a depth of 1 inch, whichever is greater.
    2. Lightly wet the mortar and brick work surface prior to placing pointing.
    3. Use mortar mixing as described in this section.
    4. Face finishing of the re-pointed joints shall be rodded (concave faced).
    5. Cleaning and construction procedure as described elsewhere in this section.

3.20 CLEANING

A. Clean work under provisions of Section 01710.
B. Remove excess mortar and mortar smears.
C. Replace defective mortar. Match adjacent work.
D. Clean soiled surfaces of unpainted surfaces with cleaning solution.
E. Use non-metallic tools in cleaning operations.

3.21 COLD WEATHER CONSTRUCTION PROCEDURE

A. Where ambient temperatures are below 40 degrees F or anticipated to drop below 40°F within 24 hours, provide "weather protection" for the masonry under construction and use heat sources to maintain temperatures above 40 degrees F within the enclosure. Maintain the heated enclosure for a minimum of 24 hours after construction.
B. Heat mortar sand or mixing water to produce mortar temperatures between 40 degrees F and 90 degrees F at the time of mixing. Maintain mortar above freezing until used in masonry.
C. Temperature of stored masonry units shall not be less than 20 degrees F when laid in the masonry. Remove visible ice on masonry units before the unit is laid in the masonry.
D. Provide a High/Low thermostat within the enclosure or at the work.

3.22 HOT WEATHER CONSTRUCTION PROCEDURE

A. When the ambient temperature exceeds 90 degrees F:
    1. Lightly wet the mortar bedding surface areas.
    2. Keep mortar moist, and do not string out on the wall so far ahead of units being placed that drying will take place prior to placement of units.
    3. After the units are in place, a very light fog spray shall be applied sufficient times during the first 24 hours for proper curing.
B. Provide a High/Low thermostat within the enclosure or at the work.

END OF SECTION

SECTION 07270

FIRESTOPPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Firestopping for penetrations in gypsum wallboard assemblies.
B. Firestopping for penetrations in concrete and masonry walls, floors and ceilings.
C. Firestopping for PVC and insulated pipe penetrations.

1.2 RELATED SECTIONS

A. Section 01050: Coordination
B. Section 01340: Submittals
C. Section 03300: Cast-in-Place Concrete
D. Section 04200: Unit Masonry
E. Section 07900: Joint Sealers
F. Division 15: Mechanical
G. Division 16: Electrical

1.3 REFERENCES

A. ASTM E814 - Methods for Fire Tests of Through-Penetration Fire Stops.
B. Underwriters Laboratories 1479.
C. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

1.4 PERFORMANCE REQUIREMENTS

A. Provide firestopping systems that meet or exceed the fire rating of the construction assembly being penetrated, when tested in accordance with ASTM E814 and UL 1479.

1.5 SUBMITTALS

A. Submit product data under provisions of Section 01340.
B. Submit manufacturer's specification and installation instructions.
C. Submit design data indicating methods of closure.
D. Submit test reports indicating that the system meets the specified performance requirements.
E. Submit shop drawing indicating large scale details for each type of penetration through each type of construction assembly.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in manufacturer's original unopened packaging.
B. Store materials in area protected from weather and moisture.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate work under provisions of Section 01050.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Gold Bond Building Products
B. United States Gypsum
C. 3M Products
D. Hilti
E. Johns Manville
F. Or equal

2.2 MATERIALS

A. The materials specified herein are the generic components of typical firestopping systems. The components shall be as required by the manufacturer to provide a complete firestopping system complying with the performance requirements specified.
B. Insulation Packing Material: A combination of mineral fiber manufactured from glass and thermosetting resins, with a minimum density of 6 PCF, complying with ASTM C665, Type 1.
C. Sealing Compound: A setting type sealing compound for use with gypsum wallboard assemblies. Material must be as required by the manufacturer of the gypsum wallboard system utilized and have passed testing in accordance with ASTM E814.
D. Intumescent-type Wrap: Flexible rubber like material capable of expanding up to ten times in volumes when subjected to heat.
E. Mortar: A cementious fire resistant material.
F. Steel Collar: As required by the manufacturer to provide the complete firestopping system.
G. Sealant: Elastomeric caulking resistant to temperatures up to 2000°F, as required by the manufacturer of the firestopping system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that openings are ready to receive work.
B. Verify that all penetrations are adequately prepared and that all back-up and systems required to support the firestopping has been provided.
C. Beginning of installation means installer accepts existing conditions.

3.2 PREPARATION

A. Protect materials surrounding the work of this section from damage.

3.3 INSTALLATION

A. Install firestopping at all new penetrations through both new and existing fire rated assemblies.
B. Products shall be installed as per the manufacturer's submitted instructions to provide a complete firestopping system at all fire rated assemblies.

C. Fill all annular spaces of penetrations in gypsum wallboard assemblies with insulation packing material and apply sealing compound.
D. Fill all annular spaces of penetrations in masonry and concrete with insulation packing material and apply mortar on other approved sealing compound.
E. Install intumescent wrap around all plastic pipe and insulated pipe penetrating fire rating assemblies.
F. Install sealant as required per manufacturer's instructions.

3.4 CLEANING

A. Clean work under provisions of Section 01710.

END OF SECTION

SECTION 07900

JOINT SEALERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Preparing sealant substrate surfaces.
B. Sealant and backing.

1.2 RELATED SECTIONS

A. Section 01340 - Submittals
B. Section 01710 - Project Cleaning
C. Section 03300 - Cast-in-Place Concrete
D. Section 04200 - Unit Masonry
E. Section 07270 - Fire Stopping
F. Section 08110 - Steel Doors and Frames

1.3 REFERENCES

A. ASTM C790 - Recommended Practices for Use of Latex Sealing Compounds.
B. ASTM C920 - Specification for Elastomeric Joint Sealant
C. ASTM C834 - Specification for Latex Sealing Compounds
D. FS-TT-S-227 - Sealing Compound: Elastomeric Type, Multi-Component
E. FS-TT-S-230 - Sealing Compound: Elastomeric Type, Single Component
F. FS-TT-S-001543 - Sealing Compound: Silicone Rubber Base
G. Sealing and Waterproofers Institute - Sealant and Caulking Guide Specification

1.4 SUBMITTALS

A. Submit product data under provisions of Section 01340.
B. Submit color charts or samples.
C. Submit manufacturer's installation instructions.
D. Submit schedule of all items to be installed. Indicate intended use of each product.

1.5 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum ten years' experience.
B. Applicator Qualifications: Company specializing in applying the work of this Section with minimum five years' experience.
C. Compatibility: Verify sealants used are compatible with joint substrates.
D. Joint Tolerance: Compliance with the manufacturer's limitation is required.
E. Conform to Sealant and Waterproofers Institute requirements for installation.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.
B. VOC Standards - All sealants shall be in accordance with all applicable State and Federal VOC standards.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate work in this Section with related sections.

1.8 WARRANTY

A. Installer to provide five-year warranty to include coverage of installed sealants, caulking and accessories which fail to achieve air tight and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 - PRODUCTS

2.1 MATERIALS

A. C-1, Acrylic Latex Sealant: Single component, non-staining, non-bleeding, non-sagging; color as selected by Engineer; AC-20 as manufactured by Pecora Sealants, Tremco or equal.

1. Durability (Bond and Cohesion) +/- 7½ percent - 12½ percent
2. Service Temperature Range 0 to 180 degrees F
3. Shore "A" Hardness Range 15 to 40

B. S-1, Epoxidized Polyurethane Sealant: Multi-component, chemical curing, non-staining, non-bleeding, non-sagging type; color as selected by Engineer; Dymeric 240 FC, as manufactured by Tremco, Sika Corporation or equal.

1. Durability (Bond and Cohesion) - 25 percent + 40 percent
2. Shore "A" Hardness Range 25

C. S-2, Polyurethane Sealant: Multi-component, chemical curing, non-staining, non-bleeding, non-sagging type; color as selected by Engineer; Sikaflex 2C as manufactured by Sika Corporation, Tremco or equal.

1. Durability (Bond and Cohesion) +/- 50 percent
2. Service Temperature Range - 40 to 170 degrees F
3. Shore "A" Hardness Range 25 (40 for self-leveling)

D. S-3, Silicone Sealant: Single component, fungus resistant, chemical curing, non-staining, non-bleeding, non-sagging type; color as selected by Engineer; as manufactured by General Electric Silicones, Dow or equal.

1. Durability (Bond and Cohesion) +/- 25 percent
2. Service Temperature Range - 80 to 400 degrees
3. Shore "A" Hardness Range 35

E. S-4, Flexible Epoxy Jointing Compound: Multi-component, solvent-free, moisture insensitive epoxy resin, self-leveling type; Sikadur 51 as manufactured by Sika Corporation, Tremco or equal.

1. Tensile Strength 650 psi

2. Shore "A" Hardness Range 75-80

F. S-6, Polyurethane Sealant: One component, moisture curing, non-staining, non-bleeding, non-sagging type; color as selected by Engineer; Sika-flex 1A as manufactured by Sika Corporation, Tremco or equal.

1. Durability (Bond and Cohesion) ± 25 percent
2. Service Temperature - 40 to 170 degrees F
3. Shore A Hardness 40

G. S-7, TREMPRO 644 High Temperature, one component, melting point, ASTM E814, by Tremco, or equal.

1. Tensile Strength 250 psi
2. Service Temperature Range -75 to 600 degrees F
3. Shore A Hardness 22

H. S-8, Sealants for fire rated assemblies shall be coordinated with Section 07270 - Fire Stopping.

I. S-9, Sealants required for completion of the air barrier system shall be coordinated with Section 07280 – Air Barriers.

2.2 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: ASTM D1056; round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width; as recommended by sealant manufacturer.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and joint openings are ready to receive work and field measurements are as shown on Drawings and recommended by the manufacturer.

B. Beginning of installation means installer accepts existing conditions.

3.2 PREPARATION

A. Clean and prime joints in accordance with manufacturer's instructions.

B. Remove loose materials and foreign matter which might impair adhesion of sealant.

C. Verify that joint backing and release tapes are compatible with sealant.

D. Perform preparation in accordance ASTM C790 for latex base sealants.

E. Protect elements surrounding the work of this Section from damage or disfiguration.

3.3 INSTALLATION

A. Install sealant in strict accordance with manufacturer's instructions.
B. Measure joint dimensions and size materials to achieve required width/depth ratios.
C. Install joint backing to achieve a neck dimension no greater than 1/3 the joint width.
D. Install bond breaker where joint backing is not used.
E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot apply within these temperature ranges.
F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
G. Tool joints concave.

3.4 CLEANING AND REPAIRING

A. Clean work under provisions of Section 01710.
B. Clean adjacent soiled surfaces.
C. Repair or replace defaced or disfigured finishes caused by work of this Section.

3.5 PROTECTION OF FINISHED WORK

A. Protect sealants until cured.

3.6 SCHEDULE

Sealant Type	**Location**
C-1, S-1, S-2 or S-6	Interior Door Frames Other Joints Designated to Receive Caulking Joints in Interior Wood Finish
S-1, S-2 or S-6	Interior Window Frames Exterior Door Frames Exterior Perimeter of Windows Control Joints in Masonry Expansion Joints At Penetrations in the Exterior Walls At Joints Between Precast Concrete Planks Other Joints Designated to Receive Sealant
S-2	Joints Between Exterior Concrete Pavement or Concrete Pads Around the Building.
S-4 or S-6	Interior Slab Perimeter Joints Interior Slab Control Joints
S-3	Joints in Ceramic Tile Joints in FRP Panels Perimeter of Plumbing Fixtures At Cabinets and Countertops Abutting Walls
S-7	At Joints Subject to High Heat Between Terra Cotta Flue Liner and Concrete Chimney Cap
S-8	At Joints in Fire Rated Assemblies
S-9	At Joints and Between Dissimilar Materials in the Air Barrier System

END OF SECTION

SECTION 11000

EQUIPMENT - GENERAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install and test all equipment specified in this Contract and as shown on the Drawings.

B. Related Work Specified Elsewhere (When Applicable):

1. Submittals are specified in Section 01340.
2. Equipment Startup, Certification and Operator Training are specified in Section 01800.
3. Concrete and grout are specified in Division 3.
4. Field painting is specified in Section 09900.
5. Surface Preparation and Shop Coatings are specified in Section 09905
6. Controls and Instrumentation are specified in Division 13.
7. Pipe, plumbing, and mechanical work are specified in Division 15.
8. Electrical work and components, and variable frequency drives, are specified in Division 16.

1.2 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" are indicated other manufacturers of equal quality, that comply fully with the specifications, are allowed. Where the words "or equivalent" are not included, the Contractor must provide equipment in compliance with the specifications that is manufactured from the listed manufacturers.

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.

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. Not used.

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 Manufacturer shall select and design the equipment system such that it is complete in all details and shall meet the specified performance requirements.

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.

G. Workmanship shall be first class in all respects.

1.3 SUBMITTALS

A. Provide shop drawings and samples as specified in the General Conditions and Section 01340 of the Construction Contract. 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. Complete Operation and Maintenance Manuals in compliance with Specification Section 01340.

E. 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.

F. 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.

G. Provide certified bearing life calculations on all equipment bearings.

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.

K. 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.

L. Contractor shall provide a Submittal Certification from each individual Equipment Manufacturer certifying that the Equipment Manufacturer has:

1. Reviewed the Construction 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 which would cause the warranty to be void; or the equipment to function improperly, or not meet the performance requirements.

The submittals will not be reviewed without the inclusion of these noted certifications. Process Equipment Manufacturer Submittal Certification Form is provided in Section 01340.

1.4 GUARANTEE/WARRANTIES

A. The Contractor shall provide the Owner with a Guarantee/ Warranty for the entire project in accordance with **Article 38 (General Guaranty) of the General Conditions**. No shop drawings submittals are required for this item.

B. Any specified extended warranties (i.e. those which run longer than the Contract Correction/ Warranty Period) shall be prepared in the name of the Owner and shall become effective after the completion of the Correction/ Warranty Period. The Contractor will be required to handle warranty problems during the Correction/ Warranty Period. Extended warranties shall meet the requirements specified in the relevant Section. Proposed extended warranty language shall be submitted to the Engineer for review as a part of the Shop Drawing process.

C. Equipment that is supplied by a system supplier and is intended to function as a complete and integrated system shall be warranted accordingly.

D. Any part of a mechanical equipment system that shows undue or excessive wear, or that fails due to normal operational conditions during the Correction/ Warranty Period, 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.

1.5 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 store and maintain all equipment in strict accordance with the manufacturer's written short term and long term storage requirements.

E. Store in a manner to protect items with epoxy shop coatings from exposure to UV light which 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

F. Should damage occur, immediately make all repairs and replacements necessary to the satisfaction of the Engineer at no costs to the Owner.

PART 2 - PRODUCTS

2.1 GENERAL DESIGN OF EQUIPMENT

A. All parts and components of mechanical equipment shall be designed for satisfactory service under continuous duty without undo wear under the specified operating conditions.

B. All parts of mechanical equipment shall be amply proportioned for all stresses which may occur during operations, and for any additional stresses which 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 Occupational Safety and Health Act (OSHA) requirements. 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. 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.

F. All equipment of identical size, type and service shall be the product of the same manufacturer.

G. All equipment selected shall suit the general arrangement of the space in which it is to be installed.

H. 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 and installed by the electrical contractor, unless otherwise noted as specified in Division 16.

I. Suitable provisions shall be made for easy access for service and replacement parts.

2.2 BOLTS, ANCHOR BOLTS AND NUTS

A. Furnish all necessary bolts, anchor bolts, nuts, washers, lock washers or locking nuts, plates and bolt sleeves in accordance herewith. Anchor bolts shall have suitable washers, lock washers and, where so required, their nuts shall be hexagonal.

B. All bolts, anchor bolts, nuts, washers, lock washers, plates, and bolt sleeves shall be galvanized unless otherwise indicated below or specified elsewhere.
   1. Galvanized steel unless otherwise indicated below or specified elsewhere.
   2. Stainless steel hardware (minimum of Type 304, unless otherwise indicated) is required in all corrosive atmospheres, exterior areas, and/or areas with NEMA 4X or NEMA 7 rating.
   3. Stainless steel hardware (minimum of Type 316, unless otherwise indicated) is required in all submerged applications, including but not limited to the headworks, dewatering rooms, chemical rooms, clarifiers, aeration basins, splitter structures, equalization or storage tanks, etc. For additional description and definition of submerged surfaces refer to Specification Section 09900.

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. 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 in. by 4 in. by 3/8 in. 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.

F. 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" diameter.

2.3 FOUNDATIONS, INSTALLATION AND GROUTING

A. The Contractor shall furnish the necessary materials and construct suitable concrete foundations for all equipment installed by the Contractor, 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. All foundation and grout exposed surfaces shall be given a burlap-rubbed finish, and painted with at least two coats of the epoxy based paint specified for concrete.

F. If threaded rod with lower support nuts are used to secure the equipment in place temporarily during concrete equipment pad placement, the support nuts shall be removed prior to grouting so that the threaded rod anchor bolts are not supporting the equipment and the top nuts can be tightened to secure the equipment directly to the large bedding surface provided by the non-shrink grout and concrete equipment pad. Equipment foundations shall be designed to absorb equipment vibration and transmit forces to building structure or ground.

2.4 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.

B. All equipment motors and appurtenances (e.g., switches, instruments, etc.) shall meet the area classification and NEMA requirements as listed on Drawing E-1.

C. Ratings of Motors

1. 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.
2. 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.
3. All electric motors shall be UL recognized.
4. Motor shall have a service factor of 1.15, unless otherwise specified.

D. Type of Motors

1. All motors shall be NEMA Design B, and shall have 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.
2. Motors shall be manufactured by General Electric Co., Reliance, Toshiba, Siemens, or be an equivalent product, that meets all the requirements herein.
3. 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.
4. 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.

5. Motors Installed in Class I Division 1 Hazardous Locations:
   a. All motors shall be explosion-proof (XP) rated for Class I Div. 1 Group C & D.
   b. Motors connected to variable speed drives shall include integral high temperature thermostats or similar device with a high temperature interlock to shut down the motor and auxiliary contact to activate an alarm condition.
   c. Motors on motor starters or reduced voltage soft starters (RVSS) will not be designed with thermostats unless specifically required by the motor manufacturer to meet the area rating.
   d. Thermostats will be normally closed, hermetically sealed and rated a minimum of 0.5A at 120 VAC. The thermostats shall be set so that the temperature of the motor will not exceed the auto-ignition temperature for a Class I Group C and D (320°F).
   e. Thermostat shall have a specific output to the Control Panel and SCADA PLC input for high motor temperature alarm. See Instrumentation Drawings.
6. Motors Installed in Class I Division 2 Hazardous Locations:
   a. All motors will be either TEFC or explosion proof (XP) rated. TEFC motors must be non-sparking type (brushless) with non-sparking cooling fans and include integral high temperature thermostats or similar device with a high temperature interlock to shut down the motor and auxiliary contact to activate an alarm condition.
   b. Thermostats will be normally closed, hermetically sealed and rated a minimum of 0.5A at 120 VAC. The thermostats shall be set so that the temperature of the motor will not exceed the auto-ignition temperature for a Class I Group C and D (320°F).
   c. Thermostat shall have a specific output to the Control Panel and SCADA PLC input for high motor temperature alarm. See Instrumentation Drawings.
7. All motors shall be NEMA Premium Efficiency type. The nominal and/or minimum guaranteed efficiency shall be printed on the motor nameplate. The efficiency values shall conform to Energy Policy Act of 1992, unless exempted, and shall be as indicated in the following table:

Nominal Full Load Motor Efficiencies						
	Open Motors			Enclosed Motors		
HP	2-Pole	4-pole	6-Pole	2-Pole	4-pole	6-Pole
1	77.0*	85.5	82.5	77.0	85.5	82.5
1.5	84.0	86.5	86.5	84.0	86.5	87.5
2	85.5	86.5	87.5	85.5	86.5	88.5
3	85.5	89.5	88.5	86.5	89.5	89.5
5	86.5	89.5	89.5	88.5	89.5	89.5
7.5	88.5	91.0	90.2	89.5	91.7	91.0
10	89.5	91.7	91.7	90.2	91.7	91.0
15	90.2	93.0	91.7	91.0	92.4	91.7
20	91.0	93.0	92.4	91.0	93.0	91.7
25	91.7	93.6	93.0	91.7	93.6	93.0
30	91.7	94.1	93.6	91.7	93.6	93.0
40	92.4	94.1	94.1	92.4	94.1	94.1
50	93.0	94.5	94.1	93.0	94.5	94.1
60	93.6	95.0	94.5	93.6	95.0	94.5
75	93.6	95.0	94.5	93.6	95.4	94.5
100	93.6	95.4	95.0	94.1	95.4	95.0
125	94.1	95.4	95.0	95.0	95.4	95.0
150	94.1	95.8	95.4	95.0	95.8	95.8
200	95.0	95.8	95.4	95.4	96.2	95.8
250	95.0	95.8	95.4	95.8	96.2	95.8
300	95.4	95.8	95.4	95.8	96.2	95.8
350	95.4	95.8	95.4	95.8	96.2	95.8
400	95.8	95.8	95.8	95.8	96.2	95.8
450	95.8	96.2	96.2	95.8	96.2	95.8
500	95.8	96.2	96.2	95.8	96.2	95.8

E. General Design of Motors

1. Motors shall comply with the latest NEMA Standards for Motors and Generators, unless otherwise specified.
2. 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.
3. Bearings shall be of the self-lubricating type, designed to ensure proper alignment of rotor and shaft and to prevent leakage of lubricant.
4. 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. The exception to this shall be belt-drive applications in which case the motor manufacturer shall determine if roller bearings are required in lieu of ball bearings due to higher radial loads.
5. Vertical motors shall be provided with thrust bearings adequate for all thrusts to which they can be subjected in operation.

6. 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.

F. Wound-Rotor Induction Motors
   1. Wound-rotor motors shall be designed for operation of the motor-driven equipment under the conditions specified in the Detailed Specifications.
   2. Motors shall be of the wound-rotor, induction type suitable for speed control by rotor resistance.
   3. 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.
   4. The collector rings and brushes for the wound-rotor induction motors shall be suitable for operation in an atmosphere containing moisture.
   5. 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.

G. Synchronous Motors
   1. Synchronous motors shall comply in all respects with the latest NEMA Standards for Motors and Generators, and AN Standard C50 for Rotating Electrical Machinery.
   2. Synchronous motors shall be designed for operation of the motor-driven equipment under the conditions specified in the Detail Specifications.
   3. 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.
   4. Synchronous motors shall be manufactured by General Electric Co., or be an equivalent product.

H. Single-Phase Motors with Auxiliary Devices
   1. 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.

I. Motor Terminal Boxes and Leads
   1. 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.

J. Special Motors
   1. 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.

K. Premium Efficiency Motors for Use with Variable Frequency Drives
   1. Motors other than inverter duty rated type intended for use on variable frequency drive equipment shall have an insulation system that shall be inverter grade to meet NEMA MG1-1998, part 31.4.4.2.A., Class Insulation system with a Class B rise at a 1.15 service factor. Motors shall be wound with inverter duty wire and shall be multidipped and baked in a polyester, Class H varnish. Nameplate on motor shall be stamped indicating motor is certified for use with VFD's.

L. Inverter Duty Rated Motors
   1. Motors which are rated for inverter duty shall be furnished and installed for all applications where used with variable frequency drive equipment.
   2. Motor shall be suitable for operation over entire speed range indicated without causing motor overheating at any condition.
   3. Forced ventilation type inverter duty rated motors with a separate external continuously operating fan shall not be acceptable.
   4. Motors installed in Division 1 hazardous (classified) location shall be identified as acceptable for variable speed when used in Division 1 locations.
   5. Motor shall have Class F insulation with a Class B temperature rise and shall be motor nameplated, stamped and labeled as Inverter Duty Rated.
   6. Motors shall be designed with a 1.0 service factor (non-sinewave power) and 40°C ambient conditions per NEMA MG1-1998, part 31.3.7.
   7. Motor shall be wound with inverter duty wire and phase paper and shall be multidipped and baked in polyester, Class H varnish.

M. Submersible Motors
   1. Motors which are rated for submersible use shall be of the highest efficiency in the industry for this type of motor and horsepower rating.
   2. When used in conjunction with variable frequency drive equipment, the submersible motor shall be rated for inverter duty with Class H insulation.

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. High torque couplings shall be all metal gear couplings with external grease fittings. A service factor of 1.50 shall be used based on the motor nameplate rating.

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.

2.6 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.

2.7 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.

2.8 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).

2.9 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 directed 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 SPARE PARTS AND SPECIAL TOOLS

A. For each type of equipment furnished by him, the Contractor shall provide spare parts, as specified on the respective sections of the Division, and a complete set of all special tools (including grease guns or other lubricating devices) which 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. All spare parts and special tools shall be delivered at the same time as the equipment to which they pertain. The Contractor shall properly store and safeguard such spare parts and special tools until completion of the work, at which time they shall be delivered to the Owner.

D. Spare parts shall be appropriately labeled and containerized, and shall be properly packaged for long-term storage.

2.12 EQUIPMENT DRIVE GUARDS

A. All equipment driven by open shafts, belts, chains, or gears shall be provided with all-metal or rigid fiberglass OSHA approved guards enclosing the drive mechanism. Guards shall be securely installed but 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 which 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. An enlarged paper copy of all the nameplate data on equipment and motors shall be provided in the Shop Drawings and Operation and Maintenance Manuals.

2.15 SURFACE PREPARATION AND SHOP COATINGS

A. Provide surface preparation and shop coatings in accordance with Specification Section 09905.

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 shall coordinate each piece of equipment. Refer to the Electrical and Instrumentation Drawings.

C. Electrical controls for all equipment shall comply with the requirements of Division 16 and the National Electric Code, including provisions to allow each piece of equipment to be locked out/tagged out for maintenance or repairs.

D. Control panels shall be constructed in conformance with UL 508A and bear the UL 508A seal confirming the construction. UL inspection and seal application can be accomplished at the panel fabrication facility or by field inspection by UL inspectors. Obtaining the UL seal and any inspections shall be provided at no additional cost to the Owner.

2.17 GAUGES

A. General:

1. Unless otherwise indicated, gauge 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 a tee with a brass test cock with female outlet end all arranged to allow field checking with a 4½-inch test gauge. Gauge assembly piping and valves for chemical feed systems shall be compatible with the chemicals being handled.
2. All gauges shall be equipped with snubbers or other protective throttling device(s) to dampen workings and pointer. If single snubber does not correct pulsing, provide additional snubbers in series.
3. All gauges shall meet requirements as outlined hereinafter.
4. All gauges provided are to be from the same manufacturer.
5. All gauge assemblies shall be supported by brackets to prevent excessive vibration that will cause damage to the gauge assembly.
6. The ranges of the gauges shall be suitable for any range of pressure that can occur during operation.
    a. Suction gauges shall be compound-type, having a range of -15 feet to 0 feet to +30 feet of water.
    b. Discharge gauges shall be selected at the nearest standard range which provides a top limit above the pump shutoff head or pump relief valve setting. Discharge gauges shall read in feet of water.

B. Process Liquid Applications:
1. Gauges shall be round black case, 4½-inches diameter, 1/2-inch NPT bottom male threaded connections, glycerin filled, 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. Gauges shall have an accuracy of 1/2 percent of scale range.
2. Gauges shall be furnished for the suction and discharge nozzle of each pump and where called for on the Drawings or within other Specification Sections.
3. All gauge assemblies shall be supported by brackets to prevent excessive vibration that will cause damage to the gauge assembly.

C. All Other Applications (Chemical, Process Water, Seal Water, Air)
1. Gauges shall be round black case, 2-1/2-inch, ¼-inch NPT stem mount, glycerin filled, polycarbonate window, stainless steel bourdon tube and rack and pinion movement, black anodized aluminum micro-adjusted rezeroing pointers, white aluminum dial with black lettering. Gauges shall have an accuracy of 1.5% of full range. For chemical feed systems, all materials of construction shall be compatible with process chemical.
2. All gauge assemblies shall be supported by brackets to prevent excessive vibration that will cause damage to the gauge assembly.

D. Diaphragm Seals
1. Gauges shall be provided with factory-mounted protective diaphragm assembly and snubber. Diaphragm assembly shall be cleanout type, which will allow cleaning of the lower diaphragm assembly without breaking the seal or refilling and shall not require recalibration of the gauge.

2. The diaphragm shall be 316 stainless steel with a 316 stainless steel housing (process and instrument flanges) and shall be fitted with a bleed screw on the instrument flange, and flushing connection on the process flange. Connecting bolts and nuts shall be 316 SS. Other diaphragm materials will be considered for acceptance on a case-by-case basis when dictated by chemical compatibility, or as specified below.
    a. Sodium Hypochlorite: PVC/ Teflon or Hastelloy C-276
3. The diaphragm shall be rated for gauge operating pressure range. Provide a locking plate or lock-wire to prevent turning of the assembly and to maintain the factory calibration.

E. Process Isolator (Diaphragm Ring Seal): As indicated on the Drawings
1. Provide a wafer-style pressure isolation flange to isolate the connected gauge from the process fluids.
2. The ring shall be constructed of 316 stainless steel meeting ANSI B16.5 Class 150 standards.
3. The pressure shall be transferred from an elastomeric ring embedded around the inside diameter of the flange to a ½" NPT port on the outside of the flange with isolation needle valve.
4. All nipples, valves and fittings will be 316 stainless steel.
5. Liner material:
    a. Wastewater/Sludge Application: NBR, natural rubber or EDPM
    b. Polymer Applications: NBR
6. Fill fluid: Silicon (10Cst)
7. Pressure gauge: per this section
8. The pressure gauge and diaphragm seal shall be factory assembled and tested.
9. Manufacturers:
    a. Ashcroft Type 80 Iso-Ring
    b. Red Valve Series 48
    c. Or equal

F. Gauges Assemblies shall be manufactured by:
1. Ametek U.S. Gauge Division
2. Ashcroft
3. Trerice
4. or equal.

G. Contractor shall provide a gauge schedule listing all gauges, functions, locations, scales, etc., as part of the shop drawing submittal package.

2.18 EQUIPMENT AND VALVE TAGS

A. All new process equipment and valves shall be identified by a color coded equipment/valve tag, provided and installed by the Contractor. Contractor shall submit a complete list of proposed Identification Tag information and it shall be reviewed by the Engineer and Owner and revised as indicated. In general, tag information shall match the information provided on the Drawings.

B. Tags shall conform to the following specifications:

1. The tags shall be 2.5-inch diameter, 1/16" thick, rigid, multi-layered sandwich laminate with contrasting inner and outer colored acrylic plastic layers. Top hole size is 5/32" for hanging tags.
2. Tags shall be available in 7 different outside colors. Owner and Engineer shall select up to 4 different colors for the project.
3. Tags shall have up to three lines engraved on a side and eight characters per line of identification information. Tags shall be engraved one side.
4. Tags shall be secured to valves with nylon cable ties or adjustable metal bead chain. Securing method shall be selected by the Owner and Engineer.
5. Tags secured to equipment shall be fastened to a flat visible surface by a minimum of two SS screws or SS pop rivets.
6. Tags shall have a service temperature of -40°F to 175°F
7. Manufactured by Seton Name Plate Corporation, New Haven, CT, Brimar Industries, Garfield, NJ or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Contractor shall carefully inspect receiving structures and anchor supports for defects in workmanship prior to equipment arrival.

B. Contractor shall 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 a duly authorized Manufacturer's 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 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 startup services, the Manufacturer's 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. Owner-Furnished Acceptance Testing Company - The Owner shall utilize the services of an independent inspector in order to verify that all equipment is operating in full compliance with the Specifications. The independent inspector shall be selected by the Owner. Cost for initial testing of equipment by independent inspector shall be by Owner. The Contractor shall provide assistance to the independent inspector as needed to complete the required equipment testing at no additional cost to the Owner, the Engineer, or the independent inspector. The Owner's independent inspector will conduct the following acceptance testing:
   a. Equipment pre-installation alignment;
   b. Equipment final alignment check;
   c. Vibration analysis;
6. All equipment found defective by the Engineer shall be replaced by the Contractor at no expense to the Owner.
7. The cost of any retesting by Owner's independent inspector, required because of defective equipment, shall be borne by the Contractor.

3.2 PREPARATION

A. Provide all required adhesives, sealants, insulation, lubricants, waterproofing, fireproofing or other protection specified in each Section of this Division.

3.3 INSTALLATION

A. Contractor shall install equipment in accordance with Manufacturer's requirement. Manufacturer(s) shall work with the Contractor to ensure that the equipment has been properly installed.
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.

3.4 STARTUP AND TESTING

A. Test and adjust all equipment in accordance with the general requirements of Specification Section 01800, and the specific requirements of the various Division 11 Specification Sections.
B. Demonstrate the equipment's ability to operate without overloading jamming, excessive vibration, etc. during normal operation conditions.
C. Demonstrate the equipment's ability to meet all the performance requirements specified for the equipment system to make a complete operational system, suited for its intended use.

END OF SECTION

SECTION 11307

VACUUM PRIMING SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install factory built, vacuum-priming system as specified herein. The vacuum priming system shall be complete with all needed equipment, factory-installed on a welded steel base. **The vacuum priming system (pumps, tank, control panel and appurtenances) are to be included in Add Alternate A on the Bid form. The priming valves and associated piping from the raw water pump suction to the vacuum tank are to be included in the Base Bid.**

B. System Description: Tank mounted vacuum priming system includes two high efficiency vacuum pumps, a duplex control panel with automatic controls, a horizontal vacuum receiver, and all interconnecting piping and wiring for single point connections. All external ferrous metals will be protected by a uniform coating of industrial enamel. The entire system will be run tested to ensure proper operation.

This system shall prime a 1300 cubic foot suction volume to a 12 foot vertical lift in approximately 7 minutes with one vacuum pump running. The prime will then be continuously sustained with the vacuum pump only running as needed. Each vacuum pump has a maximum flow of 74 acfm and is rated to 29.9” Hg.

1.2 QUALITY ASSURANCE

A. General:
   1. The Specifications and Drawings direct attention to certain required features of the equipment and materials of construction, but do not purport to cover all details entering into its design. Nevertheless, the Contractor shall furnish all materials and equipment complete in all details and ready for operation for the intended purpose.
   2. Equipment design, construction and installation in accordance with best practice and methods and conforming to the standards of the Hydraulic Institute.
   3. All equipment and accessories shall be the manufacturer's latest and proven design.
   4. All parts of the equipment shall be amply proportioned for long, continuous, and uninterrupted service.
   5. Suitable provisions shall be made for easy access for service and replacement of parts.
   6. Workmanship shall be first class in all respects.

B. Project Design
   1.
   2. If any other manufacturer is proposed by the Contractor for the Work covered in this Section, it shall be the responsibility of the Contractor to perform any

required redesign and coordination associated with, but not limited to, mechanical equipment layout, electrical wiring, conduit and controls, and structural work, at no additional cost to the Owner. Proposed redesign shall be subject to review and approval of the Engineer.

C. Acceptable Manufacturers:
   1. Combined Fluid Products Company.
   2. Or approved equal.

1.3 SUBMITTALS TO THE ENGINEER

A. Complete layout drawings illustrating all construction details and dimensions including any manufacturer instructions on installation or handling.

B. Shop drawings, manufacturer's literature, maintenance data, operating instructions, parts lists and a list of maintenance materials as specified in the General Conditions and specification Sections 01340 and 11000 of the Contract Documents and as required in the Specifications and Drawings.

C. The contractor shall integrate all the required shop drawings into a common bound submittal package for the vacuum prime system. The shop drawings shall include the following information:
   1. Sufficient information to verify compliance with the requirements herein and shall include equipment warranties and pump performance curves showing total dynamic head, pump input horsepower and pump efficiency over the rated capacity range of each pump.
   2. Manufacturer's certification that equipment, accessories and shop painting meet or exceed the Specification requirements.
   3. Letter from the Manufacturer stating that that they have: reviewed the Construction Documents, the intended installation by the Contractor, and the intended functional and operational conditions; determined all conditions to be acceptable; and found no conditions which would cause the warranty to be void; or the equipment to function improperly, or not meet the performance requirements.
   4. Sizing Calculations
   5. Installation instructions.
   6. Extended Warranty in the name of the City of Rochester.

D. Operations and Maintenance Manuals - The manuals are to be in a single binder for each pump station and shall include detailed information on the installation, assembly, alignment, start-up, normal operation, shut down, lubrication, maintenance and troubleshooting of all equipment along with parts lists and detailed drawings.

1.4 WARRANTY

A. The entire system and all components shall be covered by the priming system manufacturer's standard warranty of at least 18 months from the time of shipment or 12 months from the time of start-up.

1.5 DESIGN CRITERIA

A. Rochester Low Lift Pump Station:
   1. Function: Low lift pump station, raw unfiltered source water.

2. Number of Units: One
3. Type: Rotary Vane Vacuum Pump
4. Capacity: 74 acfm, Vacuum Rating 29.9" Hg
5. Motor: 3.6 HP, 460V, 3 phase, 60 Hz
6. Basis of Design: Combined Fluid Products Company, Q-VAC QVD-76RV-120HG-AP Automatic Duplex Vacuum Priming System.

PART 2 - PRODUCTS

2.1 GENERAL

A. The pumps shall be controlled automatically by the pressure in the suction header piping. All equipment for the station shall perform automatically.

B. Furnish a duplex automatic vacuum priming system consisting of two vacuum pumps, duplex control panel, AutoPurge feature, and accessories all mounted on a horizontal receiver tank.

2.2 VACUUM PRIMING SYSTEM

A. Vacuum Pump

1. The vacuum pump shall be of oil-lubricated rotary vane design and shall have an open flow rating of no less than 74 acfm and an ultimate vacuum rating of 29.9" HgV. The maximum noise level of each pump shall be 70 dB(A) or less at one meter. The vacuum pump shall be flanged to a 3.6 horsepower TEFC motor wired for operation on a 460-volt, 60 Hz, 3-phase power supply. Actual brake horsepower shall not exceed the motor nameplate power rating at any vacuum level. Belt drives shall not be permitted. The vacuum pump shall be constructed primarily of cast iron. Vacuum pump shall be equipped with three non-metallic, non-asbestos vanes. Multiple stages of liquid and aerosol oil separation shall be integral to the pump to ensure clean discharge air. A gas ballast valve must be included to improve moisture handling. An oil drain valve shall be piped to the edge of priming system for ease of maintenance.
2. The vacuum pump assembly shall be supplied with the following equipment connected to the inlet: a 5-micron inlet filter; secondary inlet check valve; vacuum release valve with silencer, pump isolation valve; and a flexible connector for a vibration free attachment.
3. Each vacuum pump shall be filled with semi-synthetic vacuum pump oil.

B. AutoPurge

1. The priming system should be equipped with an AutoPurge system to extend oil change intervals and help maintain the vacuum pumps in peak condition. This shall include a NEMA 4X electrically operated isolation valve for each vacuum pump and special programming for automatic operation. When signaled by the PLC the isolation valve will close and the pump will run a timed purge cycle drawing fresh, dry air through the gas ballast valve prior to shutting down.

C. Receiver

1. The receiver shall be a galvanized 120-gallon horizontal ASME coded air receiver functioning as a vacuum storage vessel. It shall include a sight gauge for visual inspection of water accumulation within the receiver; a protective

high water level switch to shut down the system and provide an alarm if the receiver begins to flood; a 4" liquid filled vacuum gauge to monitor system vacuum level; a vacuum release valve with silencer to facilitate draining; a manual drain valve for draining accumulated water; and an inlet ball valve to isolate the priming system from the process vacuum line.

D. Control Panel
   1. Automatic controls shall be utilized for maintaining preset vacuum levels and to ensure peak system operation and safety. Controls shall be housed in NEMA 4 enclosure with UL508 panel shop rating and shall include: (1) Power distribution block, (2) IEC style motor starters with UL Class 10 adjustable ambient compensated motor overload relays, (2) Through-the-door overload reset switches, (1) Control voltage transformer, (1) 24VDC power supply, (2) Pump running lights, (2) H-O-A selector switches, (1) Vacuum transducer, (1) Alarm horn, (1) Alarm silence push button, (1) Alarm light, (1) Alarm reset button, (1) PLC controller with HMI and illuminated LCD screen, and (3) dry alarm contacts for low vacuum, pump failure, and flooded vacuum receiver conditions.

E. PLC Controller
   1. The PLC controller will provide full automatic system control including lead-lag operation, pump alternation, frequent start protection, AutoPurge operation, system running status, running hours for each pump, low vacuum alarm, pump failure alarm, and flooded vacuum receiver alarm.
   2. Network Integration – The PLC shall be compatible for an optional Ethernet connection for SCADA monitoring using free OPC software which will reside in the plant's control network.

F. Coating System
   1. All external ferrous surfaces shall be uniformly primed and painted by the manufacturer to provide a high quality protective finish and uniform color. Different coatings on the receiver and other major components shall not be permitted except by special request. All ferrous surfaces must be sound, dry, clean and free of oil, grease, dirt, mildew, release agents, curing compounds, efflorescence, loose and flaking paint and other foreign substances. All external ferrous surfaces must be primed with a minimum of one coat of advanced technology, premium quality, waterborne acrylic coating designed for use as a rust inhibitive direct-to-metal (DTM) primer and finish. Primer must be applied at a rate of 5.0 – 8.0 mils wet (2.2 – 3.5 mils dry) per coat with a minimum dry time of two hours between coats. All external ferrous surfaces must receive a minimum of two finish coats of premium quality, waterborne, direct to metal (DTM) acrylic semi-gloss enamel designed for the interior-exterior areas of commercial, institutional, and industrial structures and equipment for excellent durability and protection. The finish coat must be applied at a rate of 4.4 – 11.6 mils wet (1.5 – 4.0 mils dry) per coat with a minimum dry time of 4 hours between coats.

G. Priming Valves
   1. Model QV-45P3-WLCS or approved equal, priming valve shall be furnished loose by the priming system manufacturer for each pump serviced by the priming system. Each priming valve shall be constructed of cast iron with 316 stainless steel trim. The internal and external valve body shall include a fusion bonded epoxy coating for abrasion and chemical resistance. A SPDT water level switch with weatherproof enclosure shall be provided for proof of prime interlock with each centrifugal pump.

H. Water Trap
   1. A model CVA-0150R or approved equal, inline water trap shall be furnished loose by the priming system manufacturer to help protect the system from slugs of water due to a priming valve leak or failure. The water trap shall include 1.5" FPT isolation valves, a corrosion resistant aluminum head, clear polycarbonate housing, internal baffle, stainless steel separator screen and float ball, elastomer seat, vacuum release valve with silencer, drain valve, and liquid filled vacuum gauge.

I. Spare Parts
   1. Spare parts shall be delivered at the same time as the equipment to which they pertain. The Contractor shall properly store and safeguard such spare parts until completion of the work, at which time they shall be delivered to the Owner.
   2. Parts shall be packaged in individual suitable containers labeled with the part number, name and quantity.
   3. Provide spare parts as recommended by the manufacturer.

2.3 FACTORY TESTING

A. All components of the pump station shall be given an operational test at the manufacturer's facility to assure proper operation prior to shipment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Contractor shall install equipment in accordance with manufacturer's written requirements.
B. Contractor to furnish and install supports as indicated on the Drawings, and as required by the equipment manufacturer.
C. 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.

3.2 START-UP AND TESTING

A. In accordance with the manufacturer's written requirements.
B. Contractor shall provide all necessary power, tools, equipment, piping, labor, water, fuel or other materials needed for start-up and testing.
C. Demonstrate the equipment's ability to operate without overloading, jamming, excessive vibration, or overheating during normal operation conditions. In addition, demonstrate the equipment's ability to meet the performance requirements specified

for the equipment system to make a complete operational system, suited for its intended use.

1. During tests, observe and record head, vacuum capacity, rpm and motor input. Fully demonstrate ability to operate at specified conditions without motor overload.
2. Promptly correct or replace all defects or defective equipment revealed by or noted during tests and if necessary repeat tests until results are acceptable to the Engineer.
3. Make all adjustments necessary to place equipment in satisfactory working order at time of tests.

D. The Manufacturer shall provide the services of a factory-trained representative for a minimum period of one day on-site to perform initial start-up of the priming system and to instruct the Owner's operating personnel in the operation and maintenance of the equipment.

END OF SECTION

SECTION 11312

HORIZONTAL CENTRIFUGAL PUMPS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install and test horizontal, split-case centrifugal pumps as specified herein and as shown on the Drawings.

B. Related Work Specified Elsewhere (when applicable):
   1. Additional requirements as specified in Sections 01800, 11000, and 11310.
   2. Shop and field coatings are as specified in Division 9.
   3. Instrumentation and controls as specified in Division 13.
   4. Piping, fittings and valves and specified in Division 15.
   5. Electrical as specified in Division 16.

C. Performance Requirements:
   1. Each pump shall be capable of continuously pumping raw water to the treatment plant at the conditions indicated in the Pump Schedule.

1.2 QUALITY ASSURANCE

A. In accordance with the requirements specified in Section 11000.

B. All system components specified herein shall be furnished by a single Manufacturer who regularly engages in the production of this type of equipment. The Manufacturer shall be responsible for the performance and warranty of the entire system provided under this section.

C. Qualifications of Manufacturers: The manufacturer shall have a minimum of ten years of experience in the design and manufacture of the specified equipment. The manufacturer shall have a minimum of fifty similar installations operating for a minimum of five years.

D. Acceptable Manufacturer's:
   1. Peerless Pump – Model: 8AE13

1.3 SUBMITTALS

A. In accordance with Section 01340, 11000 and 11310 and as specified herein.

PART 2 - PRODUCTS

2.1 HORIZONTAL SPLIT CASE CENTRIFUGAL PUMPS

A. Model: Peerless- 8AE13

B. Pump Casing:
   1. Constructed of hard closed grain cast iron #30 (ASTM A48-Latest Rev.) of ample thickness, capable of prolonged resistance to the abrasive action of solids or foreign matter contained in the liquid passing through the pump.
   2. Casing designed to allow back pull-out of impeller.
   3. Casing tested under a hydrostatic head of at least 75 psi or 150 percent of the rated shutoff head, whichever is greater.

4. High point of casing fitted with an air vent and the low point with a drain.

C. Suction and Discharge Nozzles:
   1. Minimum size as shown on the Pump Schedule.
   2. Drilled and tapped for installation of pressure gages.
   3. Connection flanges with flexible unions faced and drilled in accordance with the 125 lb ANSI Standard A21.10.

D. Impeller:
   1. Constructed of cast iron (ASTM A48 - Latest Rev.).
   2. Enclosed, double suction type. Cast in one piece and balanced.
   3. Vanes shall have smooth contours and well-rounded entrances.
   4. Keyseated and securely attached to shaft by a streamline locknut or equally efficient method, capable of withstanding a pump reversal to full runaway speed, but still permit easy removal.
   5. Clearance maintained by external shaft adjustment at outboard bearing.

E. Shaft:
   1. Constructed of high-strength steel or stainless steel and accurately machined.
   2. Shaft Grounding Rings,
      a. As pump motors powered with variable frequency drives, these motors shall be provided with a shaft grounding ring on all motors, vertical or horizontal as a factory installed, maintenance free, circumferential, bearing protection ring with conductive microfiber material contacting the shaft with the ring mounted on the motor drive-end; the Grounding Ring installation position and manner shall be strictly according to the manufacturer's recommendation, the grounding path shall be to the stator.
      b. The grounding rings shall be installed at the factory in full accordance with the Grounding Ring manufacturer's stated procedures including proper preparation of the pump shaft.
      c. The Grounding Rings shall be part of an appropriate grounding system for the pump motors so the stray voltages are directed fully to earth ground. The overall grounding system shall be fully described and diagrammed as a part of the Contractor's submittals. The pump station manufacturer shall properly ground the pump station according to NEC Section 250.
      d. The grounding rings shall be of proven design and be "SGR" by Electro Static Technology, Aegis, or motor manufacturer selected equal.

F. Seal: See Section 11310.

G. Base: The pump shall be mounted on a substantial, heavy fabricated steel base.

H. Couplings:
   1. The pump motor and shaft shall be connected by a flexible coupling equipped with an OSHA approved coupling guard.

I. Wearing Rings:
   1. Constructed of bronze.
   2. Installed on the impeller and in the pump casing at the suction side.
   3. Replaceable.

J. Bearings:
   1. Rotating assembly shall be supported by heavy-duty grease lubricated, cartridge mounted ball bearings.

2. The outboard bearing shall be a double row bearing, locked into position by bearing lock nuts.
3. The inboard shall be a single row bearing.
4. Dual lip seals shall seal the bearing housings against dirt and moisture.
5. Removable bearing caps and bearings covers shall permit inspection or service of bearings without disturbing the pump casing or piping.
6. Means provided in bearing cases to prevent excessive greasing.

K. Main Frame:
1. Constructed of heavy fabricated-steel.
2. Designed to support the full weight of the pump and motor and to resist without distortion the stresses due to impeller thrust and bearing load.

L. Motor: Refer to specification section 11000 and 11310.
1. Peerless-8AE13, Model 364T Pump Specifications:
a. Capacity: 1,500 (US gpm)
b. Total head: 64 (ft)
c. Power: 60 (hp)
d. Elec. Spec.: 3 phase, 230/460 V., 60 Hz
e. Rotation: Clockwise

2.2 INSTRUMENTATION AND: CONTROLS
A. As specified in Division 13.

2.3 SPARE PARTS:
A. In accordance with the requirements of Section 11000.
B. Provide the following spare parts:
1. One complete set of gaskets per pump.
2. One replacement mechanical seal per pump, including special container with complete installation instructions.

PART 3 - EXECUTION

3.1 EXAMINATION, PREPARATION AND INSTALLATION
A. In accordance with Specification Section 11000.

3.2 START-UP AND TESTING
A. In accordance with Specification Sections 01800 and 11000.

END OF SECTION

SECTION 15063

COPPER PIPE & FITTINGS (INTERIOR APPLICATIONS)

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install copper pipe and fittings of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.

B. Related Work Specified Elsewhere:
   1. Pipe & Pipe Fittings - General is specified in this Division.
   2. Copper Service Pipe & Fittings for Buried Applications is specified in Section 02626.
   3. Corporation Stops is specified in Section 02642.

1.2 QUALITY ASSURANCE

A. Pipe: Seamless copper water tube, ASTM B88 (pressure) and ASTM B-306 atmospheric.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pipe Use (When Applicable):
   1. Domestic water (interior).
      a. Type L, soft annealed, l inch and smaller.
      b. Type L, hard temper, l-l/4 inches and larger.
   2. Process fluids, compressed air, vacuum, inert gas, general use and where indicated (interior).
      a. Type L, hard temper.
   3. Fuel oil piping (where indicated):
      a. Type L soft temper.

B. Fittings:
   1. Wrought copper and bronze solder joint pressure fittings: ANSI Bl6.22.
   2. Cast bronze solder joint pressure fittings: ANSI Bl6.l8.
   3. Cast bronze solder joint drainage fittings: ANSI Bl6.23.
   4. Cast bronze fittings for flared copper tubes: ANSI Bl6.26.

C. Solder and Flux:
   1. Solid string or wire solder, 95 percent tin, 5% antimony on all pressure piping and potable water.
   2. Silver solder, 45% brazing silver alloy (where indicated).
   3. Flux: Non-corrosive paste type as required for type of solder.
   4. Acid core, paste type, or solder/flux combinations are not permitted.
   5. Solder or flux containing lead in any form will not be permitted on any potable water system.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Jointing:
   1. Solder Joints:
   2. Ream or file pipe to remove burrs.
   3. Clean and polish contact surfaces of all joints.
   4. Apply flux to both male and female ends.
   5. Insert ends of tubes into fittings, the full depth of the sockets.
   6. Bring the joints to soldering temperature in as short a time as possible.
   7. Form continuous solder beads around the entire circumferences of the joints.

B. Bending Pipe:
   1. Bend pipe by the method and to the radius to comply with the manufacturer's recommendation.
   2. Bends shall be free of any cracks or buckles.

C. Support: Support all pipes in accordance with the "Pipe Hangers & Supports" Section in this Division.

D. To permit convenient disassembly for alterations and repairs, install unions where shown on the Drawings and:
   1. In long runs of piping,
   2. In bypasses around equipment,
   3. In connections to traps, tanks, pumps, and other equipment,
   4. Between shutoff valves, and
   5. In other locations as directed by the Engineer.

E. Remove all valve internals when soldering into pipelines.

END OF SECTION

SECTION 15092

PIPE SLEEVES & SEALS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install wall sleeves and seals of the type(s) and sizes(s) and in the location(s) shown on the Drawings and specified herein.

B. Related Work Specified Elsewhere:
   1. Firestopping is specified in Section 07270.
   2. Sealants are specified in Section 07900.
   3. Pipe and Pipe Fittings - General is specified in Section 15050
   4. Plumbing - General is specified in Section 15400.

1.2 QUALITY ASSURANCE

A. Provide and install all sleeves of the types specified herein, as shown on the Drawings and as directed by the Engineer.

B. Provide sleeves that are airtight, gastight or watertight as required.

C. Penetrations through fire rated walls, floors and ceiling shall have proper fire stopping, as specified in Section 07270.

PART 2 - PRODUCTS

2.1 TYPES AND LOCATIONS

A. Penetrations through New Construction:
   1. Interior Masonry, Drywall, or Wood Partition (Non-Load Bearing) - Air to Air:
      a. 24 gauge, zinc coated (galvanized) steel tubes with wired or hemmed edges.
      b. Minimum 1/4 inch annular space between sleeve and pipe or insulation.
      c. Firmly pack with oakum and seal both ends with polyurethane sealant, per Section 07900 for standard penetrations.
      d. Install split cover plates in all finished areas. Both sides of wall if required. Plates shall be chrome finished, suitably sized to fit pipe in question and cover opening.
      e. Refer to details on Process Drawings.
   2. Exterior Masonry and Wood Walls
      a. Schedule 40 galvanized steel pipe, hot-dip galvanize after fabrication.
      b. Pipe sleeve thicknesses for sizes larger than 24-inch diameter shall be the standard 0.375-inch thickness.
      c. Minimum ¼-inch annular space between sleeve and pipe or insulation.
      d. Firmly pack with oakum and seal both ends with polyurethane sealant, per Section 07900 for standard penetrations.
   3. Interior Concrete Partitions - Air to Air:
      a. Schedule 40 galvanized steel pipe with 1 inch x 1/8 inch thick welded sealing and anchoring collar in middle, hot-dip galvanize after fabrication.

Pipe sleeve thicknesses for sizes larger than 24-inch diameter shall be the standard 0.375-inch thickness.

b. Minimum 1/4 inch annular space between sleeve and pipe or insulation.
c. Firmly pack with oakum and seal both ends with polyurethane sealant, per Section 07900 for standard penetrations.
d. Refer to details on Process Drawings.

4. Concrete Floor Penetrations - Air to Air; and Air to Ground:
   a. Same as “Interior Concrete Partitions - Air to Air”.
   b. Pipe sleeve to extend 2 inches above finished floor.
   c. Pipe sleeve bottom to be set flush with underside of slab.
   d. Galvanized steel pipe riser clamp with threaded rod embedded into concrete floor to be installed on topside of penetration to support the pipe vertically.
   e. Refer to details on Process Drawings.
5. Roof Penetrations - Air to Air:
   a. Same as “Interior Concrete Partitions” and as shown on the Drawings.
6. Exterior Concrete Walls - Air to Air; and Air to Ground:
   a. Schedule 40 galvanized steel pipe with 1 inch x 1/2 inch integrally cast sealing and anchoring collar in middle, hot-dip galvanize after fabrication. Pipe sleeve thicknesses for sizes larger than 24-inch diameter shall be the standard 0.375-inch thickness.
   b. Size of pipe sleeve as required by seal manufacturer.
   c. Seal with rubber link compression seal.
   d. Alternate wall sleeve system as manufactured by Omni Sleeve, Malden, MA can be utilized as reviewed and accepted by Engineer, in place of above specified wall sleeve system.
   e. Refer to details on Process Drawings.
7. Concrete Tank Walls - Liquid Containing Structures to Air, Ground, or Liquid
   a. For ductile iron and steel piping systems, utilize wall castings, or sleeve and double rubber link compression seal. Materials, schedule, class and size to match pipe.
      i. For galvanized steel piping systems, use SCH 40 galvanized steel pipe with 1-inch x 1/2-inch welded sealing and anchoring collar in middle, hot-dip galvanized after fabrication. Pipe sleeve thicknesses for sizes larger than 24-inch diameter shall be the standard 0.375-inch thickness.
      ii. For stainless steel piping systems, use Schedule 40 stainless steel pipe with 1-inch x 1/2-inch welded sealing and anchoring collar in middle. Pipe sleeve thicknesses for sizes larger than 24-inch diameter shall be the standard 0.375-inch thickness.
      iii. For ductile or cast iron piping systems, use wall casting with 1-inch x 1/2-inch integrally cast sealing and anchoring collar in middle; or sleeve with 1-inch x 1/2-inch welded sealing and anchoring collar in middle, hot-dip galvanized after fabrication.
      iv. Refer to details on Process Drawings.

b. For plastic piping systems, sleeve and seals to be in accordance with "Exterior Concrete Walls - Air to Ground" requirements noted above. These type penetrations will be allowable only in those locations specifically depicted on the drawings.

8. Foundation Walls Below Grade (Frost Walls) - Ground to Ground:
   a. Schedule 40 or max. 3/8 inch thick wall galvanized steel sleeve. Pipe sleeve thicknesses for sizes larger than 24-inch diameter shall be the standard 0.375-inch thickness.
   b. Minimum 1/2 inch annular space.
   c. Firmly pack with oakum and seal both ends with polyurethane sealant, per Section 07900 for standard penetrations.
9. Other conditions shall be sleeved or as reviewed and accepted by the Engineer.

B. Penetrations Through Existing Construction:
1. Interior masonry, drywall, or wood partition - Air to Air:
   a. Cleanly cut brick or block as required. Grout sleeve into place using non-shrink grout.
   b. Cleanly cut wood frames partitions as required. Set sleeve into position and secure.
   c. Sleeves to be as required for New Construction - Interior masonry, drywall, or wood partition - Air to Air.
   d. Holes bored with equipment leaving a smooth hole in masonry walls less than l/2 inch larger than the pipe will not require a sleeve, unless otherwise specified.
   e. Minimum 1/4 inch annular space between cored opening or sleeve and pipe or insulation.
   f. Firmly pack with oakum and seal both ends with polyurethane sealant, per Section 07900 for standard penetrations.
   g. Install split cover plates in all finished areas. Both sides of wall if required. Plates shall be chrome finished, suitably sized to fit pipe in question and cover opening.
2. Interior Concrete Partitions - Air to Air:
   a. Core smooth-walled opening with coring machine. Grout sleeve into place using non-shrink grout.
   b. Sleeves to be as required for "New Construction - Interior Concrete Partitions - Air to Air".
   c. Holes cored with equipment leaving a smooth hole, less than l/2 inch larger than the pipe will not require a sleeve, unless otherwise specified.
   d. Minimum 1/4 inch annular space between cored opening or sleeve and pipe or insulation.
   e. Firmly pack with oakum and seal both ends with polyurethane sealant, per Section 07900 for standard penetrations.
3. Interior Concrete Partitions - Air to Air:
   a. Same as "Exterior Concrete Wall".
4. Interior Concrete Partitions - Air to Air (Unclassified to Classified):
   a. Same as "Concrete Tank Wall".
5. Exterior Masonry Walls

a. Core drill a smooth hole through all layers of the existing masonry. Hole shall be sized to facilitate standard rubber link compression seal installation.
b. Install rubber link compression seal at each layer of masonry.
c. Seal each face with polyurethane sealant.
d. If a clean, smooth hole cannot be achieved, remove the masonry as required to install Schedule 40 galvanized wall sleeve. Pipe sleeve thicknesses for sizes larger than 24-inch diameter shall be the standard 0.375-inch thickness. Grout sleeve in place. Install rubber link compression seal and sealant as noted above.

6. Exterior Wood Walls
   a. Remove existing siding and other materials, as required to install the new item.
   b. Restore the wall and siding to provide a weather-tight seal acceptable to the Engineer.
7. Concrete Floor Penetrations - Air to Air:
   a. Same as “Interior Concrete Partitions - Air to Air”, except that sleeve will not be required.
   b. Stainless steel pipe riser clamp with stainless steel threaded rod embedded into concrete floor to be installed on topside of penetration to support the pipe vertically.
   c. Install rubber link compression seal, as shown, covered by self-leveling sealant (SikaFlex or equivalent).
   d. Refer to details on Process Drawings.
8. Roof Penetrations - Air to Air:
   a. Same as “Interior Concrete Partitions - Air to Air” and as shown on the Drawings.
9. Concrete Exterior Walls - Air to Ground:
   a. Core smooth-walled opening with coring machine. Grout smooth any irregularities in opening.
   b. Size of cored opening as required by seal manufacturer.
   c. Seal with rubber link compression seal.
10. Concrete Tank Walls - Liquid Containing Structures to Air or Ground:
    a. Core smooth-walled opening with coring machine. Grout smooth any irregularities in opening.
    b. Size of cored opening as required by seal manufacturer.
    c. Seal with two, back to back rubber link compression seals.
11. Foundation Walls Below Grade (Frost Walls) - Ground to Ground:
    a. Core smooth-walled opening with coring machine. Grout sleeve into place using non-shrink grout.
    b. Sleeves to be as required for “New Construction - Foundation Walls Below Grade (Frost Walls) - Ground to Ground”.
    c. Holes cored with equipment leaving a smooth hole, less than 1-inch larger than the pipe will not require a sleeve, unless otherwise specified.
    d. Minimum 1/2 inch annular space between cored opening or sleeve and pipe or insulation.

e. Firmly pack with oakum and seal both ends with polyurethane sealant, per Section 07900 for standard penetrations.

12. Other conditions shall be installed as reviewed and accepted by the Engineer.

C. Pipe openings in and penetrations through precast concrete structures shall be as specified in Division 2 and 3.

D. Rubber Link Compression Seals:

1. Acceptable Manufacturers:
   a. Link Seal by Thunderline Company
   b. Innerlynx by Advance Products and Systems
   c. Or equivalent.
2. Multi-rubber link type with pressure plates, bolts, nuts and sealing element providing a leak proof seal. Model numbers provided below are based on Link Seal by Thunderline Company are to establish type and level of quality.
3. General Service (Model C):
   a. Glass Reinforced Nylon Pressure Plate.
   b. Carbon steel zinc-phosphated nut and bolt.
   c. Sealing element: EPDM rubber.
   d. Temperature Rating: -40°F to 250°F.
4. Corrosive Service: (Model S-316):
   a. Use in the following locations: Sludge tanks, scum tanks, digesters, wetwells, manholes, dewatering rooms, headworks rooms, exterior tanks, chemical rooms, as shown on the Drawings.
   b. Glass Reinforced Nylon Pressure Plate.
   c. Bolt and nut, l8-8 stainless steel.
   d. Sealing element: EPDM rubber.
   e. Temperature Rating: -40ºF to 250ºF.
5. Potable/Clean Water Service (Model S61)
   a. Blue reinforced Nylon polymer pressure plates.
   b. 316 stainless steel nuts and bolts.
   c. Sealing element: Black EPDM NSF 61 certified.
   d. Temperature Rating: -40º to 250º F.
   e. Certified to NSF/ANSI standard 61.
6. High Temperature Service (Model T)
   a. Steel zinc dichromate pressure plates.
   b. Carbon steel with zinc dichromate finish nuts and bolts.
   c. Sealing element: Silicone.
   d. Temperature Rating: -67º to 400º F.
7. Refer to details on Process Drawings.

E. Wall Plates: Provide split type cast iron or brass wall plates on pipes penetrating walls in finished spaces such as labs and offices. Refer to details on Process Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. New construction:

1. Concrete: Set sleeves in proper location prior to placing concrete. Sleeves set by mechanical, plumbing, and HVAC trades as appropriate.
2. Masonry: Mechanical, plumbing, and HVAC trades to provide sleeves and locations to masonry trades for installation.
3. Partitions: Set sleeves in place as work progresses.

B. Hollow Concrete Roof or Floor Planks:
1. Provide planks with sleeve cast-in-place at time of construction,
2. Or core drill planks in location reviewed and accepted by Engineer and plank manufacturer. Submit written approval of locations from pre-cast concrete plank manufacturer.
3. Firmly grout sleeve in place.

C. Existing Construction:
1. The location will be reviewed and accepted by the Engineer prior to coring or cutting hole.
2. For concrete, holes shall be located to avoid the reinforcing steel when possible.
3. Patch all damaged work as required to maintain a neat and clean appearance.

D. Rubber Link Compression Seals: Install as required and in strict accordance with the manufacturer's instructions and recommendations.

END OF SECTION

SECTION 15094

PREFABRICATED PIPE HANGERS, SUPPORTS AND BRACING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Design, furnish and install prefabricated pipe hangers, supports, and braces to support pipes, maintain the necessary pitch, minimize vibration, prevent movement, and allow expansion and contraction of the pipes shown on the Drawings, as specified in Section 15050, as specified herein and as referenced. Supports shall be designed for all tributary gravity loads and lateral loads from operating pressures, seismic forces, and startup/shutdown water hammer thrust. This Specification covers hangers, supports, and braces for process and mechanical piping systems including ductile iron, carbon steel, galvanized steel, stainless steel, fiberglass, PVC and copper piping.

B. Hangers for electrical conduit, plumbing piping, HVAC ducts, and other utilities are found within their respective Specification sections.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-in-Place Concrete
B. Section 09900 – Painting
C. Division 11 – Equipment
D. Section 15050 – Pipe and Pipe Fittings – General
E. Pipe, pipe fittings and valves are specified in respective sections of Division 15.

1.3 REFERENCES

A. This section contains references that are applicable to this Specification Section. The applicable edition of the indicated references shall be the version that was the most current at the time of the Advertisement of Bids.

B. Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
   1. MSS SP-58 Pipe Hangers and Supports – Materials, Design and Manufacture
   2. MSS SP-69 Pipe Hangers and Supports – Selection and Application
   3. MSS SP-89 Pipe Hangers and Supports – Fabrication and Installation Practices
   4. MSS SP-90 Guidelines on Terminology for Pipe Hangers and Supports

C. ASTM A123/A123M - Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron & Steel Products

D. ASTM A153/A153M - Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

E. ASTM C881/C881M - Specification for Epoxy-Resin-Base Bonding Systems for Concrete

F. ASCE 7 – Minimum Design Loads for Buildings and Other Structures

G. International Building Code (2009)

1.4 DESIGN REQUIREMENTS

A. Contractor shall provide all necessary hangers, supports and braces as needed to provide a fully functional and adequately supported and restrained system.

B. This Specification requires the delegated design of pipe hangers, supports and bracing. The performance criteria, design requirements and materials of construction are specified herein. Refer to the Structural Drawings for a list of prohibited and allowed structural components from which piping can be hung, supported or braced. The absence of specific pipe support details shall not relieve the Contractor of the responsibility for designing and providing a fully functional system meeting the requirements of this Specification. Specification Section 15050 identifies which piping systems will and will not require a pipe support design by a Professional Engineer.

C. Prefabricated pipe supports shall be provided for all pipes shown on the Contract Drawings. Unless otherwise indicated, the terms “pipe support”, “pipe hanger” and “pipe guide” shall refer to prefabricated pipe supports, hangers, guides, and braces specified herein.

D. The term “Pipe Support Design Engineer” shall refer to the Professional Engineer hired by the General Contractor to design the pipe support system.

E. All structural steel pipe support frames and shop fabricated pipe support assemblies shown on the Contract Drawings are specified elsewhere and not required as part of this Specification.

F. Pipes supports shall be classified as one of the following:
   1. Type 1 – Supported from an overhead structural member using overhead hangers, guides, clevises, rollers, clamps or other means as specified herein.
   2. Type 2 - Supported from a structural member below the pipe using guides, rollers, clamps, saddles or other means as specified herein.
   3. Type 3 – Supported from an adjacent wall or other vertical structural member using brackets with either Type 1 supports or Type 2 supports or other means as specified herein.
   4. Type 4 – Miscellaneous Pipe Hangers, Supports and Braces not specifically identified above.
   5. Additionally, each pipe support shall be classified as one of the following based on function:
      a. Type S - Simple Support
      b. Type G - Guide Support
      c. Type F - Fixed Support

G. Where flexible joints or couplings are indicated on the Contract Drawings at equipment, tanks, etc., the end opposite to the piece of equipment, tank, etc., shall be rigidly supported, to prevent transfer of system forces to the equipment. No fixed or restraining supports shall be installed between a flexible joint or coupling and the piece of equipment.

H. All pipe and appurtenances connected to the equipment shall be supported in a manner to prevent any strain or load from being imparted on the equipment or piping system.

I. Pipe supports shall be provided to minimize forces through valves, split and sleeve type couplings, flexible expansion joints and to minimize all pipe forces on

equipment housings. Equipment housings shall not be utilized to support connecting pipes.

J. Unless otherwise indicated on the Drawings, maximum hanger and support spacing shall not exceed the following:
   1. Copper Pipe:
      a. 1" diameter and smaller – 5 feet
      b. 1 1/4", 1 1/2" and 2" diameter – 7 feet
      c. Greater than 2" diameter – 9 feet
   2. Steel and Stainless Steel Pipe:
      a. 2" diameter and smaller – 7 feet
      b. 2 ½" - 4" diameter – 11 feet
      c. 5" – 8" diameter – 16 feet
      d. Greater than 10" diameter – 22 feet
   3. Ductile and Cast Iron Pipe:
      a. All diameters – 10 feet
   4. PVC and FRP Pipe:
      a. Hanger and support spacing shall be as recommended by the pipe manufacturer based on pipe size and service temperature. Individually supported PVC pipes shall be supported as recommended by the manufacturer except that support-spacing shall not exceed 3-feet.
   5. The maximum support spacings listed above are based on the specific pipes being full of liquid without any additional vertical loads or thrusts. The actual required support spacings may be limited to the hangers selected or the presence of additional loads.
   6. Supports shall be spaced such that the resulting concentrated load at any suspended (Type 1) support does not exceed 2,000 pound maximum and combined load shall not exceed 25 pounds per square foot over each slab panel the supports extend into, or as indicated on the Structural Drawings.
   7. Pipe alignment guides shall not be used as vertical support of the piping.
   8. Wall penetration sleeves (link-seal type or equivalent) shall not be used as support of the piping.

K. Contractor shall provide pipe supports at the following locations:
   1. At all locations indicated on the Contract Drawings.
   2. At all locations such that the maximum support spacing listed above are not exceeded.
   3. At all locations such that the allowable load capacity of the prefabricated hangers are not exceeded.
   4. At the end of all pipe runs.
   5. At all changes in pipe direction greater than 22 degrees.
   6. Within 1 foot of all valves, couplings, expansion joints and pipe joints.
   7. All other locations deemed necessary by the Contractor, Pipe Support Design Engineer or pipe manufacturer.
   8. Spaced such that the deflection in the pipe under operating conditions does not exceed L/360, where L is the distance between supports.

L. All drilled anchors used in suspended Type 1 pipe supports shall meet the following requirements:

1. Anchors shall have a minimum of 2 anchors per hanger.
2. Anchors shall be sized to provide a Factor of Safety of 5 on the manufacturer's ultimate capacity of the anchor.
3. Anchors shall have a minimum embedment depth of 6 inches, minimum spacing of 6 inches and a minimum edge distance of 6 inches.

M. All pipe supports shall be designed for the following loads:
1. Dead loads (including cement lining, insulation, etc)
2. Liquid Density – use a liquid specific gravity of 1.10 for water, wastewater and sludges and use the appropriate liquid specific gravity for chemicals, unless otherwise noted
3. Operational Thrust – refer to Specification Section 15050
4. Water Hammer Thrust – refer to Specification Section 15050
5. Thermal forces – refer to Specification Section 15050
6. Wind Load – In accordance with ASCE 7. Refer to the Structural Drawings for wind design parameters
7. Snow Load – In accordance with ASCE 7. Refer to the Structural Drawings for snow design parameters
8. Ice Load – In accordance with ASCE 7

1.5 SUBMITTALS

A. Submit a complete set of shop drawings of all items to be furnished under this Section and as required by Section 01340 and 15050.

B. For piping systems that require delegated design by a Professional Engineer, submit experience statement from the proposed Pipe Support Design Engineer to demonstrate compliance with the following criteria prior to submitting any technical information.
1. Engage the services of an independent registered Professional Engineer ordinarily engaged in the business of pipe support systems analysis, to analyze system piping and service conditions and to develop a detailed support system, specific to the piping material, pipe joints, valves and piping appurtenances proposed for use. The proposed Pipe Support Design Engineer shall have at least 5 years of experience in the analysis and design of similar systems, including the use of commercial and custom pipe support and in the use of commercial pipe stress software programs. Firms meeting these criteria include: Newman Associates, LLC., Canton, MA; Waterford Associate Inc., East Providence, RI, SAC Incorporated, Williston, VT; or equivalent. The professional engineer shall be registered in the State of New Hampshire.

C. Technical submittals for all projects shall include the following information:
1. Layout drawings with all pipe supports clearly labeled, located, and coordinated with the tabulated list noted below. All pipe layout changes proposed by the General Contractor shall be incorporated in the layout and identified as a proposed modification. Layout drawings shall address gravity loads and dynamic loads including thermal effects, pressure thrusts and seismic forces.
2. Summary of Pipe Hangers, Supports and Bracing: Submit a tabulated list of pipe support information which includes the following information at a minimum:

i. Hanger/Support/Brace Number
ii. Location
iii. Pipe Diameter (nominal ID)
iv. Pipe centerline elevation
v. Pipe material
vi. Additional dead weight (Cement lining, insulation, etc)
vii. Lineal foot dead weight of pipe
viii. Contents of pipe
ix. Total lineal foot weight (dead weight and live weight)
x. Length of pipe tributary to support
xi. Total gravity and dynamic load at support
xii. Type of support (as identified in Section 1.4.B above)
xiii. Fixity of support (as identified in Section 1.4.B above)
xiv. Structure supporting pipe support (Section 1.4.F above)

3. Representative catalog cut for each different type of pipe hanger, brace, or support indicating the materials of construction, material finishes, pipe sleeve or insulation information, protective shields, important dimensions and range of pipe sizes for which that hanger is suitable. Where standard hangers and/or supports are not suitable, submit detailed drawings showing materials and details of construction for each type of special hanger and/or support.
4. Representative catalog cuts for accessories (e.g., threaded rod, insulation shields and saddles, never-seize compound, etc.)
5. Letter from the General Contractor stating that the following has been coordinated:
    i. Each pipe support system will not interfere with the other pipe support or seismic bracing systems.
    ii. Components from the pipe support systems shall not extend within any means of egress or walking pathways in building spaces or at tanks.
    iii. Components from the pipe support systems shall not interfere with the normal maintenance or operation of a component or equipment.

D. Supplemental technical submittals for projects which require a Pipe Support Design Engineer, as identified in Section 15050, shall include the following information:
1. Completed Certificate of Design (included at the end of this Section).
2. Dead weight and dynamic load analysis, including system thermal effects and pressure thrusts. Computer-based software system equivalent to ADLPIPE or Autopipe. Each piping system shall be presented in an isometric graphic and shall show the resolved and resultant force and moment systems, as well as all recommended hangers, supports, anchors, restraints and expansion/flexible joints.
3. After the work is installed, but before it is filled for start-up and testing, the Pipe Support Design Engineer shall inspect the work and shall certify its complete adequacy. Submit documentation for each piping system to demonstrate the inspection and certification of adequacy.

E. After the installation is completed and certified, submit as-built drawings for record purposes.

PART 2 - PRODUCTS

2.1 GENERAL

A. All uninsulated non-metallic piping such as PVC, CPVC, etc., shall be protected from local stress concentrations at each support point. Protection shall be provided by pipe insulation shields or other methods after review with no exceptions taken by the Engineer. All shields shall cover the pipe where it is in contact with the support.

B. All insulated pipe shall be furnished with a pipe insulation shield and/or saddle at each pipe support location as specified herein.

C. Where pipe hangers and supports come in contact with copper piping, provide protection from galvanic corrosion by wrapping pipe with 1/16-inch thick neoprene sheet and galvanized protection shield; isolators similar to Eleen, Figure No. 228; or PVC-coated hangers and supports. All stainless steel piping shall be isolated from all ferrous materials, including galvanized steel, by use of neoprene sheet material and protection shields, similar to above methods.

D. Pipe supports PVC piping:

1. Pipe supports for multiple PVC plastic piping shall be continuous wherever possible.
2. Multiple, suspended, horizontal plastic PVC pipe runs, where possible, shall be supported by ladder type cable trays.
3. Ladder shall be of galvanized steel construction.
4. Rung spacing shall be 12 inches.
5. Tray width shall be approximately 6 inches for single runs and 12 inches for double runs.
6. Ladder type cable trays shall be furnished complete with all hanger rods, rod couplings, concrete inserts, hanger clips, etc., required by a complete support system.
7. Acceptable manufacturers:
   a. Electray Ladder by Husky-Burndy;
   b. Globetray by the Metal Products, a division of United States Gypsum,
   c. Or equal.
8. Individual plastic pipes shall be secured to the rungs of the cable tray by strap clamps or fasteners similar to Globe, Model M-CAC; Husky-Burndy, Model SCR or equal.
9. Spacing between clamps shall not exceed 9 feet. The cable trays shall provide continuous support along the length of the pipe. Individual clamps, hangers and supports in contact with plastic PVC pipe shall provide firm support but not so firm as to prevent longitudinal movement due to thermal expansion and contraction.

E. All vertical pipes shall be supported at each floor or at intervals of not more than 12 feet (whichever is less) by approved pipe collars, clamps, brackets, or wall rests and at all points necessary to insure rigid construction. All vertical pipes passing through pipe sleeves shall be secured using a pipe collar.

F. Link-seal compression type wall penetration sleeves shall not be used to support static or dynamic loads. Additional supports shall be provided such that static gravity loads and horizontal dynamic loads are not transferred to these penetration sleeves.

2.2 MATERIALS

A. Unless otherwise specified herein, pipe hangers and supports shall be standard catalogued components, conforming to the requirements of MSS-SP-58, MSS SP-69 and MSS SP-89.

B. Pipe hangers, supports, braces and accessories shall be standard catalogued components as manufactured by Anvil International, Inc, Carpenter & Peterson, Inc. or equivalent (metallic pipe) or Jove (non-metallic pipe). Any reference to a specific figure number of a specific manufacturer is for the purpose of establishing a type and quality of product and shall not be considered as proprietary.

C. Materials of all prefabricated pipe hangers, supports, braces and accessories (including bolts, nuts, washers) shall be as follows:
   1. For steel, stainless steel, ductile iron, HDPE, FRP and PVC piping:
      a. Exposed interior or exterior and all other spaces not otherwise defined below shall be steel conforming to ASTM A123 and ASTM A152.
      b. Submerged or within/directly above tanks shall be Type 316 stainless steel.
      c. Exposed interior spaces subjected to a damp or corrosive environment including the following spaces shall be steel.
         i. All Pump Rooms
      d. Exposed interior spaces subjected to chemical/ corrosive environment including the following spaces shall be FRP or PVC.
         i. All chemical rooms
   2. For copper piping: shall be copper plated steel.

D. Type 1
   1. Metallic pipe (Steel, stainless steel and ductile iron):
      a. Adjustable Clevis Type (Type S) (Pipes greater than 4” diameter):
         i. Anvil International, Inc. (Fig 260)
         ii. Carpenter & Patterson Inc. (Fig 100)
         iii. Or equal
      b. Adjustable Clevis Type (Type S) (Pipes 4” diameter or less):
         i. Anvil International, Inc. (Fig 65)
         ii. Carpenter & Patterson Inc. (Fig 200)
         iii. Or equal
      c. Adjustable Steel Yoke Pipe Roll (Type S):
         i. Anvil International, Inc. (Fig 181)
         ii. Carpenter & Patterson Inc. (Fig 140)
         iii. Or equal
      d. Adjustable Pipe Roll (Type S):
         i. Anvil International, Inc. (Fig 177)
         ii. Carpenter & Patterson Inc. (Fig 142)
         iii. Or equal
      e. Pipe Clamp (Type F):
         i. Anvil International, Inc. (Fig 212, Fig 216 or Fig 295 Clamp w/ Fig 272 Eyerod)
         ii. Carpenter & Patterson Inc. (Fig 175, Fig 298 or Fig 304 Clamp w/ Fig 93 Eyerod)

iii. Or equal

f. U-Bolt (Type S)
i. Anvil International, Inc. (Fig 137)
ii. Carpenter & Patterson Inc. (Fig 283)
iii. Or equal

2. Non-Metallic pipe (HDPE, FRP and PVC):
a. Adjustable Clevis Type (Type S):
i. Jove (Model FS-11)
ii. Or equal
b. Pipe Clamp (Type F):
i. Jove (Model FS-4)
ii. Or equal

3. Copper Pipe:
a. Adjustable Clevis Type (Type S)
i. Anvil International, Inc. (Fig CT-65)
ii. Carpenter & Patterson Inc. (Fig 100CT)
iii. Or equal
b. Adjustable Swivel Ring Type (Type S)
i. Anvil International, Inc. (Fig CT-69)
ii. Carpenter & Patterson Inc. (Fig 1ACT)
iii. Or equal

E. Type 2
1. Metallic pipe (Steel, stainless steel and ductile iron):
a. Pipe Roll Stand (Type S) (Non Adjustable)
i. Anvil International, Inc. (Fig 271)
ii. Carpenter & Patterson Inc. (Fig 39)
iii. Or equal
b. Pipe Roll Stand (Type S) (Adjustable)
i. Anvil International, Inc. (Fig 274)
ii. Carpenter & Patterson Inc. (Fig 40)
iii. Or equal
c. Pipe Roll Chair (Type S)
i. Anvil International, Inc. (Fig 175)
ii. Carpenter & Patterson Inc. (Fig 67)
iii. Or equal
d. Adjustable Pipe Roll (Type S)
i. Anvil International, Inc. (Fig 177)
ii. Carpenter & Patterson Inc. (Fig 109)
iii. Or equal
e. Pipe Alignment Guide (Type G)
i. Anvil International, Inc. (Fig 255 or 256)
ii. Carpenter & Patterson Inc. (Fig 1006 or 1007)
iii. Or equal
f. Pipe Slide Assembly (welded to pipe) (Type G or F)
i. Anvil International, Inc. (Fig 257 or 436)
ii. Carpenter & Patterson Inc. (Fig 1010)

iii. Or equal

g. Pipe Slide Assembly (w/ welded clamp) (Type G or F)
   i. Anvil International, Inc. (Fig 257 or 436 w/ Fig 432 clamp)
   ii. Carpenter & Patterson Inc. (Fig 1010 w/ Fig 158 clamp)
   iii. Or equal

h. Floor Mounted Stanchions w/ Adjustable Saddles (Type S)
   i. Anvil International, Inc. (Fig 63 Stanchion w/ Fig 264 or Fig 265 Saddle)
   ii. Carpenter & Patterson Inc. (Fig 138 Stanchion w/ Fig 101 or Fig 101U Saddle)
   iii. Or equal

i. Concrete cradles
   i. Provide as detailed on the Structural Drawings

2. Non-Metallic pipe (HDPE, FRP and PVC):
   a. Pipe Slide Assembly (w/ welded clamp) (Type G or F)
      i. Jove (Model FS-8)
      ii. Or equal
   b. Floor Mounted Stanchions w/ Adjustable Saddles (Type S)
      i. Jove (Model FS-7 with stanchion)
      ii. Or equal
   c. Concrete cradles
      i. Provide as detailed on the Structural Drawings

F. Type 3 (Type S) (all pipes)
   1. Wall Bracket
      a. Anvil International, Inc. (Fig 194, Fig 195 or Fig 199)
      b. Carpenter & Patterson Inc. (Fig 69, Fig 84 or Fig 139)
      c. Or equal
      d. Fabricated brackets may be used in lieu of pre-fabricated brackets. Material shall conform to Part C above.

G. Accessories:
   1. Threaded Rods
      i. Anvil International, Inc. (Fig 140, 142 or 146)
      ii. Carpenter & Patterson Inc. (Fig 94 or 133)
      iii. Or equal
   2. Pipe Insulation Shield
      i. Anvil International, Inc. (Fig 167 or Fig 168)
      ii. Carpenter & Patterson Inc. (Fig 265GS or Fig 265P)
      iii. Or equal
   3. Pipe Insulation Saddle
      i. Anvil International, Inc. (Figs 160-166A)
      ii. Carpenter & Patterson Inc. (Figs 351-357Z)
      iii. Or equal
   4. Anti-seize compound
      i. Never Seez by Bostik, Inc.
      ii. Or equal

H. Miscellaneous Pipe Hangers, Supports and Braces (Type 4 or Custom):

1. Contractor shall provide additional hangers, supports and braces as required that are not classified as Types 1, 2 or 3 above.
2. Materials shall conform to Part C above.

I. Concrete Anchorage:
1. Epoxy anchors. ASTM C881, non-expanding, two-component epoxy resin with AISC Type 316 Stainless Steel threaded road with washer nut. Manufactured by Hilti Fastening Systems (HIT RE500SD); Ramset Fastening Systems (Chemset Capsule Series); Power Fasteners (T308 Plus); or equivalent.
2. Expansion anchors. Stainless steel AISI Type 316 for galvanized and aluminum fabrications; cadmium plated for painted steel fabrications. Manufactured by Hilti Fastening Systems (Kwik Bolt III); Ramset Fastening Systems (Tru Bolt Stud Anchor); Power Fasteners (Power Stud); or equivalent.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install prefabricated hangers and supports in accordance with the pipe support shop drawings, in accordance with MSS SP-89 and as specified herein. Deviations from the shop drawings shall not be permitted without written approval from the Pipe Support Design Engineer.

B. Hangers shall be used for their intended purpose only. They shall not be used for rigging or erection purposes.

C. General Contractor shall coordinate the installation of field run conduit, piping and other utilities to avoid interference with the pipe supports.

D. All pipe supports shall include features to permit adjustments of pipe elevations. Once all piping is properly aligned and at the correct elevations, the supports shall be locked into place. Locking nuts, cotter pins, temporary locking devices and other locking means should be properly engaged. Tack welding shall not be utilized to lock supports in place.

E. Type 1 hangers using threaded rods shall be attached to the building structure or supplemental framing. Connections to the building structure shall be with beam clamps, welded angles or embedded concrete weld plates or threaded inserts.

F. Type 1 pipe hangers installed in concrete overhead shall utilize the following anchorage:
1. All connections shall utilize a minimum of 2 anchors.
2. All drilled anchors shall have a minimum embedment depth of 6 inches, minimum concrete edge distance of 6 inches and minimum spacing of 6 inches.
3. Install all drilled anchors in accordance with the anchor Manufacturer’s instructions.

G. Secure Type 2 pipe support to structural supporting member. All pipe supports shall be rigidly anchored to their structural supporting members.

H. PVC Piping and Fiberglass Piping: Support in strict accordance with the manufacturer's instructions and recommendations for the conditions of operation,

temperature and size of pipe. Support in a manner which will prevent subsequent visible sagging of the pipe between supports due to plastic deformation.

I. All surfaces of steel and aluminum in contact with or embedded in concrete or masonry shall be coated with epoxy paint (min 5 mils dry film thickness).

J. Drain, waste, and vent piping: Support by adjustable hangers.

K. Valves, Fittings & Specialties: Independently support pipe connected to pumps, equipment and piping systems.

L. Temporary pipe supports:
   1. General Contractor shall be responsible for providing all temporary pipe supports and rigging.
   2. Lay out each section of pipeline and make connections while the pipe is held in temporary supports.
   3. After the completion of connections in each section of pipeline, hold the section in place with temporary clamps.
   4. Do not remove the temporary clamps until the piping is correctly installed on the permanent supports.

3.2 TESTING

A. All permanent pipe supports shall be installed prior to testing.

B. Demonstrate compliance with the requirements of this section with respect to support, pitch, vibration, movement, and expansion and contraction during start-up testing of the equipment and associated piping systems as indicated in Section 01800.

C. Systems which do not meet the requirements of this section with respect to support, pitch, vibration, lateral movement, and expansion and contraction shall be supplemented with additional braces as required and re-demonstrated until compliance is achieved.

3.3 COATINGS

A. Provide shop coatings in accordance with Section 09905.

B. Provide field coatings for steel items in accordance with Section 09900.

C. Provide touch-up field galvanizing for hot dipped galvanized items in accordance with Section 09900.

D. Provide field coatings on surfaces with dissimilar metals. Utilize epoxy paint (minimum 5 mil thickness) in accordance with Section 09900.

E. Provide temporary support or bracing as necessary to allow complete and continuous coats.

CERTIFICATE OF DESIGN

RE: Contract between
OWNER: _____

CONTRACTOR: _____

PROJECT: _____

The undersigned hereby certifies that the engineer listed below:

1. Is licensed or registered to perform professional engineering work in the State of _____; (Location of Project)

2. Is qualified by education and training to design the pipe support and bracing system as specified in Section 15094 of subject contract;

3. Has previously designed comparable pipe support and bracing systems;

4. Has prepared the design in full compliance with the requirements of subject contract documents, including all applicable laws, regulations, rules, and codes; and

5. Has confirmed by design that the static gravity loads and dynamic horizontal and vertical seismic, hydraulic pressure, and thrust forces tributary to each pipe support and the system as a whole have been determined, and that all supports and braces are designed to resist these forces within the allowable capacities of each component of the pipe support, including anchorage. (Excluding supports specifically designed by the Engineer-of-Record Wright-Pierce)

6. Will inspect the completed installation of the pipe support system to confirm that the system is installed and functions in accordance with the design.

CONTRACTOR	PIPE SUPPORT DESIGN ENGINEER
By: _____	By: _____
(Signature)	(Signature)
_____	_____
(Name)	(Name)
_____	_____
(Title)	(Professional Engineer No. and State)
_____	_____
(Date)	(Date)

END OF SECTION

SECTION 15180

PIPE AND EQUIPMENT INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide and apply insulation to all non-buried interior piping in accordance with Table 1, heating system pipeline components and aeration blower discharge ductwork inside the building.

B. Related Work Specified Elsewhere: "Plumbing - General" and "HVAC General" are specified in this Division.

1.2 QUALITY ASSURANCE

A. Standards:
   1. Flexible elastomeric pipe insulation shall conform to ASTM C534.
   2. Fiberglass pipe insulation shall conform to ASTM C547.
   3. All-service vapor retarder jacket shall conform to ASTM C1136.

B. Have all insulation work performed by skilled insulation workmen regularly employed in the trade.

C. Fire Hazard Rating: Except for materials listed below, all insulation materials, adhesives, coatings and other accessories shall have a UL fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed. Exceptions are:
   1. Factory pre-molded one-piece PVC fitting and valve covers and pipe jacketing.
   2. Asphaltic mastic.

D. Acceptable Manufacturers:
   1. Fiberglass:
      a. Owens-Corning.
      b. Certainteed.
      c. Knauf.
      d. Equivalent product.
   2. Flexible Elastomeric Pipe Insulation:
      a. Aeroflex Aerocell.
      b. Armacell.
      c. Equivalent product.

1.3 SUBMITTALS

A. Provide shop drawings in accordance with the requirements of the General Conditions, Division 1 and as specified herein. Shop drawings shall contain the following information at a minimum:
   1. Completed Submittal Certification Form: Shop drawing submittals will be returned un-reviewed without this form.
   2. Certified shop drawings.
   3. Manufacturer's literature and illustrations for all equipment to be installed to supplement certified shop drawing information.

4. Shop preparation and shop coatings.

B. Provide Operation and Maintenance Manuals in accordance with the requirements of Division 1.

1.4 DELIVERY AND HANDLING

A. Shipping:
1. Prepare materials for shipment as required for complete protection.
2. Box, crate, completely enclose, and protect materials from accumulations of foreign matter.

B. Storage:
1. Store materials in an area on the construction site protected from weather, moisture, or possible damage.
2. Do not store materials directly on the ground.

C. Handling: Handle materials to prevent damage of any nature to the interior and the exterior surfaces.

1.5 INSPECTION

A. Carefully inspect all materials for:
1. Defects in workmanship and materials.
2. Removal of debris and foreign material.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fiberglass Pipe Insulation:
1. Mineral fiber thermal insulation.
2. All service vapor retarder jacket.
3. Required for use on all pipes as listed in Table 1.
4. All cold piping shall be sealed to prevent condensation.
5. Thickness of insulation shall conform to Table 1.
6. Fittings and Valves:
a. Pre-formed fiberglass insulation with a PVC pre-molded fitting cover.
b. Do not insulate unions and flanges.

D. Flexible Preformed Elastomeric Insulation for piping carrying cold fluids (temperatures between 40 and 100 degrees F):
1. Thickness: As listed in Table 1.
2. Insulation material shall be manufactured without the use of CFC's, HFC's or HCFC's. Insulation shall be formaldehyde free, low VOC's, fiber free, dust free and mold and mildew resistant.
3. Insulation shall have a maximum thermal conductivity of 0.27 Btu-in./h-ft2- °F at a 75°F mean temperature when tested in accordance with ASTM C 177 or ASTM C 518, latest revision. Insulation shall have a maximum water vapor transmission of 0.08 perm-inches when tested in accordance with ASTM E 96, Procedure A, latest revision.

3. Insulation Covering: Field applied PVC jacket with joining surfaces adhered using PVC solvent weld adhesive.

E. Acceptable Manufacturers:
1. AeroFlex Aerocel.
2. Armacell.
3. Equivalent product.

F. Fittings and Valves:
1. Pre-molded insulation with PVC Fitting covers with fiberglass fill on fiberglass insulation systems.
2. Mineral fiber insert insulation with an aluminum pre-molded fitting cover
3. Do not insulate unions and flanges.

G. PVC Jacketing
1. ASTM D 1784 Type 1, with stainless steel zip tack fasteners and PVC solvent weld adhesive.
2. For use on straight runs of fiberglass insulated piping, as follows.
a. Hydronic heating piping in process areas.
b. Domestic hot water, tepid water and hot water recirculation piping.
c. Exposed piping in finished areas of the Operations Building first floor and Maintenance Building Administration Area.
3. For use on piping insulated with flexible elastomeric insulation, as follows:
a. Refrigerant piping installed outside buildings.
b. Domestic cold water piping

B. Staples: Outward clinching type, type 304 or 3l6 stainless steel.

C. Adhesives:
1. Fiberglass: Non-flammable vapor barrier adhesive as manufactured by Benjamin Foster or Childers or equal.

2.2 APPLICATION THICKNESS TABLES

TABLE 1
MINIMUM PIPE INSULATION*

	Insulation Thickness in Inches for Pipe Sizes						
	Fluid Temp Range, °F	Runouts Up to 2"	1" and Less	1-1/4" to 2"	2-1/2" to 4"	5 and 6"	8" and Larger
Piping System Type							
Domestic Water Systems							
Cold Water	--	--	½	1	1	1	1
Hot Water	--	--	1	1½	1½	2	2
Tepid Water	--	--	1	1½	1½	2	2

*Based on minimum thermal resistance ® of 4.0 per inch of thickness on a flat surface at a mean temperature of 75ºF.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Apply insulation only after all pipes have been tested and approved.
B. Clean and dry all surfaces to which insulation is to be applied.
C. Neatly finish the ends of insulation on exposed piping at valves, flanges, etc., with cover strips.
D. Insulation at sleeves:
   1. Insulation shall be continuous through all sleeves except where gas-tight seal is indicated.
   2. Provide aluminum cover on insulation where caulking is required.
   3. Delete insulation at walls requiring a gas-tight seal.
E. Insulation at Hangers:
   1. Insulation shall be continuous at hangers.
   2. Provide protection saddles at pipe hangers where required to prevent compression or distortion of insulation in accordance with insulation manufacturer's requirements.
F. Fiberglass factory applied insulation jacket:
   1. Seal all laps, joint strips, exposed staples, exposed ends with vapor barrier adhesive.
   2. Install only when temperature is between 40 degrees and l20 degrees F.
   3. Secure with staples where required for additional strength and to prevent fishmouths.

3.2 CLEANING

A. Clean all insulation of accumulated paint, concrete, mortar, etc.
B. Do not damage insulation during cleaning.

END OF SECTION

SECTION 15400

PLUMBING - GENERAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Description: Perform the following items of work required to complete the work of this Section, as shown on the DRAWINGS and specified herein:
   1. All labor, materials, equipment and transportation shall be provided as required to completely install the plumbing and water systems, with all connections as shown on the DRAWINGS and described in these specifications or as required by the International Plumbing Code (IPC), as amended by the state of New Hampshire, current edition. The accompanying DRAWINGS are provided to show the general arrangement and extent of work to be performed.

B. Work Included: The plumbing work shall include, but not be limited to the following (when applicable):
   l. Building domestic hot, cold and tepid water supply system.
   2. Electric water heater.
   3. Valves and accessories.
   4. Flow alarm switch.
   5. Pipe insulation.
   6. All other plumbing items indicated on the DRAWINGS, specified herein, or needed for a complete and proper plumbing installation.

C. Related Work Specified Elsewhere (When Applicable)
   l. Project cleaning is specified in Division l.
   2. Concrete is specified in Division 3.
   3. Pipe Sleeves and Seals are specified in Section 15092.
   4. Piping, pipe fittings, valves, insulation, fixtures, equipment, and accessories are specified in the appropriate Sections of this Division.
   5. Electrical is specified in Division l6.
   6. Pipe identification is specified in this Specifications Section.

D. Drawings and Measurements:
   l. The Drawings show the general arrangement, direction, and sizes of pipes. They are not intended to show every offset, valve, and fitting, and every structural difficulty that may be encountered.
   2. All measurements shall be verified at the job site.

1.2 QUALITY ASSURANCE

A. Materials and Workmanship: All materials and workmanship shall be suitable for the respective work and the type of service encountered.

B. Equipment: All equipment shall be constructed to operate safely without water hammer and undue wear.

C. Local Codes: Perform all work in accordance with applicable state and local plumbing codes, except where requirements of this Contract are more stringent.

D. Permits: Arrange for all permits, inspections, and tests required by codes at no additional cost to the Owner.
E. Standards: When standards are referred to, the latest issue shall apply.

1.3 JOB CONDITIONS

A. Scheduling Work: Install and test all plumbing to be cast into or buried under concrete floor slabs prior to the placement of concrete.

1.4 SUBMITTALS

A. Prior to ordering fixtures, equipment and appurtenances, submit shop drawings in accordance with the General Conditions of the Construction Contract.
B. Submit to the Engineer: Copies of manufacturer's installation, maintenance and operating instructions including parts lists for all equipment furnished as specified in the General Conditions of the Construction Contract.
C. Submit a list of local supply houses for replacement parts for all equipment furnished.

1.5 DELIVERY, STORAGE & HANDLING

A. Exercise care during loading, transporting, unloading and handling to prevent damage of any nature to interior and exterior surfaces of equipment, fixtures, pipe and fittings.
B. Do not drop plumbing equipment or fixtures.
C. Store materials on the project site in enclosures or under protective coverings.
D. Assure that all materials are kept clean and dry.
E. Do not store materials directly on the ground.
F. Exercise care so as not to damage, crack, mar finish and to prevent damage of any nature to fixtures.
G. Remove damaged fixtures from project and replace at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide materials that are new, suitable for intended use, and of type, style, and quality specified and as shown on the Drawings.
B. Provide pipe, fittings, and devices that meet requirements of local plumbing codes and be in accordance with applicable ASTM, ANSI, and Commercial Standard (CS) standards.

2.2 PIPE LABELS AND EQUIPMENT AND VALVE TAGS

A. Identify new plumbing equipment using color coded equipment/valve tags. Submit a complete list of proposed Identification Tag information and it shall be reviewed by the Engineer and Owner and revised as indicated. In general, tag information shall match the information provided on the Drawings.
B. Tags shall conform to the following specifications:

1. The tags shall be 2.5-inch diameter, 1/16" thick, rigid, multi-layered sandwich laminate with contrasting inner and outer colored acrylic plastic layers. Top hole size is 5/32" for hanging tags.
2. Tags shall be available in 7 different outside colors. Owner and Engineer shall select up to 4 different colors for the project.
3. Tags shall have up to three lines engraved on a side and eight characters per line of identification information. Tags shall be engraved one side.
4. Tags shall be secured to valves with nylon cable ties or adjustable stainless steel bead chain. Securing method shall be selected by the Owner and Engineer.
5. Tags secured to equipment shall be fastened to a flat visible surface by a minimum of two SS screws or SS pop rivets.
6. Tags shall have a service temperature of -40°F to 175°F
7. Manufactured by Seton Name Plate Corporation, New Haven, CT, Brimar Industries, Garfield, NJ, or equal.

C. Pipe marking: Provide pipe labels for new plumbing piping.
1. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
2. Pipe labels shall conform to ANSI/ASME 13.1, 2007 edition with regard to color and size.
3. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to circumference of pipe and to attach to pipe without fasteners or adhesive.
4. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
5. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install plumbing and piping systems in a neat workmanlike manner.
B. Lines and Grades:
l. Unless otherwise shown on the Drawings, install piping parallel to the building walls wherever possible.
2. Install all piping to accurate lines and grades.
C. Supports: Provide pipe hangers and supports as specified in the "Pipe Hangers & Supports" Section in this Division.
D. Expansion: Provide suitable provisions for expansion of pipelines wherever necessary.
E. Avoid installing close nipples.
F. Do not install piping through, directly over, or in front of electrical switchgears and power panels. Arrange piping in compliance with NFPA 70.

G. Fittings for Dismantling Piping: Provide sufficient of unions to allow for dismantling of piping.
H. Pitch:
    l. Pitch sanitary and drainage piping in accordance with IPC, current edition.
    2. Pitch all other piping toward low points and install valved drains at the low points.

3.2 TESTING

A. When the installation is complete, test all pipelines in the presence of the Engineer and the Plumbing or Building Inspector in accordance with the requirements of the local and state plumbing codes, at no additional cost to the Owner. Provide all necessary equipment and utilities.
B. Test underground piping prior to backfilling.
C. Test piping prior to application of paint and insulation.
D. Separately test portions of piping which will be concealed before completion.
E. Procedure:
    l. Piping Which Carries Water or Liquid Under Pressure: Fill pipes with water and subject them to l00 psig. or l-l/2 times the normal working pressure, whichever is greater, for two (2) hours with no loss in test pressure.
    2. Soil, Vent, Waste and Drain Piping:
        a. Plug all outlets and fill pipes with water to the top of the highest vent stack above the roof, or with not less than l0 feet of water at all points in section.
        b. The piping shall hold this water for a period of 30 minutes without showing a drop in water level.
    3. Remove any equipment that cannot withstand test pressures prior to any testing.
    4. Do not test plastic piping with compressed air or other gases.
F. Repairs:
    l. Should leaks be found, repair as required even to the extent of disassembling and remaking the joints, or replacing sections of pipe.
    2. Caulking of threads or the use of chemical compounds to correct leaks will not be permitted.
    3. Replace defective pipe and fittings and repeat tests until satisfactory test results are achieved. Document results for approval by the Engineer.

3.3 DISINFECTION

A. Disinfect all pipes installed to carry potable water. Perform the work in accordance with the procedure outlined in AWWA Designation 060l.
B. Use a dosage which will produce not less than 50 ppm available chlorine throughout the entire system and not less than l0.0 ppm chlorine residual after a contact period of not less than 24 hours. Repeat disinfection if chlorine residual is less than l0 ppm after 24 hour contact period.
C. During the disinfection period, exercise care to prevent the contamination of water in the existing community, town, or city water main.

D. After the disinfection period, flush the piping with clean potable water until the chlorine residual does not exceed 0.2 ppm.

3.4 PAINTING AND IDENTIFICATION

A. All plumbing piping, valves, pumps and equipment shall be painted and labeled in accordance with Specification Section 09900.

B. Signage is specified in Section 01580.

END OF SECTION

SECTION 15401

PLUMBING, PIPING AND SPECIALTIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install a complete plumbing system including required specialties and appurtenances as indicated on the Drawings and as herein specified.

B. Related Work Specified Elsewhere:

1. General plumbing is specified in Section 15400.

1.2 QUALITY ASSURANCE

A. Plumbing, piping and specialties shall comply with the following where applicable:

1. NSF 61, “Drinking Water System Components-Health Effects”.
2. ASME/ANSI A112.19.2M, “Vitreous China Plumbing Fixtures”.

B. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years.

C. Items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall assembly.

D. Install plumbing systems in accordance with the International Plumbing Code, as amended by the State of New Hampshire.

E. Installation Quality: Install plumbing systems in accordance with manufacturer's written instructions. Conflicts between the manufacturer's instructions and the contract drawings and specifications shall be referred to the Engineer for resolution. Written hard copies or computer files of manufacturer’s installation instructions shall be provided to the Engineer at least two weeks prior to commencing installation of any item.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pipe and Fittings:

1. Domestic and Process Water:
    a. Interior Building Lines - Type "L" copper tube, ASTM B88, solder fittings.

B. Solder and Flux:

1. Solid string or wire solder, 95 percent tin, 5% antimony on pressure piping and potable water piping, ASTM B828.
2. Silver solder, 45% brazing silver alloy, AWS A5.8 (where indicated).
3. Flux: Non-corrosive paste type as required for type of solder, ASTM B813.

C. Valves:

1. Acceptable Manufacturers:
    b. Stockham.
    c. Crane.
    d. Walworth.
    e. Jenkins.

f. Nibco
g. Equivalent manufacturer

2. Ball Valves: MSS SP-110, full port bronze ball, threaded or solder ends, 2 part bronze body, TFE or equal resilient seat, lever handle, 400 lb. WOG. NIBCO S-595-Y (soldered end connection) or NIBCO T-585-70 (threaded end connection) or equivalent product.
3. Emergency Fixture Mixing Valve: copper alloy body, lead free, bimetal thermostat, 1" inlets, 1-1/4" outlet, ASSE 1071 compliant, 20 gpm at 30 psi, 125 psi maximum operating pressure, 60°F-90°F adjustable temperature range. Leonard model TM-800 or equivalent product.
4. Reduced Pressure Zone Backflow Preventer:
   a. Double spring-loaded check valve assembly with automatically operating reduced pressure relief valve located in the pressure zone between the two check valves.
   b. All bronze construction with stainless steel internals, union or flanged connections.
   c. Inlet and outlet ball valves and inlet strainer.
   d. Test cocks on inlet, relief, and outlet pressure zones.
   e. Size, flow capacity and pressure drop as shown on the Drawings.
   f. N.S.F. and A.S.S.E. tested and approved.
   g. Watts 909 or equivalent.
6. Pressure Reducing Valve: Direct operating for dead end service, self-contained, 125 lb. bronze body, screwed ends, adjustable, spring loaded, diaphragm actuated, stainless steel seat, composition disc, integral strainer, thermal expansion by-pass, 25-75 psi reduced pressure range, 300 psi maximum working pressure. Watts #U5B or equivalent.
7. Vacuum Relief Valve: Bronze body, automatic venting, vacuum relief valve, ¾-inch inlet. Watts N36 or equivalent.
8. Pressure and Temperature Relief Valves: ASME rated bronze body, automatic reseating, combined pressure and temperature relief valve, thermostat element operated, test lever, 125 psi pressure relief setting. Watts 40XL or equivalent.

D. Insulation: Insulation shall be provided as specified in Section 15180 "Pipe and Equipment Insulation".
   1. Drain Valve: cast brass, handwheel, integral vacuum breaker, brass finish, ¾" hose thread outlet.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide offsets in piping to place in proper position and avoid work of other trades.
B. Install supply lines or fittings for plumbing fixtures to prevent backflow.
C. Pitch piping in accordance with the International Plumbing Code.
D. Install valves with stems horizontal to upright. Do not install with stems down.
H. Tightly cover and protect fixtures and equipment against dirt, water and chemical or mechanical injury.

I. Install fixtures at heights to rim as specified.
J. Provide shut-off valves or stops in water service lines to each fixture. Provide additional branch line isolation valves where indicated on the drawings.
K. Where fixture comes in contact with wall or floor, the joint shall be watertight.
L. Coordinate locations of piping, sleeves, inserts, hangers, and equipment, access provisions with the work of all trades. Piping, sleeves, inserts, hangers, and equipment shall be located clear of windows, doors, openings, light outlets, and other services and utilities.
M. Manufacturer's published recommendations shall be followed for installation methods not otherwise specified.
N. Arrange equipment and systems to provide clear view and easy access, without use of portable ladders, for maintenance and operation of all devices including, but not limited to: all equipment items, valves, filters, strainers, transmitters, sensors, control devices.
O. Coordinate locations of structural systems necessary for pipe and equipment support to permit proper installation.
P. Coordinate locations of pipe sleeves, trenches and chases with equipment and piping locations.
Q. Cut holes through concrete and masonry using rotary core drill. Locate holes to avoid interference with structural members such as beams or grade beams. Lay out holes in advance and perform drilling only after approval by the Engineer. Obtain approval in advance by the Engineer for drilling holes through structural members.
R. Gauges and indicators shall be clearly visible by personnel standing on the floor or on permanent platforms.
S. Handle and store equipment and materials with care to prevent damage before and during installation, in accordance with the manufacturer's recommendations. Replace damaged or defective items at no cost to the Owner.

3.2 CLEANING

A. Maintain cleanliness and safety on a continual basis. Do not let dust and debris accumulate in the work area. Remove construction debris from the site at least daily.
B. Use manufacturer's recommended solvents and cleaning materials and methods to clean systems.

END OF SECTION

SECTION 15423

ELECTRIC WATER HEATERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install electric water heater(s) and appurtenant work as shown on the Drawings and as specified herein.

B. Related Work Specified Elsewhere: "Plumbing - General" is specified in this Division. "Electrical-General" is specified in Section 16000.

1.2 QUALITY ASSURANCE

A. Acceptable Manufacturers:
   1. HTP
   2. State
   3. AO Smith
   4. Equivalent product.

1.3 GUARANTEE

A. Floor mounted electric water heaters shall have a 3-year guarantee of tank against leakage and 1-year guarantee of all other component parts.

1.4 SUBMITTALS TO THE ENGINEER

A. General: Submittals shall be in accordance with specification Section 01340.

B. Submittals shall show physical dimensions, electrical data, control information, UL certification, and warranty information.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Floor Mounted Electric Water Heater:
   1. Heating Element(s): Immersion electric type, stainless steel Incoloy element.
   2. Tank: Type 316 stainless steel. Top hot water outlet.
   3. Top hot water outlet.
   4. Enameled sheet metal enclosure with fiberglass insulation.
   5. Surface mounted thermostat (adjustable).
   6. Interstitial space between tank and casing filled with polyurethane foam insulation, in compliance with ASHRAE 90.1.
   7. Furnish any contactors and controls required for operation.
   8. Hi-limit safety cut-out.
   9. Pressure and temperature relief valve sized to meet or exceed the heating capacity of the heat element.
   10. Vacuum relief valve sized to accommodate capacity of water heater.
   11. UL approved.
   12. Size, capacity, and electrical characteristics:
      a. Tank Capacity: 80 Gallons.

b. First Hour GPH: 76.
c. Recovery GPH @ 90°F rise: 20.
d. Input (kW): 4.5.
e. Electrical data: 480 Volts/3 Phase/60 Hz, NEMA 4X.
f. Manufacturer: HTP model EVC080C2X055 or equivalent product.

13. Cold water inlet shall be equipped with a dip tube designed to release incoming cold water low in the tank.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install the electric water heater in strict accordance with the manufacturer's instructions and recommendations.
B. Install the water heater, piping, and wiring in accordance with International Plumbing Code, 2012 edition.
C. Provide a vacuum relief valve, temperature and pressure relief valve, and a drain valve on the tank.
D. Pipe the discharge from the relief valve to a floor drain, or a point 6 inches above floor.

END OF SECTION

SECTION 16000

ELECTRICAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide all labor, materials, equipment, operations, methods and procedures as specifically noted herein these specifications and as indicated in the Contract Documents, together with all items necessary for or incidental to the completion of the work.

B. All systems or additions to existing systems indicated in the Contract Documents shall mean all necessary supervision, labor, equipment and materials required to provide complete, properly functioning systems.

C. All systems shall be adjusted, tested, inspected and turned over to the Owner in perfect working order.

D. The words "provide", "supply", "supply and install", "install", "furnish" or "furnish and install", as used in DIVISION 16 or as indicated on the Drawings related to DIVISION 16 shall mean a complete and properly functioning Electrical installation performed by the Contractor.

E. References:

1. Refer to each individual drawing within the Contract Documents in order to coordinate material and equipment locations and electrical requirements.
2. Applicable portions of DIVISION 0 and DIVISION 1 are part of DIVISION 16. Refer to these sections for additional information on bidding requirements, general requirements, and product substitution.

F. Work Specified Herein:

1. The following scope of work is a brief generalization of the type and extent of the work specified under DIVISION 16. Detailed requirements are indicated on the Drawings and in related sections of the Specifications. The work includes, but is not necessarily limited to the following:
   a. Provide Electrical Service and Distribution System as indicated on the "Single-Line Diagram", related drawings and schedules, and as specified herein.
   b. Remove and installation of a new Motor Control Center at Lower Lift Pump Station.
   c. Removal and installation of float switches and pumps.
   d. Installation of fiber optic cable in existing underground conduit as shown on drawings.

G. Removals and Relocations:

1. Examine the existing site, structure(s) and installation(s) for the work of all trades which will influence the cost of the work under DIVISION 16. This work shall include removals and relocations relating to the work of all trades which may interfere with, disturb or complicate the performance of the work under DIVISION 16; and relating to the work involving systems, equipment

and related service lines which shall continue to be utilized as part of the finished project.

2. Provide all associated labor, material and costs to include all removals, relocations, and reconnections herein specified, necessary or required to provide operation and coordination of the combined new and existing systems and equipment.
3. Demolition:
   a. Disconnect and remove existing equipment, devices, boxes, conduit, and associated electrical equipment as shown on the contract drawings.
   b. Any demolition or relocation work performed which results in unused openings in control panels, instrument panels, control stations, pull or junction boxes, etc., which are to remain, shall be plugged by appropriate means such that it maintains the integrity of the NEMA classification of the area, as defined on Drawing E-1.
   c. Any demolition or relocation which results in unused openings shall be sealed.
   d. The work of this Contract involves demolition work. Review all Contract Documents and coordinate with all disciplines for a complete understanding of this demolition work. Provide all new work required to modify these changes along with all requirements for installation of the new work, as shown on the Contract Drawings.
   e. There are areas where the demolition shall require that existing equipment such as pullboxes, conduit, and wiring, and associated devices be disconnected, removed, or relocated in order for the new equipment to be constructed and installed. In most cases, the detail of these existing conditions has not been shown. This Contractor will be responsible for performing all work necessary to demolish all devices associated with equipment in their entirety for the noted and intended demolition. The Contractor shall visit the site locations and become familiar with the areas where this work is to be performed. Any concerns or issues regarding this work need to be addressed and submitted to the Engineer for clarification prior to submission of the final bid price for the work of this Contract. All costs associated with this work are the responsibility of this Contractor and shall be included as part of the overall costs for the electrical work of this project. No additional costs shall be allowed by this Contractor for any demolition work.
   f. Disconnect and remove all abandoned conduits, wiring, boxes, equipment, controls, hangers, etc., shown or not shown, which are located within the area of construction under this contract.

H. Demonstration of Complete Electrical Systems:
   1. 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.
   2. Refer to Section 3 of this specification for additional requirements.

I. Identification:

1. All distribution equipment (switchboards, motor control centers, distribution panelboards, transformers, transfer switches, disconnects, starters, control panels, control stations, etc.) shall have an engraved lamacoid tag, permanently mounted adjacent to the manufacturer's nameplate, indicating the equipment's designation (as called out on the Drawings) and identification number per the Contract Documents.
2. All switchboard and distribution panel overcurrent devices, motor control center devices, individually mounted motor controllers, disconnect switches, control devices, etc., shall be provided with permanently attached engraved lamacoid tags indicating the equipment which they serve or control per the equipment designation and identification number indicated in the Contract Documents, and in accordance with OSHA requirements.
3. All branch circuit panelboards shall have, on the inner side of the door, a permanently attached, engraved lamacoid tag with the identification number of that panelboard. Provide and mount under plastic, in the directory frame of each panelboard, a neatly typewritten directory identifying the branch circuit overcurrent devices and the circuits, devices and areas which they serve.
4. All individually mounted panelboards, disconnects, motor controllers, control stations, etc. shall have a second engraved lamacoid tag below the first one which identifies from where the equipment is receiving power. This second label shall be smaller in height.
5. Nomenclature on these nametags shall be project specific and wherever possible shall be full and complete. Excess abbreviations will not be allowed.
6. Power conductors shall be continuously polarized and color coded throughout using the following scheme:
   a. White or gray - All neutral conductors, 208/120V systems
   b. White w/tracer of any color but Green - All neutral conductors, 480/277 volt systems
   c. Green - All ground conductors
   d. Phase Conductors

208/120V Systems	**480/277V Systems**
Phase A - Black	Phase A - Yellow
Phase B - Red	Phase B - Brown
Phase C - Blue	Phase C - Orange

   e. For Conductors No. 6 and smaller, color coding shall correspond to the color of the conductor insulation. For color coding of wire larger than No. 6, use self-adhesive, wrap-around type markers. These markers shall be used at all panelboards, junction boxes, disconnect switches, circuit breakers, etc.
7. Power, Control, and Signal conductors shall be identified using tags corresponding to equipment served and where connected to similar as listed below:

   For power, control, and signal conduits feeding the wet well from the pump control panel, the respective conduit shall be identified as the following:

At Pump Control Panel
Power conduit: “Pump No.1 power to Pump”
Control conduit “Pump No.1 control to PLC”
Control conduit “High Float Switch to Wetwell”
Signal conduit: “Wetwell Level to LE/LT”
At Equipment
Power conduit: “Pump No.1 power to Pump Control Panel”
Control conduit “Pump No.1 control to Instrument Control Panel”
Control conduit “High Float Switch to Pump Control Panel”
Signal conduit: “Wetwell Level to Pump Control Panel”

8. Conductors shall be clearly identified at each terminal block, equipment connection and junction. Tags and labels shall be pre-manufactured for intended purpose.
9. Lamacoid tags shall be nominal 1" x 4" with 3/8" white lettering on black background.
10. The following safety signage shall be provided for the following equipment. Signage shall be lamacoid plastic (Large Letters) yellow background with red engraved letters:
    a. All switchboards, motor control centers, VFD equipment, automatic transfer switches, solid-state, reduced-voltage starters, enclosed circuit breakers, etc., shall be provided with signage to read "DANGER - HIGH VOLTAGE". Each section (vertical component of multi-section enclosure) shall be furnished with an individual signage. Final requirements shall be determined at the discretion of the Engineer.
    b. All motor control center motors starters, individual motor starters and/or control panels shall be provided with signage to read "CAUTION - This Enclosure Contains Voltage Sources from Outside of This Enclosure".
    c. All switchboards, motor control centers, panel boards, transformers control panels, etc., shall have large letter lamacoid nameplates which reflect the full tag names and designations noted on the Contract Drawings.
    d. All switchboards, motor control centers, panel boards, transformers control panels, etc., shall have general Arc Flash labels.
11. Label and identify with branch circuit and lighting panel for all light switches, manual motor starters, and receptacles (ie LP-1 #1).

J. Request For Information:

When there is a conflict or coordination issue, or if additional information is necessary for the contractor to proceed with the intended work, a Request of Information (RFI) form shall be submitted through the General Contractor to the Engineer. The specific issue shall be described in the RFI and shall be sent to the engineer for review and a response provided in an appropriate time period. RFI form shall be available via the General Contractor through the Engineer. This process shall be used as part of the work of this contract.

1.2 QUALITY ASSURANCE

A. In general, the workmanship of the electrical installation shall be as described in the N.E.C.A. Electrical Design Guidelines. All methods of construction, details of workmanship, etc., that are not specifically described therein or indicated in the Contract Documents, shall be subject to the control and no exceptions to the Engineer.

B. Equipment and materials shall be of the quality and manufacture indicated in their respective description within the specifications.

C. Work determined by the Engineer to be unsatisfactory according to industry standards shall be redone at the Contractor's expense, with no additional compensation.

1.3 SUBMITTALS

A. Submittals required under this section include, but are not limited to the following for each of the locations specified:
   1. Conduit
   2. Wiring and Cables
   3. Main circuit breaker
   4. Motor Control Center
   5. Receptacles
   6. Portable Generator connections
   7. Mounting hardware and materials
   8. Lighting fixtures and switches
   9. Electrical distribution equipment
   10. Miscellaneous electrical equipment
   11. Pullboxes
   12. Control station push buttons and enclosures
   13. Motor starting equipment as required for the installation
   14. Submit all other equipment as required by the Contract.

B. Operations and Maintenance Manual
   1. Requirements
      a. The O&M manual shall be submitted in a single hard cover binder, tabbed, with a table of contents. All relevant information shall be indicated in some capacity by high lighting or crossing out non relevant information.
      b. Provide contact information for contractor and equipment supplier to include contact name, address, telephone, and email address for service requests.
      c. Provide a complete bill of material for each piece of equipment.
      d. Provide a preventative maintenance section for all applicable equipment including recommended schedule and spare parts.
      e. Provide complete bill of materials.
      f. Panels which require customized schematics shall be updated with changes made in the field and submitted on 11" x 17" size drawings. Also internal and front elevation drawings shall be included identifying all equipment.

g. All equipment shall include a troubleshooting section with common symptoms and recommended solutions.
h. All equipment shall include emergency operations instructions particularly to Emergency Generators and Automatic Transfer Switches on how to operate the equipment when the automatic function of the equipment fails.

2. Submit (5) copies of the O&M.
3. Submit a letter from the owner that he or she is satisfied with the submitted documentation.

C. Submittals:

1. Submit Shop Drawings in accordance with General Conditions and as indicated herein.
2. Shop Drawings shall be submitted on all items of equipment and systems as indicated in related sections of DIVISION 16 in one complete three ring binder tabbed with a table of contents.
3. Shop Drawings shall be thoroughly checked by the Contractor for compliance with the Contract Documents. Verify that all equipment and materials proposed to be furnished will fit into available space and maintain specified and code clearances, and that all equipment is compatible with the general building construction of the areas into which they are to be installed. The submittal of any Shop Drawing implies that the Contractor has reviewed this Shop Drawing and that the above requirements have been met.
4. Shop Drawings Shall Consist Of:
   a. Project name and location.
   b. Contractor's name.
   c. Index Sheet - Listing the equipment being submitted utilizing equipment designations, or symbols, indicated on the Contract Documents together with the proposed manufacturer, style/ type and catalog number.
   d. Manufacturer's scale or dimensioned drawings along with standard catalog "cut" sheets.
   e. Equipment ratings, service clearances and configuration.
   f. Listing of accessories to be furnished.
   g. Single-line and schematic diagrams where applicable.
   h. Refer to related sections of the specifications for special shop drawing requirements for individual equipment types.
5. Provide samples of such items as lighting fixtures and wiring devices upon request of the Engineer.
6. Standard manufacturer's catalog cut sheets are acceptable; however, they shall be modified to indicate equipment and options to be provided for this project. Any listed equipment, options, or features which are not to be provided shall be properly indicated in the submittal. Failure to properly indicate project-specific equipment, options, and features will result in the submittal being returned without being reviewed.
7. Submit test results as listed in Section 3.4

1.4 PRODUCT HANDLING

A. All materials shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance.

B. Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by water. Electrical equipment shall not be stored out-of-doors. Electrical equipment shall be stored in dry permanent shelters. If any apparatus has been damaged, such damage shall be repaired at no additional cost. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through such special tests as directed by the Engineer, or shall be replaced at no additional cost to the Owner.

1.5 DESIGN CRITERIA

A. Codes, Inspection and Fees

1. All material and installation shall be in accordance with the latest edition of the National Electrical Code and the codes and ordinances of the Town or City of which the work is being performed.
2. Pay all fees required for permits and inspections.

B. Tests and Settings

Test all systems furnished under DIVISION 16, ELECTRICAL and repair or replace all defective work.

1.6 GUARANTEE

A. Guarantee all equipment, materials and workmanship in accordance with the General Conditions of the Construction Contract and Section 11000.

B. Warrant all material furnished and work executed is in accordance with all applicable laws and regulations.

1.7 BID ALTERNATES

A. Refer to DIVISION 1 of the Contract Drawings for all work related to Bid Alternates for this project. Bid Alternates have been identified and described for specific work areas and equipment. The Contractor shall determine all associated work and costs required for these items for a complete system.

B. The drawings indicate and define areas where work related to the bid alternates under this section is required. This has been noted and shown as clearly as possible. However it does not show each and every possible component for these bid alternates. Therefore it shall be the contractor's responsibility to include all associated materials, labor and costs associated with the required bid alternatives for a complete system.

PART 2 - PRODUCTS

2.1 GENERAL

A. Materials and equipment used shall be Underwriters Laboratories, Inc. listed.

B. Refer to Drawing E-1 for specific references to NEMA ratings for equipment specified unless otherwise noted.

2.2 RACEWAYS AND FITTINGS

A. Rigid steel conduit shall be hot-dipped galvanized as manufactured by Republic Steel Corp., Allied Tube and Conduit Corp., Wheeling-Pittsburg Steel Corp., or equal.

B. Conduit hubs shall be as manufactured by Myers Electric Products, Inc., Raco Div., Appleton Electric Co., or equal.

C. PVC coated rigid steel conduit as manufactured by Rob-Roy "Plasti-Bond", Ocal-Blue, or equal.

D. PVC Schedule 80 shall be extra heavy wall and UL Listed for the use intended. Acceptable Manufacturers: Carlon, Rob-Roy, or equal.

E. Aluminum conduit shall be rigid, heavy wall aluminum. Acceptable manufacturers: Anaconda, Kaiser, VAW, or equal.

F. Flexible Metal Conduit

1. Flexible Metal Conduit shall be constructed of one continuous length of U. L. Approved electro-galvanized, spirally wound steel strip with interlocking convolutions and interior surfaces free from burrs and sharp edges.
2. Flexible metal conduit shall be "liquid-tight" with PVC jacket. Acceptable Manufacturers: Alflex - a division of Southwire, Electri-Flex, Thomas & Betts - a division of ABB, or equal.

2.3 WIRES AND CABLE

A. Wires and cables shall be of annealed, 98 percent conductivity, soft drawn copper. All conductors No. 8 AWG and larger sizes shall be stranded.

B. Power wiring shall be 600V, Type XHHW. Type XHHW shall be cross-linked polyethylene, as manufactured by Pirelli Cable Corp., Collyer Insulated Wire Company, The Okonite Company, or equal.

C. Control wiring shall be 600V, Type THHW/THHN No. 14 AWG stranded. Type THHW/THWN shall be cross-linked polyethylene, as manufactured by the Pirelli Cable Corp., Collyer Insulated Wire Company, The Okonite Company or equal.

D. Signal wiring shall be 600V, individual shielded twisted pair, No. 16 AWG stranded with polyethylene jacket. Provide Belden Catalog No. 8719, Alpha Wire & Cable, or equal.

E. Ground wires shall be THW and color coded green.

F. Variable frequency drive (VFD) motor supply cables shall be provided where indicated on Drawings. VFD cables shall be four (4) conductor tinned stranded copper, with cross-linked polyethylene insulation, overall foil (100% coverage) / tinned copper braid (85% coverage) shields, No. 12 AWG tinned copper drain wire, and outer PVC jacket. Cables shall conform to UL specification for 1000

Volt flexible motor supply cable. Acceptable Manufacturers: Belden, Olflex, or equal.

G. Ethernet wiring shall be Category 6, 4-pair 23 AWG solid bare copper conductor, unshielded, FEP insulated, plenum rated. Acceptable manufacturers shall be Belden, Omni, or equal.

H. Wire markers shall be "OMNI-GRIP" as manufactured by W.H. Brady Company, or equal.

I. All wires and cables specified and installed underground shall be U.L. Listed and Labeled for underground use for all installations.

2.4 GROUND ROD

A. 10 foot long by 3/4 inch diameter copper clad steel ground rods shall be provided, arranged and installed as shown on the drawings. Provide all required Cadwelds, grounding clamps and hardware as required for a complete installation per NEC and as shown on the drawings.

B. Acceptable manufacturers are Erico, AB Chance Co., or equal.

2.5 WIRING DEVICES

A. Receptacles shall be duplex, 20 Ampere, industrial grade and shall be ground fault type. Outdoor receptacles shall be provided with weatherproof, while in use type covers.

B. Light switches shall be rated 20 Ampere, single pole or three way type as shown on drawings.

C. Duplex receptacles shall be duplex, 20 ampere, industrial grade type.

D. Light Switch covers shall be rated NEMA 4X , gray, with red lever when installed in the chemical room.

E. Acceptable manufacturers are Cooper, Hubbell, or equal.

2.6 NOT USED

2.7 LIGHT FIXTURES

A. Refer to lighting fixture schedule on the Drawings for specific requirements.

B. Acceptable manufactures are Cooper Lighting, Holophane, or equal.

2.8 PULLBOXES AND JUNCTION BOXES

A. Junction boxes shall be cast malleable iron or aluminum type and gasketed type FS series with hubs.

B. Pullboxes other than explosion proof shall be seamless weld type, galvanized with flush type screw-on covers and no hinges or side clamps all around. Use Myers hubs for conduit termination and entry into pullboxes. Acceptable manufactures are Rittal, Hoffman, or equal.

C. Boxes for concealed work shall be used only for concealed installations.

2.9 MOUNTING SUPPORTS AND HARDWARE

A. Provide 304 stainless steel uni-strut and 4" channel angle supports and stainless steel mounting plates as shown and required for equipment mounting. All legs for stanchion mounting structures shall be channel angle support, no exceptions.

B. All bolts, washers and mounting hardware shall also be 316 stainless steel for the entire installation.
C. Acceptable manufactures are B-Line Systems, Inc., Thomas & Betts-Super Strut, Unistrut, or equal.

2.10 LINK SEAL

A. Furnish and install link seal fittings at all areas of buildings and structures both above and below grade for conduit entry. Refer to the contract drawings for additional requirements.
B. Acceptable manufactures are Innerlynx, Crouse Hinds, or equal.

2.11 DISCONNECT SWITCHES

A. Furnish and install heavy duty type lockable disconnect switches as shown on the drawings. Switch NEMA ratings shall be as required and noted on the drawings. Ampacity shall be noted on the drawings and as required by NEC.
B. Disconnect switches, indicated on the drawing to be used for motors controlled by variable frequency drives shall be 4 pole type switches. The fourth pole shall be wired directly to the control circuit, in series with the safety e-stop, in order to lock-out and immediately shutdown the drive control circuit. The auxiliary 4th pole shall open prior to any of the other three power poles and shall be specifically designed for proper use with VFD type load circuits. The Contractor shall be responsible for providing a separate control conduit for required wiring from the VFD to the disconnect switch.
C. Acceptable manufactures are Square D, Cutler Hammer, or equal.

2.12 MOTOR STARTERS

A. Fractional Horsepower Single-Phase Manual Motor Starter shall be provided with thermal overload(s) and red running indicating light. Starters shall be rated for 120 Volt operation.
B. Three-Phase Motor Starters shall be combination (480 Volt or 208V), 3-phase, starter/disconnect type, employing magnetic starter (NEMA Size 1 minimum), with thermal overload protection for each phase and with an M.C.P. type circuit breaker/disconnect sized per the circuit breaker manufacturer's recommendations for coordination with the thermal overload protection. Combination starters shall be provided with a control power transformer with primary and secondary fusing.
C. Solid-state, reduced-voltage, three phase motor starters shall be (480 volt or 208V), 3 phase and shall be provided as shown on the Drawings. Enclosures for starters shall be based on location classified and drawing E-1. Provide all front mounted controls, lights, nameplates for all front mounted devices, elapsed time meter and nameplate at top center of enclosures which identifies equipment title. Also provide a through the door lockable MCP.
D. Starters shall be rated 22,000 ampere RMS symmetrical and enclosure requirements shall be as specified under Section 16160.
E. Starters shall be provided with the following features:
    1. Two (2) Primary and one (1) Secondary fuse protection for CPT and as shown on the drawings.

2. Individual control power transformers (CPT). Oversized as required.
3. Individual motor overload protection.
4. Time delay staggered starting control.
5. Auxiliary contacts for remote indication.
6. Controls and indication as shown on the drawings.

F. All starters shall be customized for the specific application as specified and shown on the drawings.

G. Provide an explosion proof motor rated switch with ampere rating not less than twice the full load current of the sump pump to control the motor at the platform as indicated on the drawings.

H. Provide a fractional horsepower manual motor starter with thermal overloads, reset, and lockout provisions.

2.13 DRY-TYPE TRANSFORMERS

A. Furnish and install dry-type transformers with ratings as shown on the drawings.

B. Transformers shall be of the energy efficient type and non-ventilated, DOE 2016 energy efficient.

C. Acceptable manufactures: Cutler-Hammer, Square D, Siemens, or equal.

2.14 LIGHTING PANELBOARD

A. Provide panelboard with main circuit breakers center mounted separate from the feeder breakers sized as shown on the drawings. Panelboard shall have bolt on breakers and copper busses rated as shown on the drawings but shall not be less than 10,000 ampere RMS symmetrical. Provide circuit breakers as noted on the drawings.

B. NEMA rating to be NEMA 3R.

C. Acceptable manufactures are Square D, Cutler Hammer, General Electric, equal.

2.15 VARIABLE FREQUENCY DRIVEs

A. Furnish and install a variable frequency drive (VFD) for the raw water pumps. VFD to be installed within the motor control center with the following:
1. Allen Bradley Power Flex 700, Eaton, or equal.
2. Line Reactor 5%/Matrix Filter/RFI/EMI Filter/Matrix Filter as manufactured by TCI or equal.
3. Through the door disconnect switch.
4. IGBT Pulse Width Modulation technology
5. Indicating lights on the front door as shown on the drawings.
6. Minimum lead length for motor not requiring an output filter is 150 feet.
7. Front panel mounted keypad.
8. Provide all programming and setup for the VFD. Provide VFD Parameter Setup and Verification. See Part 3 of this specification.
9. Refer to contract drawings for specific requirements and number of VFD units required as shown below in the schedule:

Equipment Name	HP	Constant or Variable Torque	Harmonic Traps/Line Reactors/ RFI/EMI/ dv/dt long lead filters	Supplier MCC Manufacturer	Notes
Raw Water Pump No.1, No.2, No.3	60	CT	Harmonic Traps/Line Reactors/ RFI/EMI/	MCC Manufacturer	

B. Provide a complete and operational VFD control panel for each raw water pump motor.
C. Provide a total of two (2) days of startup for the VFD equipment after confirmation of pre-startup has been completed.
D. Provide 1 day of separate training.
E. Refer to drawings for wiring requirements.

2.16 CABLE SEALS

A. Conduit sealing bushings to seal the ends of conduits entering enclosures from below grade shall be OZ Gedney Co., Type CSB Series or equal.

2.17 LOCAL CONTROL STATIONS

A. Provide a stainless steel enclosure with NEMA rating as shown on drawings. The number of devices the enclosure shall be able to hold shall be as shown on drawings. Enclosure shall have sufficient depth to accommodate mounting four Class 9001 KA-1 contact blocks side by side.
B. Provide heavy duty oil tight/water tight operators as indicated on drawings and as described below:
    1. Selector switches shall be removable from the front of the control station without disturbing the wiring or mounting of the control unit. Selector switch shall be bat wing type, 30mm in size.
    2. Emergency stop pushbuttons shall be large operator head type, red mushroom-head, maintained type switch. The operation shall be push to open and pull to re-engage. Provide multiple output contacts as shown on the drawings without disturbing the wiring or mounting of the control unit.
    3. Indicator lights shall be 30 mm, Push-to-Test, heavy duty, oiltight with LED lamps and designed to operate at 120 Volts, 60 Hz AC. Indicator lights shall be provided with mounting rings, engraved as indicated on the Drawings. Lens color shall be as indicated.
    4. Contact blocks used in heavy duty oil-tight control stations shall be Square D Type K single-pole, single-throw (SPST) or single-pole, double-throw (SPDT) and shall be suitable for mounting side by side and/or in tandem to the base of the operator. Contact block mounting screws shall be captive with a drilled and tapped head to permit easy tandem mounting of contact

blocks. Terminals shall be pressure wire type with a self-lifting pressure clamp that will compensate for wire of different size ranging from #12-#18 solid or stranded. Contacts shall be double break. Contact tips shall be silver.

C. All equipment and devices shall be rated for space where being installed.

D. Acceptable manufactures are Allen Bradley, Square D, or Cutler Hammer, equal.

2.18 MOTOR CONTROL CENTER

A. General

1. Motor Control Center(s) shall be Square D, Cutler-Hammer Freedom Series 2100 Design, equal.
2. Motor Control Center(s) shall have been tested in a high power laboratory to provide adequate mechanical and electrical capabilities. All major components shall have been individually design tested and guaranteed by the manufacturer. Wiring shall be NEMA 12 Class I, Type B. MCC wiring diagrams shall show all remote devices indicated on Contract Drawings.
3. The type of enclosure shall be in accordance with NEMA Standards for Type 12 with gasketed doors. All enclosing sheet steel, wireways and unit doors shall be gasketed.
4. The Motor Control Center shall be 600 volt class suitable for operation on a three phase, 60 Hertz system. The system operating voltage and number of wires shall be as indicated on the drawings.
5. Equipment shall meet the applicable NEMA, ANSI and UL standards.
6. The contract drawings have provided detailed customized schematic wiring diagrams for all motor control center equipment as well as individual wall mounted starters, control panels, etc. These are very detailed and a lot of effort has been expended to compile these diagrams. The equipment manufacturer/supplier of this equipment as specified shall be responsible to provide the following detailed and customized schematic wiring diagrams:
   - A separate customized and detailed schematic for each piece of equipment (i.e. RAS pumps No. 1, No. 2 and No. 3). Even though the schematic appears to be the same for this equipment a separate schematic for each will be provided with the referenced title (i.e. RAS Pump No. 1, etc.) noted on the respective schematic.
   - Each schematic shall indicate and show the specific devices (hand-off-auto, run light, ETM, etc.) and a reference to where this is located.
   - All contacts and interlocks shall be identified as to their location.
   - All metering and interface devices such as digital metering, TVSS, lightning protection, etc., shall be shown, identified, and dimensional heights from bottom of equipment shall be noted.
7. Failure to provide the proper customized schematic wiring diagrams shall be grounds for automatic rejection. Any delays, scheduling issues, and additional contract time and cost associated with delays due to equipment not being reviewed or being rejected for these reasons shall be the responsibility of the Contractor.

B. Structure Arrangement
   1. Structures shall be totally enclosed deadfront, free standing assemblies. They shall be 90 inches high and 20 inches minimum/21 inches maximum depth for front mounted and back-to-back units. Structures shall contain a horizontal wireway at the top, isolated from the horizontal bus and shall be readily accessible through a hinged cover. Adequate space for conduit and wiring to enter the top or bottom shall be provided without structural interference.
   2. Compartments for mounting control units shall be incrementally arranged such that not more than six size 1 starters can be mounted within each vertical structure. Guide rails shall be provided.
   3. A vertical wireway with minimum of 35 square inches of cross sectional area shall be adjacent to each vertical unit and shall be covered by a hinged door. Wireways shall contain steel rod cable supports.

C. Bus Arrangement
   1. Each structure shall contain a main horizontal copper bus, with minimum ampacity as shown on the drawings. Vertical busses feeding unit compartments shall be copper and shall be securely bolted to the horizontal main bus. All joints shall be front accessible for ease of maintenance. The vertical bus shall have a minimum rating of 300 amperes for front mounted units.
   2. The vertical bus shall be completely isolated and insulated by means of a labyrinth design barrier. It shall effectively isolate the vertical busses to prevent any fault generated gasses to pass from one phase to another.
   3. Busses shall be braced for 65,000 amperes rms symmetrical (minimum), or as shown on drawings.

D. Unit Construction
   1. All full voltage starter units through NEMA size 5 shall be of the draw out type. Draw out provisions shall include a positive guide rail system and stab shrouds to absolutely ensure alignment of stabs with the vertical bus. Drawout units shall have a tin-plated stab assembly for connection to the vertical bus. No wiring to these stabs shall extend into the bus compartment. Interior of all units shall be painted white for increased visibility. Units shall be equipped with side-mounted, pressure pull-apart type control terminal blocks rated 480 volts. Knockouts shall be provided for the additional of future terminal blocks.
   2. All drawout units shall be secured by a spring loaded quarter turn indicating type fastening device located at the top front of the unit. Each unit compartment shall be provided with an individual front door.
   3. An operating mechanism shall be mounted on the primary disconnect of each starter unit. It shall be mechanically interlocked with the unit door to prevent access unless the disconnect is in the OFF position. A defeater shall be provided to bypass this interlock. With the door open, an interlock shall be provided to prevent inadvertent closing of the disconnect. A second interlock shall be provided to prevent removal or re-insertion of the unit while in the ON position. Padlocking facilities shall be provided to positively lock the disconnect in the OFF position with from one to three padlocks with the door

open or closed. In addition, means shall be provided to padlock the unit in a partially withdrawn position with the stabs free of the vertical bus.

4. Combination starter units shall be full voltage non-reversing, unless shown otherwise, and shall utilize Motor Circuit Protectors Type HMCP. Each combination unit shall be rated 42,000 AIC symmetrical at 480V. The HMCP shall provide adjustable magnetic protection and be provided with pin insert to stop the magnetic adjustment at 1300% motor nameplate full load current to comply with NEC requirements. All HMCP combination starter units shall have a "tripped" position on the unit disconnect and a push-to-test button on the HMCP. Type HMCP motor circuit protectors shall include transient override feature for motor inrush current.
5. Linestarters shall be electrically operated, electrically held, three pole assemblies with arc extinguishing characteristics and shall have silver-to-silver renewable contacts. They shall have provisions for a total of eight NO or eight NC auxiliary contacts. The overload relay assembly shall be of the thermal bimetallic type. Overload relays shall be reset from outside the enclosure by means of an insulated button. The overload relay shall have a built-in push-to-test button.
6. Each starter shall be equipped with a fused control power transformer, two indicating lights, and two NO and two NC contacts, unless otherwise scheduled on the drawings. Device panel to have space to accommodate six oil-tight pilot-control devices or indicating ammeters, voltmeters, or elapsed time meters.
7. Indicating lights shall be 120V, 30mm, LED type, Push to Test type.
8. Individual feeder breakers shall have a minimum interrupting capacity of 42,000 AIC or as scheduled on the drawings.

E. Variable Frequency Drives
   1. Provided variable frequency drives as specified within this section and as shown on the drawings.

F. Finish
   1. The control center shall be given a phosphatizing pretreatment. The paint finish shall be an anionic, thermoset acrylic. Manufacturer's standard color shall be used.

G. Nameplates
   1. Each unit will have 1.0 x 2.5 inch hot stamped nameplate. The lettering shall be white 3/16 inch high, in a black background.

H. Lightning Arresters and Surge Capacitors
   1. Provide lightning arrestors and surge capacitors as shown on contract drawings.

2.19 EXHAUST FAN TIMER CONTROL PANEL

1. Provide a fiberglass or painted steel control panel rated NEMA 3R with appropriate fusing. Provide a cycle on/off timer Artisan model 4980, Omeron, or equal to cycle the exhaust fan in the chemical room while the room is not occupied. A relay shall be wired to turn on the fan continuously when the

lights in the chemical room are turned on. Wire devices as recommended by the manufacturer. Refer to wiring diagrams as a reference of operation.

2.20 FINAL AS-BUILT RECORD DRAWINGS

A. During the ongoing construction the contractor shall maintain a clean set of full size drawings for markup. The drawings shall be red lined and marked up with all appropriately noted changes noting the as-built condition. Upon completion of the project the set of as-built markups shall be provided to the Engineer for final AutoCAD revisions.

2.21 COMPLETE ELECTRICAL DISTRIBUTION EQUIPMENT SUPPLIER

A. All electrical distribution equipment submitted for this project shall be by a single equipment manufacturer. Multiple suppliers of this equipment shall not be acceptable. The following manufactures shall be acceptable:
   1. Square D Company
   2. Cutler-Hammer
   3. Or Equal

2.22 SEQUENCE OF CONSTRUCTION

A. The specification requirements have been noted the contractor's responsibility for maintaining the pump stations operational at all times for the duration of the project. This shall be served via a portable generator during times of the replacement of the electrical service upgrade as shown and specified. It is anticipated to install the fiber optic and control panel to get onto the network first to be able to control the pumps prior to removing the motor control center and variable frequency drives.

B. The use of a portable generator for temporary power must meet the dBA requirements of the respective city or town where the work is to be performed when in use during all periods of operation.

C. All permits required for this application shall be the complete responsibility of the contractor.

D. Reference below for suggested sequence of construction
   1. Install new control panel and connect to network
   2. Install temporary 480V power distribution panel (PDP) powered from the existing mcc in the chemical room. Temporarily feed the Allen Bradley VFD to be used for operating the pumps during construction.
   3. Install and wire new transformer and lighting panel from PDP.
   4. Re-wire all 120V loads and replace lighting from new lighting panel.
   5. Provide portable generator to power PDP.
   6. De-energize feed to raw water pump station and remove MCC and distribution equipment.
   7. Install new motor control center and install all new equipment form the new motor control center.

8.

PART 3 - INSTALLATION

3.1 RACEWAYS AND FITTINGS

A. Unless otherwise indicated on the Drawings, install all wiring in the following applicable raceway system:
   1. Wiring 600 volts or less in dry concealed locations (NEMA 12): Galvanized electrical metallic tubing (for raceway sizes up to and including 2" trade size) or galvanized rigid heavy wall steel conduit. Only to be used in above ceiling spaces or within block walls or stud walls.
   2. Wiring 600 volts or less in indoor and outdoor, above grade locations (NEMA 12 and 4X): Rigid heavy wall aluminum conduit. Galvanized rigid heavy wall steel conduit with no exceptions by the Engineer.
   3. Wiring 600 volts or less in indoor wet locations (NEMA 3R or 4X): Rigid heavy wall aluminum conduit or galvanized rigid heavy wall steel conduit.
   4. Wiring 600 volts or less in indoor or outdoor corrosive chemical areas (NEMA 4X-Corrosive): Use PVC-coated rigid steel conduit for 4-20 ma signal wiring and PVC schedule 80 conduit for power and control wiring.
   5. All VFD cable and 4-20mA signal cable is to be installed in galvanized rigid steel conduit unless otherwise noted.

B. No wire shall be pulled until the raceway system is complete in all details.

C. The ends of all raceways shall be tightly capped to exclude dust and moisture during the construction period. Caps shall be of a UL Listed type specifically used for this purpose. Rags, papers, etc. shall not be used.

D. Raceways terminating in gasketed enclosures shall be terminated with conduit hubs.

E. Provide conduit expansion fittings as required. Install per manufacturers recommendation.

F. Installation of Bushings and Grounding Bushings
   1. Provide grounding type insulated bushings on all power conduits regardless of size.
   2. Provide grounding type insulated bushings on all control conduit sizes and signal conduit sizes one and one-quarter inch (l-l/4") trade size and larger.
   3. Provide standard bushings for conduits one inch (l") and smaller unless otherwise stated.
   4. Install cable seal bushings in conduits for all outdoor locations and NEMA 4X locations to prevent moisture from entering enclosures and equipment.
   5. Install cable seals in all conduits where there is a change in temperature such as transitioning from a room to the attic.
   6. Provide a bushing at each conduit termination unless fitting at box where conduit terminates has hubs designed in such a manner to afford equivalent protection to conductors.
   7. Any installations not provided with these requirements shall be removed and reinstalled at no additional cost to the Owner.

3.2 WIRES AND CABLES

A. All conductors shall be carefully handled to avoid kinks or damage to insulation.

B. Alarm wires shall be uniquely identified at each end with wire markers. A typed list of the numbers used and their function (alarm served) shall be submitted to the Engineer by the Contractor.

3.3 GROUNDING

A. Provide grounding conductors from ground electrodes to equipment as shown on the Drawings.

B. Do not use conduit as the ground and/or bonding conductor.

C. Bond ground terminal of receptacles to outlet boxes with #l2 AWG green insulated wire.

D. Ground conduit system and neutral conductor of wiring system with a connection at the main electrical service breaker.

E. The grounding network shall be connected to metallic water piping system, at two or more locations, with stranded copper, AWG, Green Insulated Conductor of the same size as grounding electrode conductor shown on the drawings or required by the National Electrical Code (NEC).

F. Make connections to ground rods with an exothermic welding process. Mechanical connections may be made at equipment only.

G. Ensure that a ground loop is not formed between equipment ground in electrical conduit and grounding electrode conductors directly connected to ground electrodes.

H. Group and bond ground wires to panel boxes, light fixtures, receptacles, etc., not to system neutral.

I. Make connection to water pipe with a suitable ground clamp or lug connection. If flanged pipes are encountered, make connection with lug bolted to flange connections.

J. Bond and ground all conduit systems.

3.4 EQUIPMENT

A. The inside of all equipment and enclosures shall be checked for tools and vacuumed cleaned of any debris.

B. The Contractor shall be responsible to ensure that all connections to motors, distribution equipment, and control panels are tightened to manufactures recommendations.

Install motor control center on a 4” concrete maintenance pad extending a minimum of 2” in front of the equipment.

D. All equipment is to be installed per manufacture’s requirements and the National Electric Code.

E. Install Safety Labels in compliance with NEMA 260.

3.5 TESTS

A. The entire grounding network resistance to be meggered and certified results recorded and submitted with no exceptions to the Engineer. Resistance shall not exceed 25 Ohms.

B. Branch circuits shall be tested during installation for continuity and identification and shall pass operational tests to determine that all circuits perform the function for which they are designed.

C. Adjust all settings on protective equipment and verify, check and establish with the power company that the secondary voltage is within 2% of rated voltage.

D. Test and set all motor circuit protectors, motor overload heaters to the nameplate horsepower of the equipment; and all circuit breaker settings in all electrical equipment shall be tested and verified operational.

E. Three phase panelboard's line currents shall be balanced to within 10% of each other.

F. For all 480V feeder wiring rated 600 volts or less, provide 1,000 volt "Megger" insulation test prior to energizing feeders. Use a motor-driven megger for all tests. Test voltage shall be applied until readings reach a constant value, and until three (3) equal readings, each one (1) minute apart, are obtained. Minimum megger reading shall be 45 megohms for feeder conductors. Document test results and submit to engineer. There shall be no exceptions taken by the Engineer before conductors are to be energized. See attached table at end of this section for recording data and submission to the Engineer.

G. Three phase motors shall be checked for rotation and, if necessary, reverse the connections at the starter. Single phase and DC motors at motor connection box.

H. VFD START UP, TESTING AND VERIFICATION

1. Responsibility and Coordination: The VFD supplier/electrical subcontractor is responsible for adjusting all of the VFD parameters for a fully functional system integrated with the instrumentation and control systems for this project. The VFD supplier/electrical subcontractor is responsible for coordinating with the instrumentation subcontractor and the instrumentation programmer so the control systems function as intended as described in the instrumentation control descriptions.
2. VFD Parameter Setup: Complete the VFD Parameter Setup Checklist and Verification below in the presence of the specifying engineer.
3. Submit a print out of each Variable Frequency Drive's parameters in the Operations and Maintenance Manual to show the final setting of the drives for record purposes. Submit a list of parameters for each drive.
4. The electrical subcontractor shall be responsible to coordinate an onsite meeting with the VFD supplier and the specifying engineer. This meeting shall take place prior to the initial startup of the equipment.

VFD PARAMETER SETUP CHECKLIST

- o 1. Ramp up speed _____
- o 2. Ramp down speed _____
- o 3. Min speed (Hz) _____
- o 4. Max speed (Hz) _____
- o 5. 4-20mA setting at min speed (mA) _____
- o 6. 4-20mA setting at max speed (mA) _____
- o 7. Output scale calibration _____
- o 8. Auto restart after power failure (yes/no) _____
- o 9. Auto restart after overcurrent fault (yes/no) _____
- o 10. Speed reference (internal/external) _____
- o 11. If external - signal source _____
- o 12. If external - signal type _____
- o 13. Restart after E-Stop (yes/no) _____
- o 14. Discrete outputs - Run (yes/no) _____
- o 15. Discrete outputs - Fault (yes/no) _____
- o 16. Analog outputs - Amps (absolute units) _____
- o 17. Analog outputs - KW (absolute units) _____
- o 18. Analog outputs - Speed (Hz) _____
- o 19. Analog outputs - Speed (RPM) _____
- o 20. Analog inputs - 4mA set to 0Hz (yes/no) _____
- o 21. Analog inputs - 20mA set to 60Hz (yes/no) _____
- o 22. Analog inputs - min speed limit set (yes/no) _____
- o 23. Analog inputs - max speed limit set (yes/no) _____
- o 24. Voltage boost (%) _____
- o 25. Starting frequency (Hz) _____
- o 26. PMW carrier frequency (Hz) _____
- o 27. Acceleration time (sec) _____
- o 28. Deceleration time (sec) _____
- o 29. Forward run (yes/no) _____
- o 30. Reverse run (yes/no) _____
- o 31. Overload (60%-100%) _____

VFD PARAMETER SETUP VERIFICATION

Date: _____

General Contractor: _____

Electrical Subcontractor: _____

VFD Supplier: _____

This certifies that the VFD parameters have been coordinated per the specifications and the requirements of this section.

_____ _____
(Authorized Representative of the General Contractor) Date

_____ _____
(Authorized Representative of the Electrical Subcontractor) Date

_____ _____
(Authorized Representative of the VFD Supplier) Date

PUMP STATION "NAME"
MEGGER TEST RESULTS

Project: _____ **Temperature:** _____
Date: _____ **Weather:** _____
Location: _____ **Test Equipment:** _____

Equipment / Feeder Under Test: _____ **Start Time:** _____ **End Time:** _____

Test Equipment: **Make:** _____ **Serial No.:** _____ **Test Voltage:** _____

	0.5 min	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min	P.I.
ΦA-Gnd.												
ΦB-Gnd.												
ΦC-Gnd.												
ΦA-ΦB												
ΦA-ΦC												
ΦB-ΦC.												

Equipment / Feeder Under Test: _____ **Start Time:** _____ **End Time:** _____

	0.5 min	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min	P.I.
ΦA-Gnd.												
ΦB-Gnd.												
ΦC-Gnd.												
NEUT -Gnd.												
ΦA-ΦB												
ΦA-ΦC												
ΦB-ΦC.												

Notes: *Megger test only should record 5 minute value*
Polarization Index (P.I.) is 10 min reading divided by 1 min reading

END OF SECTION

DRAWING INDEX

GENERAL

-----	COVER SHEET

CIVIL

C-1	CIVIL NOTES, ABBREVIATIONS, DETAILS, AND SITE PLAN
C-2	EROSION CONTROL NOTES AND DETAILS

ARCHITECTURAL

A-1	ARCHITECTURAL PLANS, NOTES, AND DETAILS

PROCESS

PR-1	PROCESS NOTES, LEGEND, AND ABBREVIATIONS
PR-2	DEMOLITION AND MODIFICATION PLANS AND SECTIONS

INSTRUMENTATION

I-1	NOTES, LEGEND, AND ABBREVIATIONS
I-2	CONTROL LOOPS

ELECTRICAL

E-1	ELECTRICAL LEGEND, NOTES, ABBREVIATIONS, NEMA AND CONDUIT INSTALLATION SCHEDULE
E-2	SITE PLAN MODIFICATIONS
E-3	SINGLE LINE DIAGRAM
E-4	WATER TREATMENT PLANT MODIFICATIONS
E-5	PUMP STATION FIRST FLOOR ELECTRICAL DEMOLITION PLAN
E-6	PUMP STATION FIRST FLOOR ELECTRICAL MODIFICATION PLAN
E-7	ELECTRICAL SCHEMATICS AND DETAILS
E-8	ELECTRICAL SCHEDULES

CITY OF ROCHESTER
LOW LIFT PUMP STATION UPGRADES
ROCHESTER, NH

PROJ NO: 13614A | DATE: JANUARY 2018

WRIGHT-PIERCE
Engineering a Better Environment

NO.	REVISIONS	DRAWN BY	APP'D
1	C-1 AND C-2 ISSUED PER ADDENDUM NO. 1	APC	CDB
2			
3			

ADDENDUM NO. 1
REFERENCE: DWG COVER

FIGURE: G-1

CIVIL DEMOLITION NOTES

1. REFER TO THE EXISTING SITE PLAN, DRAWING PR-2, E-4, AND E-5 FOR ADDITIONAL INFORMATION REGARDING EXISTING FACILITIES. REFER TO DRAWING C-1 FOR LIMITS OF WORK.
2. REFER TO ARCHITECTURAL, STRUCTURAL, PROCESS, MECHANICAL AND ELECTRICAL DRAWINGS FOR SPECIFIC INFORMATION REGARDING DEMOLITION AND REMOVAL. THIS DRAWING IS FOR USE AS GENERAL GUIDANCE ONLY.
3. REFER TO SPECIFICATION SECTION 01010A, WHICH CONTAINS INFORMATION ON CONSTRAINTS OF CONSTRUCTION SEQUENCING.
4. THE CONTRACTOR SHALL KEEP A RECORD OF DEMOLITION AS PART OF THE PROJECT RECORD DOCUMENTS IN ACCORDANCE WITH SPECIFICATION SECTION 01720.
5. THE CONTRACTOR SHALL TAKE ALL NECESSARY STEPS TO ENSURE THAT ALL PROCESS FLOWS ARE MAINTAINED DURING CONSTRUCTION. GRAVITY OR PUMPED BYPASSES AND OTHER MEANS OF MAINTAINING FLOW SHALL BE SUBJECT TO THE REVIEW AND ACCEPTANCE OF THE ENGINEER. THE CONTRACTOR SHALL COORDINATE ANY TEMPORARY STOPPAGES OR BYPASSES WITH THE OWNER AND ENGINEER.
6. CONTRACTOR IS REFERRED TO SPECIFICATION SECTION 01050 FOR COORDINATION WITH OTHERS.

SITE GRADING NOTES

1. STRIPPING OF TOPSOIL (LOAM) SHALL BE IN ACCORDANCE WITH SPECIFICATION SECTION 02115. REFER TO DRAWING C-1, FOR LIMIT OF WORK AND STRIPPING.
2. ALL AREAS THAT ARE EXCAVATED, FILLED, OR OTHERWISE DISTURBED BY THE CONTRACTOR SHALL BE LOAMED, GRADED, LIMED, FERTILIZED, SEEDED AND MULCHED, UNLESS OTHERWISE NOTED. THE TOP 4 INCHES OF SOIL SHALL BE LOAM. REFER TO SPECIFICATION SECTION 02485, LANDSCAPING/LOAM AND SEED.
3. THE CONTRACTOR SHALL PROVIDE PROPER EROSION CONTROL AND DRAINAGE MEASURES IN ALL AREAS OF WORK, AND CONFINE SOIL SEDIMENT TO WITHIN THE LIMITS OF EXCAVATION AND GRADING. PRIOR TO BEGINNING EXCAVATION WORK, EROSION CONTROL FENCE SHALL BE INSTALLED AT THE DOWN GRADIENT PERIMETER OF THE ACTUAL LIMITS OF GRUBBING AND/OR GRADING, AND AS SHOWN ON THE DRAWINGS. EROSION CONTROL MEASURES SHOWN ON THE DRAWINGS ARE A MINIMUM, CONTRACTOR SHALL TAKE ALL OTHER NECESSARY MEASURES. EROSION CONTROL FENCE SHALL ALSO BE INSTALLED AT THE DOWN GRADIENT PERIMETER OF THE TOPSOIL STOCKPILES. ALL DISTURBED EARTH SURFACES SHALL BE STABILIZED IN THE SHORTEST PRACTICAL TIME AND TEMPORARY EROSION CONTROL DEVICES SHALL BE EMPLOYED UNTIL SUCH TIME AS ADEQUATE SOIL STABILIZATION HAS BEEN ACHIEVED. TEMPORARY STORAGE OF EXCAVATED MATERIAL SHALL BE STABILIZED IN A MANNER THAT WILL MINIMIZE EROSION. ALL INSTALLED EROSION CONTROL FACILITIES SHALL BE REMOVED AT THE END OF THE PROJECT. REFER TO SPECIFICATION SECTION 02270.
4. ALL STORM DRAINAGE INLETS SHALL BE PROTECTED BY HAY BALE FILTERS TO PREVENT ENTRY OF SEDIMENT FROM RUNOFF WATERS DURING CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL AND DISPOSAL OF ALL COLLECTED SEDIMENT, AND THAT WHICH COLLECTS IN THE STORM DRAIN SYSTEM.
5. TEST PIT AND/OR BORING LOGS FOR THE PROJECT SITE ARE INCLUDED IN APPENDIX A OF THE SPECIFICATIONS.
6. CONTRACTOR SHALL NOT TRACK OR SPILL EARTH, DEBRIS OR OTHER CONSTRUCTION MATERIAL ON PUBLIC OR PRIVATE STREETS AND PLANT DRIVES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE IMMEDIATE ASSOCIATED CLEAN UP.
7. CONTRACTOR SHALL REMOVE AND DISPOSE OF ALL DEBRIS AND EXCESS EXCAVATED MATERIAL FROM WITHIN THE CONSTRUCTION LIMIT OF WORK, TO A SUITABLE SITE PROVIDED BY THE CONTRACTOR, IN COMPLIANCE WITH ALL STATE AND LOCAL REGULATIONS. ANY EXCESS SUITABLE MATERIAL MAY REMAIN ON SITE AT THE REQUEST OF THE OWNER.
8. CONTRACTOR SHALL REMOVE AND REPLACE, OR REPAIR, ALL CURBS, SIDEWALKS, PAVEMENT AND OTHER ITEMS DAMAGED BY HIS CONSTRUCTION ACTIVITIES TO AT LEAST THEIR ORIGINAL CONDITION, TO THE SATISFACTION OF THE OWNER AND ENGINEER.
9. WHERE EXISTING PAVEMENT IS REMOVED AND REPLACED, MATCH EXISTING GRADES TO THE EXTENT POSSIBLE. COORDINATE FINE GRADING WITH THE ENGINEER.

SITE LAYOUT NOTES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LAYOUT OF ALL PROPOSED WORK AS SHOWN ON THE DRAWINGS. THE ENGINEER WILL PROVIDE TWO POINTS THAT DEFINE THE HORIZONTAL CONTROL. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THIS PROVIDED LAYOUT INFORMATION THROUGHOUT THE COURSE OF CONSTRUCTION. REPORT ANY LAYOUT DISCREPANCIES IMMEDIATELY TO THE ENGINEER.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LAYOUT OF ALL PROPOSED LINES AND STRUCTURES AS SHOWN ON THE DRAWINGS. THE LAYOUT PLAN SHALL BE REVIEWED BY THE ENGINEER PRIOR TO CONSTRUCTION.
3. THE LOCATION AND LIMITS OF ALL ON-SITE WORK AND STORAGE AREAS SHALL BE REVIEWED/COORDINATED WITH, AND ACCEPTABLE TO, THE OWNER AND ENGINEER. THE CONTRACTOR SHALL LIMIT HIS ACTIVITIES TO THESE AREAS.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RE-ESTABLISHING AND RESETTING ALL EXISTING PROPERTY MONUMENTATION DISTURBED BY HIS OPERATIONS. THIS WORK SHALL BE DONE BY A LAND SURVEYOR REGISTERED IN THE STATE OF NEW HAMPSHIRE, AT NO ADDITIONAL COST TO THE OWNER.
5. WRITTEN DIMENSIONS SHALL PREVAIL. DO NOT SCALE DISTANCES FROM THE DRAWINGS. REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER.

ABBREVIATIONS

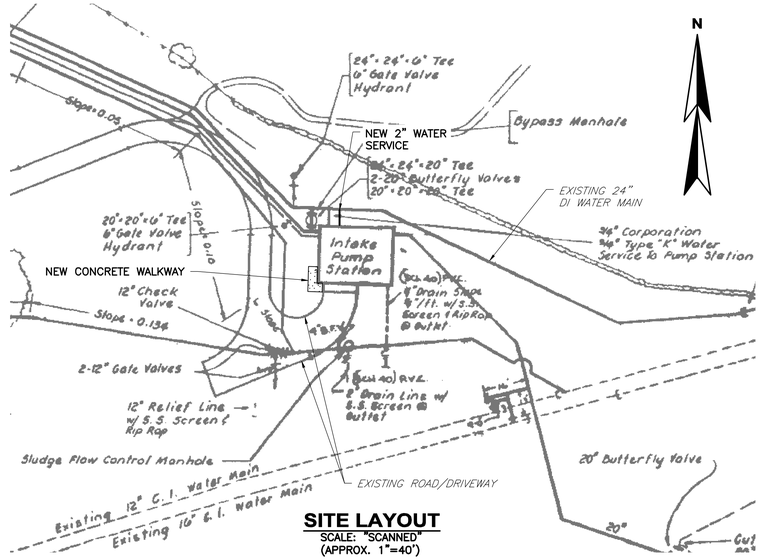
A	AIR
CB	CATCH BASIN
CI	CAST IRON PIPE
CLS	CHLORINE SOLUTION
CW	CITY WATER
DEC	SODIUM BISULFITE SOLUTION
DEW	DEWATERING
DI	DUCTILE IRON PIPE
DR	DRAIN
GS	GALVANIZED STEEL PIPE
HYD	HYDRANT
INV	INVERT ELEVATION
OHE	OVERHEAD ELECTRICAL
OUT	OUTFALL
PE	POLYETHYLENE PIPE
PRW	PROCESS WATER
PTE	PRELIMINARY TREATMENT EFFLUENT
PVC	POLYVINYL CHLORIDE PIPE
PW	PLANT WATER
RCP	REINFORCED CONCRETE PIPE
S	SEWER
SAM	SAMPLER LINE CONDUIT
SD	STORM DRAIN
SMH	SEWER MANHOLE
SS	STAINLESS STEEL PIPE
UD	UNDERDRAIN
UGE	UNDERGROUND ELECTRIC
W	WATER
XFMR	TRANSFORMER

SITE PIPING NOTES

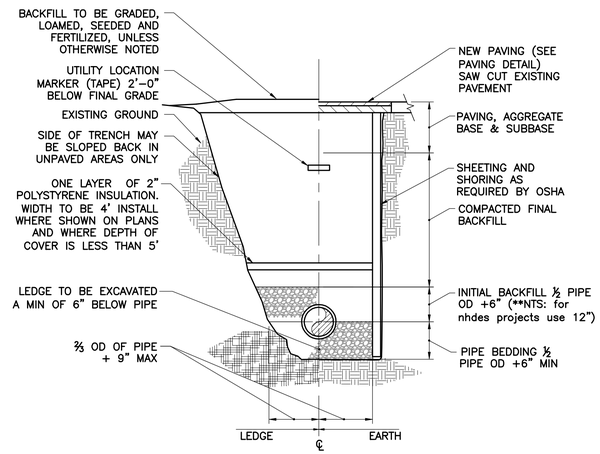
1. THE CONTRACTOR SHALL ASCERTAIN THE LOCATION AND SIZE OF EXISTING PIPING AND UTILITIES IN THE FIELD BY TEST PIT EXCAVATION PRIOR TO COMMENCING INSTALLATION OF ANY OF THE NEW PIPING AFFECTED. WHERE NEW PIPE CONNECTS TO EXISTING PIPING OR STRUCTURAL PENETRATION, CONTRACTOR SHALL VERIFY ELEVATION BY TEST PIT, AS REQUIRED, PRIOR TO INSTALLATION OF ANY OF THE ASSOCIATED/AFFECTED NEW PIPING. IDENTIFIED CONFLICTS WITH EXISTING PIPING AND UTILITIES WILL BE REVIEWED WITH THE ENGINEER PRIOR TO COMMENCING INSTALLATION. THE HORIZONTAL ALIGNMENT OF NEW PIPING MAY BE ADJUSTED IN THE FIELD SUBJECT TO PRIOR REVIEW AND ACCEPTANCE OF THE ENGINEER. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY LAYOUT OF ALL PROPOSED WORK AS SHOWN ON THE DRAWINGS AND REPORT ANY LAYOUT DISCREPANCIES IMMEDIATELY TO THE ENGINEER.
2. ALL BURIED CONNECTIONS TO STRUCTURES, INCLUDING BUT NOT LIMITED TO SHALL HAVE SLEEVE TYPE FLEXIBLE CONNECTIONS APPROXIMATELY 4 FEET FROM THE STRUCTURES. ALL SLEEVE TYPE COUPLINGS ON PRESSURE LINES SHALL BE RESTRAINED (SOLID SLEEVE). REFER TO SPECIFICATION SECTION 15088.
3. PROVIDE CAST OR DUCTILE IRON WALL CASTINGS, OR GALVANIZED STEEL PIPE SLEEVES, FOR ALL PIPE PENETRATIONS MADE THROUGH CONCRETE FOUNDATIONS, WALLS AND SLABS. ALL WALL SLEEVES AND WALL CASTINGS SHALL HAVE WATERSTOPS. SEE PROCESS, MECHANICAL AND STRUCTURAL DRAWINGS FOR LOCATIONS OF PENETRATIONS. NEW PENETRATIONS THROUGH EXISTING STRUCTURE WALLS SHALL BE BY CORING MACHINE AND "LINK-SEAL" TYPE SEALS, UNLESS OTHERWISE INDICATED. OPENINGS TO BE COMPATIBLE WITH REQUIRED PIPING AND STANDARD LINK SEAL SIZES. SEE DRAWING C-1 FOR DETAILS.
4. TRENCH INSULATION SHALL BE USED WHERE DEPTH OF COVER IS LESS THAN 5 FEET. REFER TO DRAWING C-1 FOR TRENCH INSULATION DETAIL.
5. REFER TO SPECIFICATION SECTION 02200 FOR PIPE AND STRUCTURE BEDDING AND BACKFILL REQUIREMENTS.
6. COMPACTION TESTS WILL BE PERFORMED IN ACCORDANCE WITH SPECIFICATION SECTION 02200. ANY SETTLEMENT OCCURRING WITHIN ONE YEAR OF FINAL COMPLETION OF THE WORK SHALL BE CORRECTED BY THE CONTRACTOR AT NO ADDITIONAL COST.
7. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE REGULATIONS OF THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA).
8. REFER TO SECTION 01050 OF THE SPECIFICATIONS FOR INFORMATION REGARDING COORDINATION WITH OTHERS, INCLUDING RESPONSIBILITIES AND RELATED COSTS.
9. WHERE NEW PIPING IS TO BE CONNECTED TO EXISTING PIPING, THE CONTRACTOR SHALL FURNISH AND INSTALL ALL ADAPTERS, FITTINGS, AND ADDITIONAL PIPE AS REQUIRED TO COMPLETE THE CONNECTION. CONTRACTOR SHALL VERIFY LOCATION, ELEVATION, ORIENTATION AND MATERIAL OF CONSTRUCTION. TEST PITS SHALL BE USED AS REQUIRED.
10. ALL EXISTING UTILITIES ENCOUNTERED DURING CONSTRUCTION ARE TO REMAIN IN SERVICE UNLESS OTHERWISE NOTED ON THE SITE PLAN, DRAWING C-1.
11. CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL AND DISPOSAL OF ALL DEMOLITION MATERIALS IN ACCORDANCE WITH SPECIFICATION SECTION 02050.
12. WHERE POSSIBLE, WATER LINES SHOULD BE INSTALLED OVER WASTEWATER OR SLUDGE LINES. A MINIMUM SEPARATION OF 18 INCHES BETWEEN THE BOTTOM OF THE WATER LINE AND THE TOP OF THE WASTEWATER OR SLUDGE LINE SHALL BE MAINTAINED, IF POSSIBLE. WHERE A WATER LINE CROSSES UNDER A WASTEWATER OR SLUDGE LINE, A FULL LENGTH OF PIPE SHALL BE CENTERED ABOVE THE WATER LINE SO THAT BOTH JOINTS WILL BE AS FAR FROM THE WATER LINE AS POSSIBLE.
13. ALL STRUCTURES AND PIPELINES LOCATED ADJACENT TO ANY TRENCH EXCAVATION SHALL BE PROTECTED AND FIRMLY SUPPORTED BY THE CONTRACTOR UNTIL THE TRENCH IS BACKFILLED. DAMAGE TO ANY SUCH STRUCTURES CAUSED BY OR RESULTING FROM THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE. ALL UTILITIES REQUIRING REPAIR, RELOCATION OR ADJUSTMENT AS A RESULT OF THE PROJECT SHALL BE COORDINATED THROUGH THE OWNER.
14. CONTRACTOR SHALL FOLLOW ALL ENDANGERED SPECIES ACT 4(D) RULES REGARDING THE NORTHERN LONG EARED BAT. THIS INCLUDES AVOIDANCE OF TREE REMOVAL DURING THE MONTHS OF JUNE AND JULY. CONTRACTOR SHALL PLAN ACCORDINGLY.

SITE PIPING NOTES

1. THE LOCATIONS OF UNDERGROUND UTILITIES AND STRUCTURES, AS SHOWN ON THE DRAWINGS, ARE APPROXIMATE AND MAY NOT BE COMPLETE. THE LOCATION OF EXISTING UNDERGROUND UTILITIES ARE BASED ON PREVIOUS CONSTRUCTION DESIGN PLANS, WHICH ARE AVAILABLE FOR INSPECTION AT THE ENGINEER'S OFFICE. NO GUARANTEE IS MADE THAT UTILITIES OR STRUCTURES WILL BE ENCOUNTERED WHERE SHOWN OR THAT ALL UNDERGROUND UTILITIES AND STRUCTURES ARE SHOWN. ALL LOCATIONS AND SIZES OF EXISTING UTILITIES AND STRUCTURES SHALL BE VERIFIED IN THE FIELD WITH TEST PITS AS REQUIRED PRIOR TO BEGINNING CONSTRUCTION OF NEW FACILITIES OR PIPING THAT MAY BE AFFECTED. THE CONTRACTOR WILL REALIGN NEW PIPE LOCATIONS AS REQUIRED TO CONFORM TO EXISTING LINES AND AS APPROVED BY THE ENGINEER.
2. CONTRACTOR TO NOTE THAT, IN GENERAL, ALL EXISTING CONDITION INFORMATION ON THE DRAWINGS ARE SHOWN WITH A LIGHTER LINE WEIGHT AND WITH A SLANTED TYPE TEXT.
3. UNLESS OTHERWISE NOTED, THERE IS NO KNOWN ASBESTOS WITHIN THE AREA OF WORK. IF THE PRESENCE OF ASBESTOS IS DISCOVERED, THE CONTRACTOR SHALL NOTIFY THE OWNER AND THE ENGINEER IMMEDIATELY. DISPOSAL OF ASBESTOS SHALL BE IN ACCORDANCE WITH STATE OF NEW HAMPSHIRE REGULATIONS.

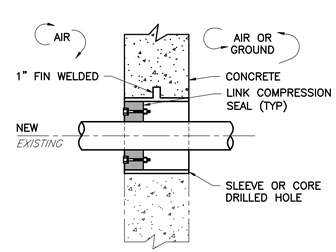


SITE LAYOUT
SCALE: "SCANNED"
(APPROX. 1"=40')



NOTES:
1. ALL EXCAVATION MUST MEET OSHA STANDARDS.
2. SEE SPECIFICATIONS FOR BEDDING AND BACKFILL REQUIREMENTS.

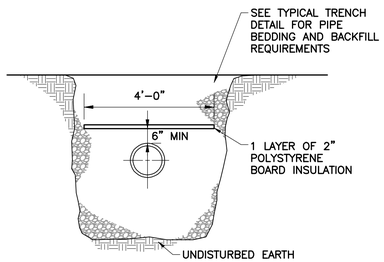
PIPE TRENCH
SCALE: "NTS"



EXTERIOR WALL

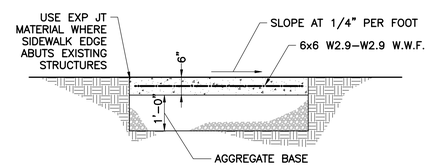
NOTES:
1. REFER TO SPECIFICATION SECTION 15092 FOR REQUIREMENTS AND INFORMATION.

CONSTRUCTION PIPING PENETRATION DETAILS
SCALE: NTS



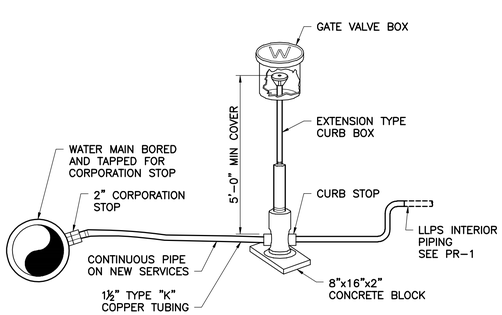
NOTE:
TRENCH PIPE INSULATION TO BE USED WHERE DEPTH OF COVER IS LESS THAN 5 FEET OR AS DIRECTED BY THE ENGINEER

TRENCH PIPE INSULATION
SCALE: NTS



NOTE: SAWCUT CONTROL JOINTS AT 5'-0" CENTERS (2" DEEP)

CONCRETE SIDEWALK
SCALE: NTS



WATER SERVICE CONNECTION
SCALE: NTS

NO	SUBMISSIONS/REVISIONS	APP'D	DATE
1	ISSUED PER ADDENDUM NO. 1	CDB	1/18
2			
3			
4			

DESIGNED BY: KJD
CAD CORR.: APC
CAD: APC
CHECKED BY: KJD
DATE:
APPROVED BY: CDB
DATE:
PROJECT NO: 13614A

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CITY OF ROCHESTER
LOW LIFT PUMP STATION UPGRADES
ROCHESTER, NH

CIVIL NOTES, ABBREVIATIONS, DETAILS, AND SITE PLAN

DRAWING
C-1

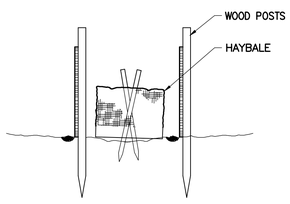
EROSION AND SEDIMENTATION CONTROL NOTES

THIS PLAN HAS BEEN DEVELOPED AS A STRATEGY TO CONTROL SOIL EROSION AND SEDIMENTATION DURING AND AFTER CONSTRUCTION. THIS PLAN IS BASED ON THE NEW HAMPSHIRE STORMWATER MANUAL BY THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES, TERRAIN ALTERATION BUREAU, DATED DECEMBER 2008

THE PROPOSED LOCATIONS OF SILTATION AND EROSION CONTROL STRUCTURES REQUIRED ARE SHOWN ON THE DRAWINGS. PROVIDE SILT FENCE, STONE CHECK DAMS AND OTHER EROSION CONTROL MEASURES AS REQUIRED TO ADEQUATELY PREVENT SEDIMENT TRANSPORT AS NOTED IN THE BMP.

ALL SEDIMENT AND EROSION CONTROL MEASURES SHALL BE DONE IN ACCORDANCE WITH THE NEW HAMPSHIRE STORMWATER MANAGEMENT MANUAL AND THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES, ENV-Wq 1500: ALTERATION OF TERRAIN, DECEMBER 2008

1. THOSE AREAS UNDERGOING ACTUAL CONSTRUCTION, IN NO CASE AT MORE THAN 5 ACRES AT A TIME, WILL BE MAINTAINED IN AN UNTREATED OR UN-VEGETATED CONDITION FOR THE MINIMUM TIME REQUIRED. IN GENERAL, AREAS TO BE VEGETATED SHALL BE PERMANENTLY STABILIZED WITHIN 3 DAYS OF FINAL GRADING AND TEMPORARILY STABILIZED WITHIN 45 DAYS OF INITIAL DISTURBANCE OF THE SOIL.
2. TEMPORARY STORAGE OF STOCKPILED MATERIAL SHALL BE STABILIZED IN A MANNER THAT WILL MINIMIZE EROSION.
3. EROSION CONTROL MEASURES SUCH AS SEDIMENT BARRIERS (SILT FENCE, STONE CHECK DAMS, ETC.) AND OUTLET PROTECTION (WHERE APPLICABLE) SHOULD BE INSTALLED PRIOR TO ANY SOIL DISTURBANCE OR EARTH MOVING OPERATIONS OF UPGRADIENT DRAINAGE AREAS.
4. FUGITIVE DUST MUST BE CONTROLLED IN ACCORDANCE WITH NEW HAMPSHIRE STANDARDS.
5. ALL EROSION CONTROL STRUCTURES WILL BE INSPECTED, REPLACED AND/OR REPAIRED EVERY 7 DAYS AND IMMEDIATELY FOLLOWING ANY SIGNIFICANT RAINFALL OR SNOW MELT OR WHEN NO LONGER SERVICEABLE DUE TO SEDIMENT ACCUMULATION OR DECOMPOSURE. SEDIMENT DEPOSITS MUST BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY ONE THIRD THE HEIGHT OF THE BARRIER. SEDIMENT CONTROL DEVICES SHALL REMAIN IN PLACE AND BE MAINTAINED BY THE CONTRACTOR UNTIL AREAS UPSLOPE ARE PERMANENTLY STABILIZED AND/OR WILL NOT ERODE UNDER THE CONDITIONS OF A 10-YEAR STORM. STABILIZATION SHALL BE DEFINED AS ONE OF THE FOLLOWING:
   A. BASE COURSE GRAVELS HAVE BEEN INSTALLED IN AREAS TO BE PAVED;
   B. A MINIMUM OF 85% VEGETATIVE GROWTH HAS BEEN ESTABLISHED;
   C. A MINIMUM OF 3" OF NON-EROSIVE MATERIALS SUCH AS STONE OR RIPRAP HAS BEEN INSTALLED; OR
   D. EROSION CONTROL BLANKETS HAVE BEEN PROPERLY INSTALLED.
6. NO SLOPES, EITHER PERMANENT OR TEMPORARY, SHALL NOT BE STEEPER THAN THREE HORIZONTAL TO ONE VERTICAL (3 TO 1) UNLESS STABILIZED WITH PERMANENT EROSION CONTROL MEASURES. IF MOWING IS TO OCCUR, MAXIMUM SLOPE ANGLE SHALL BE THREE HORIZONTAL TO ONE VERTICAL (3 TO 1). ON SLOPES FOUR HORIZONTAL TO ONE VERTICAL (4 TO 1), FINAL PREPARATION SHOULD INCLUDE SURFACE ROUGHING.
7. DURING THE CONSTRUCTION PHASE, INTERCEPTED SEDIMENT WILL BE RETURNED TO THE SITE AND RE-GRADED ONTO OPEN AREAS. POST SEEDING SEDIMENT, IF ANY, WILL BE DISPOSED OF IN AN ACCEPTABLE MANNER. AT NO TIME SHALL THE INTEGRITY OF THE EROSION CONTROL FENCE BE IN DANGER DUE TO BUILD UP OF SEDIMENT.
8. RE-VEGETATION MEASURES WILL COMMENCE UPON COMPLETION OF CONSTRUCTION. ALL DISTURBED AREAS NOT OTHERWISE STABILIZED WILL BE GRADED, SMOOTHED, AND RE-VEGETATED.
9. AN AREA SHALL BE CONSIDERED TO HAVE BEEN STABILIZED WHEN EXPOSED SURFACES HAVE BEEN EITHER MULCHED WITH STRAW OR HAY AT A RATE OF 2 BALES (70-90 LBS) PER 1,000 SQUARE FEET OR 1.5 TO 2 TONS (90-100 BALES) PER ACRE TO COVER 75 TO 90% OF THE GROUND SURFACE.
10. DITCHES AND SWALES SHALL BE STABILIZED PRIOR TO DIRECTING RUNOFF TO THEM.
11. SEED MIX SELECTION AND APPLICATION RATES WILL BE CONSISTENT WITH THE FOLLOWING TABLES AS REFERENCED FROM MINNICK, E.L. AND H.T. MARSHALL, STORMWATER MANAGEMENT AND EROSION CONTROL FOR URBAN AND DEVELOPING AREAS IN NEW HAMPSHIRE, ROCKINGHAM COUNTY CONSERVATION DISTRICT, AUGUST 1992, AND TABLES 4-1 THROUGH 4-3 OF SECTION 3 IN THE NEW HAMPSHIRE STORMWATER MANUAL. NOTE: REED CANARY GRASS SHALL NOT BE USED.
12. ALL TEMPORARY EROSION CONTROL MEASURES SHALL BE REMOVED ONCE THE WORK AREA IS STABILIZED.
13. WETLANDS (EXCEPT THOSE WHICH ARE TO BE FILLED IN ACCORDANCE WITH STATE AND FEDERAL REGULATIONS) WILL BE PROTECTED WITH SILT FENCE INSTALLED AT THE EDGE OF THE WETLAND OR THE BOUNDARY OF WETLAND DISTURBANCE.
14. IN GENERAL, AREAS WITHIN 100 FEET OF DELINEATED WETLANDS OR STREAMS SHALL HAVE A MAXIMUM PERIOD OF EXPOSURE OF NOT MORE THAN 15 DAYS.
15. FOLLOW APPROPRIATE EROSION CONTROL MEASURES PRIOR TO EACH STORM IN ALL AREAS WITHIN 100 FEET OF DELINEATED WETLANDS OR STREAMS.



COMBINATION SILT FENCE AND HAY BALE BARRIER
NTS

EROSION CONTROL DURING WINTER CONSTRUCTION

1. WINTER CONSTRUCTION PERIOD DEFINED: NOVEMBER 1 THROUGH MAY 1
2. WINTER EXCAVATION AND EARTHWORK SHALL BE DONE SUCH THAT NO MORE THAN 1 ACRE OF THE SITE IS WITHOUT STABILIZATION AT ANY ONE TIME.
3. EXPOSED AREAS SHOULD BE LIMITED TO WHICH CAN BE MULCHED IN ONE DAY PRIOR TO ANY PRECIPITATION EVENT.
4. ALL PROPOSED VEGETATED AREAS THAT DO NOT EXHIBIT A MINIMUM OF 85 PERCENT VEGETATIVE GROWTH BY OCTOBER 15, OR WHICH ARE DISTURBED AFTER OCTOBER 15, SHALL BE STABILIZED BY SEEDING AND INSTALLING EROSION CONTROL BLANKETS ON SLOPES GREATER THAN 3:1, AND SEEDING AND PLACING 3 TO 4 TONS OF MULCH PER ACRE, SECURED WITH ANCHORED NETTING, ELSEWHERE. THE INSTALLATION OF EROSION CONTROL BLANKETS OR MULCH AND NETTING SHALL NOT OCCUR OVER ACCUMULATED SNOW OR ON FROZEN GROUND AND SHALL BE COMPLETED IN ADVANCE OF THAW OR SPRING MELT EVENTS.
5. ALL DITCHES OR SWALES WHICH DO NOT EXHIBIT A MINIMUM OF 85 PERCENT VEGETATIVE GROWTH BY OCTOBER 15, OR WHICH ARE DISTURBED AFTER OCTOBER 15, SHALL BE STABILIZED TEMPORARILY WITH STONE OR EROSION CONTROL BLANKETS APPROPRIATE FOR THE DESIGN FLOW CONDITIONS.
6. AFTER NOVEMBER 15, INCOMPLETE ROAD OR PARKING SURFACES, WHERE WORK HAS STOPPED FOR THE WINTER SEASON, SHALL BE PROTECTED WITH A MINIMUM OF 3 INCHES OF CRUSHED GRAVEL PER NHDOT ITEM 304.3

LIME AND FERTILIZER SCHEDULE

SEEDING TYPE	SEED DATES	LIME RATE [TONE/ACRE]	FERTILIZER RATE/RATIO (TYPE) [LBS/1,000 SQ. FT.]
PERMANENT AND/OR TEMPORARY	MAY. 1 – SEPT. 15	3	600/ENGINEER APPROVED (N-P205-K20)

NOTES:
1. USE LOW PHOSPHATE FERTILIZER AT ALL TIMES AND SLOW RELEASE NITROGEN FERTILIZER WHEN BETWEEN 25 AND 250 FEET OF A SURFACE WATER BODY.
2. NO FERTILIZER EXCEPT LIMESTONE SHOULD BE APPLIED WITHIN 25 FEET OF THE SURFACE WATER.
3. APPLY LIMESTONE AT 50 PERCENT CALCIUM PLUS MAGNESIUM OXIDE.

TEMPORARY VEGETATION (TABLE 4-1)

ADDITIONAL TEMPORARY SEED MIXTURE (FOR PERIODS LESS THAN 12 MONTHS)

DATES	SEED	RATE
PRIOR TO MAY 15	OATS	80 LBS/ACRE
AUG. 15 – SEP. 15	ANNUAL RYE GRASS	40 LBS/ACRE
AUG. 15 – SEP. 15	WINTER RYE GRASS	112 LBS/ACRE
APR. 1 – JUN. 1 (AUG. 15 – SEP. 15)	PERENNIAL RYE GRASS	40 LBS/ACRE

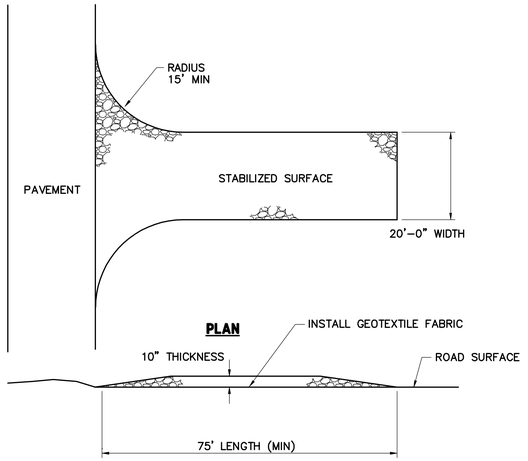
PERMANENT VEGETATION (TABLE 4-2)

USE	MIXTURE TABLES	SOIL DRAINAGE I.	II.	III.	IV.
STEEP CUTS AND FILLS, BORROW AND DISPOSAL AREAS	A	FAIR	GOOD	GOOD	FAIR
	B	POOR	GOOD	FAIR	FAIR
	C	POOR	GOOD	EXC.	GOOD
	E	FAIR	EXC.	EXC.	POOR
WATERWAYS, EMERGENCY SPILLWAYS AND OTHER CHANNELS WITH FLOWING WATER	A	GOOD	GOOD	GOOD	FAIR
	C	GOOD	EXC.	EXC.	FAIR
LIGHTLY USED PARKING LOTS, ODD AREAS, UNUSED LANDS, AND LOW INTENSITY USE RECREATION SITES	A	GOOD	GOOD	GOOD	FAIR
	B	GOOD	GOOD	FAIR	POOR
	C	GOOD	EXC.	EXC.	FAIR
PLAY AREAS AND ATHLETIC FIELDS. (TOPSOIL IS ESSENTIAL FOR GOOD TURF)	F	FAIR	EXC.	EXC.	EXC.
	G	FAIR	EXC.	EXC.	EXC.

NOTES:
1. I. DROUGHTY
   II. WELL DRAINED
   III. MODERATELY WELL DRAINED
   IV. POORLY DRAINED
2. EXC.= EXCELLENT
3. REFER TO TABLE 4-3 FOR SEED MIXTURE AND APPLICATION RATES

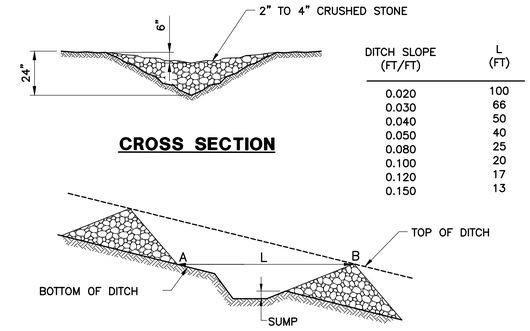
PERMANENT VEGETATION (TABLE 4-3)

MIXTURE	SPECIES	RATE-POUNDS PER ACRE	RATE-POUNDS PER 1,000 SQ. FT.
A	TALL FESCUE	20	0.45
	CREEPING RED FESCUE	20	0.45
	REDTOP	2	0.05
	TOTAL	*42*	*0.95*
B	TALL FESCUE	15	0.35
	CREEPING RED FESCUE	10	0.25
	CROWN VETCH/OR	15	0.35
	FLATPEA	30	0.75
	TOTAL	*40 OR 55*	*0.95 OR 1.35*
C	TALL FESCUE	20	0.45
	CREEPING RED FESCUE	20	0.45
	BIRDSFOOT TREFOIL	8	0.2
	TOTAL	*48*	*1.10*
E	CREEPING RED FESCUE	50	1.15
	KENTUCKY BLUEGRASS	50	1.15
	TOTAL	*100*	*2.30*
F	*TALL FESCUE*	*150*	*3.60*



NOTES
1. TEMPORARY, TO BE REMOVED PRIOR TO FINAL SITE PAVING
2. REFER TO SPECIFICATION SECTION 02270.
3. STONE SHALL BE 3" CRUSHED STONE.

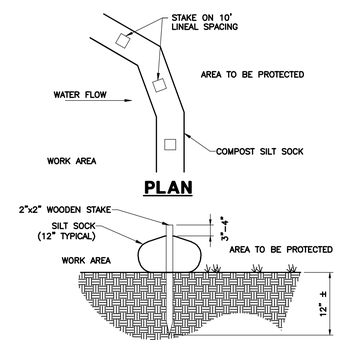
STABILIZED CONSTRUCTION EXIT
NTS



DITCH SLOPE (FT/FT)	L (FT)
0.020	100
0.030	66
0.040	50
0.050	40
0.080	25
0.100	20
0.120	17
0.150	13

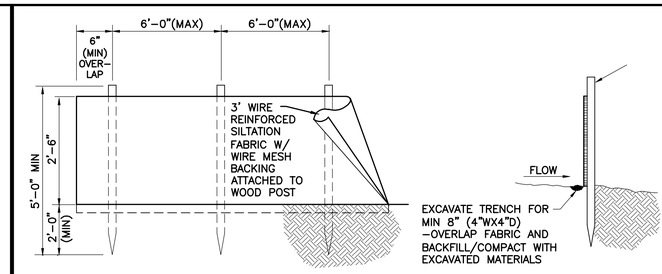
NOTE: FOR DRAINAGE AREAS 1 ACRE OR LESS

STONE CHECK DAM DETAIL
NTS



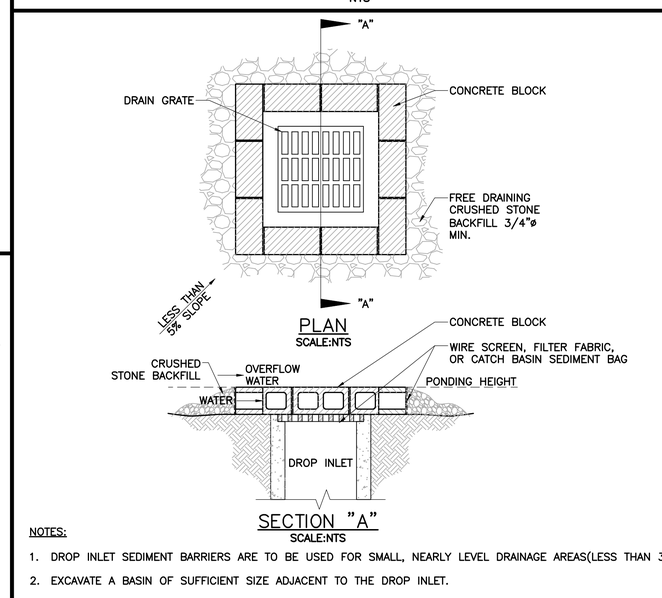
NOTES:
1. ALL MATERIAL TO MEET SPECIFICATIONS
2. SILT SOCK COMPOST/SOIL/ROCK/SEED FILL TO MEET APPLICATION REQUIREMENTS
3. SILT SOCK DEPICTED IS FOR MINIMUM SLOPES. GREATER SLOPES MAY REQUIRE LARGER SOCKS PER THE ENGINEER
4. COMPOST MATERIAL TO BE DISPERSED ON SITE, AS DETERMINED BY ENGINEER.

COMPOST SILT SOCK
NTS



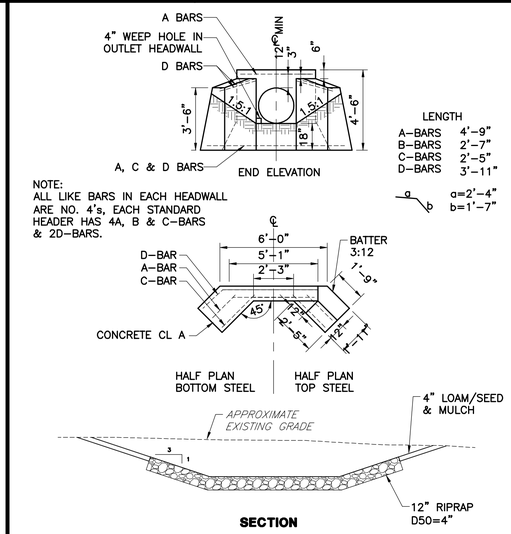
NOTES:
1. MAXIMUM LENGTH OF SLOPE ABOVE THE FENCE SHALL BE 100 FEET
2. MAXIMUM SLOPE ABOVE FENCE SHALL BE 2H TO 1V

SILT FENCE INSTALLATION DETAIL
NTS



NOTES:
1. DROP INLET SEDIMENT BARRIERS ARE TO BE USED FOR SMALL, NEARLY LEVEL DRAINAGE AREAS(LESS THAN 3%).
2. EXCAVATE A BASIN OF SUFFICIENT SIZE ADJACENT TO THE DROP INLET.
3. THE TOP OF THE STRUCTURE, PONDING HEIGHT, MUST BE WELL BELOW THE GROUND ELEVATION DOWNSLOPE TO PREVENT RUNOFF FROM BYPASSING THE INLET. A TEMPORARY DIKE MAY BE NECESSARY ON THE DOWNSLOPE SIDE OF THE STRUCTURE.
4. SILT BAGS MAY ALSO BE USED FOR CB GRATE INLET PROTECTION.

DROP INLET SEDIMENT BARRIER DETAIL
NTS



HEADWALL DETAIL
NTS

NO	SUBMISSIONS/REVISIONS	APP'D	DATE
1	ISSUED PER ADDENDUM NO. 1	CDB	1/18
2			
3			
4			

DESIGNED BY: KJD
CAD CORR.: APC
CAD: APC
CHECKED BY: KJD
DATE:
APPROVED BY: CDB
DATE:
PROJECT NO: 13614A

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CITY OF ROCHESTER
LOW LIFT PUMP STATION UPGRADES
ROCHESTER, NH

EROSION CONTROL NOTES AND DETAILS

DRAWING
C-2

PROCESS GENERAL NOTES

1. ALL EQUIPMENT AND PIPING LAYOUT DIMENSIONS SHALL BE FIELD VERIFIED AND COORDINATED WITH EQUIPMENT SUPPLIED, AND/OR EXISTING CONDITIONS. SOME INFORMATION ASSOCIATED WITH EXISTING STRUCTURES, PIPING AND EQUIPMENT LOCATIONS, ELEVATIONS AND SIZES, WERE TAKEN FROM THE EXISTING CONSTRUCTION PLANS. CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN THE FIELD AS REQUIRED PRIOR TO BEGINNING CONSTRUCTION OF NEW FACILITIES, EQUIPMENT OR PIPING THAT MAY BE AFFECTED. IN SOME SPECIFIC INSTANCES, WHERE SPECIAL ATTENTION MAY BE REQUIRED BY THE CONTRACTOR, SOME DIMENSIONS, ELEVATIONS, ETC. HAVE BEEN NOTED WITH AN " * ". THIS DOES NOT HOWEVER, LIMIT THE CONTRACTOR'S RESPONSIBILITY TO VERIFY AND COORDINATE ALL NECESSARY INFORMATION FOR HIS CONSTRUCTION.
2. THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY OF ANY DIMENSIONS, LAYOUT OR ELEVATION CHANGES REQUIRED TO SUIT THE SPECIFIC EQUIPMENT BEING PROVIDED UNDER THIS CONTRACT. FINAL EQUIPMENT SHOP DRAWINGS SHALL BE REVIEWED AND "NO EXCEPTIONS TAKEN" PRIOR TO SUBMITTING REINFORCING STEEL SHOP DRAWINGS.
3. FOR PIPING MATERIAL, SEE THE PIPE SCHEDULE IN SPECIFICATION SECTION 15050.
4. ALL FLOW ELEMENTS SHALL BE LOCATED A MINIMUM OF TEN PIPE DIAMETERS DOWNSTREAM AND FIVE DIAMETERS UPSTREAM OF ANY HYDRAULIC DISTURBANCE, EXCEPT IN SITUATIONS WHERE DIMENSIONAL CONSTRAINTS PRECLUDE THESE SEPARATION DISTANCES. IN THESE CASES THE ENGINEER WILL REVIEW THE LAYOUT AND PROVIDE REVISED MINIMUM SEPARATION DISTANCES.
5. ALL ANCHOR BOLTS TO BE REMOVED SHALL BE CUT/MELTED TO A MINIMUM OF 3/4" BELOW EXISTING CONCRETE OR MASONRY SURFACES AND PATCHED/FILLED FLUSH TO SURFACE WITH NON-SHRINK GROUT.
6. PROVIDE DRIP PANS, WITH CENTRAL COLLECTION POINT AND DRAIN TO FLOOR, FOR ELECTRICAL AND INSTRUMENTATION EQUIPMENT LOCATED BENEATH LIQUID CARRYING PIPES.
7. PIPES 3-INCH IN DIAMETER AND UNDER SHALL HAVE UNIONS INSTALLED ADJACENT TO EQUIPMENT AND TANKS, UNLESS OTHERWISE NOTED ON DRAWINGS. FLANGES ARE ACCEPTABLE ON 3-INCH DIAMETER PIPING.
8. ALL PIPES SHALL BE ADEQUATELY RESTRAINED AND SUPPORTED IN ACCORDANCE WITH SPECIFICATION SECTION 15094.
9. AFTER INSTALLATION, ALL PIPELINES SHALL BE PRESSURE TESTED FOR TIGHTNESS IN ACCORDANCE WITH SPECIFICATION SECTIONS 15050 AND 01715. ALL LEAKS SHALL BE CORRECTED AND RETESTED UNTIL PRESSURE TEST IS SATISFACTORY COMPLETED.
10. ALL PIPING SHALL BE CLEANED, TO THE SATISFACTION OF THE ENGINEER, BEFORE TESTING.
11. PROVIDE 4-INCH HIGH (MIN.) REINFORCED CONCRETE PAD UNDER ALL EQUIPMENT, CONTROL PANELS, PIPE AND EQUIPMENT SUPPORTS, TANKS, ETC. UNLESS OTHERWISE INDICATED.
12. DO NOT SCALE DISTANCES OR DIMENSIONS FROM THE DRAWINGS. WRITTEN DIMENSIONS SHALL PREVAIL. REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER.
13. FLEXIBLE CONNECTIONS ON AIR LINES ARE TO BE PROVIDED WHERE SHOWN ON THE DRAWINGS; AND AS REQUIRED FOR EXPANSION/CONTRACTION, AS REQUIRED BY THE MANUFACTURER.
14. ALL PENETRATIONS BETWEEN CLASS 1, DIVISION 1 AREAS AND UNCLASSIFIED AREAS SHALL BE GAS TIGHT.
15. WHERE NEW PIPING IS TO BE CONNECTED TO EXISTING PIPING, THE CONTRACTOR SHALL FURNISH AND INSTALL ADAPTERS, FITTINGS AND ADDITIONAL PIPE AS REQUIRED TO COMPLETE THE INSTALLATION. THE USE OF UNI-FLANGES WILL NOT BE ALLOWED.
16. CONTRACTOR TO NOTE THAT ALL EXISTING INFORMATION ON THE DRAWINGS IS SHOWN WITH A LIGHTER LINE WEIGHT AND INDICATED WITH A SLANTED TYPE TEXT. THE EXCEPTION IS WHEN SCANNED IMAGES ARE UTILIZED FROM THE PREVIOUS CONSTRUCTION PROJECTS NOTED IN GENERAL NOTE NO. 1, ABOVE. WHEN REVIEWING DRAWINGS NOTED AS "SCANNED" UNDER DRAWING TITLE, THE CONTRACTOR SHALL IGNORE ANY REFERENCE TO PREVIOUS CONTRACT WORK. SCANNED IMAGES ARE NOT NECESSARILY TO SCALE.
17. CONTRACTOR SHOULD BE AWARE OF THE CONVENTION USED IN IDENTIFYING PIPE ELEVATIONS. IN GENERAL, UNLESS OTHERWISE INDICATED, ALL PIPES EXITING A STRUCTURE WHICH ARE CONTINUED ON CIVIL DRAWINGS, HAVE INVERT ELEVATIONS SHOWN. ALL PIPE ELEVATIONS GIVEN WITHIN A STRUCTURE ARE CENTERLINE ELEVATIONS.
18. IT IS IMPORTANT TO NOTE THAT THESE DRAWINGS WERE DEVELOPED USING A 3D PIPING PACKAGE. IN ORDER TO PRESERVE THE 3D DESIGN MODEL, IN MANY INSTANCES THE SYMBOLS DEPICTING VALVES AND EQUIPMENT DO NOT NECESSARILY PORTRAY THE ACTUAL EQUIPMENT SPECIFIED IN THE SPECIFICATIONS. MOST NOTABLY FOR INSTANCE WOULD BE VALVE OPERATORS AND THE DESIRED ORIENTATION. THE SPECIFICATIONS WILL PREVAIL AND THE VALVES SHOWN WITHIN THIS DRAWING SET SHOULD BE CONSIDERED PURELY SYMBOLIC.

GENERAL SCHEMATIC NOTES:

1. CONTRACTOR SHALL COORDINATE TUBING SIZES AS REQUIRED FOR CONNECTIONS TO PUMPS AND ANALYZERS. PROVIDE REDUCERS AND FITTINGS AS REQUIRED AT NO ADDITIONAL COST TO THE OWNER.
2. CHEMICAL FEED PIPING SHALL BE INSTALLED IN SUCH A WAY AS TO ALLOW EQUIPMENT ACCESS AND SPACE FOR MAINTENANCE. PROVIDE PIPE PROTECTION TO PROTECT PIPING FROM PHYSICAL DAMAGE WHERE IN THE OPINION OF THE ENGINEER THE POTENTIAL FOR DAMAGE EXISTS. PROTECTION SYSTEM SHALL BE CORROSION RESISTANT.
3. FIELD COORDINATE LOCATION OF EQUIPMENT, PIPING, VALVES, GAUGES, ETC. WITH THE ENGINEER PRIOR TO INSTALLATION.
4. THE SYSTEM SCHEMATICS DO NOT SHOW ALL UNIONS. HOWEVER, CONTRACTOR IS RESPONSIBLE FOR PROVIDING SUFFICIENT UNIONS TO PERMIT THE REMOVAL OF EQUIPMENT, VALVES, ETC. FOR MAINTENANCE.
5. PROVIDE SUCTION AND DISCHARGE PULSATION DAMPENERS WHERE REQUIRED BY THE EQUIPMENT MANUFACTURER.
6. FIELD LOCATE CALIBRATION COLUMN SUCH THAT TOP OF COLUMN ELEVATION IS NO HIGHER THAN LIQUID LEVEL IN THE STORAGE TANKS WHEN HALF FULL.
7. FOR INSTRUMENTATION ABBREVIATIONS AND LEGEND, REFER TO INSTRUMENTATION DRAWINGS.
8. CONTRACTOR TO PROVIDE PIPE SUPPORTS AS REQUIRED.
9. REFER TO SPECIFICATION SECTION 11231 AND 11236 FOR CHEMICAL FEED SYSTEMS AND PIPE SPECIFICATIONS.
10. CONTAINMENT PIPING MUST BE USED WHERE CHEMICAL FEED PIPING IS ROUTED ABOVE ACCESS DOORS.
11. USE LONG RADIUS ELBOWS FOR CARRIER PIPE CONTAINING CHEMICAL FEED TUBING.
12. INSTALL BACKPRESSURE VALVE AT EACH CHEMICAL INJECTION LOCATION.
13. CHEMICAL METERING PUMPS AND BRACKETS LOCATED 24 INCHES ABOVE FINISHED FLOOR.

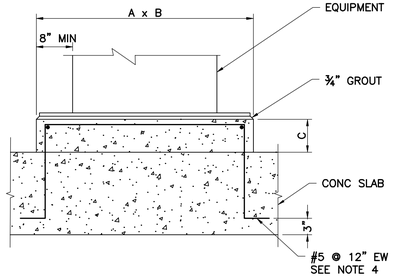
VALVES, FITTINGS AND ACTUATORS

	EXISTING	NEW	ORTHOGRAPHIC
BUTTERFLY VALVE (BFV)			
CHECK VALVE (CKV)			

FIELD INSTRUMENTS

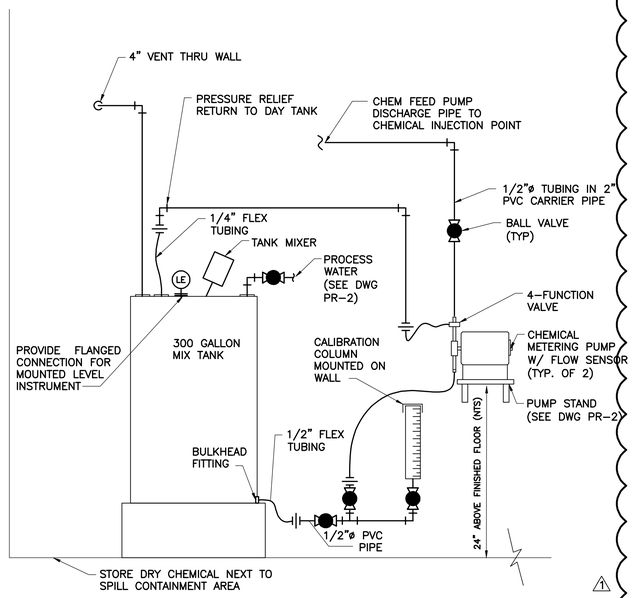
FOR ADDITIONAL INFORMATION REFER TO INSTRUMENTATION DWG I-1

	EXISTING	NEW	ORTHOGRAPHIC
MAGNETIC FLOW METER	M	M	M



NOTES:
1. PROVIDE A MINIMUM 4" THICK REINFORCED CONCRETE PAD BELOW ALL EQUIPMENT, PIPE SUPPORTS, STANCHIONS, CONTROL PANELS, TANKS, ETC. UNLESS OTHERWISE NOTED.
2. A, B AND C DIMENSIONS SHALL BE DETERMINED BY THE GENERAL CONTRACTOR BASED ON EQUIPMENT SUPPLIED (OR AS INDICATED ON THE DRAWINGS).
3. CONCRETE PAD SHALL ATTAIN A COMPRESSIVE STRENGTH OF 4500 PSI PRIOR TO STARTUP OF EQUIPMENT.
4. FOR CONCRETE PADS PLACED ON EXISTING CONCRETE, DRILL HOLES AND INSTALL #5 @ 12" W/ HS EPOXY (MIN 8" EMBEDMENT).
5. FOR CONCRETE PADS PLACED ON EXISTING CONCRETE, USE SS EPOXY ANCHORS.
6. APPLY EPOXY BONDING AGENT ON CLEANED, ROUGHENED SURFACE PRIOR TO PLACING CONCRETE PAD.

EQUIPMENT PAD
NTS



PERMANGANATE CHEMICAL FEED SCHEMATIC
NTS

ELECTRIC WATER HEATER SCHEDULE

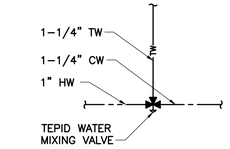
UNIT	LOCATION	TANK CAPACITY	TYPE	FIRST HOUR GPH	RECOVERY GPH @ 80°F RISE	INPUT (kW)	ELECTRICAL			REMARKS	NOTES
							VOLTS	PHASE	HERTZ		
WH-1	CHEMICAL ROOM	80 GAL	TANK	16	20	4.5	480	3	60	HTP EVC 080ET045 OR EQUAL	-

PLUMBING ABBREVIATIONS

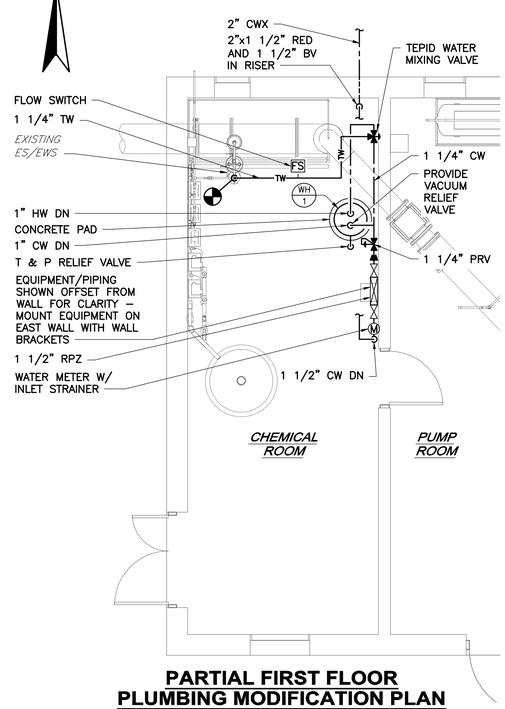
AFF	ABOVE FINISH FLOOR
BFP	BACKFLOW PREVENTER
BHP	BRAKE HORSEPOWER
BOE	BOTTOM OF EQUIPMENT
BV	BALL VALVE
℄	CENTERLINE
CHB	COMBINATION HOSE BIBB
CI	CAST IRON
CO	CLEANOUT
COND	CONDENSATE
CP	CIRCULATING PUMP
CV	CHECK VALVE
CW	DOMESTIC COLD WATER
CWX	DOMESTIC COLD WATER BELOW SLAB OR GRADE
DCFE	DRY CHEMICAL FIRE EXTINGUISHER
DCVA	DOUBLE CHECK VALVE ASSEMBLY
DIA, ø	DIAMETER
DN	DOWN
DR	DRAIN
EFF	EFFICIENCY
EL	ELEVATION
ES/EWS	EMERGENCY SHOWER / EYE WASH STATION
ET	EXPANSION TANK
°F	DEGREES FAHRENHEIT
F	FIXTURE
FD	FLOOR DRAIN
FFE	FINISH FLOOR ELEVATION
FM	FORCEMAIN
GAL	GALLON
GPM	GALLONS PER MINUTE
HB	HOSE BIBB
HP	HORSEPOWER (SCHEDULES)
HP	HEAT PUMP (DRAWINGS)
HW	DOMESTIC HOT WATER
HWR	DOMESTIC HOT WATER RECIRCULATION
INV EL	INVERT ELEVATION
MAX	MAXIMUM
MFR	MANUFACTURER
MIN	MINIMUM
MNT	MOUNT
N/A	NOT APPLICABLE
NTS	NOT TO SCALE
P	PUMP
PRV	PRESSURE REDUCING VALVE
PRW	PROCESS WATER
PSIG	POUNDS PER SQUARE INCH
RCP	RECIRCULATION PUMP
RPM	REVOLUTIONS PER MINUTE
RPZ	REDUCED PRESSURE ZONE BACKFLOW PREVENTER
SCH	SCHEDULE
SS	STAINLESS STEEL
TP	TEMPERATURE AND PRESSURE
TRANS	TRANSITION
TW	TEPID WATER
TYP	TYPICAL
W/	WITH
WH	WATER HEATER

PLUMBING LEGEND

EXISTING	NEW	
		BALL VALVE
		UNION
		CONCENTRIC REDUCER
		WYE STRAINER
PSV	PSV	TEMPERATURE & PRESSURE SAFETY (RELIEF VALVE)
V	V	VACUUM RELIEF
PRV	PRV	PRESSURE REDUCING VALVE
		3-WAY MIXING VALVE
		COLD WATER SUPPLY
		HOT WATER SUPPLY
		HOT WATER RECIRCULATION
TW	TW	TEPID WATER
		PIPE TURNING DOWN
		PIPE TURNING UP
		PIPE TEE DOWN
		PIPE TEE UP
		BACKFLOW PREVENTER (RPZ STYLE)
M	M	WATER METER
		CIRCULATING PUMP
		POINT OF CONNECTION BETWEEN EXISTING AND NEW
EQ #	EQ #	EQUIPMENT DESIGNATION PER SCHEDULE / EQUIPMENT SEQUENCE NUMBER



TEPID WATER MIXING VALVE SCHEMATIC
NTS

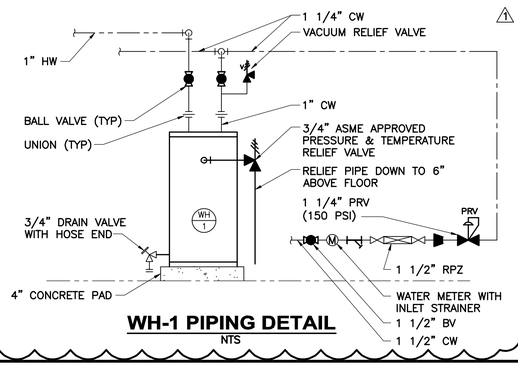


PARTIAL FIRST FLOOR PLUMBING MODIFICATION PLAN
SCALE= 1/4"=1'-0"

GENERAL NOTES:
1. FOR GENERAL NOTES, LEGEND, AND ABBREVIATIONS REFER TO THIS DRAWING.
2. PIPING ORIENTATION IS TO BE USED AS SCHEMATIC ONLY. ACTUAL PIPING ROUTING MAY VARY.

GENERAL PLUMBING NOTES

1. ALL EQUIPMENT AND PIPING LAYOUT DIMENSIONS SHALL BE FIELD VERIFIED AND COORDINATED WITH EQUIPMENT SUPPLIED, AND/OR EXISTING CONDITIONS. CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN THE FIELD AS REQUIRED PRIOR TO BEGINNING CONSTRUCTION OF NEW FACILITIES, EQUIPMENT OR PIPING THAT MAY BE AFFECTED.
2. THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY OF ANY DIMENSIONS, LAYOUT OR ELEVATION CHANGES REQUIRED TO SUIT THE SPECIFIC EQUIPMENT BEING PROVIDED UNDER THIS CONTRACT. WHEN SUCH EQUIPMENT REQUIRES PADS, PIERS, CURBING, ETC., THAT DIFFERS FROM THAT SHOWN ON THE CONSTRUCTION DRAWINGS, THE CONTRACTOR SHALL COORDINATE THE STEEL REINFORCING SHOP DRAWINGS ACCORDINGLY.
3. CONTRACTOR TO NOTE THAT ALL EXISTING INFORMATION ON THE DRAWINGS IS SHOWN WITH A LIGHTER LINE WEIGHT AND INDICATED WITH A SLANTED TYPE TEXT.
4. ALL PIPES SHALL BE ADEQUATELY RESTRAINED AND SUPPORTED IN ACCORDANCE WITH SPECIFICATION SECTION 15094.
5. ALL PIPING SYSTEMS SHALL BE PRESSURE TESTED FOR TIGHTNESS IN ACCORDANCE WITH SPECIFICATION SECTION 15050. ALL LEAKS SHALL BE CORRECTED AND RETESTED UNTIL PRESSURE TEST IS SATISFACTORY PRIOR TO THE INSTALLATION OF PIPE INSULATION.
6. DO NOT SCALE DISTANCES OR DIMENSIONS FROM THE DRAWINGS. WRITTEN DIMENSIONS SHALL PREVAIL. REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER.



WH-1 PIPING DETAIL
NTS

NO	SUBMISSIONS/REVISIONS	APP'D	DATE
1	ISSUED FOR BID	CDB	1/18
2	RE-ISSUED PER ADDENDUM NO. 1	CDB	1/18

DESIGNED BY: CDB
CAD COORD.: APC
CAD: APC
CHECKED BY: DDL
DATE: 1/10/2018
APPROVED BY: CDB
DATE: 1/10/2018
PROJECT NO: 13614A

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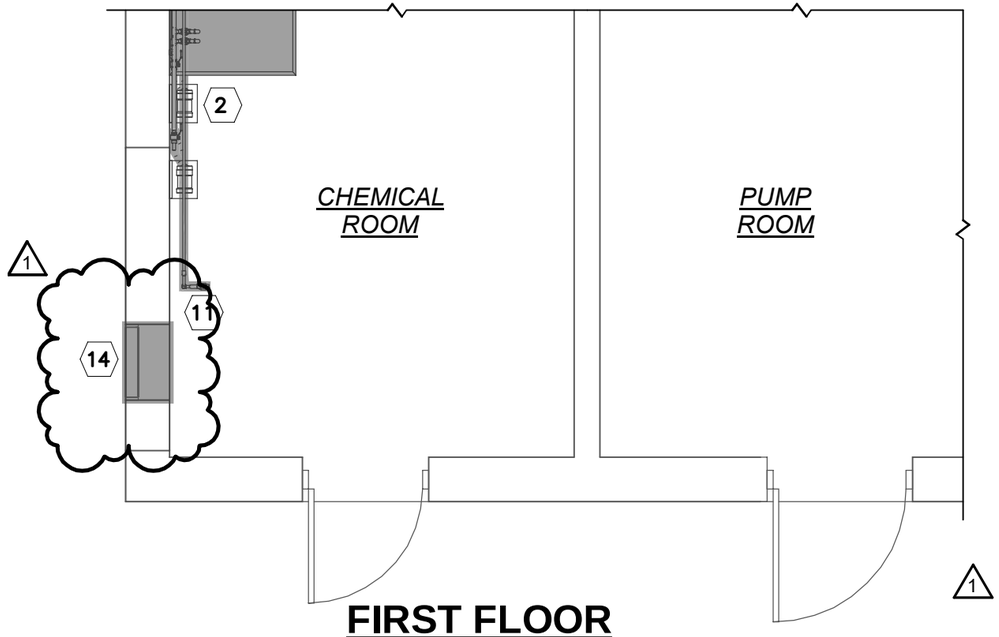
CITY OF ROCHESTER
LOW LIFT PUMP STATION UPGRADES
ROCHESTER, NH

PROCESS NOTES, LEGEND AND ABBREVIATIONS

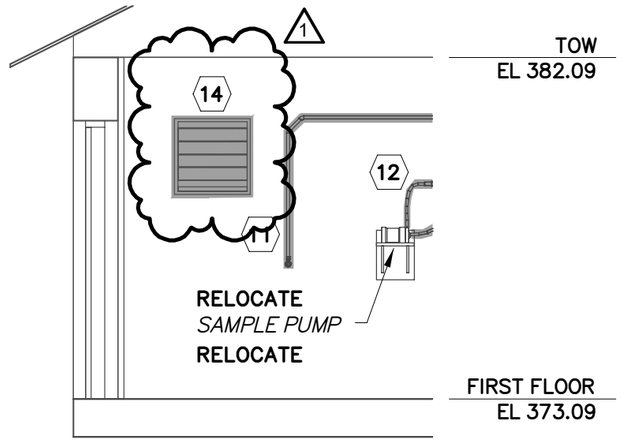
DRAWING
PR-1



N

FIRST FLOOR DEMOLITION PLAN

SCALE: 1/4" = 1'–0"



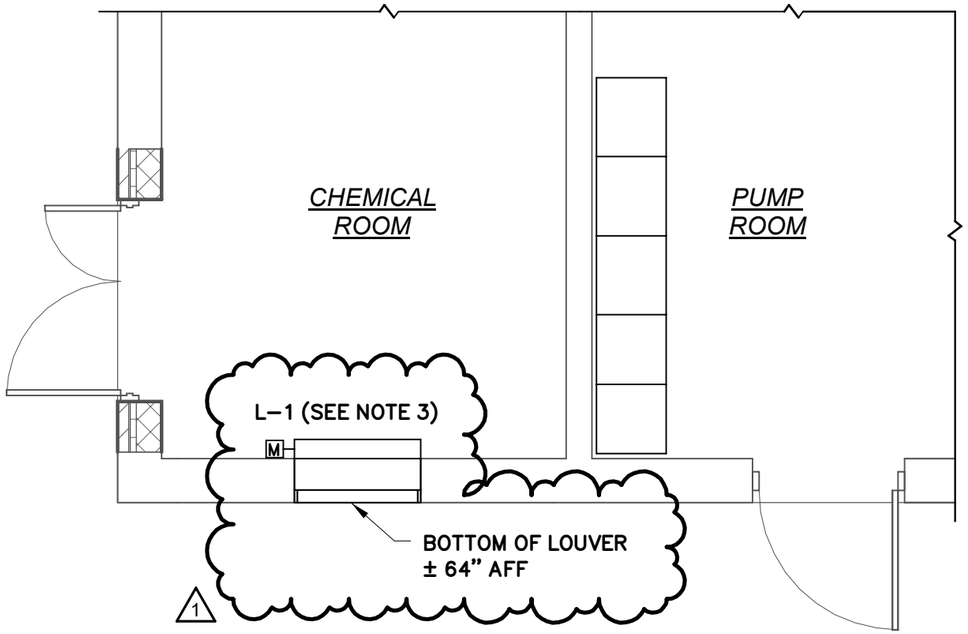
2 PR–2 **SECTION**

SCALE: 1/4" = 1'–0"

1

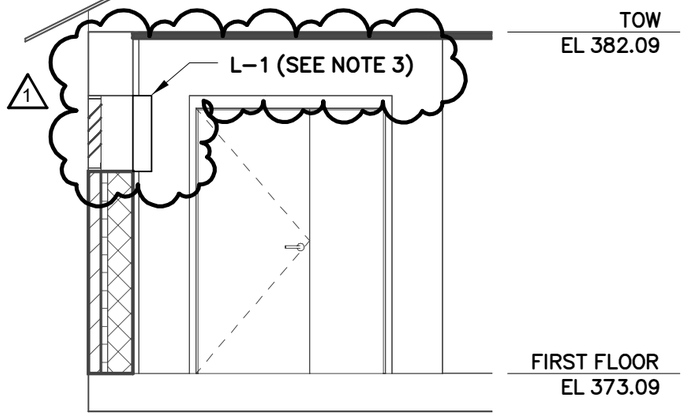
DEMOLITION NOTES:

(14) DISCONNECT/REMOVE EXISTING LOUVER/DAMPER ASSEMBLY.



FIRST FLOOR MODIFICATION PLAN

SCALE: 1/4" = 1'–0"



4 PR–2 **SECTION**

SCALE: 1/4" = 1'–0"

1

NOTES:

3. GREENHECK ECD–401, 40"Wx24"Hx4"D, 3.1SF FREE AREA COMBINATION LOUVER/DAMPER ASSEMBLY WITH 3 COATS OF KYNAR FINISH, 1/2" MESH, ALUMINUM BIRDSCREEN. DAMPER ACTUATOR RECOMMENDED BY LOUVER/DAMPER MANUFACTURER. CONNECT TO EXISTING CONTROLS.

DRAWN BY: APC
APP'D: CBD
FIGURE: PR-1

ADDENDUM NO. 1
REFERENCE DWG. PR–2

NO.	REVISIONS
1	LOUVER/DAMPER ASSEMBLY
2	
3	

CITY OF ROCHESTER
LOW LIFT PUMP STATION UPGRADES
ROCHESTER, NH

PROJ NO: 13614A
DATE: JANUARY 2018

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