



**CONTRACT DOCUMENTS, BIDDING DOCUMENTS,
AND TECHNICAL SPECIFICATIONS**

**SOUTH MAIN STREET WATER DISTRICT
PUMP STATION UPGRADES
PWS ID # 2422010
WARREN, NEW HAMPSHIRE**



34 SCHOOL STREET • LITTLETON, NH 03561 • PHONE 603-444-4111 • FAX 603-444-1343 • www.horizonsengineering.com

Contract Documents, and Technical Specifications

FOR

SOUTH MAIN STREET WATER DISTRICT

PUMP STATION UPGRADES

NH- DWSRF, ARPA

WARREN, NEW HAMPSHIRE

JUNE 2024

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Section A: Bidding Documents

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Advertisement for Bids

Owner Name: SOUTH MAIN STREET WATER DISTRICT	Project Number: 220365		
Project Address:	PO BOX 35	WARREN	NH 03279
	Street # and name	City/Town	State ZIP

Separate sealed BIDS for the construction of: SOUTH MAIN STREET WATER DISTRICT – PUMP STATION UPGRADES will be received by SOUTH MAIN STREET WATER DISTRICT at the office of HORIZONS ENGINEERING, INC., 34 School Street, Littleton, NH 03561 **until 4 PM**. Local Time on **JULY 11, 2024** and then at said office publicly opened and read aloud.

Alternatively, at the bidder's discretion, bids can be submitted electronically to Devan Currier, PE at dcurrier@horizonsengineering.com by the date and time listed above. All bids received, paper or electronic, will be opened at the date and time listed above.

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

- 210 calendar days for substantial completion.
- 300 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 their Bid.
4. Any contract or contracts awarded under this Advertisement for Bids are expected to be funded in whole or in part by: **(Select all appropriate.)**
 - A loan from the NH Clean Water State Revolving Fund.
 - A loan from the NH Drinking Water State Revolving Fund.
 - A loan from the NH Drinking Water and Groundwater Trust Fund.
 - A grant from the NH Drinking Water and Groundwater Trust Fund.
 - A State Aid Grant from the NH Department of Environmental Services (SAG).
 - A grant from the American Rescue Plan Act from the NH Department of Environmental Services (ARPA).
 - A loan or grant from USDA Rural Development.
 - A Community Development Block Grant (CDBG) from the NH Community Development Finance Authority.

Include paragraphs 5-8 below if project is funded in whole or in part by a loan under the CWSRF and/or DWSRF programs

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 rule in order to be deemed a responsible bidder. The requirements for bidders and contractors covered by this rule 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.
10. A PRE-BID MEETING WILL NOT BE HELD FOR THIS PROJECT.

The Contract Documents may be examined at the following locations:

The Contract Documents may be examined and/or purchased at Horizons Engineering, Inc., 34 School Street, Littleton, NH 603-444-4111 for a non-refundable fee of \$250.00. All requests for mailed documents must be accompanied by an additional fee of \$25.00 to cover the cost of postage and handling. **Electronic**

copies of the Contract Documents will be available upon request at no cost by contacting Devan Currier, PE at dcurrier@horizonsengineering.com.

All questions and communications regarding the Project shall be directed to Horizons Engineering, Inc., attention Devan Currier, PE, phone number (802) 477-3043, email dcurrier@horizonsengineering.com.

Information for Bidders

All Contracts

Bids will be received by: SOUTH MAIN STREET WATER DISTRICT herein called the "OWNER" at:

Address: 34 SCHOOL STREET LITTLETON NH 03561

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

HORIZONS ENGINEERING, INC. at LITTLETON OFFICE.

Each sealed envelope containing a BID must be plainly marked on the outside as BID for SOUTH MAIN STREET WATER DISTRICT_ PUMP STATION UPGRADES 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 HORIZONS ENGINEERING, LITTLETON, NH

Alternatively, at the bidder's discretion, bids can be submitted electronically to Devan Currier, PE at dcurrier@horizonsengineering.com by the date and time listed above. All bids received, paper or electronic, will be opened at the date and time listed above.

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 them 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 PAYMENT BOND and PERFORMANCE 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 their 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 their 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 **not** 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 their BID.

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

MANUFACTURER'S EXPERIENCE

Wherever it may be written that an equipment manufacturer must have a specified period of experience with their 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.

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 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.

NONDISCRIMINATION IN EMPLOYMENT

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

STATE INSPECTION

Work performed on this project shall be subject to inspection by representatives of the New Hampshire Department of Environmental Services (NHDES). 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 NHDES 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 at least five (5) executed copies of the Contract to be distributed as follows:

- a) One (1) copy each to the Owner, Engineer and Contractor.
- b) One electronic copy in PDF format to NHDES.
- c) 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 their true and lawful attorney upon whom all lawful processes in any actions or proceedings against them may be served; and in such writing, which shall set forth said attorney's place of residence, shall agree that any lawful process against them which is served on said attorney shall be of the same legal force and validity as if served on them and that the authority shall continue in force so long as any liability remains outstanding against them 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.

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 do 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.

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 their bid in accordance with the foregoing conditions will be returned

SRF Contracts

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.

DBE RULE PROGRAM REQUIREMENTS (MBEs and WBEs)

Bidders on this project are required to demonstrate compliance with the US Environmental Protection Agency's MBE/WBE rules in order to be deemed responsive. The MBE/WBE documentation, DBE Subcontractor Utilization Form and DBE Subcontractor Performance Forms (Formerly 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) Good Faith Efforts.
- 2) Annual Reporting of MBE/WBE accomplishments.
- 3) Contract Administration Requirements.

- 4) Bidders List Requirements.
- 5) Record Keeping.

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

SRF and SRF/ARPA Contracts

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.

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 (Applies to all SRF and SRF/ARPA contracts)

This project is funded in whole or in part by a loan available through NHDES' 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.

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.

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. You can find additional information on [DBA Conformances](#) in the US Department of Labor Learning Center.

If multiple wage determinations apply, the Contractor shall be responsible for keeping track of all work performed under each wage rate determination. The Contractor is responsible for designating which wage rates are applicable to each employee on each certified payroll, including subcontractor payrolls.

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

SUSPENSION AND DEBARMENT

Bidders and contractors shall fully comply with Subpart C of 2 C.F.R. Part 180 entitled, “Responsibilities of Participants Regarding Transactions Doing Business With Other Persons,” as implemented and supplemented by 2 C.F.R. Part 1532. subrecipient is responsible for ensuring that any lower tier covered transaction, as described in Subpart B of 2 C.F.R. Part 180, entitled “Covered Transactions,” and 2 C.F.R. § 1532.220, includes a term or condition requiring compliance with 2 C.F.R. Part 180, Subpart C. Bidders and contractors are responsible for further requiring the inclusion of a similar term and condition in any subsequent lower tier covered transactions. Bidders and contractors acknowledge that failing to disclose the information required under 2 C.F.R. § 180.335 to NHDES may result in the delay or negation of this assistance agreement, or pursuance of administrative remedies, including suspension and debarment. Bidders and contractors may access the System for Award Management (SAM) exclusion list at ["System for Award Management \(SAM\)" database](#) to determine whether an entity or individual is presently excluded or disqualified.

By entering into this agreement, the Bidders and contractors certify that the Bidder and contractor is not debarred or suspended. Furthermore, the Bidder and contractors certify that no part of this contract will be subcontracted to a debarred or suspended person or firm.

Bidders shall refer to [PART D – FEDERAL PROVISIONS, RULES, REGULATIONS AND FORMS](#) for additional information on suspension and debarment requirements.

PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT

This term and condition implements 2 CFR 200.216 and is effective for obligations and expenditures of EPA financial assistance funding on or after 8/13/2020. Bidders/contractors and their subcontractors must comply with the above provision when procuring or obtaining equipment, services, or systems that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system.

Bidders shall refer to [PART D - PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT](#) for additional information on procuring or obtaining equipment, services, or systems using covered telecommunications equipment or services.

CIVIL RIGHTS COMPLIANCE

The sub-grantee, contractor, subcontractor, successor, transferee, and assignee shall comply, and shall include in every contract or agreement funded with these funds this same requirement to comply, with Title VI of the Civil Rights Act of 1964, which prohibits recipients of federal financial assistance from excluding from a program or activity, denying benefits of, or otherwise discriminating against a person on the basis of race, color, or national origin (42 U.S.C. § 2000d et seq.), as implemented by the Department of the Treasury’s Title VI regulations, 31 CFR Part 22, which are herein incorporated by reference and made a part of this contract (or agreement). Title VI also includes protection to persons with “Limited English Proficiency” in any program or activity receiving federal financial assistance, 42 U.S.C. § 2000d et seq., as implemented by the Department of the Treasury’s Title VI regulations, 31 CFR Part 22, and herein incorporated by reference and made a part of this contract or agreement.

ARPA Only Contracts (non-SRF)

~~**DAVIS BACON WAGE RATES** (Does not apply to ARPA only contracts less than \$10M)~~

~~This project is funded in whole or in part by an American Rescue Plan Act grant through NHDES for a contract over \$10M 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.

~~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.~~

~~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. You can find additional information on [DBA Conformances](#) in the US Department of Labor Learning Center.~~

DOMESTIC PREFERENCES FOR PROCUREMENTS (2 C.F.R. § 200.322)

As appropriate and to the extent consistent with law, to the greatest extent practicable, there is a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subawards including all contracts and purchase orders for work or products under this award.

For purposes of this section:

- (1) “Produced in the United States” means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.
- (2) “Manufactured products” means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

RESTRICTIONS ON LOBBYING

The Contractor shall comply with the terms of 15 CFR part 28 and 2 CFR Part 200 Subpart E which prohibit the use of federal Contract funds to influence (or attempt to influence) a federal employee, and requires the submission of Standard Form LLL ("Disclosure of Lobbying Activities") if *non*federal funds have been used to influence (or attempt to influence) a federal employee.

DRUG-FREE WORKPLACE

The Contractor shall comply with the terms of 2 CFR part 1329 which require that as a condition of the Agreement, certification that they maintain a drug-free workplace. By signing and submitting the Agreement, the Contractor certifies that they will not engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance in conducting any activity associated with the Agreement.

PROTECTION FOR WHISTLEBLOWERS

The Contractor shall comply with the terms of 41 U.S.C. §471 regarding Whistleblower protections. As described in 41 USC §471 “an employee of a contractor, subcontractor, grantee, or subgrantee or personal services contractor may not be discharged, demoted, or otherwise discriminated against as a reprisal for disclosing to a person or body described in paragraph (2) information that the employee reasonably believes is evidence of gross mismanagement of a Federal contract or grant, a gross waste of Federal funds, an abuse of authority relating to a Federal contract or grant, a substantial and specific danger to public health or safety, or a violation of law, rule, or regulation related to a Federal contract (including the competition for or negotiation of a contract) or grant.”

Bid

Proposal of _____ [company](hereinafter called the "BIDDER", organized and existing under the laws of the State of __ doing business as Corporation, Partnership, Individual to the _____ [owner name](herein after called "OWNER").

In compliance with your Advertisement for Bids, BIDDER hereby proposes to perform all WORK For the construction of _____ [project name]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 their 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:

- 210 calendar days for substantial completion.
- 300 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:

- 1 _____
- 2 _____
- 3 _____
- 4 _____
- 5 _____

The Bidder shall state below what works of a similar character to that of the proposed contract they have performed and provide such references as will enable the Owner to judge their 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.

Bidder Name:		
Permanent Main Office Address:		
Street # and name	City/Town	State ZIP
When was it organized?		Where incorporated?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	Is the bidder registered with the Secretary of State to do business in NH?
For how many years has your firm engaged in the contracting business under its present name?		
Please list previous firm names and dates if applicable.		
Years	Previous Name	
Contracts on hand, attach a schedule or list showing gross amount of each contract and the approximate anticipated dates of completion.		
Describe the general character of work performed by your company.		
<input type="checkbox"/> Yes	<input type="checkbox"/> No	Have you ever failed to complete any work awarded you in the scheduled contract time, including approved time extensions? If so where and why?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	Have you ever defaulted on a contract? If so where and why?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	Have you ever had liquidated damages assessed on a contract? If so where and why?
List the more important contracts recently executed by your company:		
Recent Contract Name	Approximate Cost	Month/Year Completed
List your major equipment available for this contract: (Attach additional sheets as necessary.)		
List your key personnel available for this contract: (Attach additional sheets as necessary.)		
Staff Name	Role (i.e. Project Superintendent, Foreman)	

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

Civil Engineering
Utility Installation
Other please describe:

Please list banks with whom you conduct business.

Empty lines for listing subcontractors and banks.

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

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

Respectfully Submitted:

Signature: _____ Date: _____
Printed Name: _____ Title: _____
Street # and name City/Town State ZIP
[Signed Name] Being duly sworn, deposes and says that they are [Position Title] of [Organization]
and all the answers to the foregoing questions and all statement contained therein are true and correct.
Sworn to before me this _____ day of _____, 20____
_____, Notary Public
My Commission Expires _____

Seal

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

BID SCHEDULE

BASE BID

Item No.	Brief Description; Unit or Lump Sum Price (both words and numbers)	Quantity and Units	Item Price
1.	General Conditions and Miscellaneous Work, Per Lump Sum: _____ Dollars And _____ Cents (\$_____)	1 LS	\$_____
2.	Site Work Complete, Per Lump Sum: _____ Dollars And _____ Cents (\$_____)	1 LS	\$_____
3.	Plumbing and Mechanical Work Complete, Per Lump Sum: _____ Dollars And _____ Cents (\$_____)	1 LS	\$_____
4.	Electrical Work Complete, Including New Service, Per Lump Sum: _____ Dollars And _____ Cents (\$_____)	1 LS	\$_____
5.	Demolition Work Complete, Per Lump Sum: _____ Dollars And _____ Cents (\$_____)	1 LS	\$_____
6.	Iron and Manganese and pH Treatment System Complete, including Pressure Filters, Chemical Equipment, Per Lump Sum: _____ Dollars And _____ Cents (\$_____)	1 LS	\$_____
7.	Emergency Standby Generator and Automatic Transfer Switch Complete, Per Lump Sum: _____ Dollars And _____ Cents (\$_____)	1 LS	\$_____
	_____ Dollars		

8. Building Storage Addition Complete,
including Foundation, Per Lump Sum:
 _____ Dollars
 And _____ Cents (\$ _____) 1 LS \$ _____
 _____ Dollars

Total Base Bid Price in Words

ADD ALTERNATE 1

Item No.	Brief Description; Unit or Lump Sum Price (both words and numbers)	Quantity and Units	Item Price
-------------	---	-----------------------	---------------

9. 3-Inch and 4-inch Main Line Distribution Gate Valves, New and Replacement, Per Each:
 _____ Dollars
 And _____ Cents (\$ _____) 9 EA \$ _____

10. 2-inch Flush Hydrant, Per Each:
 _____ Dollars
 And _____ Cents (\$ _____) 4 EA \$ _____

11. Remove Water Main Vaults, Per Each:
 _____ Dollars
 And _____ Cents (\$ _____) 2 EA \$ _____

Total Add Alternate Bid Price in Words

ADD ALTERNATE 2

Item No.	Brief Description; Unit or Lump Sum Price (both words and numbers)	Quantity and Units	Item Price
----------	---	--------------------	------------

12. Service Line Curb Stop, Per Each:

_____ Dollars

And _____ Cents (\$ _____) 45 EA \$ _____

Total Add Alternate Bid Price in Words

ADD ALTERNATE 3

Item No.	Brief Description; Unit or Lump Sum Price (both words and numbers)	Quantity and Units	Item Price
----------	---	--------------------	------------

13. 4" Diameter Mainline PVC Pipe, Per Linear Foot:

_____ Dollars

And _____ Cents (\$ _____) 120 LF \$ _____

14. 1" Diameter Service Pipe, Per Linear Foot:

_____ Dollars

And _____ Cents (\$ _____) 100 LF \$ _____

Total Add Alternate Bid Price in Words

NOTE: AWARD SHALL BE TO THE RESPONSIBLE BIDDER SUBMITTING THE LOWEST RESPONSIVE BID FOR BASE BID. ADD ALTERNATE 1, 2, AND/OR 3 WILL BE AWARDED TO THE LOW BIDDER IF AVAILABLE FUNDING IS SUFFICIENT FOR INCLUSION IN THE AWARD.

Add the following for projects utilizing CWSRF and/or DWSRF funding (not necessary for ARPA Only funded projects):

The BIDDER hereby certifies, by checking the boxes below, that the following documents are included with this bid proposal:	
<input type="checkbox"/>	DBE Subcontractor Utilization Form NHDES Form #NHDES-W-09-059 (Formerly EPA Form 6100-4).
<input type="checkbox"/>	DBE Subcontractor Performance Forms NHDES-09-NHDES-W-09-058 (Formerly EPA Form 6100-3) Submit one form for each DBE subcontractor.
<input type="checkbox"/>	Bidder's American Iron and Steel acknowledgement.

All of these forms are in the SRF Federal Provisions: [Section D](#) of the front-end documents.

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 _____ in the year _____.

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 Signature

Witnessed By:

Surety Signature

Witnessed 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.

NHDES Front End Documents
Section B: Contract

Section B: Contract

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NOTICE OF AWARD

Dated _____

TO: _____

ADDRESS: _____
Street Address City/Town State ZIP

Project Number Owner Contract Number

Project : _____ Contract For: _____

Insert the name of the contract as it appears on the bid documents

You are notified that your bid dated _____ for the above contract has been considered. You are the apparent successful bidder and have been awarded a contract for:

(Indicate total Work, alternates or sections of Work awarded)

The Contract Price of your contract is _____ dollars (\$ _____).
_____ copies of each of the proposed Contract Documents (except Drawings) accompany this Notice of Award. The same number of sets of the drawings will be delivered separately or otherwise made available to you immediately.

You must comply with the following conditions precedent within 10 days of receiving this Notice of Award.

1. You must deliver to the OWNER all of the fully executed counterparts of the Agreement including all the Contract Documents. This includes the sets of drawings. Each of the Contract Documents must bear your signature on (the cover) (every) page.
2. You must deliver with the executed Agreement the Contract Security (Bonds) as specified in the Information for Bidders and General Conditions.
3. (List all other conditions of precedent.)

Failure to comply with these conditions within the time specified will entitle **OWNER** to consider your bid abandoned, to annul this Notice of Award and to declare your Bid Security forfeited.

Within 10 days after receipt of acceptable performance **BOND**, payment **BOND** and agreement signed by the party to whom the Agreement was awarded, the **OWNER** will return to you one fully signed counterpart of the Agreement with the Contract Documents attached.

(OWNER)

(Authorized Signature)

(Title)

ACKNOWLEDGEMENT OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged:

By: _____, The _____ day of _____, 20____ by
_____ title _____.

Copy to ENGINEER (Use Certified Mail, Return Receipt Requested)

AGREEMENT

THIS AGREEMENT, made this _____ day of _____, 20__ by and between _____, hereinafter called "**OWNER**" and _____ doing business as _____ (an individual, a partnership or a corporation) hereinafter called "**CONTRACTOR**".

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned:

1. The **CONTRACTOR** will commence and complete the construction of _____.
2. The **CONTRACTOR** will furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of the **PROJECT** described herein.
3. The **CONTRACTOR** will commence the work required by the **CONTRACT DOCUMENTS** within _____ calendar days after the date of the **NOTICE TO PROCEED** unless the period for completion is extended otherwise by the **CONTRACT DOCUMENTS**. Completion time for the project will be calculated as calendar days from the date specified in the **NOTICE TO PROCEED** as follows:
_____ calendar days for substantial completion.
_____ calendar days for final completion.
Liquidated damages will be in the amount of \$_____ for each calendar day of delay from the date established for the substantial completion and \$_____ for each calendar day of delay from the date established for final completion.
4. The **CONTRACTOR** agrees to perform all of the **WORK** described in the **CONTRACT DOCUMENTS** and comply with the terms therein for the sum of \$_____ or as shown in the **BID** schedule.
5. The term "**CONTRACT DOCUMENTS**" means and includes the following:
 - a. ADVERTISEMENT FOR BIDS
 - b. INFORMATION FOR BIDDERS
 - c. BID
 - d. BID BOND
 - e. NOTICE OF AWARD
 - f. AGREEMENT
 - g. PAYMENT BOND
 - h. PERFORMANCE BOND
 - i. CERTIFICATE OF INSURANCE
 - j. NOTICE TO PROCEED
 - k. CHANGE ORDER(S)
 - l. CERTIFICATON OF SUBSTANTIAL COMPLETION
 - m. CERTIFICATION OF FINAL COMPLETION
 - n. CONTRACTOR'S AFFIDAVIT
 - o. CONTRACTOR'S RELEASE
 - p. GENERAL CONDITIONS
 - q. SUPPLEMENTAL GENERAL CONDITIONS
 - r. SPECIAL CONDITIONS
 - s. FEDERAL PROVISIONS, RULES, REGULATIONS AND FORMS
 - t. DRAWINGS prepared by: _____ numbered _____ through _____ and dated _____, 20__

u. SPECIFICATIONS prepared or issued by:

_____ and dated
_____, 20__

v. ADDENDA

No. _____ dated _____, 20__

No. _____ dated _____, 20__

No. _____ dated _____, 20__

No. _____ dated _____, 20__

- 6. The **OWNER** will pay to the **CONTRACTOR** in the manner and at such times as set forth in the General Conditions such amounts as required by the **CONTRACT DOCUMENTS**.
- 7. This agreement shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors and assigns.

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials this Agreement in ___ copies, each of which shall be deemed an original on the date first above written.

OWNER: _____

By: _____

NAME: _____

(SEAL)

ATTEST: _____

NAME: _____

TITLE: _____

CONTRACTOR: _____

BY: _____

NAME: _____

ADDRESS: _____

(SEAL)

ATTEST: _____

NAME: _____

TITLE: _____

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that

_____, (contractor name),
_____, (contractor address), a
_____(corporation partnership, individual), hereinafter called
Principal, and _____, (surety name),
_____, (surety address) herein after called
surety, are held and firmly bound unto _____,
(owner name), _____, (owner address)
hereinafter called OWNER and unto all persons, firms, and corporations who or which may furnish labor, or who furnish materials to perform as described under the contract and to their successors and assigns, in the total aggregate penal sum of _____ dollars, (\$_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the **OWNER**, dated the _____ day of _____, 20____, a copy of which is hereto attached and made a part hereof for the construction of _____.

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, and corporations furnishing materials for or performing labor in the prosecution of the **WORK** provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such **WORK**, and for all labor cost incurred in such **WORK** including that be a subcontractor, and to any mechanic or materialman lienholder whether it acquires its lien by operation of State or Federal Law; then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, that beneficiaries or claimants hereunder shall be limited to the subcontractors, and persons, firms, and corporations having a direct contract with the **PRINCIPAL** or its **SUBCONTRACTORS**.

PROVIDED FURTHER, that the said Surety for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the **WORK** to be performed thereunder or the **SPECIFICATIONS** accompanying the same shall in any way affect its obligation on this **BOND**, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the **WORK** or to the **SPECIFICATIONS**.

PROVIDED, FURTHER that no suit or action shall be commenced hereunder by any claimant: (a) Unless claimant, other than one having a direct contract with the **PRINCIPAL** shall have given written notice to any two of the following: The **PRINCIPAL**, the **OWNER**, or the **SURETY** above named within ninety (90) days after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the **PRINCIPAL**, **OWNER**, or **SURETY**, at any place where an office is regularly maintained for the transaction business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer; (b) After the expiration of one (1) year following the date on which **PRINCIPAL** ceased work on said **CONTRACT**, it being understood, however, that if any limitation embodied in the **BOND** is prohibited by any law controlling the construction hereof, such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

PROVIDED, FURTHER, that it is expressly agreed that this BOND shall be deemed amended automatically and immediately, without formal and separate amendments hereto, upon amendment to the Contract not increasing the contract price more than 20 percent, so as to bind the PRINCIPAL and the SURETY to the full and faithful performance of the Contract as so amended. The term "Amendment", wherever used in this BOND and whether referring to this BOND, the contract or the loan Documents shall include any alteration, addition, extension or modification of any character whatsoever.

PROVIDED FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____
counterparts, each one of which shall be deemed an original this day of _____, 20__

ATTEST:

BY: _____
(Principal) Secretary

BY: _____
Witness as to Principal

(ADDRESS)

ATTEST:
BY: _____
Witness to Surety

(PRINCIPAL)

BY: _____

(ADDRESS)

(SURETY)

BY: _____
(ATTORNEY in FACT)

(ADDRESS)

NOTE: Date of BOND must not be prior to date of Contract.
If CONTRACTOR is partnership, all partners should execute BOND.

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.

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that

_____, (contractor name),
_____, (contractor address), a
_____(corporation partnership, individual), hereinafter called
Principal, and _____, (surety name),
_____, (surety address) herein after called
surety, are held and firmly bound unto _____, (owner name),
_____, (owner address) hereinafter called
OWNER in the total aggregate penal sum of _____ dollars, (\$_____) in lawful money
of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors,
administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the
OWNER, dated the _____ day of _____, 20____, a copy of which is hereto attached and made a part
hereof for the construction of _____.

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants,
terms, conditions, and agreements of said contract during the original term thereof, and any extension thereof which
may be granted by the **OWNER**, with or without notice to the Surety and during the one year guaranty period, and if the
PRINCIPAL shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless
the **OWNER** from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay
the **OWNER** all outlay and expense which the **OWNER** may incur in making good any default, then this obligation shall
be void: otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said surety, for value received hereby stipulates and agrees that no change, extension of
time, alteration or addition to the terms of the contract or to **WORK** to be performed thereunder or the specifications
accompanying same shall in any way affect its obligation on this **BOND**, and it does hereby waive notice of any such
change, extension of time alteration or addition to the terms of the contract or to the **WORK** or to the specifications.

PROVIDED, FURTHER, that it is expressly agreed that this **BOND** shall be deemed amended automatically and
immediately, without formal and separate amendments hereto, upon amendment to the Contract not increasing the
contract price more than 20 percent, so as to bind the **PRINCIPAL** and the **SURETY** to the full and faithful performance of
the Contract as so amended. The term "Amendment", wherever used in this **BOND** and whether referring to this **BOND**,
the contract or the loan Documents shall include any alteration, addition, extension or modification of any character
whatsoever.

PROVIDED, FURTHER, that no final settlement between the **OWNER** and the **CONTRACTOR** shall abridge the right of any
beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts, each one of which shall be deemed an original this day of _____, 20____

ATTEST:

BY: _____
(Principal) Secretary

BY: _____
Witness as to Principal

(ADDRESS)

ATTEST:

BY: _____
Witness to Surety

(PRINCIPAL)

BY: _____

(ADDRESS)

(SURETY)

BY: _____
(ATTORNEY in FACT)

(ADDRESS)

NOTE: Date of **BOND** must not be prior to date of Contract.
If **CONTRACTOR** is partnership, all partners should execute **BOND**.

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.

NOTICE TO PROCEED

Dated _____, 20__

TO: _____
(Insert Name of Contractor as it appears in the Bid Documents)

ADDRESS: _____

OWNER'S PROJECT NO. _____

PROJECT: _____

OWNER'S CONTRACT NO. _____

CONTRACT FOR: _____

You are notified that the Contract Time under the above contract will commence to run on _____, 20___. By that date, you are to start performing your obligations under the Contract Documents. In accordance with paragraph 3 of the Agreement, the dates of Substantial Completion and Final Completion are _____, 20__ and _____, 20___, respectively.

Before you may start any Work at the site, paragraph 27 of the General Conditions provides that you and Owner must each deliver to the other (with copies to ENGINEER) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents. Also before you may start any Work at the site, you must:

Copy to ENGINEER
(Use Certified Mail, return receipt Requested)

OWNER: _____

By: _____

(Authorized Representative)

NAME: _____

(Title)

ACKNOWLEDGEMENT OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by:

(Contractor)

This the _____, day of 20__, by _____

Employee Identification Number: _____

CHANGE ORDER

No. _____

PROJECT NAME: _____	DATE OF ISSUANCE: _____
OWNER: _____	OWNER PROJECT NO. _____
OWNER ADDRESS: _____	
Street Name	City/Town
State	ZIP
CONTRACTOR: _____	
CONTRACT FOR: _____	
ENGINEER: _____	ENG. PROJECT NO. _____
ENGINEER ADDRESS: _____	
Street Name	City/Town
State	ZIP

You are directed to make the following changes in the Contract Documents.

Description: _____

Purpose of Change Order: _____

Justification: _____

Attachments: (List documents supporting change)

CHANGE IN CONTRACT PRICE	CHANGE IN CONTRACT TIME
Original Contract Price	Original Contract Time days date
Previous Change Orders	Net change from previous Change Orders days date
Contract Price prior to this Change Order	Contract Time prior to this Change Order days date
Net Increase (Decrease) of this Change Order	Net Increase (decrease) this Change Order days date
Contract Price with all approved Change Orders	Contract Time with all Change Orders days date

This document will become a supplement to the CONTRACT and all provisions will apply hereto. The attached Contractor's Revised Project Schedule reflects increases or decreases in Contract Time as authorized by this Change Order.

Stipulated price and time adjustment includes all costs and time associated with the above described change. Contractor waives all rights for additional time extension for said change. Contractor and Owner agree that the price(s) and time adjustment(s) stated above are equitable and acceptable to both parties.

RECOMMENDED BY: _____	APPROVED BY: _____	APPROVED BY: _____	APPROVED BY: _____
Engineer	Owner	Contractor	NHDES
_____	_____	_____	_____
Date	Date	Date	Date

CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner Project No. _____ Engineer Project No. _____
Project: _____
Contractor: _____
Contract For: _____ Contract Date: _____

This Certificate of Substantial Completion applies to all work under the Contract Documents or to the following specified parts thereof:

To _____
(Owner)
And to _____
(Contractor)

The Work to which this Certificate applies has been inspected by authorized representatives of OWNER, CONTRACTOR and ENGINEER, and that Work is hereby declared to be substantially complete in accordance with the Contract Documents on Documents on _____.
(Date of Substantial Completion)

A tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item in it does not alter the responsibility of CONTRACTOR to complete all the work in accordance with the Contract Documents. The items in the tentative list shall be completed or corrected by CONTRACTOR within _____ calendar days of the above Substantial Completion.

The responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, heat, utilities, insurance and warranties shall be as follows:

RESPONSIBILITIES:

OWNER: _____

CONTRACTOR: _____

The following documents are attached to and made a part of this Certificate:

This certificate does not constitute an acceptance of work not in accordance with the Contract Documents nor is it a release of CONTRACTOR's obligation to complete the work in accordance with the Contract Documents.

Executed by the Engineer on

_____, 20__

(Engineer)

By: _____

CONTRACTOR accepts this Certificate of Substantial Completion on _____, 20__

(Contractor)

By: _____

OWNER accepts this Certificate of Substantial Completion on _____, 20__

(Owner)

By: _____



CERTIFICATE OF FINAL COMPLETION
NHDES CLEAN WATER AND DRINKING WATER
STATE REVOLVING FUND



Owner Project No. _____ Engineer Project No. _____
Project: _____
Owner: _____
Contractor: _____
Engineer: _____
Agreement Date: _____
Notice to Proceed Date: _____
Contractual Substantial Completion date as modified by change orders: _____
Actual Substantial Completion date _____
Contractual final completion date as modified by Change Orders _____

The work to which this certificate applies has been inspected by authorized representatives of Owner, Contractor, Engineer and NHDES, the punch list has been completed and the work of the contract is hereby declared to be Finally Complete in accordance with the Contract Documents on _____ (Date of Final Completion)

This certificate does not constitute an acceptance of any work not in accordance with the Contract Documents nor is it a release of contractor's obligation to complete the work in accordance with the Contract Documents. The warranty for all work completed subsequent to the date of Substantial Completion expires one year from the date of this Final Acceptance.

Executed by Engineer on _____, 20__

By: _____

Contractor Accepts this Certificate of Final Completion on _____, 20__

By: _____

Owner Accepts this Certificate of Final Completion on _____, 20__

By: _____

NHDES Accepts this Certificate of Final Completion on _____, 20__

By: _____

CONTRACTORS AFFIDAVIT

STATE OF: _____

COUNTY OF: _____

Before me the undersigned a _____ (Notary Public, Justice of the Peace, Alderman) in and for said County and State Personally appeared _____ (Individual, partner or duly) who being duly sworn according to law deposes and says that the cost of all the Work, and outstanding claims and indebtedness of whatever nature arising out of the performance of the contract between _____ (Owner) and _____ (Contractor) of _____ (Contractor Address) dated _____ for the construction of the _____ (Project Name) and necessary appurtenant installations have been paid in full.

(Individual, Partner, or duly authorized representative of corporate contractor)

(Title)

Sworn to and subscribed before me
this _____ day of _____, 20__

(Notary Public)

CONTRACTOR'S FINAL RELEASE AND WAIVER OF LIEN

Project Name: _____
Project Address: _____
Street Name _____ City/Town _____ State _____ ZIP _____
Owner Name: _____
Contractor Name: _____
Contractor Address: _____
Street Name _____ City/Town _____ State _____ ZIP _____

TO ALL WHOM IT MAY CONCERN:

For good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the undersigned Contractor hereby waives, discharges, and releases any and all liens, claims, and rights to liens against the above-mentioned project, and any and all other property owned by or the title to which is in the name of the above-referenced Owner and against any and all funds of the Owner appropriated and available for the construction of said project, and any and all warrants drawn upon or issued against any such funds or monies, which the undersigned Contractor may have or may hereafter acquire or process as a result of the furnishing of labor, materials and/or equipment, and the performance of work by the Contractor on or in connection with said project, whether under and pursuant to the above-mentioned contract between the Contractor and the Owner pertaining to said project or otherwise, and which said liens, claims or rights of lien may arise and exist.

The undersigned further hereby acknowledges that the sum of:

_____ Dollars (\$ _____) constitutes the entire **unpaid** balance due the undersigned in connection with said project whether under said contract or otherwise and that the payment of said sum to the contractor will constitute payment in full and will fully satisfy any and all liens, claims, and demands which the contractor may have or assert against the owner in connection with said contract or project.

Dated this _____ day of _____ 20__

(Contractor)

Witness to Signature

BY: _____ BY: _____
Title _____ Title _____

NHDES Front End Documents Section C: General Conditions

General Conditions

Section C: General Conditions

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1. Contract and Contract Documents.

The plans, information for bidders, bids, advertisement for bids, bid payment and performance bonds, agreements, change orders, notice to proceed, specifications and addenda, hereinafter enumerated in the agreement, shall form part of this Contract and the provisions thereof shall be as binding upon the parties hereto as if they were herein fully set forth. The table of contents, titles, headings, running headlines and marginal notes contained herein and in said documents are solely to facilitate reference to various provisions of the Contract Documents and in no way affect, limit or cast light on the interpretation of the provisions to which they refer.

2. Definitions.

- 2.1 "Addenda" means written or graphic instruments issued prior to the execution of the agreement which modify or interpret the Contract Documents, drawings and specifications, by additions, deletions, clarifications or corrections. Such written or graphic instruments will be issued no less than five days before the bid opening.
- 2.2 "Bid" means the offer or proposal of the bidder submitted on the prescribed form setting forth the prices for the work to be performed.
- 2.3 "Bidder" means any person, firm or corporation submitting a bid for the work.
- 2.4 "Bonds" means bid, performance, and payment bonds and other instruments of security, furnished by the Contractor and his surety in accordance with the Contract Documents.
- 2.5 "Change Order" means a written order to the Contractor authorizing an addition, deletion or revision in the work within the general scope of the Contract Documents, or authorizing an adjustment in the Contract Price or Contract Time.
- 2.6 "Contract Documents" means the Contract, including any advertisement for bids, information for bidders, bid, bid bond, agreement, payment bond, performance bond, notice of award, notice to proceed, change orders, drawings, specifications and addenda.
- 2.7 "Contract Price" means the total monies payable to the Contractor under the terms and conditions of the Contract Documents.
- 2.8 "Contract Time" means the number of calendar days stated in the Contract Documents for the completion of the work.
- 2.9 "Contractor" means the person, firm or corporation with whom the owner has executed the agreement.
- 2.10 "Division" means the state of New Hampshire Department of Environmental Services, Water Division.
- 2.11 "Drawings" mean the part of the Contract Documents which show the characteristics and scope of the work to be performed and which have been prepared or approved by the engineer.
- 2.12 "Engineer" means the person, firm or corporation named as such in the Contract Documents.
- 2.13 "Field order" means a written order effecting a change in the work not relating to an adjustment in the Contract price or an extension of the Contract time and issued by the engineer to the Contractor during construction.
- 2.14 "Notice of Award" means the written notice of the acceptance of the bid from the owner to the successful Bidder.

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- 2.15 "Notice to Proceed" means the written communication issued by the owner to the Contractor authorizing him to proceed with the Work and establishing the date of commencement of the work.
- 2.16 "Owner" means a public or quasi-public body or authority, corporation, association, partnership, or individual for whom the work is to be performed.
- 2.17 "Plans" means the Contract drawings or exact reproductions thereof which show the scope, character, dimensions and details of the work and which have been prepared or approved by the engineer.
- 2.18 "Project" means the undertaking to be performed as provided in the Contract Documents.
- 2.19 "Resident Project Representative" means the authorized representative of the owner who is assigned to the project site or any part thereof.
- 2.20 "Shop Drawings" means all drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by the Contractor, a subcontractor, manufacturer, supplier or distributor, which illustrates how specific portions of the work shall be fabricated or installed.
- 2.21 "Special conditions" means revisions or additions to these general conditions, supplemental general conditions or specifications applicable to an individual project.
- 2.22 "Specifications" means a part of the Contract Documents consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards and workmanship.
- 2.23 "Subcontractor" means an individual, firm or corporation having a direct Contract with the Contractor or with any other Subcontractor for the performance of a part of the work at the site.
- 2.24 "Substantial Completion" means that date as certified by the engineer when the construction of the Project or a specified part thereof is sufficiently completed, in accordance with the Contract Documents, so that the project or specified part can be utilized for the purposes for which it is intended.
- 2.25 "Supplemental General Conditions" means modifications to these general conditions required by a federal agency for participation in the Project and approved by the agency in writing prior to inclusion in the Contract Documents, or such documents that may be imposed by applicable state laws.
- 2.26 "Supplier" means any person or organization who supplies materials or equipment for the work, including that fabricated to a special design, but who does not perform labor at the site.
- 2.27 "Work" means all labor necessary to produce the construction required by the Contract Documents, and all materials and equipment incorporated or to be incorporated in the project.
- 2.28 "Written Notice" means any notice to any party of the agreement relative to any part of this agreement in writing and considered delivered and the service thereof completed, when posted by certified or registered mail to the said party at his last given address, or delivered in person to said party or his authorized representative on the work.

3. Additional Instructions and Detail Drawings.

The Contractor may be furnished additional instructions and detail drawings as necessary to carry out the work included in the Contract. The additional drawings and instructions thus supplied to the Contractor will coordinate with the Contract Documents and will be so prepared that they can be reasonably interpreted as part thereof.

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- 4. Shop or Setting Drawings.** Shop or setting drawings shall be in accordance with the following:
- 4.1 The Contractor shall furnish 6 copies of the manufacturer's shop drawings, specific design data as required in the detailed specifications, and technical literature covering all equipment and fabricated materials which he proposes to furnish under this Contract in sufficient detail to indicate full compliance with the specifications. Shop drawings shall indicate the method of installing, the exact layout dimensions of the equipment or materials, including the location, size and details of valves, pipe connections, etc.
 - 4.2 No equipment or materials shall be shipped until the manufacturer's shop drawings and specifications or other identifying data, assuring compliance with these specifications, are approved by the engineer.
 - 4.3 The Contractor shall check and verify all field measurements and shall be responsible for the prompt submission of all shop and working drawings so that there shall be no delay in the work.
 - 4.4 Regardless of corrections made in or approval given to such drawings by the engineer, the Contractor will nevertheless be responsible for the accuracy of such drawings and for their conformity to the plans and specifications. The Contractor shall notify the engineer in writing of any deviations at the time he furnishes such drawings. He shall remain responsible for the accuracy of the drawings showing the deviations but not for the acceptance of the deviations from the original design shown in the plans and specification. Approval by the engineer and the owner of any deviation in material, workmanship or equipment proposed subsequent to approval of the shop drawings or design data, shall be requested in writing by the Contractor.
 - 4.5 When submitted for the engineer's review, shop drawings shall bear the Contractor's certification that he has reviewed, checked and approved the shop drawings and that they are in conformance with the requirements of the Contract Documents.
- 5. Materials, Services, Facilities and Workmanship** shall be furnished as follows:
- 5.1 Except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, superintendence, temporary construction of every nature, and all other services and facilities of every nature whatsoever necessary to execute, complete, and deliver the work within the specified time.
 - 5.2 Unless otherwise specifically provided for in the specifications, all workmanship, equipment, materials and articles incorporated in the work shall be new and the best grade of the respective kinds for the purpose.
 - 5.3 The Contractor shall furnish to the engineer for approval the manufacturer's detailed specifications for all machinery, mechanical and other special equipment, which he contemplates installing together with full information as to type, performance characteristics, and all other pertinent information as required.
 - 5.4 Materials which are specified by reference to the number or symbol of a specific standard, such as an ASTM standard, a federal specification or other similar standard, shall comply with requirements in the latest revision thereof and any amendment or supplement thereto in effect on the date of the advertisement for bids, except as limited to type, class or grade, or modified in such reference. The standards referred to shall have full force and effect as though printed therein.
 - 5.5 For equipment or for materials, when requested by the engineer, the Contractor shall submit certificates of compliance from the manufacturer, certifying that the equipment or the materials comply with the requirements of the specifications or the standards.

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- 5.6 Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer.
- 5.7 Materials, supplies, and equipment shall be in accordance with samples submitted by the Contractor and approved by the engineer.

6. Contractor's Title To Materials.

No material, supplies, or equipment to be installed or furnished under this Contract shall be purchased subject to any chattel mortgage or under a conditional sale, lease purchase or other agreement by which an interest therein or in any part thereof is retained by the seller or supplier. The Contractor shall warrant good title to all materials, supplies, and equipment installed or incorporated in the work and upon completion of all work, shall deliver the same together with all improvements and appurtenances constructed or placed thereon by him to the owner free from any claims, liens, or charges. Neither the Contractor nor any person, firm or corporation furnishing any material or labor for any work covered by this Contract shall have any right to a lien upon any improvement or appurtenance thereon. Nothing contained in this paragraph, however, shall defeat or impair the right of persons furnishing materials or labor to recover under any bond given by the Contractor for their protection or any rights under any law permitting such persons to look to funds due the Contractor in the hands of the owner. The provisions of this paragraph shall be inserted in all Subcontracts and material Contracts and notice of its provisions shall be given to all persons furnishing materials for the work when formal Contract is entered into for such materials.

7. Inspection and Testing of Materials shall be as follows:

- 7.1 All materials and equipment used in the construction of the project shall be subject to inspection and testing by the engineer in accordance with accepted standards at any and all times during manufacture or during the project construction and at any or all places where such manufacture is carried on.
- 7.2 The Contractor shall furnish promptly upon request by the engineer, all materials required to be tested. All tests made by the engineer shall be performed in such manner and ahead of scheduled installation, as not to delay the work of the Contractor. When required, testing of concrete, masonry, soils, pipe and pipe materials will be made in accordance with provisions in the specifications.
- 7.3 Material required to be tested which is delivered to the job site shall not be incorporated into the work until the tests have been completed and approval or acceptance given in writing by the engineer.
- 7.4 Each sample submitted by the Contractor for testing shall carry an identification label containing such information as is requested by the engineer. It shall also include a statement that the samples are representative of the remaining materials to be used on the project.
- 7.5 Approval of any materials shall be general only and shall not constitute a waiver of the owner's right to demand full compliance with the Contract requirements.
- 7.6 The engineer may, at his own discretion, undertake the inspection of materials at the source. In the event plant inspection is undertaken, the following conditions shall be met:
 - a. The engineer shall have the cooperation and assistance of the Contractor and the producer with whom he has Contracted for materials.
 - b. The engineer shall have full entry at all reasonable times to such areas as may concern the manufacture or production of the materials being furnished.

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- c. If required, the Contractor shall arrange for a building for the use of the inspector; such building to be located near the plant, independent of any building used by the material producer, in which to house and use the equipment necessary to carry on the required tests. Cost for such arrangement shall be paid by the owner as a stated allowance in the bid.
 - d. Adequate safety measures shall be provided and maintained at all times.
- 7.7 Except as otherwise specifically stated in the Contract, the costs of sampling and testing will be divided as follows:
- a. The Contractor shall furnish the engineer, without extra cost, all samples required for testing purposes. All sampling and testing including the number and selection of samples shall be determined by the engineer for his own information and use.
 - b. When testing of materials is specified in the appropriate section of the specifications, the cost of the same shall be charged to the owner or Contractor, as detailed in the specifications. However, costs of equipment performance tests shall be borne by the Contractor, as detailed in the appropriate section of the specifications.
 - c. When the Contractor proposes a material, article or component as equal to the ones specified, reasonable tests may, or may not, be required by the engineer. If the engineer requires tests of a proposed equal item, the Contractor will be required to assume all costs of such testing.
 - d. Any material, article or component which fails to pass tests required by the Engineer or by the specifications, will be rejected and shall be removed from the project site. However, if, upon request of the Contractor, retesting or further tests are permitted by the Engineer, the Contractor shall assume all costs related to such retesting or further tests.
 - e. Neither the Owner nor the Engineer will in any way be charged for the manufacturer's costs in supplying certificates of compliance.
- 7.8 If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to specifically be inspected, tested or approved by someone other than the Contractor, the Contractor will give the Engineer timely notice of readiness. The Contractor will then furnish the Engineer with the required certificates of inspection, testing or approval.
- 7.9 Inspections, tests, or approvals by the engineer or others shall not relieve the Contractor from obligations to perform the Work in accordance with the requirements of the Contract Documents.
- 8. "Or Equal " Clause, Substitutions and Contractor Options.**
- 8.1 Whenever a material, article, or piece of equipment is identified on the plans or in the specifications by reference to manufacturer's or vendor's names, trade names, catalogue numbers, etc., it is intended merely to establish a standard of quality and performance. Any material, article, or equipment of other manufacturers and vendors, which will perform satisfactorily the duties imposed by the general design, shall be considered equally acceptable provided the material, article, or equipment so proposed is, in the opinion of the Engineer, of equal quality and function. The Engineer shall determine equality based on such information, tests, or other supporting data that may be required of the Contractor.
- 8.2 Upon acceptance and approval by the Engineer of an equal product, it shall remain the responsibility of the Contractor to coordinate installation of the item with all other items to be furnished to assure proper fitting together of all items. Similar responsibility applies to items which are left to the Contractor's option. Any

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additional cost of equal items and any additional cost incidental to the coordination and/or fitting together of such items shall be borne by the Contractor at no extra cost to the Owner.

- 8.3 If a specified or equal item is not available to meet the construction schedule, the Contractor may propose a substitute item of less than equal performance and quality. If this substitute is acceptable to the Engineer, any difference in purchase cost or costs incidental to the installation of such item will be negotiated between the parties to the Contract.
- 8.4 Neither equal nor substitute items shall be installed without written approval of the Engineer.
- 8.5 The Contractor shall warrant that if substitutes are approved, no major changes in the function or general design of the Project will result.
- 9. Patents.** Patent information is as follows:
- 9.1 The Contractor shall hold and save the owner and its officers, agents, servants, and employees harmless from liability of any nature or kind, including cost and expenses for, or on account of, any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the Contract, including its use by the owner, unless otherwise specifically stipulated in the Contract Documents.
- 9.2 License and/or royalty fees for the use of a process used in wastewater plant design which is authorized by the owner for the project, must be reasonable, and paid to the holder of the patent, or his authorized licensee.
- 9.3 If the Contractor uses any design, device or materials in the construction methods for the project covered by patents or copyrights, he shall provide for such use by suitable agreement with the owner of such patented or copyrighted design, device or material. It is mutually agreed and understood, that, without exception, the Contract prices shall include all royalties or costs arising from the use of such design, device or materials, in any way involved in the work. The Contractor and/or his sureties shall indemnify and save harmless the owner of the project from any and all claims for infringement by reason of the use of such patented or copyrighted design, device or materials or any trademark or copyright in connection with work agreed to be performed under this Contract, and shall indemnify the Owner for any cost, expense or damage which it may be obliged to pay by reason of such infringement at any time during the construction of the work or after completion of the work.
- 10. Surveys. Surveys of land, property and construction** shall be as follows:
- 10.1 The owner will provide all land surveys and will establish and locate all property lines relating to the project.
- 10.2 For structures, the Engineer will establish and stake out one or more base lines as needed and will establish bench marks in and around the project site for the use of the Contractor and for the Engineer's own reference in checking the work in progress. For structures such as pipelines, the Engineer will establish the location of the pipe, manholes and other appurtenances, and will establish bench marks along the route of the pipeline at intervals for the using of the Contractor and for his own reference in checking the pipe and manhole inverts and other elevations throughout the project. The Contractor shall utilize the lines and bench marks established by the Engineer to set up whatever specific detail controls he may need for establishing location, elevation lines and grades of all structures. All this work is subject to checking, approval, and continuous surveillance by the Engineer to avoid error. The Contractor shall provide the Engineer with a qualified man or men to assist in this checking as needed and on request of the Engineer.
- 10.3 For construction other than pipelines and appurtenances in roadways and cross country, the Contractor shall be responsible for the location and setting lines and grades. The Contractor shall establish the location for pump

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station and wastewater treatment facility structures, associated yard piping including electrical conduits, internal piping and all equipment. Base lines and benchmarks for setting of the lines and grades for the above shall be provided by the Engineer.

10.4 Protection of stakes. The Contractor shall protect and preserve all of the established baseline stakes, bench marks, or other controls placed by the Engineer. Any of these items destroyed or lost through fault of the Contractor will be replaced by the Engineer at the Contractor's expense.

11. Contractor's Obligations are as follows:

The Contractor shall and in good workmanlike manner, do and perform all work and furnish and pay for all supplies and materials, machinery, equipment, facilities and means, except as herein otherwise expressly specified, necessary or proper to perform and complete all the work required by this Contract, within the time stated in the proposal in accordance with the plans and drawings covered by this Contract, and any and all supplemental plans and drawings, in accordance with the directions of the Engineer as given from time to time during the progress of the work, whether or not he considers the direction in accordance with the terms of the Contract. He shall furnish, erect, maintain and remove such construction plant and such temporary works as may be required. The Contractor shall observe, comply with, and be subject to all terms, conditions, requirements, and limitations of the Contract Documents, and shall do, carry on and complete the entire work to the satisfaction of the Engineer and Owner.

Contractor shall carry on the work and adhere to the progress schedule during all disputes, disagreements or unresolved claims with the owner. No work shall be delayed or postponed pending the resolution of any disputes, disagreements, or claims except as the owner and Contractor may otherwise agree in writing.

12. Weather Conditions.

In the event of temporary suspension of work, or during inclement weather, or whenever the Engineer shall direct, the Contractor and his Subcontractors shall protect their work and materials against damage or injury from the weather. If, in the opinion of the Engineer, any work or material shall have been damaged or injured by reason of failure on the part of the Contractor or any of his Subcontractors to so protect his work, such materials shall be removed and replaced at the expense of the Contractor.

13. Protection of Work and Property shall be provided as follows:

13.1 The Contractor shall at all times safely guard the Owner's property from injury or loss in connection with this Contract. He shall at all times safely guard and protect his own work, and that of adjacent property, from damage. The Contractor shall replace or make good any such damage, loss or injury unless caused directly by errors contained in the Contract, or by the Owner, or his authorized representatives. The Contractor will notify owners of adjacent utilities when prosecution of the Work may affect them.

13.2 The Contractor shall take all necessary precautions for the safety of employees on the work site, and shall comply with all applicable provisions of federal, state and municipal safety laws and building codes to prevent accidents or injury to persons on, about or adjacent to the premises where the work is being performed. He shall erect and properly maintain at all times, as required by the conditions and progress of the work, all necessary safeguards for the protection of the workmen and the public and shall post danger signs warning against the hazards created by such features of construction as protruding nails, hoists, well holes, elevator hatchways, scaffolding, window openings, stairways, trenches and other excavations, and falling materials, and he shall designate a responsible member of his organization on the work, whose duty shall be the prevention of accidents. The name and position

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of any person so designated shall be reported to the Engineer by the Contractor. The person so designated shall be available by phone during nonworking hours.

- 13.3 In case of emergency which threatens loss or injury of property, and/or safety of life, the Contractor is allowed to act, without previous instructions from the Engineer. He shall notify the Engineer immediately thereafter. Any claim for compensation by the Contractor due to such extra work shall be promptly submitted in writing to the Engineer for approval.
- 13.4 When the Contractor has not taken action but has notified the Engineer of an emergency threatening injury to persons or damage to the work or any adjoining property, he shall act as instructed or authorized by the Engineer.
- 13.5 The intention is not to relieve the Contractor from acting, but to provide for consultations between Engineer and Contractor in an emergency which permits time for such consultations.
- 13.6 The amount of reimbursement claimed by the Contractor on account of any emergency action shall be determined in the manner provided in Article 17 (extra work and change orders) of the general conditions.

14. Inspection of work for conformance with plans and specifications.

- 14.1 For purposes of inspection and for any other purpose, the Owner, the Engineer, and agents and employees of the Division or of any funding agency may enter upon the work and the premises used by the Contractor, and the Contractor shall provide safe and proper facilities therefore. The Engineer shall be furnished with every facility for ascertaining that the work is in accordance with the requirements and intention of this Contract, even to the extent of uncovering or taking down portions of finished work.
- 14.2 During construction and on its completion, all work shall conform to the location, lines, levels and grades indicated on the drawings or established on the site by the Engineer and shall be built in a workmanlike manner, in accordance with the drawings and specifications and the supplementary directions given from time to time by the Engineer. In no case shall any work which exceeds the requirements of the drawings and specifications be paid for as extra work unless ordered in writing by the Engineer.
- 14.3 Unauthorized work and work not conforming to plans and specifications shall be handled as follows:
 - a. Work considered by the Engineer to be outside of or different from the plans and specifications and done without instruction by the Engineer, or in wrong location, or done without proper lines or levels, may be ordered by the Engineer to be uncovered or dismantled.
 - b. Work done in the absence of the Engineer or his agent may be ordered by the Engineer to be uncovered or dismantled.
 - c. Should the work thus exposed or examined prove satisfactory, the uncovering or dismantling and the replacement of material and rebuilding of the work shall be considered as "Extra Work" to be processed in accordance with article 17.
 - d. Should the work thus exposed or examined prove to be unsatisfactory the uncovering or dismantling and the replacement of material and rebuilding of the work shall be at the expense of the Contractor.

- 15. **Reports, Records and Data** shall be furnished as follows: The Contractor shall submit to the owner such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as are required by the Contract Documents or as the owner, division or any funding agency may request concerning work performed or to be performed under this Contract.

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- 16. Superintendence by Contractor** shall be furnished as follows: At the site of the work, the Contractor shall employ a competent construction superintendent or foreman who shall have full authority to act for the Contractor. The superintendent or foreman shall have been designated in writing by the Contractor as the Contractor's representative at the site. It is understood that such representative shall be acceptable to the Engineer and shall be the one who can be continued in that capacity for the particular job involved unless he ceases to be on the Contractor's payroll. Such representative shall be present on the site at all times as required to perform adequate supervision and coordination of the Work.
- 17. Extra Work and Change Orders** shall be processed as follows:
- 17.1 The Engineer may at any time by written order and without notice to the sureties require the performance of such extra work or changes in the work as may be found necessary. The amount of compensation to be paid to the Contractor for any extra work so ordered shall be made in accordance with one or more of the following methods in the order of precedence listed below:
- a. A price based on unit prices previously approved; or
 - b. A lump sum price agreed upon between the parties and stipulated in the order for the extra work;
 - c. A price determined by adding 15 percent to the "reasonable cost" of the extra work performed, such "reasonable cost" to be determined by the Engineer in accordance with the following paragraph.
- 17.2 The Engineer shall include the reasonable cost to the Contractor of all materials used, of all labor, both common and skilled, of foreman, trucks, and the fair-market rental rate for all machinery and equipment for the period employed directly on the work. The reasonable cost for extra work shall include the cost to the Contractor of any additional insurance that may be required covering public liability for injury to persons and property, the cost of workmen's compensation insurance, federal social security, and any other costs based on payrolls, and required by law. The cost of extra work shall not include any cost or rental of small tools, buildings, or any portion of the time of the Contractor, his project supervisor or his superintendent, as assessed upon the amount of extra work, these items being considered covered by the 15 percent added to the reasonable cost. The reasonable cost for extra work shall also include the premium cost, if any, for additional bonds and insurance required because of the changes in the work.
- 17.3 In the case of extra work which is done by Subcontractors under the specific Contract, or otherwise if so approved by the Engineer, the 15 percent added to the reasonable cost of the work will be allowed only to the Subcontractor performing the work. On such work an additional 5 percent for reasonable cost will be paid to the Contractor for their work in directing the operations of the Subcontractor, for administrative supervision, and for any overhead costs. If two or more tiers of Subcontractors are involved in the extra work, a maximum of 27 percent of the cost incurred by the Subcontractor actually performing the work will be allowed to be added to the reasonable cost of the work. The 27 percent maximum represents 15 percent added to the reasonable cost of the work allowed by the Subcontractor performing the work, an additional 5 percent allowed to the next tier higher subcontractor and 5 percent allowed to the Contractor for their work in directing the operations of the Subcontractor, for administrative supervision, and for any overhead costs.
- 17.4 The Engineer may authorize minor changes or alterations in the work not involving extra cost and not inconsistent with the overall intent of the Contract Documents. These shall be accomplished by a written field order. However, if the Contractor believes that any minor change or alteration authorized by the Engineer entitles him to an increase in the Contract price, he may make a claim therefore as provided in article 21.

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- 18. Time For Completion and Liquidated Damages.** The following paragraphs address time for completion and liquidated damages:
- 18.1 It is hereby understood and mutually agreed, by and between the Contractor and the Owner, that the date of beginning and the time for completion as specified in the Contract of the work to be done hereunder are Essential Conditions of this Contract; and it is further mutually understood and agreed that the work embraced in this Contract shall be commenced on a date to be specified in the "Notice to Proceed."
- 18.2 The Contractor agrees that said work shall be pursued regularly, diligently and continuously at such rate of progress as will insure full completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the Owner, that the time for the completion of the work described herein is a reasonable time, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.
- 18.3 If the Contractor shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part consideration for the awarding of this Contract, to pay to the Owner the amount specified in the Contract, not as a penalty but as liquidated damages for such breach of Contract as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the Contract for completing the work.
- 18.4 The liquidated damages amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain. Said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be deducted from time to time by the owner from current periodical payments.
- 18.5 It is further agreed that "time is of the essence" of each and every portion of this Contract and of the specifications wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the Contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall "be of the essence." Provided, that the Contractor shall not be charged with liquidated damages or any excess cost when the Owner determines that the Contractor is without fault and the Contractor's reasons for the time extension are acceptable to the Owner; provided, further, that the Contractor shall not be charged with liquidated damages or any excess cost when the delay in the completion of the work is due to:
- a. A preference, priority or allocation order duly issued by the government.
 - b. An unforeseeable cause beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God, or of the public enemy, acts of the Owner, acts of another Contractor in the performance of a Contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes and severe weather.
 - c. Any delays of Subcontractors or suppliers occasioned by any of the causes specified in subsections (a) and (b) of this article.
- 18.6 The Contractor shall promptly notify the Owner in writing of the causes of the delay. The Owner shall ascertain the facts and extent of the delay and notify the Contractor within a reasonable time of his decision in the matter.

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19. Defective Work. Defective work shall be processed as follows:

- 19.1 The Contractor shall promptly remove from the premises all materials and work condemned by the Engineer as failing to meet Contract requirements, whether incorporated in the work or not, and the Contractor shall promptly replace and re-execute his own work in accordance with the Contract and without expense to the Owner and shall bear the expense of making good all work of other Contractors which was destroyed or damaged by such removal or replacement.
- 19.2 All removal and replacement work shall be done at the Contractor's expense. If the Contractor does not take action to remove such condemned work and materials within 10 days after receipt of written notice, the Owner may remove them and store the material at the expense of the Contractor. If the Contractor does not pay the expense of such removal and storage within 10 days time thereafter, the Owner may, upon 10 days written notice, sell such materials at auction or at private sale and shall pay to the Contractor any net proceeds thereof, after deducting all the costs and expenses that should have been borne by the Contractor.

20. Differing Site Conditions. Claims for differing site conditions shall be processed as follows:

- 20.1 The Contractor shall promptly and before such conditions are disturbed, notify the Engineer in writing of:
- a. Subsurface or latent physical conditions at the site differing materially from those indicated in this Contract; or,
 - b. Unknown physical conditions at the site, differing materially from those ordinarily encountered and generally recognized as inherent in the type of work provided for in this Contract.
- 20.2 The Engineer shall promptly investigate the conditions. If he finds that conditions differ materially and will cause an increase or decrease in the Contractor's cost or the time required to perform any part of the work under this Contract whether or not changed as a result of such conditions, the Engineer will notify the Owner and recommend an equitable adjustment. Contractor and Owner will enter into negotiations via the Engineer to modify the contract in writing.
- 20.3 No claim of the Contractor under this clause shall be allowed unless the Contractor has given proper notice as required in paragraph 20.1 of this clause.
- 20.4 No claim by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this Contract.

21. Claims For Extra Cost. Claims for extra cost shall be processed as follows:

- 21.1 No claim for extra work or cost shall be allowed unless the same was done pursuant to a written order by the Engineer, approved by the Owner and the claim presented for payment with the first estimate after the changed or extra work is done. When work is performed under the terms of article 17, the Contractor shall furnish satisfactory bills, payrolls and vouchers covering all items of cost when requested by the Owner and shall allow the Owner access to accounts relating thereto.
- 21.2 If the Contractor claims that any instructions by drawings or similar documents issued after the date of the Contract involve extra cost under the Contract, he shall give the Engineer written notice after the receipt of such instruction and before proceeding to execute the work, except in an emergency which threatens life or property, then the procedure shall be as provided for under article 17, "Extra Work & Change Orders." No claim shall be valid unless so made.

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22. Right of Owner to Terminate Contract.

- 22.1 In the event that any of the provisions of this Contract are violated by the Contractor, or by any of his Subcontractors, the Owner may serve written notice upon the Contractor and the surety of its intention to terminate the Contract, and unless within 10 days after the serving of such notice upon the Contractor, such violation or delay shall cease and satisfactory arrangement for correction be made, the Contract shall, upon the expiration of said 10 days cease and terminate. In the event of any such termination, the Owner shall immediately serve notice thereof upon the surety and the Contractor and the surety shall have the right to take over and perform the Contract; provided, however, that if the surety does not commence performance thereof within 10 days from the date of the mailing to such surety of notice of termination, the Owner may take over the work and prosecute the same to completion by Contract or by force account for the account and at the expense of the Contractor and the Contractor and his surety shall be liable to the Owner for any excess cost occasioned the Owner thereby, and in such event the Owner may take possession of and utilize in completing the work, such materials, appliances, and plant as may be on the site of the work and necessary therefore.
- 22.2 If the Contractor should be adjudged bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency, or if he should refuse or should fail, except in cases for which extensions of time are provided, to supply enough skilled workmen or materials, or if he should fail to make payments to Subcontractors or for material or labor, so as to affect the progress of the work, or be guilty of a violation of the Contract, then the Owner, upon the written notice of the Engineer that sufficient cause exists to justify such action may, without prejudice to any other right or remedy and after giving the Contractor and his surety 7 days' written notice, terminate the employment of the Contractor and take possession of the premises and of all materials, tools, equipment and other facilities installed on the work and paid for by the Owner, and finish the work by whatever method he may deem expedient. In the case of termination of this Contract before completion from any cause whatever, the Contractor, if notified to do so by the Owner, shall promptly remove any part or all of his equipment and supplies at the expense of the Contractor. If such expense exceeds such unpaid balance, the Contractor shall pay the difference to the Owner. The expense incurred by the Owner as herein provided, and the damage incurred through the Contractor's default, shall be approved by the Engineer.
- 22.3 Where the Contract has been terminated by the Owner, said termination shall not affect or terminate any of the rights of the Owner as against the Contractor or his surety then existing or which may thereafter accrue because of such default. Any retention or payment of monies by the Owner due the Contractor under the terms of the Contract, shall not release the Contractor or his surety from liability for his default.
- 22.4 After ten (10) days from delivery of a Written Notice to the Contractor and the Engineer, the Owner may, without cause and without prejudice to any other remedy, elect to abandon the Project and terminate the Contract. In such case the Contractor shall be paid for all Work executed and any expense sustained plus reasonable profit.
- 22.5 If through no act or fault of the Contractor, the work is suspended for a period of more than ninety (90) days by the Owner or under an order of court or other public authority, or the Engineer fails to act on any request for payment within thirty (30) days after approved by the engineer, or the Owner fails to pay the Contractor substantially the sum approved by the Engineer or awarded by arbitrators within thirty (30) days of its approval and presentation, then the Contractor may, after ten (10) days from delivery of a Written Notice to the Owner and the Engineer terminate the Contract and recover from the Owner payment for all Work executed and all expenses sustained. In addition and in lieu of terminating the Contract, if the Engineer has failed to act on a request for payment or if the Owner has failed to make any payment as aforesaid, the Contractor may upon ten (10) days written notice to the Owner and the Engineer stop the Work until paid all amounts then due, in which event and

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upon resumption of the Work Change Orders shall be issued for adjusting the Contract Price or Extending the Contract Time or both to compensate for the costs and delays attributable to the stoppage of the work.

22.6 If the performance of all or any portion of the Work is suspended, delayed, or interrupted as a result of failure of the Owner or Engineer to act within the time specified in the Contract Documents, or if no time is specified, within a reasonable time, an adjustment in the Contract Price or an extension of the Contract Time, or both, shall be made by Change Order to compensate the Contractor for the costs and delays necessarily caused by the failure of the Owner or Engineer.

23. Construction Schedule and Periodic Estimates shall provide for the following:

23.1 Before starting the work or upon request by the Engineer during its progress, the Contractor shall submit to the Engineer a work plan showing construction methods and the various steps he intends to take in completing the work.

23.2 Before the first partial payment is made, the Contractor shall prepare and submit to the Engineer:

- a. A written schedule fixing the dates for submission of drawings; and
- b. A written schedule fixing the respective dates for the start and completion of segments of the work. Each such schedule shall be subject to review and change during the progress of the work.
- c. Respective dates for submission of Shop Drawings and for the beginning of manufacture, the testing, and the installation of materials, supplies, and equipment.
- d. A schedule of payments that the Contractor anticipates will be earned during the course of the Work.

24. Payments to Contractor. Payments to the Contractor shall be made as follows:

24.1 Progress payments. The Owner will once each month make a progress payment to the Contractor on the basis of an estimate of the total amount of work done to the time of the estimate and its value as prepared by the Contractor and approved by the Engineer.

24.2 Retainage by Owner. The Owner will retain a portion of the progress payment, each month, in accordance with the following procedures:

- a. The Owner will establish an escrow account in the bank of the Owner's choosing. The account will be established such that interest on the principal will be paid to the Contractor. The principal will be the accumulated retainage paid into the account by the Owner. The principal will be held by the bank, available only to the Owner, until termination of the Contract.
- b. Until the work is 50% complete, as determined by the Engineer, retainage shall be 10% of the monthly payments claimed. The computed amount of retainage will be deposited in the escrow account established above.
- c. After the work is 50% complete, and provided the Contractor has satisfied the Engineer in quality and timeliness of the work, and provided further that there is no specific cause for withholding additional retainage no further amount will be withheld. The escrow account will remain at the same balance throughout the remainder of the project, unless drawn upon by the Owner in accordance with articles 19, 22, and 56.
- d. Upon substantial or final completion (as defined in article 25), the amount of retainage will be reduced to 2% of the total Contract Price plus an additional retainage based on the Engineer's estimate of the fair value of

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the punch list items and the cost of completing and/or correcting such items of work, with specified amounts for each incomplete or defective item of work. As these items are completed or corrected, they shall be paid for out of the retainage until the entire project is declared completed (See article 25). The final 2% retainage shall be held during the one-year warranty period and released only after the Owner has accepted the project.

- 24.3 In reviewing monthly estimates for payments of the value of work done, the Engineer may accept in the estimate, prior to subtracting the retainage, the delivered cost of certain equipment and nonperishable material which have been delivered to the site or off-site location and which are properly stored and protected from damage. With the estimate, the Contractor shall submit to the Engineer invoices as evidence that the material has been delivered to the site. Prior to submitting the next monthly estimate, the Contractor shall provide the Engineer with paid invoices or other evidence that the materials have been paid for. If the Contractor fails to submit such evidence, the Engineer may then subtract the value of such materials or equipment for which the Owner has previously paid, from the next monthly estimate. The type of equipment and material eligible for payment prior to being incorporated in the work will be at the Engineer's discretion. Material and equipment made specifically for the subject job will be eligible for payment.
- 24.4 All material and work for which partial payments have been made shall thereupon become the sole property of the Owner. This provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of materials and work upon which payments have been made or for the restoration of any damaged work, or as a waiver of the right of the Owner to require compliance with all of the terms of the Contract.
- 24.5 Owner's right to withhold payments and make application. The Contractor agrees that he will indemnify and save the Owner or the Owner's agents harmless from all claims growing out of the lawful demands of Subcontractors, laborers, workmen, mechanics, material men, and furnishers of machinery and parts, equipment, power, tools and all supplies, including commissary, incurred in the furtherance of the performance of this Contract. The Contractor shall, at the Owner's request, furnish satisfactory evidence that all claims of the nature hereinabove designated have been paid, discharged, or waived. If the Contractor fails to do so, then the Owner may, upon written notice to the Contractor either pay unpaid bills of which the Owner has written notice directly, or withhold from the Contractor's unpaid compensation a sum of money to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged. Payment to the Contractor shall then be resumed in accordance with the terms of this Contract but in no event shall the above provisions be construed to impose any obligations upon the Owner to either the Contractor or his surety or any third party. In paying any unpaid bills of the Contractor, the Owner shall be deemed the agent of the Contractor, and any payment so made by the Owner shall be considered as payment made under Contract by the Owner to the Contractor and the Owner shall not be liable to the Contractor for any such payments made in good faith.
- 24.6 If the Owner fails to make payment forty-five (45) days after approval by the Engineer, in addition to other remedies available to the Contractor, there shall be added to each such payment interest at an annual rate of 10% commencing on the first day after said payment is due and continuing until the payment is received by the Contractor.
- 25. Acceptance and Final Payment** provisions shall be as follows:
- 25.1 Substantial completion and payment.
- a. Substantial completion shall be that point, as certified by the Engineer, at which the Contract or specified part thereof, has been completed to the extent that the Owner may occupy and/or make use of the work

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performed for the purposes for which it was intended. Upon substantial completion there may be minor items, such as seeding, landscaping, etc., yet to be completed or items of work to be corrected.

- b. Upon receipt of written notice from the Contractor that the work is substantially complete, the Engineer shall promptly make an inspection, and when he finds the work complies with the terms of the Contract and the Contract is substantially completed, he will issue a signed and dated certificate, and a list of all items to be completed or corrected, stating that the work required by this Contract has been substantially completed and is accepted by him.
 - c. Upon substantial completion, the entire balance due and payable to the Contractor less 2 percent of the Contract Price, and less a retention based on the Engineer's estimate of the fair value for the cost of completing or correcting listed items of work with specified amounts for each incomplete or defective item of work shall be made.
 - d. The general guarantee period for the work shall begin on the date certified by the Engineer that the work is substantially completed.
- 25.2 Final completion shall be that point at which all work has been completed and all defective work has been corrected. Unless the Engineer has issued a certificate of substantial completion, the general guarantee period shall begin upon certification by the Engineer of final completion.
- 25.3 At the end of the general guarantee period for the entire Contract which has been certified finally completed or substantially completed, the Owner, through the Engineer, shall make a guarantee inspection of all or portions of the work. When it is found that the work is satisfactory and that no work has become defective under the terms of the Contract, the Owner will accept the entire project and make final payment, including the reimbursement of monies retained pursuant to the guarantee period.
- 25.4 If the guarantee inspection discloses any work as being unsatisfactory, the Engineer will give the Contractor the necessary instructions for correction of such work, and the Contractor shall immediately execute such instructions. Upon correction of the work, another inspection will be made which shall constitute the guarantee inspection, provided the work has been satisfactorily completed.
- 25.5 Before issuance of final payment, the Contractor shall certify in writing to the Engineer that all payrolls, material bills, and other indebtedness connected with the work have been paid or otherwise satisfied; except that in case of disputed indebtedness or liens, if the Contract does not include a payment bond, the Contractor may submit in lieu of certification of payment a surety bond in the amount of the disputed indebtedness or liens, guaranteeing payment of all such disputed amounts, including all related costs and interest in connection with said disputed indebtedness or liens which the Owner may be compelled to pay upon adjudication.
- 25.6 If upon substantial completion, full completion is delayed through no fault of the Contractor, and the Engineer so certifies, the Owner may, upon certificate of the Engineer, and without termination of the Contract, make payment of the balance due for that portion of the work fully completed and accepted. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.
- 25.7 The acceptance by the Contractor of final payment shall release the Owner from all claims and all liability to the Contractor for all things relating to this work and for every act and neglect of the Owner and others relating to or arising out of this work. No payment, however, final or otherwise, shall operate to release the Contractor or his sureties from any obligations of the performance and payment bond under this Contract.

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26. Payments by Contractor. The Contractor shall pay the costs:

- 26.1 For all transportation and utility services not later than the 20th day of the calendar month following that in which services are rendered;
- 26.2 For all materials, tools, and other expendable equipment to the extent of 90 percent of the cost thereof, not later than the 20th day of the calendar month following that in which such materials, tools and equipment are delivered at the site of the work and the balance of the cost thereof not later than the 30th day following the completion of that part of the work in or on which such materials, tools and equipment are incorporated or used; and
- 26.3 To each of his Subcontractors, not later than the 5th day following each payment to the Contractor, the respective amounts allowed the Contractor on account of the work performed by his Subcontractors to the extent of each Subcontractor's interest therein.

27. Insurance. The Contractor and any Subcontractor shall obtain all the insurance required under this article and such insurance shall be approved by the Owner.

- 27.1 The Contractor and all Subcontractors shall procure and shall maintain during the life of this Contract workmen's compensation insurance as required by applicable state law. The Contractor shall provide and shall cause each Subcontractor to provide adequate employer's liability insurance.

Limits of Liability: \$100,000 each accident;
\$500,000 disease - policy limit;
\$100,000 disease - each employee.

- 27.2 The Contractor shall procure and shall maintain during the life of this Contract Commercial General liability insurance to include Contractual liability, explosion, collapse and underground coverages.

Limits of liability: \$1,000,000 each occurrence bodily injury and property damage;
\$2,000,000 general aggregate-include per project aggregate endorsement;
\$2,000,000 products/completed operations aggregate.

If blasting or demolition or both is required by the Contract, the Contractor or Subcontractor shall obtain the respective coverage and shall furnish the Engineer a certificate of insurance evidencing the required coverages prior to commencement of any operations involving blasting or demolition or both.

- 27.3 The Contractor shall procure and shall maintain during the life of this Contract comprehensive automobile liability insurance to include all motor vehicles including owned, hired, borrowed and non-owned vehicles. Limits of liability: \$1,000,000 combined single limit for bodily injury and property damage.

- 27.4 The Contractor shall either:

- a. Require each of his Subcontractors to procure and to maintain during the life of his subcontract commercial general liability insurance and comprehensive automobile liability insurance of the type and in the amounts specified in articles 27.2 and 27.3; or

- b. Insure the activities of his Subcontractors in his policy.

- 27.5 The required insurance shall provide adequate protection for the Contractor and his Subcontractors, respectively, against damage claims which may arise from work under this Contract, whether such work be by the insured or by anyone employed by him and also against any of the special hazards which may be encountered in the performance of this Contract.

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- 27.6 The Contractor shall furnish the Owner with certificates showing the type, amount, class of operations covered, effective dates and dates of expiration of policies. Such insurance shall not be canceled or materially altered, except after 10 days written notice has been received by the Owner.
- 27.7 For builder's risk insurance (fire and extended coverage) and until the work is completed and accepted by the Owner, the Contractor is required to maintain builder's risk type insurance on a 100 percent completed value basis on the insurable portion of the work for the benefit of the Owner, the Contractor, and Subcontractors as their interests may appear.
- 27.8 The Contractor shall take out and furnish to the Owner and maintain during the life of this Contract, complete Owner's protective liability insurance.
- Limits of Liability: \$1,000,000 each occurrence;
\$2,000,000 aggregate.
28. **Contract Security.** The Contractor shall within ten (10) days after the receipt of the Notice of Award furnish the Owner with a performance bond and a payment bond in penal sums equal to the amount of the Contract price conditioned upon the performance by the Contractor of all undertakings, covenants, terms, conditions and agreements of the Contract Documents, and upon the prompt payment by the Contractor to all persons supplying labor and materials in the prosecution of the Work provided by the Contract Documents. Such Bonds shall be executed by the Contractor and a corporate bonding company licensed to transact business in the state in which the Work is to be performed and named on the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Treasury Department Circular Number 570. The expense of these Bonds shall be borne by the Contractor.
29. **Additional or Substitute Bond.** If at any time a surety on any such Bond is declared as bankrupt or loses its right to do business in the state in which the Work is to be performed, or is removed from the list of Surety Companies accepted on Federal Bonds, the Contractor shall within ten (10) days after notice from the Owner to do so, substitute an acceptable bond (or bonds) in such form and sum and signed by such other surety or sureties as may be satisfactory to the Owner. The premiums on such bond shall be paid by the Contractor. No further payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished such an acceptable bond to the Owner.
30. **Assignments.** The Contractor shall not assign the whole or any part of this Contract or any monies due or to become due hereunder without written consent of the Owner. In case the Contractor assigns all or any part of any monies due or to become due under this Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any monies due or to become due to the Contractor shall be subject to prior claims of all persons, firms and corporations for services rendered or materials supplied for the performance of the work called for in this Contract.
31. **Mutual Responsibility of Contractors.** If, through acts of neglect on the part of the Contractor, any other Contractor or any Subcontractor shall suffer loss or damage on the work site, the Contractor agrees to settle with such other Contractor or Subcontractor by agreement or arbitration if such other Contractor or Subcontractors will so settle. If such other Contractor or Subcontractors shall assert any claim against the Owner on account of any damage alleged to have been sustained, the Owner shall notify the Contractor, who shall indemnify and save harmless the Owner against any such claim.

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32. Subcontracting. When subcontracting, the Contractor:

- 32.1 May utilize the services of specialty Subcontractors on those parts of the work which, under usual Contracting practices, are performed by specialty Subcontractors.
- 32.2 Shall be as fully responsible to the Owner for the acts and omissions of his Subcontractors, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.
- 32.3 Shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bind Subcontractors to the Contractor by the terms of the Contract Documents insofar as applicable to the work of Subcontractors and to give the Contractor the same power as regards terminating any subcontract that the Owner may exercise over the Contractor under any provision of the Contract Documents.
- 32.4 Shall not create any Contractual relation between any Subcontractor and the Owner.
- 32.5 Shall not award Work to Subcontractor(s), in excess of fifty percent (50%) of the Contract Price, without prior written approval of the Owner.

33. Authority of the Engineer. In performing his duties, the Engineer or his representative shall:

- 33.1 Have the authority to suspend the work in whole or in part for such periods as he may deem necessary due to the failure of the Contractor to carry out provisions of the Contract or for failure of the Contractor to suspend work in weather conditions considered by the Engineer to be unsuitable for the prosecution of the work. The Engineer shall give all orders and directions under this Contract, relative to the execution of the work. The Engineer shall determine the amount, quality, acceptability, and fitness of the several kinds of work and materials which are to be paid for under this Contract and shall decide all questions which may arise in relation to the work. The Engineer's estimates and decisions shall be final and conclusive, except as otherwise provided. In case any question shall arise between the parties hereto relative to said Contract or specifications, the determination or decision of the Engineer shall be a condition precedent to the right of the Contractor to receive any money or payment for work under this Contract affected to any extent by such question. The Engineer shall decide the meaning and intent of any portion of the specifications and of any plans or drawings where the same may be found unclear. Any differences or conflicts in regard to their work which may arise between the Contractor under this Contract and other Contractors performing work for the Owner shall be adjusted and determined by the Engineer.
 - a. The purpose of the above article is not in any way to relieve the Contractor of his responsibilities for the safety of workmen or general public in the execution of the work. Attention is drawn to Article 13 of these Conditions which refers to the safety obligations of the Contractor.
 - b. The Engineer, acting on behalf of the Owner, has the authority to enforce corrective action for work not in accordance with the specifications.
 - c. In addition, the Engineer, acting on behalf of the Owner, is to ensure that the work is in accordance with the Contract Documents. He is not held responsible, however, for the methods of construction, sequences, schedules and procedures in the execution of the work. The Engineer does have the opportunity under 33.1 to reject the method of construction, work plan schedule, procedures, as he thinks appropriate.
- 33.2 Appoint assistants and representatives as he desires, and they shall be granted full access to the work under the Contract. They have the authority to give directions pertaining to the work, to approve or reject materials, to suspend any work that is being improperly performed, to make measurements of quantities, to keep records of

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costs, and otherwise represent the Engineer in all matters except as provided below. The Contractor may, however, appeal from their decision to the Engineer himself, but any work done pending its resolution is at the Contractor's own risk. Except as permitted and instructed by the Engineer, the assistants and representatives are not authorized to revoke, alter, enlarge, relax, or release any requirements of these specifications, nor to issue instructions contrary to the plans and specifications. They are not authorized to act as superintendents or foremen for the Contractor, or to interfere with the management of the work by the Contractor. Any advice which the assistants or representatives of the Engineer may give the Contractor shall not be construed as binding the Engineer or the Owner in any way, nor as releasing the Contractor from the fulfillment of the terms of the Contract. All transactions between the Contractor and the representatives of the Engineer which are liable to protest or where payments are involved shall be made in writing.

- 34. Stated Allowances.** The Contractor shall include in his proposal for costs of materials not shown in his bid under "cash allowances" or "allowed materials," any cash allowances stated in the supplemental general conditions or other Contract Documents. The Contractor shall purchase the "allowed materials" as directed by the Owner on the basis of the lowest and best bid of at least 3 competitive bids. If the actual price for purchasing the "allowed materials" is more or less than the "cash allowance," the Contract price shall be adjusted accordingly. The adjustment in Contract price shall be made on the basis of the purchase price without additional charges for overhead, profit, insurance or any other incidental expenses. The cost of installation of the "allowed materials" shall be included in the applicable sections of the Contract specifications covering this work.
- 35. Use of Premises, Removal of Debris, Sanitary Conditions.** In the use of premises or removal of debris, the Contractor expressly undertakes at his own expense: to take every precaution against injuries to persons or damage to property; to maintain sanitary conditions; to store his apparatus, materials, supplies and equipment in such orderly fashion at the site of the work as will not interfere with the progress of his work or the work of any other Contractors; to place upon the work or any part thereof only such loads as are consistent with the safety of that portion of the work; to clean up frequently all refuse, rubbish, scrap materials and debris caused by his operations, to the end that at all times the site of the work shall present an orderly and workmanlike appearance; before final payment to remove all surplus material falsework, temporary structures, including foundations thereof, plant of any description and debris of every nature resulting from his operations, and to put the site in an orderly condition; to effect all cutting, fitting or patching of his work required to make the same conform to the plans and specifications and, except with the consent of the Engineer, not to cut or otherwise alter the work of any other Contractor; to provide and maintain in a sanitary condition such toilet accommodations for the use of his employees as may be necessary to comply with the requirements of the state and local boards of health, or of other bodies or authorities having jurisdiction.
- 36. Quantities of Estimate.** Wherever the estimated quantities of work to be done and materials to be furnished under this Contract are shown in any of the documents including the proposal, they are given for use in comparing bids and the right is specifically reserved except as herein otherwise specifically limited, to increase or decrease them as may be deemed reasonably necessary by the Owner to complete the work contemplated by this Contract, and such increase or decrease shall in no way invalidate this Contract, nor shall any such increase or decrease give cause for claims or liability for damages. Such increases or decreases shall not exceed 25 percent of the estimated quantities of work. An increase or decrease in quantities for subsurface materials (e.g. ledge, unsuitable backfill), which overrun or underrun by 25% or more of the bid quantity may be the basis for a Contract price adjustment, at the rate of a negotiated adjusted unit rate. Negotiated unit price rates shall be equitable and shall take into account, but not be limited to the following factors; bid unit rate, distribution of rates and bid balance, and the scope of work as affected by the changed quantities. Claims for extra work resulting from changed quantities shall be processed under article 21.

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- 37. Lands and Rights-of-Way.** Acquisition and usage of lands and rights-of-way shall be as follows:
- 37.1 Prior to issuing the Notice to Proceed, the Owner shall legally obtain all lands and rights-of-way necessary for carrying out and completing the work to be performed under this Contract.
 - 37.2 The Contractor shall not (except after written consent from the Owner) enter or occupy with men, tools, materials, or equipment, any land outside the rights-of-way or property of the Owner. A copy of the written consent shall be given to the Engineer.
 - 37.3 The Owner shall provide to the Contractor information which delineates and describes the lands owned and the rights-of-way acquired.
 - 37.4 The Contractor shall provide at its own expense and without liability to the Owner any additional land and access thereto that the Contractor may desire for temporary construction facilities, or for storage of materials.
- 38. General Guarantee.** With reference to warranties, neither the final certificate of payment nor any provision in the Contract Documents, nor partial or entire occupancy of the premises by the Owner, shall constitute an acceptance of work not done in accordance with the Contract Documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall remedy any defects in the work and pay for any damage to other work resulting therefrom, which appear within the warranty period one year or longer if required by the Contract, from the certified date of completion or substantial completion of the work. The Owner will give notice of observed defects within two working days of their discovery.
- 39. Errors and Inconsistencies.** With reference to errors and inconsistency in Contract Documents, any provisions in any of the Contract Documents which may be in conflict with the paragraphs in these general conditions shall be subject to the following order of precedence for interpretation:
- 39.1 Drawings will govern technical specifications.
 - 39.2 General conditions will govern drawings and technical specifications.
 - 39.3 Supplemental general conditions will govern general conditions, drawings and technical specifications.
 - 39.4 Special conditions will govern supplemental general conditions, general conditions, drawings and technical specifications.
 - 39.5 The Contractor shall take no advantage of any apparent error or omission in the plans or specifications. In the event the Contractor discovers such an error or omission, he shall notify the Engineer. The Engineer will then make such corrections and interpretations as may be deemed necessary for fulfilling the intent of the plans and specifications.
 - 39.6 Figure dimensions on Drawings shall govern over general drawings.
- 40. Notice and Service Thereof.** Any notice to the Contractor from the Owner relative to any part of this Contract will be in writing and will be considered delivered and the service completed, when said notice is mailed, by certified registered mail, to the Contractor at his last given address, or delivered in person to the Contractor or his authorized representative on the work.
- 41. Required Provisions Deemed Inserted.** Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted or is not correctly

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inserted (example; miswording, etc.), then upon the application of either party the Contract shall forthwith be physically amended to make such insertion or correction.

- 42. Protection of Lives and Health.** The work under this Contract is subject to the safety and health regulations (CRF 29, part 1926, and all subsequent amendments) as promulgated by the U.S. Department of Labor on June 24, 1974. Contractors are urged to become familiar with the requirements of these regulations.
- 43. OSHA Construction Safety Program.**
- 43.1 Pursuant to NHRSA 277:5-a, the Contractor shall provide an Occupational Health and Safety Administration (OSHA) 10-hour construction safety program for its on-site employees. All employees are required to complete the program prior to beginning work. The training program shall utilize an OSHA-approved curriculum. Graduates shall receive a card from OSHA certifying the successful completion of the training program.
- 43.2 Any employee required to complete the OSHA 10-hour construction safety program, and who cannot within 15 days provide documentation of completion of such program, shall be subject to removal from the job site.
- 43.3 The following individuals are exempt from the requirements of the 10-hour construction safety program: law enforcement officers involved with traffic control or jobsite security; flagging personnel who have completed the training required by the Department of Transportation; all relevant federal, state and municipal government employees and inspectors; and all individuals who are not considered to be on the site of work under the federal Davis-Bacon Act, including, but not limited to, construction and non-construction delivery personnel and non-trade personnel.
- 44. Equal Employment Opportunity.** Under equal employment opportunity requirements and during the performance of this Contract the Contractor agrees to the following:
- 44.1 The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, national origin, or sex. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, creed, color, national origin, or sex. 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.
- 44.2 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, creed, color, national origin, or sex.
- 44.3 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 labor union or worker's representative of the Contractor's commitment under section 202 of executive order no. 11246 of September 24, 1965, and 11375 of October, 13, 1967, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- 44.4 The Contractor will comply with all provisions of executive orders no. 11246 and 11375.
- 44.5 The Contractor will furnish all information and reports required by executive orders no. 11246 and 11375.

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- 44.6 In the event of the Contractor's noncompliance with the nondiscrimination clauses of this Contract or with any of such rules, regulations, or orders, this Contract may be canceled, terminated, or suspended in whole or in part by the Owner or the Department of Labor and the Contractor may be declared ineligible for further government Contracts or federally-assisted construction, however, that in the event the Contractor becomes involved in, or is threatened with, litigation with a Subcontractor or vendor as a result of such direction by the Department of Labor, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.
- 44.7 A breach of this article may be grounds for termination of this Contract and for debarment as provided in 29 CFR 5.6.
- 45. Interest of Federal, State or Local Officials.** No federal, state or local official shall be admitted to any share or part of this Contract or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this Contract if made with a corporation for its general benefit.
- 46. Other Prohibited Interests.** No official of the Owner who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept or approve, or to take part in negotiating, making, accepting, or approving any architectural, Engineering, inspection, construction or material supply Contract or any subcontract in connection with the construction of the project, shall become directly or indirectly interested personally in this Contract or in any part hereof. No officer, employee, architect, attorney, Engineer or inspector of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory or other similar functions in connection with the construction of the project, shall become directly or indirectly interested personally in this Contract or in any part thereof, any material supply Contract, subcontract, insurance Contract, or any other Contract pertaining to the project.
- 47. Use and Occupancy Prior to Acceptance.** Use and occupancy of a portion or unit of the project, upon completion of that portion or unit, and before substantial completion of the project, shall be a condition of this Contract with the following provisions:
- 47.1 The Owner will make his request for use or occupancy to the Contractor in writing.
- 47.2 There must be no significant interference with the Contractor's work or performance of duties under the Contract.
- 47.3 The Engineer, upon request of the Owner and agreement by the Contractor, will make an inspection of the complete part of the work to confirm its status of completion.
- 47.4 Consent of the surety and endorsement of the insurance carrier must be obtained prior to use and/or occupancy by the Owner. Also, prior to occupancy, the Owner will secure the required insurance coverage on the building.
- 47.5 The Owner will have the right to exclude the Contractor from the subject portion of the project after the date of occupancy but will allow the Contractor reasonable access to complete or correct items.
- 47.6 The warranty period shall begin upon substantial completion.
- 48. Suspension of Work.** The Owner may, at any time and without cause, suspend the work or any portion thereof for a period of not more than 90 days by notice in writing to the Contractor and the Engineer. The Owner shall fix the date on which work shall be resumed. The Contractor will be allowed an increase in the Contract price or an extension of the Contract time, or both, directly attributable to any suspension if he makes a claim therefore as provided in articles 17 and 21.

General Conditions

49. [Reserved]

50. [Reserved]

51. [Reserved]

52. **Project Sign.** Furnish and erect a sign at the project site to identify the project and to indicate that the State Government is participating in the development of the project. Place the sign in a prominent location as directed by the Engineer. Do not place or allow the placement of other advertising signboards at the project site or along rights-of-way furnished for the project work. See Exhibit 1 for details of construction.

53. [Reserved]

54. **Public Convenience and Traffic Control** requirements:

54.1 The Contractor shall at all times so conduct his work as to assure minimal obstruction to traffic. The safety and convenience of the general public and the residents along the work site route and the protection of property shall be provided for by the Contractor. The Contractor shall be responsible for timely notification to local residents before causing any interruptions of their access.

54.2 Fire hydrants and water holes for fire protection on or adjacent to the work site shall be kept accessible to fire apparatus at all times, and no obstructions shall be placed within 10 feet of any such facility. No footways, gutters, drain inlets, or portions of highways adjoining the work site shall be obstructed. In the event that all or part of a roadway is officially closed to traffic during construction, the Contractor shall provide and maintain safe and adequate traffic accessibility, satisfactory to the Engineer, for residences and businesses along and adjacent to the roadway so closed.

54.3 When the maintenance of traffic is considered by the Engineer to be minimal, the Contract may not show this work as a pay item. In such cases, the Contractor shall bear all expense of maintaining traffic over the sections of road undergoing improvement and of constructing and maintaining such approaches, crossings, intersections, and other features as may be necessary, without direct reimbursement.

55. **Pre-Construction Conference.** The Contractor shall not commence work until a pre-construction conference has been held at which representatives of the Contractor, Engineer, Division and Owner are present. The pre-construction conference shall be scheduled by the Engineer.

56. **Maintenance During Construction.**

56.1 The Contractor shall maintain the work during construction and until it is accepted by the Owner. This maintenance shall be continuous and effective work prosecuted day by day, with adequate equipment and forces, to the end that roads or structures are kept in satisfactory condition at all times.

56.2 All cost of maintenance during construction and before the work is accepted by the Owner shall be included in the unit prices bid on the various pay items and the Contractor shall not be paid an additional amount for such maintenance.

56.3 If the Contractor, at any time, fails to comply with the provisions above, the Engineer may direct the Contractor to do so. If the Contractor fails to remedy unsatisfactory maintenance within the time specified by the Engineer, the Engineer may immediately cause the project to be maintained and the entire cost of this maintenance will be deducted from money to become due the Contractor on this Contract.

General Conditions

57. Cooperation with Utilities.

- 57.1 The Owner will notify all utility companies, all pipe line owners, or other parties affected, and have all necessary adjustments of the public or private utility fixtures, pipe lines, and other appurtenances within or adjacent to the limits of construction made as soon as practicable.
- 57.2 Water lines, gas lines, wire lines, service connections, water and gas meter boxes, water and gas valve boxes, light standards, cableways, signals, and all other utility appurtenances within the limits of the proposed construction which are to be relocated or adjusted are to be moved by the owners of such utilities at their expense, except as may otherwise be provided for in the special conditions or as noted on the plans.
- 57.3 It is understood and agreed that the Contractor has considered in his bid all of the permanent and temporary utility appurtenances in their present or relocated positions as shown on the plans and as evident on the site, and that no additional compensation will be allowed for any delays, inconvenience, damage sustained by him due to any interference from such utility appurtenances or the operation of moving them.
- 57.4 The Contractor shall cooperate with the Owners of any underground or overhead utility lines in their removal and rearrangement operations in order that these operations may progress in a reasonable manner, that duplication of rearrangements may be reduced to a minimum, and that services rendered by those parties will be minimal.
- 57.5 In the event of interruption to a water or utility service as a result of accidental breakage or as a result of being exposed or unsupported, the Contractor shall promptly notify the proper authority and shall cooperate with said authority in the restoration of services. If water service is interrupted, repair work shall be continuous until the service is restored. No work shall be undertaken around fire hydrants until provisions for continued service have been approved by the local fire authority. If any utility service is interrupted for more than 4 hours, the Contractor shall make provisions for temporary service at his own expense until service is resumed.

58. Work Performed at Night and on Sundays and Holidays shall comply with the following:

- 58.1 No work will be permitted at night or on Sundays or holidays except as approved in writing by the Engineer, and provided such work is not in violation of a local ordinance. When working at night, the Contractor shall provide flood lighting sufficient to insure the same quality of workmanship and the same conditions regarding safety as would be achieved in daylight.
- 58.2 Whenever Memorial Day or Fourth-of-July is observed on a Friday or a Monday and during the weekend of Labor Day, the Contractor may be required to suspend work for the 3 calendar days. Prior to the close of work, the work site shall be placed in a condition acceptable to the Engineer for the comfort and safety of the traveling public. An arrangement shall be made for responsible personnel acceptable to the Engineer to maintain the project in the above conditions.

59. Laws to be Observed. With reference to laws that shall be observed:

- 59.1 The Contractor shall keep fully informed of all federal and state laws, all local laws, ordinances, and regulations, and all orders and decrees of tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the work. He shall at all times observe and comply with all such laws, ordinances, regulations, orders, and decrees; and shall protect and indemnify the state and its representatives against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by himself or his employees.

General Conditions

59.2 Indemnification

The Contractor will indemnify and hold harmless the Owner and the Engineer and their agents and employees from and against all claims, damages, losses, and expenses including attorney's fees arising out of or resulting from the performance of the Work, provided that any such claims, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property including the loss of use resulting therefrom; and is caused in whole or in part by any negligent or willful act or omission of the Contractor, and Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable.

In any and all claims against the Owner or the Engineer, or any of their agents or employees, by any employees of the Contractor, and Subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by disability benefit or other employee benefit acts.

The obligation of the Contractor under this paragraph shall not extend to the liability of the Engineer, his agents or employees arising out of the preparation or approval of maps, Drawings, opinions, reports, surveys, Change Orders, designs or Specifications.

60. Permits. Permits to be obtained by the Contractor shall be in accordance with the following:

- 60.1 Permits and licenses of a temporary nature necessary for the prosecution of the work shall be obtained and paid for by the Contractor. Permits, licenses and easements for permanent structures or permanent changes in existing facilities will be secured and paid for by the Owner. Permits may include:
- a. New Hampshire Department of Transportation Highway Trench Permits.
 - b. RSA 485-A:17 and 483-A N.H. DES Wetlands Bureau Dredge and Fill Permit.
 - c. RSA 485-A:17 - N.H. DES Site Specific Permit (Water Quality)
 - d. RSA 149-M:10 N.H. DES Solid Waste Management Bureau - disposal of construction debris and/or demolition waste.
 - e. N.H. Department of Environmental Services Air Resources Division (burning permits).
 - f. Other permits, as required by State and Local laws and ordinances.
 - g. Notice of intent for coverage under EPA's General NPDES Permit for construction dewatering activities.

61. Control of Pollution due to construction shall comply with the following:

- 61.1 During construction, the Contractor shall take precautions sufficient to avoid the leaching or runoff of polluting substances such as silt, clay, fuels, oils, bitumens, calcium chloride and any other polluting materials which are unsightly or which may be harmful to humans, fish, or other life, into groundwaters and surface waters of the State.
- 61.2 In waters used for public water supply or used for trout, salmon, or other game or forage fish spawning or nursery, control measures must be adequate to assure that turbidity in the receiving water will be increased not more than 10 standard turbidity units (s.t.u.) in the absence of other more restrictive locally-established limitations, unless otherwise permitted by the Division. In no case shall the classification for the surface water be violated.

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61.3 In water used for other purposes, the turbidity must not exceed 25 s.t.u. unless otherwise permitted by the Division.

62. Use of Explosives.

- 62.1 When the use of explosives is necessary for the prosecution of the Work, exercise the utmost care not to endanger life or property. The Contractor shall be responsible for any and all damage resulting from the use of explosives.
- 62.2 Store all explosives in a secure manner, in compliance with all State and local laws and ordinances, and legally mark all such storage places. Storage shall be limited to such quantity as may be needed for the work underway.
- 62.3 Designate as a "Blasting Area" all sites where electric blasting caps are located and where explosive charges are being placed. Mark all blasting areas with signs as required by law. Place signs as required by law from each end of the blasting area and leave in place while the above conditions prevail. Immediately remove signs after blasting operations or the storage of caps is over.
- 62.4 Notify each property Owner and public utility company having structures in proximity to the site of the work sufficiently in advance to enable the companies to take such steps as they may deem necessary to protect their property. Such notice shall not relieve the Contractor of any of his responsibility for damage resulting from his blasting operation. Warn all persons within the danger zone of blasting operations and do not perform blasting work until the area is cleared. Provide sufficient flagmen outside the danger zone to stop all approaching traffic and pedestrians. Provide watchmen during the loading period and until charges have been exploded. Place adequate protective covering over all charges before being exploded.

63. Arbitration by Mutual Agreement.

- 63.1 All claims, disputes, and other matters in question arising out of, or relating to, the Contract Documents or the breach thereof, except for claims which have been waived by making an acceptance of final payment as provided in Section 25, may be decided by arbitration if the parties mutually agree. Any agreement to arbitrate shall be specifically enforceable under the prevailing arbitration law. The award rendered by the arbitrators shall be final, and judgment may be entered upon it in any court having jurisdiction thereof.
- 63.2 Notice of the request for arbitration shall be filed in writing with the other party to the Contract Documents and a copy shall be filed with the Engineer. Request for arbitration shall in no event be made on any claim, dispute, or other matter in question which would be barred by the applicable statute of limitations.
- 63.3 The Contractor will carry on the Work and maintain the progress schedule during any arbitration proceedings, unless otherwise mutually agreed in writing.

64. Taxes. The Contractor shall pay all sales, consumer, use, and other similar taxes required by the laws of the place where the Work is performed.

65 Separate Contracts.

65.1 The Owner reserves the right to let other Contracts in connection with this Project. The Contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their materials and the execution of their Work, and shall properly connect and coordinate the Work with theirs. If the proper execution or results of any part of the Contractor's Work depends upon the Work of any other Contractor, the Contractor shall inspect

General Conditions

and promptly report to the Engineer any defects in such Work that render it unsuitable for such proper execution and results.

- 65.2 The Owner may perform additional Work related to the Project or the Owner may let other Contracts containing provisions similar to these. The Contractor will afford the other Contractors who are parties to such Contracts (or the Owner, if the Owner is performing the additional Work) reasonable opportunity for the introduction and storage of materials and equipment and the execution of the Work, and shall properly connect and coordinate the Work with theirs.
- 65.3 If the performance of the additional Work by other Contractors or the Owner is not noted in the Contract Documents prior to the execution of the Contract, written notice shall thereof be given to the Contractor prior to starting such additional Work. If the Contractor believes that the performance of such additional Work by the Owner or others involves it in additional expense or entitles it to an extension of the Contract Time, the Contractor may make a claim thereof as provided in Sections 17 and 18.

General Conditions

EXHIBIT 1

Project Sign Detail

[Insert project sign detail here - Contact NHDES for appropriate detail]



WATER INFRASTRUCTURE SIGN GUIDANCE

For Drinking Water State Revolving Fund Projects



The following guidance is designed for projects with funding from the New Hampshire Drinking Water State Revolving Fund (DWSRF).

The Environmental Protection Agency requires that projects funded through federal programs such as the Drinking Water State Revolving Loan Fund (DWSRF) are required to display signage at construction sites to increase transparency and make the effectiveness of SRF funding visible to the public.

Projects accessing multiple funding sources will design a sign that satisfies all funder's particular signage requirements. Template signs are available to download from the [NHDES DWSRF webpage](#) for DWSRF projects co-funded with other water infrastructure programs administered by NHDES.

Sign Requirements

A [Template DWSRF Sign](#) is located at the end of this document.

Email DWSRF@des.nh.gov to request zip files of PSD sign templates, logos, and specific fonts.

Sign design must be approved by NHDES before being implemented.

Signage displayed on construction sites should be displayed throughout the construction phase of the project in an easily visible location that can be directly linked to the work taking place and be maintained in good condition throughout the construction period.

Costs associated with signage must be reasonable and limited.

Dimensions

96-inches long by 48-inches tall.

Sign Material

0.75-inch high-density overlay plywood signboard or other approved material suitable for signs.

Provide 4-inch by 4-inch signposts or other adequate supports to mount the sign at the project site.

Miter edge at all corners.

Logos

Funding program logos and color codes are available in the [Logos and Color](#) section of this document.

Logos are for funding sources only. Contractor logos are not permitted on the signage.

Logos should be aligned along the top length of the sign. The NHDES logo should be in the top left corner. The Environmental Protection Agency's (EPA) logo should be in the top right corner. If additional logos of other funding sources need to be added to the sign, EPA's logo should be listed second in order from left to right after NHDES's logo. The EPA logo must not be displayed in a manner that implies that EPA itself is conducting the project. Instead, the EPA logo must be accompanied by a statement indicating that the recipient received financial assistance from EPA for the project.

Required Content

Drinking Water SRF (DWSRF) projects should use the phrasing "Water Supply Improvement" in a yellow banner centered prominently at the top of the construction sign underneath the logos. The banner should be yellow with blue text and blue edging.

List the identifying project numbers assigned by each funding source separated by a vertical bar |. Project numbers should be located under the yellow water supply improvement banner in a smaller font. Numbers should be listed in the same order that funding sources appear in.

The name of the project should be prominently centered in a large font.

Name the public water supplier.

Name the community, town, city, or district that the project is located in.

List the sources of funding financing this project. Use the name “NHDES Drinking Water State Revolving Fund” to reference the DWSRF.

Funding program-specific requirements

American Rescue Plan Act (ARPA)

Use the program name “American Rescue Plan Act of 2021” if used as a funding source.

No required logo.

Bipartisan Infrastructure Law (BIL)

Consult the [Water Infrastructure Construction Sign Guidance for DWSRF in Combination with the Bipartisan Infrastructure Law](#) (BIL) for how to integrate BIL’s specific signage requirements.

Clean Water State Revolving Fund (CWSRF)

Expand the yellow banner to fit the phrase “Water Supply and Pollution Control Project.”

Use the name “State Revolving Fund” to refer to both the Clean Water and Drinking Water SRF programs as funding sources.

Drinking Water and Groundwater Trust Fund (DWGTF)

List the Drinking Water and Groundwater Trust Fund if used as a funding source.

Include the DWGTF logo.

PFAS Remediation Grant and Loan Fund (PFAS RLF)

List the PFAS Remediation Grant and Loan Fund if used as a funding source.

No required logo.

Water Infrastructure Improvement for the Nation (WIIN)

List the Water Infrastructure Improvement for the Nation if used as a funding source.

No required logo.

Posters, Flyers, and other Publications

Projects may design and distribute posters, flyers, and other communications to educate the public where large signage isn't practical or would not reach a wide audience of community members.

All publications must contain all content outlined in the [Logos](#) and [Required Content](#) sections as well as a brief description of the project and of the water quality benefits the project will achieve.

All publication formats must be approved by NHDES before use.

Posters and Brochures

see [Template DWSRF Poster](#)

Posters or brochures must be placed in a public location that is accessible to a wide audience of community members.

Given the low cost of printing multiple copies, projects can explore options for displaying these publications in several visible locations simultaneously to achieve the overall objective of reaching a broad audience.

Newsletter, Periodical, or Press Release

When there is no suitable public space or where advertisement through signage is unlikely to reach community members effectively, projects can advertise in a community newsletter or similar periodical.

If projects decide on a public or media event to publicize the accomplishment of significant events related to construction, EPA must be provided with at least 10 working days' notice of the event and provided the opportunity to attend or participate in the event.

Online and Social Media

Online publications may appear on the community or facility website, if available.



Online notices to social media platforms such as Facebook or Twitter may be appropriate for sites where physical signage would not be visible to a wide audience or where the community's website is a well-recognized source of information for residents.

Logos and Color

Below are the color codes of all logos used by all water infrastructure funding programs available through NHDES.




Drinking Water State Revolving Fund Banner



	Color	CMYK	RGB	HEX
	Yellow	0, 0, 75, 0	255 / 255 / 65	#FFFF41
	Blue	83, 48, 0, 48	22 / 68 / 132	#164484



Environmental Protection Agency



	Color	CMYK	RGB	HEX
	Blue	78, 40, 0, 0	55 / 153 / 255	#3799FF
	Blue, text and water	100, 56, 0, 29	0 / 80 / 180	#0050B4
	Green	100, 0, 78, 20	0 / 204 / 44	#00CC2C




NH Department of Environmental Services



	Color	CMYK	RGB	HEX
	Blue	67, 67, 0, 40	51 / 51 / 153	#333399
	Green	50, 0, 50, 60	51 / 102 / 51	#336633

NH Drinking Water and Groundwater Trust Fund



	Color	CMYK	RGB	HEX
	Light blue	60, 31, 0, 22	80 / 138 / 200	#508AC8
	Blue	76, 61, 0, 41	36 / 59 / 151	#243B97
	Dark blue	66, 55, 0, 60	35 / 46 / 102	#232E66

Template DWSRF Sign



WATER SUPPLY IMPROVEMENT

Project Number

Project Name

Public Water Supplier
Town/City, NH

Funds Provided by
the Drinking Water State Revolving Loan Fund

Template DWSRF Poster



WATER SUPPLY IMPROVEMENT

Project Number

Project Name

Public Water Supplier
Town/City, NH

Loan Amount \$

Funds Provided by

The Drinking Water State Revolving Fund, **[list additional funding sources if applicable]**.

Construction of upgrades and improvements to the **[name of facility]**, in **[project location]** were financed by the Drinking Water State Revolving Fund (DWSRF), **[list additional funders if applicable]**.

This project will **[insert a description of the project]**, and will provide water quality benefits **[insert details of particular benefits]** for community residents and businesses in or near the **[name of town/city]**.

The DWSRF program is administered by the NH Department of Environmental Services with joint funding from the Environmental Protection Agency. DWSRF programs operate around the country to provide states and communities with the resources necessary to maintain and improve the infrastructure that protects our valuable water resources nation-wide.



WATER SUPPLY IMPROVEMENT

DWSRF Project Number | DWGTF Project Number

Project Name

Public Water Supplier

Town/City, NH

Funds Provided by

the Drinking Water State Revolving Loan Fund
and the Drinking Water and Groundwater Trust Fund

This project also is funded by ARPA, so that will need to be added to the template to read “**Funds Provided by** the Drinking Water State Revolving Loan Fund, the Drinking Water and Groundwater Trust Fund and the American Rescue Plan Act of 2021.”

NHDES Front End Documents Section D: Federal Provisions Rules Regulations and Forms

Section D: Federal Provisions Rules Regulations and Forms

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Links to Other NHDES Front End Documents

[NHDES Front End Documents: Section A Bidding Requirements](#)

[NHDES Front End Documents: Section B Contract](#)

[NHDES Front End Documents: Section C General Conditions](#)

Pertinent Federal Acts and Provisions

The Contractor shall comply with the regulations of the Davis-Bacon Act, the Contract Work Hours Standards Act, Executive Order 11246 (Federal Equal Employment Opportunity), and Title X of the Clean Air Act Amendments of 1990 (Disadvantage Business Enterprise), and any amendments or modifications thereto. The Contractor shall cause appropriate provisions to be inserted in subcontracts to ensure compliance with the above acts by all Subcontractors, as applicable.

The Contractor shall comply with the American Iron and Steel requirements of the Water Resources Reform and Development Act of 2014, the Consolidated Appropriations Act of 2014 (Public Law 113-76), and subsequent laws that continue the requirement for the use of American Iron and Steel products in State Revolving Fund construction projects.

The Contractor shall comply with Subpart B and Subpart C of 2 CFR Part 180 and 2 CFR Part 1532. By entering into this contract, the contractor certifies that neither the contractor's firm, nor any person or firm who has an interest in the contractor firm, is a debarred or suspended person or firm. Furthermore, by entering into this contract, the contractor certifies that no part of this contract will be subcontracted to a debarred or suspended person or firm. Contractors may access the federal government's Excluded Parties List System for verification of excluded parties at the following website: <http://www.sam.gov>.

The Contractor shall comply with prohibition on certain telecommunications and video surveillance services or equipment. This term and condition implements 2 CFR 200.216 and is effective for obligations and expenditures of EPA financial assistance funding on or after 8/13/2020. As required by 2 CFR 200.216, EPA recipients and subrecipients, including borrowers under EPA funded revolving loan fund programs, are prohibited from obligating or expending loan or grant funds to procure or obtain; extend or renew a contract to procure or obtain; or enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Public Law 115-232, section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities). Recipients, subrecipients, and borrowers also may not use EPA funds to purchase:

- a. For the purpose of public safety, security of government facilities, physical security surveillance of critical Page 4 of 29 infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).
- b. Telecommunications or video surveillance services provided by such entities or using such equipment.
- c. Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

Consistent with 2 CFR 200.471, costs incurred for telecommunications and video surveillance services or equipment such as phones, internet, video surveillance, and cloud servers are allowable except for the following circumstances:

- a. Obligating or expending EPA funds for covered telecommunications and video surveillance services or equipment or services as described in 2 CFR 200.216 to:
 - (1) Procure or obtain, extend or renew a contract to procure or obtain;
 - (2) Enter into a contract (or extend or renew a contract) to procure; or
 - (3) Obtain the equipment, services, or systems. Certain prohibited equipment, systems, or services, including equipment, systems, or services produced or provided by entities identified in section 889, are recorded in the [System for Award Management](#) exclusion list.

Links for more Information

- [U.S.DOL Prevailing Wage Resources](#)
- [General Wage Determinations](#)
- [U.S. DOL Certified Payroll Form WH-347](#)
- [WH-1321 “Employee Rights Under the Davis-Bacon Act” poster](#)
- [EPA’s DBE Resources](#)
- [NHDOT Certified Disadvantaged Business Enterprise \(DBE\) Directory](#)
- [EPA American Iron and Steel \(AIS\) Requirement - Guidance and Questions and Answers website](#)
- [AIS Approved National Waivers](#)
- [Sole Source Aquifers \(SDWA\)](#)
- [Protection and Enhancement of the Cultural Environment \(1971\)](#)
- [Fish and Wildlife Coordination Act](#)
- [Migratory Bird Treaty Act of 1918](#)
- [Systems for Award Management exclusion list](#)

**CONTRACTOR’S PAYROLL CERTIFICATION
AND
AMERICAN IRON AND STEEL CERTIFICATION**

PUBLIC LAW: 113-76

This form will be submitted with each disbursement request.

Project Name:		Project Number:	
Project Location:			
Contractor Name:			
Contractor Address:			
Street # and name		City/Town	State ZIP
Payment Application #		Payment Application 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 the Water Resources Reform and Development Act of 2014, the Consolidated Appropriations Act of 2014 ([Public Law 113-76](#)), and subsequent laws that continue the requirement for the use of American Iron and Steel products in State Revolving Fund construction projects 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 Signature:	Printed Name:
Title:	Date:

**NOTICE TO LABOR UNIONS OR OTHER ORGANIZATIONS OF WORKERS
NONDISCRIMINATION IN EMPLOYMENT**

PUBLIC LAW: 41 CFR Part 60-1.4(b)-3.1

THIS DOCUMENT MUST BE COMPLETED BY THE SUCCESSFUL BIDDER AND BOUND IN THE EXECUTED CONTRACT

The Contractor, and his subcontractors if applicable, shall 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. To

_____ (Union or Organization). The undersigned currently holds contract(s) with _____ (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.

<input type="checkbox"/> Contractor		<input type="checkbox"/> Subcontractor	
Signature:		Printed Name:	
Title:		Date:	

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

EQUAL EMPLOYMENT OPPORTUNITY REQUIREMENTS (EO11246)

(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 action 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
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).

CERTIFICATION OF NONSEGREGATED FACILITIES

Public Law: 41 CFR 60 (a) §60-1.8

APPLICABLE TO FEDERALLY ASSISTED CONSTRUCTION CONTRACTS AND RELATED SUBCONTRACTS EXCEEDING \$10,000 WHICH ARE NOT EXEMPT FROM THE EQUAL OPPORTUNITY CLAUSE.

THIS DOCUMENT MUST BE COMPLETED BY THE SUCCESSFUL BIDDER AND BOUND IN THE EXECUTED CONTRACT.

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 that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, sexual orientation, gender identity, or national origin cannot result.

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, color, religion, sex, sexual orientation, gender identity 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

<input type="checkbox"/> Contractor	<input type="checkbox"/> Subcontractor
Signature:	Printed Name:
Title:	Date:

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

Disadvantaged Business Enterprises 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. Good Faith Efforts.
2. Annual Reporting of MBE/WBE accomplishments (for projects that exceed \$250,000).
3. Contract Administration Requirements.
4. Bidders List Requirements.
5. 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. 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.
- f. 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.

2. 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 \$250,000. Contact NHDES for guidance if you think this reporting requirement may not apply to your project}

3. 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)

4. 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 NHDES W-09-58(formally EPA Form 6100-3), and DBE Subcontractor Utilization Form NHDES W-09-59(formally EPA Form 6100-4). The Owner is required to submit these forms to NHDES when requesting authorization to award the construction contract.
- b. DBE Subcontractor Participation form
The contractor shall provide a copy of the DBE Subcontractor Participation Form NHDES-W-09-57 (formally EPA Form 6100-2) to each of its DBE subcontractors.
- c. Bidders List Reporting
The Contractor shall provide the updated Bidders List to the Owner periodically upon Owner's request, and at project substantial completion.



**DISADVANTAGED BUSINESS ENTERPRISE
(DBE) PROGRAM
SUBCONTRACTOR PARTICIPATING FORM
CLEAN WATER AND DRINKING WATER
STATE REVOLVING LOAN FUND**



FEDERAL RULE: 40 CFR Part 33

FORMERLY EPA-6100-2

An EPA Financial Assistance Agreement Recipient must require its prime contractors to provide this form to its DBE subcontractors. This form gives a DBE¹ subcontractor² 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 other EPA DBE Coordinator at any time during the project period of performance.

Subcontractor Name:		Project Name:	
Bid/Proposal No:	Assistance Agreement ID: (if known)	Point of Contact:	
Address:			
Street # and Name		City/Town	State ZIP
Telephone No:		Email:	
Prime Contractor Name:		Issuing Funding Entity:	
Contract Item Number	Description of Work Receive from the Prime Contractor Involving Construction, Services, Equipment or Supplies	Amount Received by Prime Contractor	
Please use the space below to report any concerns regarding the above EPA-funded project:			
Subcontractor Signature:		Printed Name:	
Title:		Date:	

¹ A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from with EPA accepts certifications as described in 40CFR 33.204-33.205. 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.



**DISADVANTAGED BUSINESS ENTERPRISE
(DBE) PROGRAM
SUBCONTRACTOR PERFORMANCE FORM**
NHDES CLEAN WATER AND DRINKING WATER STATE
REVOLVING LOAN FUND



FEDERAL RULE: 40 CFR Part 33

FORMERLY EPA FORM 6100-3

This form is intended to capture the DBE³ subcontractor's⁴ 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 contractor's bid or proposal package. You will find NHDES bid information in [Section A](#) of the front-end documents.

Subcontractor Name:		Project Name:	
Bid/Proposal No:	Assistance Agreement ID: (if known)	Point of Contact:	
Address:			
Street # and Name		City/Town	State ZIP
Telephone No:		Email:	
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: <input type="checkbox"/> DOT <input type="checkbox"/> SBA <input type="checkbox"/> Other:		Meets/exceeds EPA Certification Standards? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown	
Prime Contractor Signature:		Printed Name:	
Title:		Date:	
Subcontractor Signature:		Printed Name:	
Title:		Date:	

³ A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from with EPA accepts certifications as described in 40CFR 33.204-33.205. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

⁴ 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.

DISADVANTAGED BUSINESS ENTERPRISE (DBE) PROGRAM SUBCONTRACTOR UTILIZATION FORM



CLEAN WATER AND DRINKING WATER
STATE REVOLVING LOAN FUND



FEDERAL RULE: 40 CFR Part 33

FORMERLY EPA FORM 6100-4

This form is intended to capture the prime contractor's actual and/or anticipated use of identified certified DBE subcontractors 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 proposed package. Prime contractors should also maintain a copy of this form on file. You will find NHDES bid information in [Section A](#) of the front-end documents.

THIS DOCUMENT MUST BE COMPLETED BY THE SUCCESSFUL BIDDER AND BOUND IN THE EXECUTED CONTRACT

Prime Contractor Name:		Project Name:	
Bid/Proposal No:	Assistance Agreement ID: (if known)	Point of Contact:	
Address:			
Street # and Name	City/Town	State	ZIP
Telephone No:		Email:	
Issuing Funding Entity:			
I have identified potential DBE certified subcontractors:		<input type="checkbox"/> Yes	<input type="checkbox"/> No
If yes please complete the table below. If no, please explain:			
Subcontractor Name Company Name	Company Contact Information Street Number and Name, City/Town, State, ZIP Phone and Email	Est. Dollar Amount	Currently DBE Certified?
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to use the subcontractors above. I am aware 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:		Printed Name:	
Title:		Date:	



NEW HAMPSHIRE STATE REVOLVING FUND: BIDDERS LIST

NHDES CLEAN WATER AND DRINKING WATER
STATE REVOLVING LOAN FUND



PUBLIC LAW: 40 CFR § 33.501

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)].

Project Name and Number:			Prime Contractor:		
Contact Information to include Company Name, Contact Name, Phone, Street Address, Town/City, Email, State/ZIP	Contract Item Number	Contract Item Description	Bid/Quote Date	Entity Status MBEs/WBEs	
			/ /	<input type="checkbox"/> Yes <input type="checkbox"/> No	
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			/ /	<input type="checkbox"/> Yes <input type="checkbox"/> No	
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American Iron and Steel

The Water Resources Reform and Development Act of 2014, the Consolidated Appropriations Act of 2014 ([Public Law 113-76](#)), and subsequent laws that continue the American Iron and Steel requirements of Public Law 113-76 include “American Iron and Steel (AIS)” requirements for the Clean Water and Drinking Water State Revolving Fund (SRF) programs. Under these laws, 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. The Contractor shall comply with these AIS requirements.

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 paragraphs in *italics* below are excerpts from the EPA AIS guidance available at the EPA website. Words in plain text are clarifications added by NHDES.

(a) Iron and Steel Products [5]

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 Project⁶

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 Steel⁷

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.⁸

⁵ EPA guidance dated March 20, 2014, Question 11.

⁶ EPA guidance dated March 20, 2014, Question 18.

⁷ EPA guidance dated March 20, 2014, Question 12.

⁸ See example at EPA guidance March 20, 2014, Question 13.

(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?⁹

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) Steel¹⁰

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 States¹¹

Production in the United States of the iron or steel products used in the project requires that all manufacturing processes¹², 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.*

*** External Coatings Applied Outside of the United States¹³**

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 Castings¹⁴

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;*

⁹ EPA guidance dated March 20, 2014, Question 14.

¹⁰ EPA guidance dated March 20, 2014, Question 15.

¹¹ EPA guidance dated March 20, 2014, Question 16.

¹² **Assembly and all other steps in the manufacturing process** must take place in the US, except metallurgical processes involving refinement of steel additives in accordance with the EPA guidance dated March 20, 2014, Question 23]. There is also an additional exception for application of exterior coating.

¹³ EPA guidance dated March 16, 2015, Q/A No. 6.

¹⁴ EPA guidance dated March 20, 2014, Question 19.

- Construction Covers and Frames;
 - Curb and Corner Guards;
 - Inlets;
 - Junction Boxes;
 - Steel Hinged Hatches, Square and Rectangular;
- (g) Municipal Castings (Cont.)**
- Curb Openings;
 - Detectable Warning Plates;
 - Downspout Shoes (Boot, Inlet);
 - Drainage Grates, Frames and Curb Inlets;
 - Lampposts;
 - Manhole Covers, Rings and Frames, Risers;
 - Meter Boxes;
 - Service Boxes;
 - Steel Riser Rings;
 - Trash receptacles;
 - Tree Grates;
 - Tree Guards;
 - Trench Grates; and
 - Valve Boxes, Covers and Risers.

(h) Structural Steel¹⁵

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 Materials¹⁶

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 Guidance¹⁷)

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 Materials¹⁸

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.

¹⁵ EPA guidance dated March 20, 2014, Question 20.

¹⁶ EPA guidance dated March 20, 2014, Question 21.

¹⁷ EPA guidance dated September 10, 2014, Q/A No. 10.

¹⁸ EPA guidance dated March 20, 2014, Question 22.

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.*

** If products come from one manufacturer and are shipped together as a system, then this is generally considered a “packaged system” and those items used to connect the system are appurtenances. However, if the borrower or contractor must purchase items to connect the system (valves, piping, etc.) separately from another manufacturer, then these items would need to be domestic, or otherwise obtain a waiver.¹⁹*

***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.²⁰*

****“Meters” includes any type of meter, including: flow meters, wholesale meters, and water meters/service connections.²¹*

(l) Assembled Products²²

AIS requirements only apply to the final product as delivered to the work site and incorporated into the project. 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. If a listed iron and steel product is used as a part for an assembled product that is nondomestic, the components, even if specifically listed in the Act, do not have to be domestically produced.

(m) Sluice and Slide Gates are not Valves, and are not Subject to AIS²³

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 AIS²⁴

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 Concrete²⁵

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

¹⁹ EPA AIS Refresher Webinar, December 15, 2016.

²⁰ EPA guidance dated September 10, 2014, Q/A No. 19 on aerators.

²¹ EPA guidance dated September 10, 2014, Q/A No. 14 on meters.

²² EPA guidance dated September 10, 2014, Q/A No. 11, AIS Refresher Webinar, December 15, 2016.

²³ EPA guidance dated September 10, 2014, Q/A No. 20.

²⁴ EPA guidance dated May, 30, 2014, Q/A No. 4.

²⁵ EPA guidance dated March 20, 2014, Question 24.

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 Pipe²⁶

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 Actuators²⁷

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 Valves²⁸

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 Systems²⁹

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 Pipe³⁰

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 Connectors³¹

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,

²⁶ EPA guidance dated September 10, 2014, Q/A No. 2.

²⁷ EPA Q/A guidance dated May 30, 2014, Q/A No. 2.

²⁸ EPA guidance dated May 30, 2014, Q/A No. 3

²⁹ EPA guidance dated September 10, 2014, Q/A No. 4

³⁰ EPA guidance dated September 10, 2014, Q/A No. 5

³¹ EPA guidance dated September 10, 2014, Q/A No. 6

The Drinking Water Dictionary, 2000). Therefore, these products must comply with the AIS requirements and be produced domestically.

(v) Saddles and tapping Sleeves³²

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)³³

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:

- Manufacturer name;
- SRF construction project name and location;
- A list of specific product(s) delivered to the project site;
- 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 foundry/mill/factory where the product was manufactured (City and State); 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 in this guidance.](#)

3. 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.

4. De Minimis Waiver

EPA’s April 15, 2014 [Nationwide Waiver](#) for De Minimis incidental AIS components is part of this guidance, 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-**

³² EPA guidance dated September 10, 2014, Q/A No. 7

³³ EPA guidance dated September 10, 2014, Q/A No. 8

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 Waiver³⁴ []

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 as common nails or brads). You can find further information on the [EPA Website](#).

³⁴ EPA guidance dated September 10, 2014, Q/A No. 1

American Iron and Steel Manufacturer Example Certification

Date

Manufacturer Name
Manufacturer Street Address
City, State ZIP

RE: Project Name, Project Location

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, Product and/or Materials

Item, Product and/or Materials

Item, Product and/or Materials

Item, Product and/or Materials

Item, Product and/or Materials

Manufacturing of the above items, products and/or materials 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).

Manufacturer's Signature

Note: The signature must be by manufacturer's authorized responsible party, not the material distributor or supplier.

Manufacturer Certification Checklist

- ✓ Manufacturer name;
- ✓ SRF construction project name and location;
- ✓ A list of specific product(s) delivered to the project site;
- ✓ 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 foundry/mill/factory where the product was manufactured (City and State); and
- ✓ A signature by a manufacturer's responsible party.

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” (the Water Resources Reform and Development Act of 2014, the Consolidated Appropriations Act of 2014 ([Public Law 113-76](#)), and subsequent laws that continue the requirement for the use of American Iron and Steel products in State Revolving Fund construction projects); 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.”



BIDDERS AMERICAN IRON AND STEEL
ACKNOWLEDGEMENT
NHDES CLEAN WATER AND DRINKING WATER
STATE REVOLVING FUND



Public Law 113-76

Instructions: This acknowledgement form must be completed and signed by the bidder's authorized representative, and conveyed to owner with bid submittal. You will find NHDES bid information in Section A of the front-end documents.

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)" requirements of the Water Resources Reform and Development Act of 2014, the Consolidated Appropriations Act of 2014 (Public Law 113-76), and subsequent laws that continue the requirement for the use of American Iron and Steel products in State Revolving Fund construction projects , and these laws require that 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" (the Water Resources Reform and Development Act of 2014, the Consolidated Appropriations Act of 2014 (Public Law 113-76), and subsequent laws that continue the requirement for the use of American Iron and Steel products in State Revolving Fund construction projects); 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

Printed Name



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.

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:

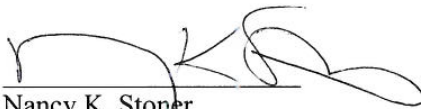
- What percentage of total project costs were consumables or incidental costs?
- What percentage of materials costs were consumables or incidental costs?
- Did these percentages vary by type of project (drinking water vs. wastewater treatment plant vs. pipe)?

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.

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 DE MINIMIS TRACKING REPORT

NHDES CLEAN WATER AND DRINKING WATER STATE REVOLVING FUND

(To be submitted with each application for payment.)



Public Law 113-76 Consolidated Appropriations Act

De Minimis Waiver Section 436

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 #:				
Has the contractor purchased or used AIS materials that will be covered under this waiver?						
<input type="checkbox"/> Yes. Please continue to the next section. <input type="checkbox"/> No. Please simply sign below.						
Total cost of materials incorporated into the project.		De Minimis 5% Limit		De Minimis 1% Limit		
<input type="checkbox"/> Yes <input type="checkbox"/> No	Is this your final report? In order to be considered a final report all materials have been delivered for the project.					
Component Description	Date Added	County of Origin (if available)	Quantity (if applicable)	Cost Per Unit (if applicable)	Component Total Cost	How is cost documented ³⁵ ?

Total Cost of De Minimis Components

Contractor Signature:		Printed Name:	
Title:		Date:	

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.

³⁵ Documentation must demonstrate confirmation of the components' actual costs (invoice etc.).

NH Department of Environmental Services Federal Labor Standards Provisions

29 CFR 5.5(a)

Contract and Subcontract provisions

(a) The Contractor shall insure that all sub contracts entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF - financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or -FY 2015 Water Resource Reform and Development Act, contain the following clauses:

(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 website](#).

(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.

(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:

(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.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may be appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and 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.

(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.

{Insert Davis Bacon Wage Decision(s) here}

"General Decision Number: NH20240018 04/19/2024

Superseded General Decision Number: NH20230018

State: New Hampshire

Construction Type: Building

County: Grafton County in New Hampshire.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	<ul style="list-style-type: none">. Executive Order 14026 generally applies to the contract.. The contractor must pay all covered workers at least \$17.20 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 2024.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	<ul style="list-style-type: none">. Executive Order 13658 generally applies to the contract.. The contractor must pay all covered workers at least \$12.90 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2024.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number	Publication Date
0	01/05/2024
1	04/19/2024

ASBE0006-014 09/01/2023

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR.....	\$ 42.80	35.16

ELEV0004-007 01/01/2023

	Rates	Fringes
ELEVATOR MECHANIC.....	\$ 68.38	37.335+a+b

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.

* IRON0007-040 03/16/2024

	Rates	Fringes
IRONWORKER, STRUCTURAL.....	\$ 31.37	25.17

PLUM0131-004 06/05/2023

	Rates	Fringes
PIPEFITTER.....	\$ 40.36	25.24

* SUNH2015-004 06/16/2017

	Rates	Fringes
BRICKLAYER.....	\$ 30.45	3.64
CARPENTER, Includes Drywall Finishing/Taping, Drywall Hanging, Form Work, and Metal Stud Installation.....	\$ 24.86	12.82
CEMENT MASON/CONCRETE FINISHER...	\$ 23.71	9.71
ELECTRICIAN.....	\$ 25.29	3.91
IRONWORKER, REINFORCING.....	\$ 29.89	10.70
LABORER: Common or General.....	\$ 17.02 **	6.99
LABORER: Mason Tender - Brick...	\$ 19.60	2.73
LABORER: Mason Tender - Cement/Concrete.....	\$ 20.85	2.61
OPERATOR: Backhoe/Excavator/Trackhoe.....	\$ 21.00	2.34
PAINTER (Brush and Roller).....	\$ 16.87 **	2.02
PLUMBER, Includes HVAC Pipe		

Installation.....	\$ 24.77	10.27
ROOFER.....	\$ 18.87	0.00
SHEET METAL WORKER, Includes HVAC Duct Installation.....	\$ 24.77	11.89
TRUCK DRIVER: Dump Truck.....	\$ 17.43	3.60

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

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$17.20) or 13658 (\$12.90). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

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 <https://www.dol.gov/agencies/whd/government-contracts>.

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) (iii)).

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 National Office because National Office has 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.

=====
END OF GENERAL DECISION"

SOUTH MAIN STREET WATER DISTRICT

PUMP STATION UPGRADES

JUNE 2024

TECHNICAL SPECIFICATIONS

SECTION 01 11 13

SUMMARY OF WORK

PART 1 – GENERAL

1.1 PROJECT DESCRIPTION

- A. Work at the site consists of the following, as set forth in more detail in the Drawings and Specifications: site work, concrete emergency generator pad, demolition of 3000-gallon tank and mechanical equipment, demolition of electrical service equipment, building addition, installation of iron and manganese treatment, booster pumps, plumbing and mechanical work, and electrical work including stand by generator and automatic transfer switch. **Contractor will need to maintain water service during the work.**
- B. Work at the site to be performed by others: None
- C. Owner-Furnished Equipment: None
- D. Provide all items, articles, materials, operations, or methods listed, mentioned, scheduled on the Drawings and/or specified herein including all labor, materials, equipment, and incidentals necessary and required for a complete functioning system.
- E. Contractor is responsible for permits and associated fees, including local building permits, electrical permit, NHDOT utility excavation permit, electrical service (temporary and permanent) and telephone service.

1.2 WORK SEQUENCE

- A. The Work will be conducted in a sequence and in such a manner as to minimize utility and traffic interruptions and to minimize the risk to health and the environment. **Temporary water service shall remain operational during the work.**

1.3 CONTRACTOR USE OF PREMISES

- A. General: Limit use of the premises to construction activities in areas indicated; allow for Owner operation and use by the public.
 - 1. Confine operations to areas within Contract limits indicated. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.
 - 2. Keep driveways and entrances serving the premises clear and available to the Owner, the Owner's employees, and the public at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

3. Disposal of Excess, Unsuitable, and/or Waste Materials: Unless otherwise approved by Engineer, all excess, unsuitable, or waste materials shall be removed from the project site and shall be lawfully disposed of at Contractor's expense. Do not dispose of hazardous material on site by burial or by burning.

1.4 OWNER OCCUPANCY

- A. Full Owner Occupancy: The Owner will occupy the site during the entire construction period. Cooperate with the Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with the Owner's operations.

1.5 SAFETY AND HEALTH REGULATIONS

- A. Portions of the Work may be exposed to water of varying degrees of treatment. The Contractor certifies that it is experienced and qualified to anticipate and meet the safety and health requirements of this Project.
- B. The Contractor shall comply with Safety and Health Regulations for Construction under the Contract Work Hours and Safety Standards Act Section 107 as set forth in the Code of Federal Regulations Title 29. Copies of these regulations may be obtained from official internet websites or from the Department of Labor building at 14th Street and Constitution Avenue NW, Washington, DC 20013.
- C. The Contractor shall also comply with the provisions of the Federal Occupational Safety and Health Act of 1970, as amended.

1.6 GENERAL

- A. The Project has been designed and the Contract Documents prepared with the intention that resulting Work will comply with applicable local, State, and Federal rules and regulations.
 1. Before Substantial Completion, inspect, test, and adjust performance of every system or facility of the Work to ensure that overall performance complies with the Contract Documents and all permit requirements.
 2. Instruct the Owner's operating personnel on operational requirements needed to maintain compliance.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

End of Section

SECTION 01 22 13

MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.1 SUMMARY

- A.** This Section specifies administrative and procedural requirements for the measurement and payment of Contract pay items.

1.2 SUBMITTALS

- A.** Provide the following submittals in accordance with Section 01 33 23.
 - 1. Field notes of all measurements for payment purposes.

1.3 SCHEDULING

- A.** Notify Engineer as far in advance as possible of pay item measurements a minimum of three days prior to submission of the application for payment.
- B.** Allow for and afford Engineer ample time, space, and equipment to observe and verify measurements.

1.4 DESCRIPTION

- A.** For unit price items, the Contractor shall be paid for the actual amount of work accepted and for the actual number of materials in place during the period of construction. After the work is completed and before final payment is made, the Engineer shall make final measurements to determine the quantities of the various items of work accepted as the basis for final payment.
- B.** For lump sum items, the Contractor shall be paid based on actual work accepted until the work item is completed. A breakout of costs for each lump sum item shall be submitted to the Engineer before the commencement of construction. Upon completion of the item, 100 percent of the lump sum price may be paid, subject to the terms of the General Conditions or Supplemental Conditions.
- C.** 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.

1.5 MEASUREMENT REQUIREMENTS

- A.** Where payments are to be made on a unit price or adjustment item unit price basis, notify Engineer so that they may observe existing conditions and the status of work-in-place and may witness

measurements being made. Where Engineer has not witnessed required measurements and cannot verify or substantiate quantities, they may not recommend payment for same.

- B.** Maintain complete and legible field notes for all measured items. Notes shall contain spaces for Contractor's and Engineer's signatures plus additional space for comments. An original and copy shall be made for all notes with the copy being submitted to Engineer. The Engineer's signature shall not be construed as an acceptance of the Work or the measurements made but shall mean the Engineer was present when the measurements were made.
- C.** The Owner reserves the right to reject the Contractor's measurement of work-in-place and to have this Work measured by the Engineer or independent party acceptable to the Contractor at the Owner's expense.

1.6 LIMITS OF PAYMENT

- A.** Payments will be made for the quantities installed and accepted in accordance with the Contract. Upon completion of construction, if actual quantities are different than the quantities estimated in the Bid, the Contract unit prices will still prevail, except as follows. When alterations in the quantities of work not requiring Change Orders 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 Change Orders will be paid for as stipulated in such Change Orders.
- B.** The Contractor shall accept as full payment for furnishing all materials, labor, tools, equipment, and incidentals necessary to complete the work and for performing all work; 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. No extra payment shall be made to the Contractor for any delays caused by defective workmanship or rescheduling of work by others.

1.7 WORK ELIMINATED FROM CONTRACT

- A.** Should any work be deleted from the Contract a Change Order shall be issued as stipulated in the General Conditions.

1.8 PARTIAL PAYMENTS

- A.** Partial payments shall be made monthly as the work progresses. All partial invoices and payments shall be subject to correction in the final quantity invoice and payment. No monthly payment shall be required to be made when, in the judgment of the Engineer, the Work is not proceeding in accordance with the provisions of the Contract.
- B.** No partial payment shall be made upon fuels, supplies, lumber, false work, or other materials, or on temporary structures of any kind which are not a permanent part of the Contract.

- C. Each subsequent Application for Payment shall include an affidavit of the Contractor stating that all previous progress payments received on account of the Work have been applied to discharge in full all of the Contractor's obligations reflected in prior Applications for Payment. The Owner shall have the right to deduct from the next progress payment an amount equal to payment for said material and/or equipment if reasonable and adequate proof is not submitted.

1.9 FINAL PAYMENT

- A. The Contractor will prepare a final payment requisition for review by the Engineer for the work performed. Upon approval by the Engineer, the Owner will pay the entire sum found to be due less any retainage provided for in the General Conditions and any previous payments.

1.11 PAYMENT FOR MATERIALS DELIVERED

- A. Payment may be made for all or part of the value of materials stored on site. The application for payment shall be accompanied by a summary of materials stored on site that will establish the Owner's title to the materials and protect the Owner's interest therein, including insurance. The amount thus paid by the Owner shall reduce the estimated amounts due the Contractor as the material is incorporated into the Work. Materials stored on site, that have been paid for by the Owner, shall become the property of the Owner and, in the event of default on the part of the Contractor, the Owner may use these materials in the construction of the Work. The Contractor shall be responsible for any damage to, or loss of, any materials.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Provide all labor, materials, facilities, measuring devices and all other equipment necessary to perform all measurements for payment purposes.

PART 3 – EXECUTION

3.1 GENERAL

- A. Perform all measuring required by this Section.
- B. No separate payments will be made for Work under this Contract except for the pay items stipulated in this Part 3. All costs in connection with the Work shall be included in one or more of the pay items as appropriate.
- C. The names of pay items in this Section, the Schedule of Values, or the Bid Form may be abbreviated or non-comprehensive and are for general identification purposes of the item only. The names shall not be construed to represent a complete description of all the Work included under each pay item. Refer to the subsequent paragraphs of this Section for more complete descriptions of Work to be included under each Contract pay item.

3.2 LUMP SUM PRICE PAY ITEMS

- A. Measurement - no measurements will be made.
- B. Payment shall be on a lump sum basis, based on the percentage of work completed and accepted by the engineer for each lump sum pay item.

3.3 UNIT PRICE PAY ITEMS

- A. Measurement and payment shall be made by the unit.

3.4 DESCRIPTION OF PAY ITEMS

The following pay items describe the measurement of and payment for the work to be done under the items listed in the Bid.

Item 1 – General Conditions and Miscellaneous Work

- A. Measurement: Mobilization shall consist of preparatory work and operations including but not limited to, the following items:

1. Testing not paid by owner
2. Equipment delivery
3. Sanitary facilities
4. Furnishing of bonds/insurance
5. Erosion control/ Dust control
6. Permits and permit conditions as required
7. Plugging existing pipes to be abandoned
- 8. Temporary Water Service to Community**
- 9. Temporary Power as required**
10. Survey/layout re-establishment
11. Clearing, grubbing, stripping
12. Clean-up
13. Construction signs/project signs
14. Coordination with Owner, utilities, other contractors, and other project-related entities
15. Utility permits and fees for the new electrical and telephone service connection, NHDOT
Utility Excavation Permit, building permit
16. Utility crossings and relocations, unless otherwise provided for
17. Project record drawings
18. Submittals

- B. Payments:

1. Payment shall be made at the contract lump sum price, which price shall be full compensation for all costs incurred in furnishing labor, tools, materials an equipment and incidental work item costs for the preparatory work and operations described in the above measurement section for this item.
2. The adjusted contract price shall include all contract unit price and lump sum items except the contract lump sum price for the item General Conditions, Mobilization, and Demobilization.
3. Payments shall be made as follows:
 - a. First payment of fifty percent (50%) of the contract lump sum price for Mobilization or 2.5 percent of the adjusted contract price, whichever is less, will be made not later than payment of the first application for payment following the completion of five percent (5%) of the total contract price.
 - b. Second payment of twenty five percent (25%) of the contract lump sum price for Mobilization or 1.2 percent of the adjusted contract price, whichever is less, will be made not later than payment of the first application for payment following the completion of fifty percent (50%) of the total contract price.
 - c. Upon substantial completion of all work on the project, payment of the remainder of the contract lump sum price for Mobilization will be paid.

Item No. 2 – Site Work Complete

- A.** Measurement for payment shall be proportional to the percentage of work installed and accepted by the Engineer.
- B.** Payment for this item shall be at the lump sum price as stated in the Bid Schedule. Payment shall include all work found to be necessary to complete the exterior site work shown on the Plans including, but not limited to, clearing, grubbing, stripping, foundation excavation and backfill, common excavation and fill (except for rock excavation), installation of well level sensors, piping and conduit, well pump, select fill, compaction, generator and propane tank pads, loam, fertilizing, seeding, and all work incidental to the satisfactory completion of the item for which payment is not provided under other items.

Item No. 3 – Plumbing and Mechanical Work Complete

- A.** Measurement for payment shall be proportional to the percentage of work installed and accepted by the Engineer.
- B.** Payment for this item shall be at the lump sum price as stated in the Bid Schedule. Payment shall include all work found to be necessary to complete the piping, valving, equipment, and control work shown on the Plans. Including work to connect existing well pumps to the new treatment, interior concrete work, and all work incidental to the satisfactory completion of the

item for which payment is not provided under other items.

Item No. 4 – Electrical Work Complete

- A. Measurement for payment shall be proportional to the percentage of work installed and accepted by the Engineer.
- B. Payment for this item shall be at the lump sum price as stated in the Bid Schedule. Payment shall include all work found to be necessary to complete the electrical work including new electrical service equipment, standby generator interconnection, and building and process electrical as shown on the Plans, and all work incidental to the satisfactory completion of the item for which payment is not provided under other items.

Item No. 5 – Demolition Work Complete

- A. Measurement for payment shall be proportional to the percentage of work installed and accepted by the Engineer.
- B. Payment for this item shall be at the lump sum price as stated in the Bid Schedule. Payment shall include all work found to be necessary to complete the demolition of the interior systems of the existing pump station, including removal of 3000-gallon tank, removal of electrical and mechanical equipment, fill material for abandonment of existing sump, restoration of the impacted areas as indicated on the Plans, and all work incidental to the satisfactory completion of the item for which payment is not provided under other items.

Item No. 6 – Iron and Manganese Treatment System Complete

- A. Measurement for payment shall be proportional to the percentage of work installed and accepted by the Engineer.
- B. Payment for this item shall be at the lump sum price as stated in the Basis of Bid. Payment shall include all work found to be necessary to complete the Iron and Manganese Treatment System work shown on the Plans, including, but not limited to, the Calsite Neutralizer Tanks, Greensand Filters, Chlorine Contact Tank, piping, valves, and all work incidental to the satisfactory completion of the item for which payment is not provided under other items.

Item No. 7 – Standby Generator/ Automatic Switch Complete

- A. Measurement for payment shall be proportional to the percentage of work installed and accepted by the Engineer.
- B. Payment for this item shall be at the lump sum price as stated in the Bid Schedule. Payment shall include all work to furnish and install the standby generator for a complete installation. Work includes, but is not limited to, the GENERATOR, automatic transfer switch, wiring,

electrical equipment, programming and start-up, as shown on the Plans, and all work incidental to the satisfactory completion of the item for which payment is not provided under other items.

Item No. 8 – Building Storage Addition Complete

- A. Measurement for payment shall be proportional to the percentage of work installed and accepted by the Engineer.
- B. Payment for this item shall be at the lump sum price as stated in the Bid Schedule. Payment shall include all work to furnish and install the new building storage addition for a complete installation as shown on the Plans, and all work incidental to the satisfactory completion of the item for which payment is not provided under other items.

Item No. 9 – 3-Inch and 4-Inch Main Line Distribution Gate Valves, New and Replacement – **ADD ALTERNATE 1**

- A. Measurement shall be per each gate valve furnished and installed.
- B. Payment for furnishing and installing each gate valve as specified shall be made for the quantity installed at the unit bid price. Payment shall be full compensation for removal of existing gate valve, furnishing and installing new gate valves, and necessary fittings, including all work incidental to the satisfactory completion of the item for which payment is not provided under other items.

Item No. 10 – 2-inch Flush Hydrant -- **ADD ALTERNATE 1**

- A. Measurement shall be per each flush hydrant furnished and installed.
- B. Payment for furnishing and installing each flush hydrant as specified shall be made for the quantity installed at the unit bid price. Payment shall be full compensation for furnishing and installing the flush hydrants including all work incidental to the satisfactory completion of the item for which payment is not provided under other items.

Item No. 11 – Remove Water Main Vaults -- ADD ALTERNATE 1

- A. Measurement shall be per each Vault removed.
- B. Payment for removal of existing water main vaults as specified shall be made for the quantity removed at the unit bid price. Payment shall be full compensation for removal of the vaults including all work incidental to the satisfactory completion of the item for which payment is not provided under other items.

Item No. 12 – Service Line Curb Stops-- ADD ALTERNATE 2

- A. Measurement for payment shall be for each unit furnished and installed and accepted by the Engineer.
- B. Payment for this item shall be for each curb stop furnished and installed at the unit bid price. Payment shall include all work to remove and replace the Curb Stops as shown on the Plans. Work includes materials, labor, excavation, backfill, and restoration of the surfaces for each unit installed, and all work incidental to the satisfactory completion of the item for which payment is not provided under other items.

Item No. 13 – 4-Inch Diameter Mainline PVC Pipe-- ADD ALTERNATE 3

- A. Measurement for payment shall be for each unit furnished and installed and accepted by the Engineer.
- B. Payment for this item shall be at the unit price as stated in the Bid Schedule. Payment shall include all work to install mainline pipe as shown on the Plans. Work includes materials, labor, excavation, backfill, and restoration of the surfaces for each unit installed, and all work incidental to the satisfactory completion of the item for which payment is not provided under other items.

Item No. 14 – 1-Inch Diameter Service Pipe-- ADD ALTERNATE 3

- A. Measurement for payment shall be for each unit furnished and installed and accepted by the Engineer.
- B. Payment for this item shall be at the unit price as stated in the Bid Schedule. Payment shall include all work to install 1-inch service pipe as shown on the Plans. Work includes materials, labor, excavation, backfill, and restoration of the surfaces for each unit installed, and all work incidental to the satisfactory completion of the item for which payment is not provided under other items.

End of Section

SECTION 01 31 13

PROJECT COORDINATION

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:
1. Administrative and supervisory personnel.
 2. General installation provisions.
 3. Cleaning and protection.

1.2 COORDINATION

- A. Coordination: Coordinate construction activities to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations for proper installation, connection, and operation.
1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.
 2. Where availability of space is limited, coordinate installation of different components to ensure maximum accessibility for required maintenance, service and repair that meets each component manufacturer's written installation requirements.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Where specified, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly and timely progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of schedules.
 2. Installation and removal of temporary facilities.
 3. Delivery and processing of submittals.

4. Progress meetings.
 5. Project close-out activities.
- D. Conservation:** Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work. Refer to other sections for disposition of salvaged materials that are designated as Owner's property.
- E. Utilities:** Coordinate Work with applicable utilities within the Project limits. **Contact DigSafe at 811 or 888-DIG-SAFE to locate utilities prior to starting Work as well as if damage occurs or if conflicts or emergencies arise during the Work.**

1.4 SUBMITTALS

- A.** Provide the following submittals in accordance with Section 01 33 23.
- B. Coordination Drawings:** Prepare and submit coordination drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.
1. Show the interrelationship of components shown on separate Shop Drawings.
 2. Indicate required installation sequences.
- C. Staff Names:** Within 15 days of Notice to Proceed, submit a list of the Contractor's principal staff assignments, including the Superintendent and other onsite personnel; identify individuals with their duties and responsibilities; list their addresses and telephone numbers.
1. Post copies of the list in the Project meeting room, in the temporary field office, and at each temporary land telephone.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

- A. Inspection of Conditions:** Require the installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

- B.** Manufacturer's Instructions: Comply with manufacturer's written installation instructions and recommendations to the extent that those instructions and recommendations are more explicit or stringent than the Contract Documents' requirements.
- C.** Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.
- D.** Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and structure movement.
- E.** Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Engineer for final decision.
- F.** Recheck measurements and dimensions before starting each installation.
- G.** Install each component during weather conditions and Project status that meet industry and manufacturer installation requirements. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.
- H.** Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.
- I.** Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Engineer for final decision.

3.2 CLEANING AND PROTECTION

- A.** During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- B.** Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- C.** Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

End of Section

SECTION 01 33 23

SUBMITTALS

PART 1 – GENERAL

1.1 SUMMARY

- A.** This Specification specifies administrative and procedural requirements for submittals required for performance of the Work. Submittals covered by these requirements include project schedule, manufacturers' information, shop drawings, test procedures, test results, samples, requests for substitutions, operation and maintenance manuals, record drawings, and miscellaneous work-related submittals. Submittals shall also include, but not be limited to, all mechanical, electrical and electronic equipment and systems, materials, reinforcing steel, fabricated items, and piping and conduit details.
- B.** Administrative submittals may include, but are not limited to:
1. Permits
 2. Applications for payment
 3. Performance and payment bonds
 4. Insurance certificates
 5. List of Subcontractors
 6. Documentation confirming conformance to Equal Employment Opportunity and Labor Laws
- C.** The Contractor shall furnish all drawings, specifications, descriptive data, certificates, samples, tests, methods, schedules, and manufacturer's installation and other instructions as specifically required in the Contract Documents to demonstrate fully that the materials and equipment to be furnished and the methods of work comply with the provisions and intent of the Contract Documents.

1.2 RESPONSIBILITIES

- A.** The Contractor shall be responsible for the accuracy and completeness of the information contained in each submittal and shall assure that the material, equipment or method of work shall be as described in the submittal. The Contractor shall verify that all features of all products conform to the specified requirements. Submittal documents shall be clearly edited to indicate only those items, models, or series of equipment, which are being submitted for review. All extraneous materials shall be crossed out or otherwise obliterated.
- B.** The Contractor shall coordinate submittals with the work so that work will not be delayed. The Contractor shall coordinate and schedule different categories of submittals, so that one will not be delayed for lack of coordination with another. No extension of time will be allowed because of failure to properly schedule submittals.

1.3 SUBMITTAL PROCEDURES

- A. Coordination:** Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
 2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
 - a. The Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
 3. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.
 - a. Allow two weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Engineer will promptly advise the Contractor when a submittal being processed must be delayed for coordination.
 - b. If an intermediate submittal is necessary, process the same as the initial submittal.
 - c. No extension of Contract Time will be authorized because of failure to transmit submittals to the Engineer sufficiently in advance of the Work to permit processing.
- B. Submittal Preparation:** Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
1. Provide a space approximately 4" x 5" on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.
 2. Include the following information on the label for processing and recording action taken.
 - a. Project name
 - b. Date
 - c. Name and address of Engineer
 - d. Name and address of Contractor
 - e. Name and address of subcontractor
 - f. Name and address of supplier

- g. Name of manufacturer
- h. Number and title of appropriate Specification section
- i. Drawing number and detail references, as appropriate

C. Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Engineer using a transmittal form. Submittals received from sources other than the Contractor will be returned without action.

1. On the transmittal record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.
2. A unique, sequential number shall be noted on the transmittal form accompanying each item submitted.

1.4 CONTRACTOR'S CONSTRUCTION PROGRESS SCHEDULES

A. Prepare fully-developed, horizontal bar chart (Gantt) type construction progress schedules prepared by the critical path method or other approved means and in accordance with Specification section 00 72 43-2.03.A and 2.05.

1. Provide a separate time bar for each significant construction activity and all items of work listed in the bid. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the Schedule of Values, if applicable. The dependencies between activities shall be indicated so that it may be established what effect the progress of any one activity has on the schedule.
2. Schedule items included in Section 01 11 13 must be addressed on the schedule.
3. Within each time bar indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate actual completion.
4. Time for completion, materials delivery dates, specific dates for construction activities, and sequencing requirements shall be shown on the schedule. Activities making up the critical path shall be identified.
5. No activity on the schedule shall have a duration longer than 21 days, excepting a delivery schedule, or assigned value greater than \$50,000.
6. The schedule duration of each activity shall be based on the work being performed during the normal 40-hour work week with allowances made for legal holidays and normal weather conditions.

7. Prepare the schedule on a sheet, or series of sheets, of sufficient width to show data for the entire construction period.
 8. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the Work.
 9. Coordinate the Contractor's construction schedule with the Schedule of Values, list of subcontracts, submittal schedule, progress reports, payment requests and other schedules.
 10. The Contractor shall be responsible for revising the schedule when changes occur, when requested by the Owner and with each application for progress payment. Changes from the previous submission shall be highlighted for ease of identification. The Contractor shall provide a brief narrative report summarizing anticipated problems, recommended actions and effects upon the schedule and the schedule of other trades or activities.
 11. The Engineer's review is only for the purpose of checking conformity with the Contract Documents and assisting the Contractor in coordinating the work with the needs of the Project. It is not to be construed as relieving the Contractor from any responsibility to determine the means, methods, techniques, sequences, and procedures of construction and site safety as provided in the Contract Documents.
- B. Phasing:** Provide notations on the schedule to show how the sequence of the Work is affected by requirements for phased completion to permit work by separate Contractors and partial occupancy by the Owner prior to Substantial Completion.
- C. Work Stages:** Indicate important stages of construction for each major portion of the Work, including testing and installation.
- D. Area Separations:** Provide a separate time bar to identify each major construction area for each major portion of the Work. Indicate where each element in an area must be sequenced or integrated with other activities.
- E. Distribution:** Following response to the initial submittal, print and distribute copies to the Engineer, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.
1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

- F. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.5 SCHEDULE OF SUBMITTALS

- A. Refer to Specification section 00 72 43 for additional Schedule of Submittals requirements. Engineer shall review the Contractor's Schedule of Submittals and may add or delete submittals from the list as deemed appropriate by the Engineer.
- B. Distribution: Following response to initial submittal, print and distribute copies to the Engineer, Owner, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the Project meeting room and field office.
 - 1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- C. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.6 SHOP DRAWINGS

- A. Submit newly prepared information, drawn to accurate scale. Indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis for Shop Drawings.
- B. Shop Drawings shall adequately provide the dimensions and layout of equipment and shall include plan and elevation views, blow-up drawings to depict all key components and materials, sections to depict how parts fit together and function, and other details as required to provide full detail of the equipment and its component parts. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
 - 1. Dimensions
 - 2. Identification of products and materials included
 - 3. Compliance with specified standards
 - 4. Notation of coordination requirements
 - 5. Notation of dimensions established by field measurement

6. Sheet Size: Except for templates, patterns and similar full size drawings, submit Shop Drawings on sheets at least 8-1/2" x 11" but no larger than 24" x 36"
7. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
8. Do not use Shop Drawings for construction without an appropriate final stamp indicating action taken.

C. Shop Drawings shall not fulfill the requirements for record drawings but may be included with record drawings when applicable.

1.7 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's catalog cut sheets, installation instructions, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, performance curves, brochures, model number identification, and standard published manufacturer's material specifying the quality, make-up, application and materials of fabrication for the specified products.

1.8 SAMPLES

- A. Submit samples as required. Samples include, but are not limited to, physical examples of the work, such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effects, graphic symbols, and units of work to be used by the Engineer or Owner for independent inspection and testing, as applicable to the work.
1. Submittals: Except for samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit 3 sets; one will be returned marked with the action taken.
 2. Maintain sets of samples as returned at the Project site for quality comparisons throughout the course of construction.
 3. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.

1.9 TEST DATA

- A. The Contractor shall notify the Owner not less than 7 working days prior to the date that the equipment installation(s) and/or other materials or portions of the Work will be ready for inspection and testing.
- B. Test certification shall be provided and signed by the responsible party to the satisfaction of the Owner within two weeks of the actual test. It shall include the following:
 - 1. Date of report, name, address, telephone number and signatures of individuals performing the test or inspection and of individuals issuing the report.
 - 2. Project name, number, and Contract number.
 - 3. Dates, times, temperature, weather conditions, and locations of tests and inspections.
 - 4. Identify the work or product by specification section and test or inspection method.
 - 5. Complete inspection or test data, results of test, interpretation of test results, compliance with the Contract Documents, and recommendations regarding retesting.

1.10 ENGINEERED PRODUCTS

- A. Products requiring professional engineering design and/or certification shall be stamped by a professional engineer with valid registration in the state in which the Project is located. Such stamp shall be consistent with the rules and regulations of the state governing professional engineering registration.

1.11 ENGINEER'S ACTION

- A. Except for submittals for record, information, or similar purposes, where action and return is required or requested, the Engineer will review each submittal, mark to indicate action taken, and return two (2) marked-up copies to the Contractor within 20 calendar days after receipt of a submittal for review and comment unless otherwise specified. Compliance with specified characteristics is the Contractor's responsibility.
 - 1. Action Stamp: The Engineer will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked as follows to indicate the action taken:
 - a. Reviewed as submitted: Where submittals are marked "Reviewed as submitted," that part of the work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.

- b. Reviewed – make corrections noted: When submittals are marked "Reviewed – make corrections noted," that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and the requirements of the Contract Documents; final acceptance will depend on that compliance. Where submittal information will be incorporated in operation and maintenance data, a corrected copy shall be provided.
- c. Rejected – revise and re-submit: When submittal is marked "Rejected - revise and resubmit," the Contractor shall not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay.

1.12 EFFECT OF REVIEW OF CONTRACTOR’S SUBMITTALS

- A. Review of drawings, methods of work, or information regarding materials or equipment the Contractor proposes to provide shall not relieve the Contractor of its responsibility for errors therein and shall not be regarded as an assumption of risks or liability by the Engineer or the Owner, or by any officer or employee thereof, and the Contractor shall have no claim under the contract on account of the failure, or partial failure, of the method of work, material, or equipment so reviewed. A mark of "Reviewed as submitted" or "Reviewed – make corrections noted" shall mean that the Owner has no objection to the Contractor, upon the Contractor’s own responsibility, using the plan or method of work proposed or providing the materials or equipment proposed.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

End of Section

SECTION 01 77 19

PROJECT CLOSEOUT

PART 1 – GENERAL

1.1 GENERAL

- A. Substantial Completion:** Before requesting inspection for Substantial Completion, complete the following:
1. In the Application for Payment that coincides with the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed substantially complete.
 2. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
 3. Submit record drawings, maintenance manuals, final project photographs, damage or settlement survey, property survey, and similar record information.
 4. Change-over permanent locks and transmit keys to the Owner.
 5. Complete start-up testing of systems, and instruction of the Owner's personnel. Remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
 6. Complete final clean up. Touch-up and repair and restore marred exposed finishes.
- B. Inspection Procedures:** On receipt of a request for inspection, the Engineer will proceed or advise the Contractor of unfilled requirements. The Engineer will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.
1. The Engineer will repeat inspection when requested and assured that the Work has been substantially completed.
 2. Results of the completed inspection will form the basis of requirements for final acceptance.
- C. Final Acceptance:** Before requesting inspection as basis for final acceptance and final payment, complete the following:
1. Submit final payment request with releases.
 2. Submit a final statement, accounting for changes to the Contract Sum.

3. Submit a copy of the final inspection list stating that each item has been completed or otherwise resolved for acceptance.
4. Submit final meter readings for utilities, a record of stored fuel, and similar data as of Substantial Completion.
5. Submit consent of surety to final payment.
6. Submit evidence of continuing insurance coverage complying with insurance requirements.

D. Reinspection Procedure: The Engineer will reinspect the Work upon receipt of notice that the Work has been completed, except items whose completion has been delayed because of circumstances acceptable to the Engineer.

1. Upon completion of reinspection, the Engineer will advise the Contractor if Work is incomplete or if obligations that have not been fulfilled but are required for final acceptance.
2. If necessary, reinspection will be repeated.

E. Training: Arrange for the installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. Include a detailed review of the submitted operations and maintenance manuals. As part of the instruction, demonstrate the following procedures:

1. Start-up and shutdown.
2. Control Sequences.
3. Adjustments.
4. Inspection procedures.
5. Safety procedures.
6. Emergency operations.

F. Final Cleaning: The Contractor must clean the Site before Final Acceptance will be made. Employ experienced workers for final cleaning. Clean each surface to the condition expected in a commercial building cleaning and maintenance program. Such cleaning shall include, but not be limited to, the following:

1. Remove labels that are not permanent labels.
2. Clean transparent materials. Remove glazing compound. Replace chipped or broken glass.
3. Clean exposed hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective

condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.

4. Clean surfaces of mechanical and electrical equipment using cleaning materials appropriate to the surface and material being cleaned. Remove excess lubrication.
5. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
6. Clean the site of rubbish, litter and other foreign substances. Sweep paved areas; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.
7. Remove waste and surplus materials, rubbish, and temporary construction facilities from the Site.

G. Removal of Protection: Remove temporary protection and facilities.

H. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Remove waste materials from the site and dispose of in a lawful manner.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

End of Section

SECTION 01 78 23

OPERATIONS AND MAINTENANCE MANUALS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Preparation of operations and maintenance data and instructions for equipment and components.

1.2 QUALITY ASSURANCE

- A. The manuals shall be prepared by personnel experienced with this type of work.

1.3 REVIEW SUBMITTALS

- A. Within thirty (30) days after shop drawing approval, the Contractor shall submit a minimum of six (6) copies of complete instruction manuals for installation, operations, maintenance, and lubrication of each item as specified.
- B. Mark identification on front and spine of each binder. Include the following information:
 - 1. Shop drawings and product data
 - 2. Wiring diagrams
 - 3. Spare parts list
 - 4. Tools and lubricants
 - 5. Copies of warranties
 - 6. Start-up and shut-down procedures
 - 7. Control sequences
 - 8. Adjustments
 - 9. Maintenance schedules
 - 10. Inspection procedures
 - 11. Trouble shooting guides
 - 12. Hazards and safety procedures
 - 13. Emergency procedures
 - 14. Maintenance agreements and similar continuing commitments
- C. The Engineer will review each manual submitted in a reasonable amount of time.
- D. The Engineer will return five (5) copies of the manuals to the Contractor for any revisions as noted by the Engineer.
- E. The Contractor shall make the necessary corrections and re-submit four (4) copies in final format. The final copies shall be submitted as noted in the following paragraph.

- F. The Engineer will retain the four (4) final copies (for Owner's, Engineer's, and Field Representative's files). If the Contractor requires more copies, then the number of copies submitted shall be adjusted accordingly.

1.4 FINAL SUBMITTAL

A. Contents:

1. Table of Contents: Provide title of Project and list of equipment and components with corresponding section numbers.
2. For each product or component, list names, addresses and telephone numbers of subcontractors, manufacturers and suppliers, including local source of supplies and replacement parts.
3. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.
4. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
5. Incorporate manufacturer's instructions for delivery, storage, assembly, installation, start-up, adjusting, finishing, operation and maintenance.
6. Bind in one (1) copy all warranties in their specified section.

B. Format:

1. Information shall be included in 3-ring binders not exceeding 3 inches in width. Multiple binders may be used; however, each binder must have a table of contents.
2. Information shall be printed on standard 8-1/2 inch x 11 inch paper with individual pouches for drawings.
3. A tab shall be provided that notes the piece of equipment or component along with its corresponding specification section and/or drawing number.

1.5 MANUFACTURER'S MANUALS FOR EQUIPMENT AND SYSTEMS

- A. Each Item of Equipment and Each System:** Include a description of unit or system, and component parts. Give function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data, tests, and certifications where appropriate and complete nomenclature and commercial number of replaceable parts where applicable.

- B. Panel Board Circuit Directories:** Provide electrical service characteristics and name of load on each branch circuit breaker.
- C. Operating Procedures:** Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- D. Maintenance Requirements:** Include routine procedures and guides for trouble-shooting, disassembly, repair, and reassembly instructions and alignment, adjusting, balancing, and checking instructions. Provide servicing and lubrication schedule, and list of lubricants required. Provide the manufacturer's list of recommended spare parts.
- E. Controls:** Provide the following:
 - 1. Sequence of operation;
 - 2. Original parts list, illustrations, assembly drawings, and diagrams required for maintenance;
 - 3. As-installed control diagrams;
 - 4. Contractor's coordination drawings, with as-installed color coded piping diagrams;
 - 5. Charts of valve tag numbers with location and function of each valve, keyed to flow and control diagrams; and,
 - 6. As-installed color coded wiring diagrams.
- F. Additional Requirements:** As specified in individual Specification sections.

1.6 SCHEDULE OF SUBMITTALS

- A.** Operations and maintenance manuals conforming to this specification and individual specifications shall be submitted for all major equipment and systems provided.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

End of Section

SECTION 01 78 36

WARRANTIES

PART 1 – GENERAL

1.1 GENERAL

- A. Standard Product Warranties are pre-printed written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special Warranties are written warranties required by or incorporated in Contract Documents, to extend time limits provided by standard warranties or to provide greater rights for the Owner.
 - 1. Refer to the General Conditions for terms of the Contractor's special warranty of workmanship and materials.
- C. Requirements for warranties for products and installations that are specified to be warranted, are included in the individual Specifications.
- D. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.
- E. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- F. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- G. Replacement Cost: On determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through part of its useful service life.
- H. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and limit selections to products with warranties not in conflict with requirements of the Contract Documents.
 2. The Owner reserves the right to refuse to accept Work where a special warranty, or similar commitment is required, until evidence is presented that entities required to countersign commitments are willing to do so.
- I.** Submit written warranties to the Engineer prior to the date for Substantial Completion. If the Engineer's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion, submit written warranties on the Engineer's request.
1. When a designated portion of the Work is completed and occupied or used, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Engineer within fifteen days of completion of that designated portion of the Work.
- J.** When a special warranty is to be executed by the Contractor or the Contractor and a subcontractor, supplier, or manufacturer, prepare a written document that contains appropriate terms and identification ready for execution by the required parties. Submit a draft to the Owner through the Engineer for approval prior to final execution.
1. Refer to individual Specifications for specific content and particular requirements for submittal of special warranties.
- K.** Bind warranties in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper.
1. Provide heavy paper dividers with celluloid covered tabs for each warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.
 2. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES", the Project title or name, and the name of the Contractor.
 3. When operating and maintenance manuals are required for warranted construction, provide additional copies of each warranty, as necessary, for inclusion in each required manual.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

End of Section

SECTION 02 01 00

EXISTING UTILITIES AND UNDERGROUND STRUCTURES

PART 1 – GENERAL

1.1 DESCRIPTION

- A. The Engineer and Owner have made limited investigations to determine the locations of underground utilities and structures. Because of the nature of subsurface utilities and the difficulty in determining exact locations, the locations as shown on the plans should be considered approximate. Wherever underground utilities are encountered by the Contractor during construction they shall be protected by the Contractor, at his own expense, until the construction work is complete and the existing structures are made secure. Injury to any such utilities/structures caused by or resulting from the Contractor's work shall be repaired at the Contractor's expense. No additional compensation will be allowed for any delays sustained by the Contractor due to any interference from underground utilities.
- B. It shall be the Contractor's responsibility to notify **Dig Safe** and locate all utilities within the construction area prior to proceeding with construction.
- C. The restoration of existing property shall be done as promptly as practicable and shall not be left until the end of the construction period.
- D. Cooperation with Utilities:
 - 1. The Contractor shall allow the Owner or its agents and other contractors, and public service corporations, or their agents, to enter upon the work for the purpose of constructing, maintaining, repairing, removing, altering or replacing such pipes, sewers, conduits, manholes, wires, poles, or other structures and appliances as are now located or as may be required or permitted at or on the work by the Engineer.
 - 2. The Contractor shall cooperate with all aforesaid parties and shall allow reasonable facilities for the prosecution of any other work by the Owner, or of public service corporation, to be done in connection with this work. Care shall be taken at all times to inconvenience abutters as little as possible.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

End of Section

SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 – GENERAL

1.1 GENERAL

- A. This Section requires the selective removal and subsequent off-site disposal of the following:
1. Portions of structure indicated on drawings and as required to accommodate new construction.
 2. Removal of existing 3000-gallon pressure tank.
 3. Removal of booster pumps indicated "remove."
 4. Removal of mechanical equipment indicated "remove."
 5. Removal of existing electrical equipment indicated "remove."
 6. Removal and protection of existing fixtures and equipment items indicated "salvage."
- B. Related work specified elsewhere:
1. Remodeling construction work and patching are included within the respective sections of specifications, including removal of materials for reuse and incorporation into remodeling or new construction.
 2. Relocation of pipes, conduits, ducts, and other mechanical and electrical work is specified in other Divisions.
 3. **Contractor will be required to submit a plan for maintaining water service during the demolition of the existing pressure tank and booster pumps. The temporary system will need to be in place until the new work is installed and tested. The plan will be reviewed by the owner and engineer prior to approval to commence the work.**
- C. Schedule: Submit schedule indicating proposed sequence of operations for selective demolition work to Owner's Representative for review prior to start of work. Include coordination for shutoff, capping, and continuation of utility services as required, together with details for dust and noise control.
1. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
- D. Occupancy: Owner will occupy portions of the building immediately adjacent to areas of selective demolition. Conduct selective demolition work in manner that will minimize need for disruption of Owner's normal operations. **Provide minimum of 72 hours advance notice to Owner of demolition activities that will impact Owner's normal operations.**

- E. Condition of Structures:** Owner assumes no responsibility for actual condition of items or structures to be demolished.
1. Conditions existing at time of commencement of contract will be maintained by Owner insofar as practicable. However, variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.
- F. Partial Demolition and Removal:** Items indicated to be removed but of salvageable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.
1. Storage or sale of removed items on site will not be permitted.
- G. Protections:** Provide temporary barricades and other forms of protection as required to protect Owner's personnel and general public from injury due to selective demolition work.
1. Provide protective measures as required to provide free and safe passage of Owner's personnel and general public to and from occupied portions of building.
 2. Erect temporary covered passageways as required by authorities having jurisdiction.
 3. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.
 4. Protect floors with suitable coverings when necessary.
 5. Construct temporary insulated solid dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks if required.
 6. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing building.
 7. Remove protections at completion of work.
- H. Damages:** Promptly repair damages caused to adjacent facilities by demolition work at no cost to Owner.
- I. Traffic:** Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

- J. Utility Services:** Maintain existing utilities indicated to remain. Keep in service and protect against damage during demolition operations.
1. Do not interrupt utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.
 2. Maintain fire protection services during selective demolition operations.
- K. Environmental Controls:** Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.
1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 GENERAL

- A. Inspection:** Prior to commencement of selective demolition work, inspect areas in which work will be performed. Photograph existing conditions of structure surfaces, equipment, or surrounding properties that could be misconstrued as damage resulting from selective demolition work; file with Owner's representative prior to starting work.
- B. Preparation:** Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structures to be demolished and adjacent facilities to remain.
1. Cease operations and notify Owner's representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.
- C. Cover and protect furniture, equipment, and fixtures indicated "to remain" from soilage or damage.**
- D. Erect and maintain dust-proof partitions and closures as required to prevent spread of dust or fumes to occupied portions of the building.**
1. Provide weatherproof closures for exterior openings resulting from demolition work.
- E. Locate, identify, stub off, and disconnect utility services that are not indicated to remain.**

1. Provide bypass connections as necessary to maintain continuity of service to occupied areas of building. Provide minimum of 72 hours advance notice to Owner if shutdown of service is necessary during changeover.

F. Demolition: Perform selective demolition work in a systematic manner.

1. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.
2. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors, or framing.
3. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.
4. Demolish foundation walls to a depth of not less than 12 inches below existing ground surface. Demolish and remove below-grade wood or metal construction. Break up below-grade concrete slabs.
5. For interior slabs on grade, use removal methods that will not crack or structurally disturb adjacent slabs or partitions. Use power saw where possible.
6. Completely fill below-grade areas and voids resulting from demolition work. Provide fill consisting of approved earth, gravel, or sand, and free of trash and debris, stones over 6 inches in diameter, roots, and other organic matter.

G. If unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure both nature and extent of conflict. Submit report to Owner's representative in written, accurate detail. Pending receipt of directive from Owner's representative, rearrange selective demolition schedule as necessary to continue overall job progress without delay.

H. Salvage Items: Where indicated on Drawings as "Salvage - Deliver to Owner," carefully remove indicated items, clean, store, and turn over to Owner and obtain receipt.

I. Disposal of Demolished Materials: Remove debris, rubbish, and other materials resulting from demolition operations from building site. Transport and legally dispose off site.

1. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.
2. Burning of removed materials is not permitted on project site.

- J.** Cleanup and Repair: Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections and leave interior areas broom clean.
- K.** Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

End of Section

SECTION 03 30 53

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 SUMMARY

- A.** This Section specifies cast-in-place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.

1.2 SUBMITTALS

- A.** General: Provide submittals in accordance with Specification 01 33 23.
- B.** Manufacturer's Data: Provide manufacturer's data with installation instructions for proprietary materials including reinforcement and forming accessories, admixtures, joint materials, hardeners, curing materials, bonding compounds, sealing compounds, and others as requested by Engineer.
- C.** Test Reports: Laboratory test or evaluation reports for concrete materials and mix designs that include (1) compressive strength test results, (2) corresponding slump and water-cement ratio, (3) weights and test results of the ingredients, and (4) other physical properties necessary to check each mix design. Provide reports from the concrete supplier certifying that all concrete materials comply with the specifications and all test requirements. All test reports including compressive strength tests must be less than 12 months old.
- D.** Ready-Mixed Concrete Truck Delivery Tickets: Each load of ready-mixed concrete delivered to the job site shall be accompanied by a delivery ticket showing the information listed in ASTM C94.

1.3 QUALITY ASSURANCE

- A.** All concrete testing will be done in accordance with the Contract to demonstrate conformance with the specified requirements for cast-in-place concrete. The Owner will provide the services of an Engineer-approved independent testing laboratory that shall comply with the requirements of ASTM E329. Costs of testing laboratory services shall be borne by the Owner unless otherwise specified.
- B.** Codes and Standards: ACI 301, "Specifications for Structural Concrete Buildings"; ACI 318, "Building Code Requirements for Reinforced Concrete"; comply with applicable provisions except as otherwise indicated.

C. Quality Control: Perform sampling and testing during concrete placement, as follows:

1. Sampling: ASTM C172 and C31.
2. Slump: ASTM C143, one of test for each load at point of discharge.
3. Air Content: ASTM C173, one for each set of compressive strength specimens.
4. Compressive Strength: ASTM C39, one set for each 50 cubic yards or fraction thereof of each class of concrete; one specimen tested at 7 days, one specimen tested at 28 days, and one retained for later testing if required.
5. When the total quantity of a given class of concrete is less than 50 cubic yards, Engineer may waive strength tests if field experience indicates evidence of satisfactory strength.
6. If compressive test results indicate concrete in place may not meet structural requirements, tests shall be made to determine if the structure or portion thereof is structurally sound. Tests may include, but not be limited to, cores in accordance with ASTM C42 and any other analyses or load tests acceptable to the Engineer. Costs of such tests shall be borne by the Contractor.

D. Test results will be reported in writing to Engineer, Contractor, and concrete producer within 24 hours after tests are made.

E. Mix Proportions and Design: Proportion mixes complying with mix design procedures specified in ACI 301.

1. Submit written report to Engineer for each proposed concrete mix at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed and are acceptable to Engineer.
2. Mix designs may be adjusted when material characteristics, job conditions, weather, test results, or other circumstances warrant. Do not use revised concrete mixes until submitted to and accepted by Engineer.
3. Classes of concrete are:

	Class AA	Class A	Class B	Class C
28 Day Comp. Strength (PSI)	4000	3000	3000	2000
Max. Water-Cement Ratio (LB/LB)	0.444	0.464	0.488	0.532
Min. Cement Factor (LBS/CY)	658	611	564	489
Entrained Air Content (%)	5 - 8	4 - 7	3 - 6	3 - 6
Slump (Inches)	2 - 3	2 - 4	1 - 3	0 - 4

PART 2 – PRODUCTS

2.1 MATERIALS

A. Concrete Class: Unless otherwise specified, all concrete shall be Class AA.

B. Concrete Materials

1. Portland Cement: ASTM C150, Type II unless otherwise specified
2. Aggregates: ASTM C33, except local aggregates of proven durability may be used when acceptable to Engineer.
3. Water: Drinkable
4. Air-Entraining Admixture: ASTM C260
5. Water-Reducing Admixture: ASTM C494; type as required to suit project conditions. Use only admixtures that have been tested and accepted in mix designs.

C. Related Materials

1. Waterstop: Flat dumbbell or centerbulb type, size to suit joints, of either rubber (CRD C 513) or PVC (CRD C 572). Hydrophilic waterstop shall be Adeka Ultra Seal, by Asahi Denka Kogyo K.K.; Hydrotite CJ-1020-2K by Sika; or approved equal.
2. Moisture Barrier: Clear 8-mils-thick polyethylene; polyethylene-coated barrier paper; 1/8-inch-thick asphalt core membrane sheet.
3. Membrane-Forming Curing Compound: ASTM C309, Type I.
4. Joint Fillers: See Division 07.
5. Concrete Floor Sealer: Concrete floor sealer/hardener shall be Curecrete Ashford Formula, Sonneborn Lapidolith or approved equal.
6. Crystalline Waterproofing: Waterproofing shall be Xypex or Euclid Chemical HEY'DI crystalline waterproofing. Waterproofing shall consist of one coat of Xypex Concentrate applied at the rate of 1-1/2 pounds per square yard of concrete surface and one coat of Xypex Modified applied at the rate of 1-1/2 pounds per square yard of concrete surface.

D. Form Materials

1. Provide form materials with sufficient stability to withstand pressure of placed concrete without bow or deflection.
2. Exposed Concrete Surfaces: Suitable material to suit project conditions.
3. Form Liners: Rigid polymer sheets such as Sika Greenstreak Uni-Cast, Multi-Cast, or Dura-Cast, or approved equal, where specified.

E. Reinforcing Materials

1. Deformed Reinforcing Bars: ASTM A615, Grade 60, unless otherwise indicated. ASTM A616 or ASTM A617 steel shall not be used. Bars provided as dowels for future construction and bars where specified shall be epoxy-coated in conformance with ASTM A775.
2. Welded Wire Fabric: ASTM A185.
3. Tie Wire: Minimum 16 gage annealed steel conforming to FEDSPEC QQ-W-461H.

4. Bar Supports: Concrete block supports shall be provided for footing and slabs on grade. Stainless steel or plastic protected plain steel supports shall be provided for other work.

F. Epoxy Grout For Dowel Anchorage and Crack Repair

1. Except as noted below, epoxy grout shall be a high modulus, two-component, moisture insensitive, 100 percent solids, and thermosetting modified polyamide epoxy compound. The consistency shall be a paste form capable of not sagging in horizontal or overhead anchoring configurations. Material shall conform to ASTM C881 Type 1, Grade 3, such as Sika Corporation Sikadur AnchorFix-4, Adhesive Technology Corporation Ultrabond HS-200, or equal, and shall have a heat deflection temperature in excess of 130 degrees F.
2. Epoxy for pressure grouting/crack injection shall be a two-component, moisture insensitive, high modulus, injection grade, 100 percent solids, and blend of epoxy-resin compounds. The consistency shall be as required to achieve complete penetration in hairline cracks and larger. Material shall conform to ASTM C881 Type 1 Grade 1, such as Sika Corporation Sikadur 52, Adhesive Technology Corporation SLV 300 series, or equal.

G. Bonding Compounds

1. Epoxy resin bonding compounds shall be used for wet areas and shall be Sika Chemical Corporation, Sikadur 35 Hi-Mod LV, Sikadur 32 Hi-Mod, or Sikadur 31 Hi-Mod Gel as applicable; or equal. Nonepoxy bonding compounds shall be used for dry areas and shall be Thoro System Products Acryl 60, Thorobond, or equal. Bonding compounds shall be applied in accordance with the manufacturer's written instructions.

PART 3 – EXECUTION

3.1 FORMING AND PLACING CONCRETE

- A. Job-Site Mixing: Use drum-type batch machine mixer, mixing not less than 1-1/2 minutes for one cu. yd. or smaller capacity. Increase mixing time at least 15 seconds for each additional cu. yd. or fraction thereof.
- B. Ready-Mix Concrete: ASTM C94.
- C. Formwork: Construct so that concrete members and structures are of correct size, shape, alignment, elevation, and position. Formwork shall be installed in accordance with ACI 347. All exposed corners and edges shall have a formed chamfered surface.
- D. Provide openings in formwork to accommodate work of other trades. Accurately place and securely support items built into forms.

- E.** Clean and adjust forms prior to concrete placement. Apply form-release agents or wet forms, as required. Re-tighten forms during concrete placement if required to eliminate mortar leaks.
- F. Reinforcement**
1. Reinforcing steel shall be cleaned of mill rust scale, dried concrete, or other coatings that may reduce bond. Reinforcement reduced in section is not acceptable. When concrete placement is delayed, reinforcement shall be cleaned by sandblasting if directed by the Engineer.
 2. Position, support, and secure reinforcement against displacement. Locate and support with metal chairs, runners, bolsters, spacers, and hangers, as required. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces. Install welded wire fabric in as long lengths as practicable, lapping at least one mesh.
- G. Joints:** Provide construction, isolation, and control joints as indicated or required. Locate construction joints so as not to impair strength and appearance of structure. Place isolation and control joints in slabs-on-ground to stabilize differential settlement and random cracking.
- H. Installation of Embedded Items:** Set and build into work anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting diagrams, templates, and instructions provided by others for locating and setting.
- I. Concrete Placement:** Comply with ACI, placing concrete in a continuous operation within planned joints or sections. Do not begin placement until work of other trades affecting concrete is completed.
- J.** Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping, so that concrete is worked around reinforcement and other embedded items and into forms.
- K.** Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placing, and curing.
1. In cold weather (ambient air temperature below 40 degrees F), comply with ACI 306.
 2. In hot weather (ambient air temperature above 80 degrees F), comply with ACI 305.
- L. Repair of Surface Defects:** Surface defects, including tie holes, minor honeycombing, or otherwise defective concrete shall be repaired in accordance with ACI 301 Chapter 9. Areas to be patched shall be cleaned. Patches on exposed surfaces shall be finished to match the adjoining surfaces after they have set. Patches shall be cured as specified for the concrete.

3.2 CONCRETE FINISHES

- A.** Exposed-to-View Surfaces in General: Provide a smooth finish for exposed concrete surfaces and surfaces to be covered with a coating or covering material applied directly to concrete. Remove fins and projections, patch defective areas with cement grout, and rub smooth.
- B.** Steel Trowel Finish: Apply steel trowel finish in accordance with ACI 301 Section 11.7.3 to monolithic slab surfaces that are exposed to view or are to be covered with resilient flooring, paint, or other thin film coating. Consolidate concrete surfaces by finish troweling, free of trowel marks, and uniform in texture.
- C.** Float Finish: Apply float finish in accordance with ACI 301 Section 11.7.2 to surfaces of channel and tank bottom slabs and to footings. Floating shall be performed with a hand or power-driven float. Floating of any one area shall be the minimum necessary to produce the finish specified. Floating shall compact and smooth the surface and close any cracks and checking of surfaces.
- D.** Broomed Finish: Apply broomed finish in accordance with ACI 301 Section 11.7.4 for walks, tops of walls, wet well floors, and where otherwise specified.
- E.** Curing: Begin initial curing as soon as free water has disappeared from exposed surfaces or immediately after final troweling. Where possible, keep continuously moist for not less than 72 hours. Continue curing by use of moisture-retaining cover or membrane-forming curing compound. Cure formed surfaces by moist curing until forms are removed. Provide protections as required to prevent damage to exposed concrete surfaces.

3.3 WATERTIGHTNESS, TESTING, AND REPAIR

- A.** Concrete tanks and channels that have walls or slabs that are subjected to hydrostatic pressure shall be tested for water-tightness. The tests shall be made prior to application of waterproofing coating. Testing shall consist of filling the tank or channel with water to the maximum operating water surface for at least 24 hours. Wet spots, leakage, or seepage revealed by the test, including those caused by shrinkage of concrete, honeycombed areas, construction joints, or other sources shall be repaired by either or both of the following methods:
 1. Grouting of the joint by drilling grout holes to the affected crack or honeycombed area, installing injection ports, and forcing expansive urethane grout into the joint under pressure.
 2. Cutting of a bevel groove on the water side of the joint. The groove shall be ½- to ¾-inch in width and depth and shall be caulked with joint sealer in accordance with manufacturer's instructions.

3.4 DISINFECTION

- A. Perform wet well disinfection in accordance with AWWA C653. The Contractor shall provide for disinfection after the work has been completed. All oil, grease, soil, and other materials that could harbor and protect bacteria from disinfectants shall be removed from all surfaces exposed to water. Equipment shall be installed prior to or during disinfection and be thoroughly hosed, scrubbed or otherwise cleaned of foreign material.

3.5 CLEANUP

- A. Upon completion of the work and prior to final inspection, the Contractor shall clean all concrete surfaces, except outside sidewalks or paved areas and those having curing and sealing compound.

End of Section

SECTION 06 10 53

ROUGH CARPENTRY

PART 1 – GENERAL

1.1 SUMMARY

- A.** This Section includes the following:

Framing with dimension lumber.
Wood furring, grounds, nailers, and blocking.
Sheathing.
Subflooring.
Underlayment.
Rooftop equipment bases and support curbs.
Fasteners and metal framing anchors.

1.2 REFERENCES

- A.** American Forest and Paper Association (AFPA)

Manual for Wood Frame Construction

- B.** American National Standards Institute (ANSI)

A208.1 Mat-Formed Manufactured Panels

- C.** American Plywood Association (APA)

Form E30 Design/Construction Guide: Residential and Commercial

- D.** American Society of Mechanical Engineers (ASME)

B18.2.1 Square and Hex Bolts and Screws - Inch Series

B18.6.1 Wood Screws (Inch Series)

- E.** American Society for Testing and Materials (ASTM)

A153 Specification for Zinc -Coating (Hot-Dip of Iron and Steel Hardware)

A307 Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength

A563 Specification for Carbon and Alloy Steel Nuts

A653 Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

D245 Practice for Establishing Structural Grades and Related Allowable Properties for Visually Graded Lumber

D2555 Test Method for Establishing Clear Wood Strength Values

F. American Wood Preservers Association (AWPA)

C2 Lumber, Pressure Treatment
C9 Plywood, Pressure Treatment
C20 Structural Lumber, Fire-Retardant Pressure Treatment
C27 Plywood, Fire-Retardant Pressure Treatment
M4 Standard for the Care of Preservative-Treated Wood Products

G. Federal Specification (FS)

FF-N-105B Nails, Brads, Staples and Spikes: Wire, Cut and Wrought

H. International Conference of Building Officials (ICBO)

Uniform Building Code (UBC) Chapter 23 Wood

I. U.S. Department of Commerce, National Institute of Standards and Technology

PS 1 US Product Standard for Construction and Industrial Plywood
PS 2 Performance Standard for Wood-Based Structural-Use Panels
PS 20 American Softwood Lumber Standard (ASLS)

1.3 SUBMITTALS

- A. General:** Provide submittals in accordance with Specification 01 33 23.
- B. Product Data:** Submit manufacturer's product data for each distinct product specified.
- C. Material certificates** for dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use, and design values approved by American Lumber Standards Committee's (ALSC) Board of Review.
- D. Wood treatment data** as follows, including chemical treatment manufacturer's warranty and instructions for handling, storing, installing, and finishing treated materials:
1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
 2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.
 3. For fire-retardant-treated wood products, include certification by treating plant that treated materials comply with specified standard and other requirements as well as

data relative to bending strength, stiffness, and fastener-holding capacities of treated materials.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility for Fire-Retardant-Treated Wood: Obtain each type of fire-retardant-treated wood product from one source and by single producer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wood products bundled or crated to provide adequate protection during transit and job storage, with required grade marks clearly identifiable. Inspect wood products for damage upon delivery. Remove and replace damaged materials.
- B. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks, and under temporary coverings.
 - 1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.
- C. Protect sheet materials during handling to prevent breaking of corners and damage to surfaces.

PART 2 – PRODUCTS

2.1 LUMBER, GENERAL

- A. Lumber Standards: Comply with PS 20, “American Softwood Lumber Standard,” and with applicable grading rules of inspection agencies certified by ALSC’s Board of Review. Lumber design values are to comply with ASTM D245 and ASTM D2555.
- B. Inspection Agencies: Inspection agencies, and their grading rules include the following:
 - 1. Northeastern Lumber Manufacturers Association (NELMA)
Standard Grading Rules
 - 2. National Lumber Grades Authority (NLGA)(Canadian)
Standard Grading Rules
 - 3. Redwood Inspection Service (RIS)
Standard Specifications for Grades of California Redwood Lumber
 - 4. Southern Pine Inspection Bureau (SPIB)
Standard Grading Rules for Southern Pine Lumber

5. West Coast Lumber Inspection Bureau (WCLIB)
No. 17 Standard Grading Rules for West Coast Lumber
 6. Western Wood Products Association (WWPA)
Western Lumber Grading Rules
- C. Grade Stamps:** Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps and provide grade-compliance certificates issued by inspection agency.
- D.** Where nominal sizes are indicated, provide actual sizes required by PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
1. Provide dressed lumber, surfaced four sides (S4S), unless otherwise indicated.
 2. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38 mm actual) thickness or less, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. General:** Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood). Mark each treated item with Quality Mark Requirements of inspection agency approved by ALSC's Board of Review.
1. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- B.** Pressure treat aboveground items with waterborne preservatives to minimum retention of 0.25 lb/cu. ft. (4.0 kg/cu. m.). After treatment, kiln-dry lumber and plywood to maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 3. Wood framing members less than 18 inches (460 mm) above grade.
 4. Wood floor plates installed over concrete slabs directly in contact with earth.

- C. Pressure treat wood members in contact with ground or freshwater with waterborne preservatives to minimum retention of 0.40 lb/cu. ft. (6.4 kg/cu. m.).
- D. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated wood is indicated, comply with applicable requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of Underwriter Laboratory (UL), U.S. Testing, or Timber Products Inspection, Inc.
- B. Interior Type A: For interior locations, use chemical formulation that produces treated lumber and plywood with the following properties under conditions present after installation:
 - 1. Bending strength, stiffness, and fastener-holding capacities are not reduced below values published by manufacturer of chemical formulation under elevated temperature and humidity conditions simulating installed conditions when tested.
 - 2. No form of degradation occurs due to acid hydrolysis or other causes related to treatment.
 - 3. Contact with treated wood does not promote corrosion of metal fasteners.
- C. Exterior Type: Use for exterior locations, and where indicated.
- D. Inspect each piece of treated lumber or plywood after drying, and discard damaged or defective pieces.

2.4 DIMENSION LUMBER

- A. General: If not indicated on Contract documents, provide dimension lumber of any species and grades indicated for applicable use category listed in table below. Lumber shall comply with ALSC National Grading Rule (NGR) provisions of inspection agency applicable to species.

PRODUCT (Nominal Dimension)	GRADE	USE
Structural Light Framing 2 to 4 inches thick 2 to 4 inches wide	Select Structural No. 1 No. 2 No. 3	Structural applications where highest design values are needed in light framing sizes.
Light Framing 2 to 4 inches thick 2 to 4 inches wide	Construction Standard Utility	Where high-strength values are not required, such as wall framing, plates, sills, cripples, and blocking.
Stud 2 to 4 inches thick 2 inches and wider	Stud	Optional all-purpose grade designed primarily for stud uses, including bearing walls.
Structural Joists and Planks 2 to 4 inches thick 5 inches and wider	Select Structural No. 1 No. 2 No. 3	Intended to fit engineering applications for lumber nominal 5 inches and wider, such as joists, rafters, headers, beams, trusses, and general framing.

B. Species and grades must meet or exceed the following values, unless indicated otherwise on Contract documents.

1. F_b (extreme fiber stress in bending): Minimum 850 psi (5.9 MPa).
2. E (modulus of elasticity): Minimum 1,300,000 psi (8950 MPa).

C. Exposed Framing: Refers to dimension lumber which is not concealed by other work, and is indicated to receive stained, painted, or natural finish.

1. Provide material hand-selected from lumber of species and grade indicated for type of use, for uniformity of appearance, and freedom from characteristics that would impair finish appearance.

2.5 MISCELLANEOUS LUMBER

- A.** General: Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.
- B.** Fabricate miscellaneous lumber from dimension lumber of sizes indicated, and into shapes shown on Contract documents.
- C.** Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.

- D. Grade and Species:** For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common or Standard grade per WWPA of any species.

2.6 WOOD-BASED STRUCTURAL-USE PANELS, GENERAL

- A. Structural-Use Panel Standards:** Panel thickness, grade, veneer qualities and group number or span rating, shall be as shown on Drawings, and in accordance with recommendations of APA. Comply with PS 1 for plywood panels, and PS 2 for products not manufactured under PS 1 provisions.
1. Panels which have any edge or surface permanently exposed to weather shall be classed Exterior Grade.
 2. Panel thickness, grade, and group number or span rating shall be at least equal to that shown on Drawings.
 3. Application shall be in accordance with recommendations of APA.
- B. Trademark:** Factory-mark each structural-use panel with APA trademark evidencing compliance with grade requirements.

2.7 CONCEALED, PERFORMANCE-RATED STRUCTURAL-USE PANELS

- A. General:** Where structural-use panels are indicated for concealed types of applications, provide APA performance rated panels complying with requirements indicated for grade designation, span rating, exposure durability classification, and edge detail (where applicable).
1. Provide panel clips for edge support as recommended by panel manufacturer, or where required by UBC.
 2. Provide panels of thickness meeting requirements specified, but not less than thickness indicated.
- B. Combination Subfloor-Underlayment:** APA- rated Sturd-I-Floor.
1. Exposure Durability Classification: Exposure 1.
 2. Span Rating: As required to suit joist spacing indicated.
 3. Edge Detail: Tongue and groove.
 4. Surface Finish: Fully sanded face.
- C. Subflooring:** APA-rated sheathing.
1. Exposure Durability Classification: Exposure 1.

2. Span Rating: As required to suit joist spacing indicated.

D. Wall Sheathing: APA-rated sheathing.

1. Exposure Durability Classification: Exposure 1. Where sheathing is exposed on any side, it shall be Exposure Durability Classification “Exterior.”

2. Span Rating: As required to suit stud spacing indicated.

E. Roof Sheathing: APA-rated sheathing.

1. Exposure Durability Classification: Exposure 1.

2. Span Rating: As required to suit joist or truss spacing indicated.

2.8 STRUCTURAL-USE PANELS FOR BACKING

A. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade C-D plugged Exposure 1, in thickness indicated on Contract documents or, if not otherwise indicated, not less than 15/32 inch (11.9 mm) thick.

2.9 STRUCTURAL-USE PANELS FOR UNDERLAYMENT

A. General: Over smooth subfloors, provide underlayment not less than 1/4 inch (6.4 mm) thick. Over board or uneven subfloors, provide underlayment not less than 1 1/32 inch (8.7 mm) thick.

B. Plywood Underlayment for Resilient Flooring: For underlayment under 19/32 inch (15.1 mm) thick, provide plywood panels with fully sanded face, APA Underlayment grade, Exposure 1.

C. Structural-Use Panel Underlayment for Resilient Flooring: For underlayment 19/32 inch (15.1 mm) thick or more, provide fully sanded, veneer-faced, APA-rated, Sturd-I-Floor panels, Exposure 1.

D. Plywood Underlayment for Ceramic Tile: Provide APA-rated, Underlayment grade, exterior plywood, 5/8 inch (15.9 mm) thick, for ceramic tile set in epoxy mortar.

E. Plywood Underlayment for Carpet: For underlayment under 19/32 inch (15.1 mm) thick, provide plywood panels with fully sanded face, APA Underlayment grade, Exposure 1.

F. Structural-Use Panel Underlayment for Carpet: For underlayment 19/32 inch (15.1 mm) thick or more, provide APA-rated Sturd-I-Floor panels with touch-sanded face, Exposure 1.

2.10 PARTICLEBOARD

- A. General: Comply with and factory mark each panel according to ANSI A208.1. Provide thickness indicated on Contract documents.
- B. Particleboard Underlayment: Grade PBU.
- C. Particleboard Subflooring: Grade M-3-Exterior Glue.
- D. Particleboard Wall Sheathing: Grade M-1-Exterior Glue.

2.11 FASTENERS

- A. General: Provide fasteners of size and type indicated, that comply with requirements specified.
- B. Where rough carpentry work is exposed to weather, in ground contact, or in areas of high relative humidity, provide fasteners with hot-dip, zinc-coating per ASTM A153
- C. Nails, Wire, Brads, and Staples: FS FF-N-105B.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A307, Grade A with ASTM A563 hex nuts and, where indicated, flat washers.

2.12 METAL FRAMING ANCHORS

- A. General: Provide galvanized steel framing anchors of structural capacity, type, and size indicated, with allowable design loads as published by the manufacturer, that meet or exceed those indicated.
- B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653, G60 coating designation; structural, commercial, or lock-forming quality, as standard with manufacturer for type of anchor indicated.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.

- C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
- D. Apply field treatment complying with AWP A M4 to cut surfaces of preservative-treated lumber and plywood.
- E. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with UBC Table 23-I-Q “Nailing Schedule”.

3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

- A. Install wood grounds, nailers, blocking, and sleepers where shown, and where required for screeding or attaching other work. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.
- C. Install permanent grounds of dressed, preservative-treated, key-beveled lumber not less than 1-1/2 inches (38.1 mm) wide, and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING

- A. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Firestop furred spaces of walls at each floor level, and at ceiling with wood blocking or noncombustible materials, accurately fitted to close furred spaces.

3.4 WOOD FRAMING, GENERAL

- A. Framing Standard: Comply with AFPA’s “Manual for Wood Frame Construction,” unless otherwise indicated.
 - 1. Install framing members of size and at spacing indicated.
 - 2. Do not splice structural members between supports.
 - 3. Firestop concealed spaces of wood-framed walls and partitions at each floor level and at ceiling line of top story. Where firestopping is not inherent in framing system used, provide closely fitted wood blocks of 2-inch nominal (38 mm actual) thickness lumber of same width as framing members.

- B.** Arrange studs so that wide face of stud is perpendicular to direction of wall or partition and narrow face is parallel.
1. Provide single bottom plate and double top plates using members of 2-inch nominal (38 mm actual) thickness whose widths equal that of studs; except single top plate may be used for non-load-bearing partitions. Nail or anchor plates to supporting construction, unless otherwise indicated.
 2. For exterior walls, provide 2 by 6-inch nominal (38 by 140 mm actual) size wood studs spaced 24 inches (610 mm) o.c., except where otherwise indicated or required.
 3. For interior partitions and walls, provide 2 by 4-inch nominal (38 by 89 mm actual) size wood studs spaced 16 inches (406 mm) o.c., except where otherwise indicated or required.
- C.** Construct corners and intersections with three (3) or more studs. Provide miscellaneous blocking and framing as shown, and as required to support facing materials, fixtures, specialty items, and trim.
1. Provide continuous horizontal blocking at mid-height of single-story partitions over 96 inches (2.4 m) high and multistory partitions, using members of 2-inch nominal (38 mm actual) thickness and of same width as wall or partitions.
- D.** Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Set headers on edge and support on jamb studs.
1. For non-load-bearing partitions, provide double-jamb studs with headers not less than 4-inch nominal (89 mm actual) depth for openings 36 inches (914 mm) and less in width, and not less than 6-inch nominal (140 mm actual) depth for wider openings.
 2. For load-bearing walls, provide double-jamb studs for openings 72 inches (1.8 m) and less in width, and triple-jamb studs for wider openings. Provide headers of depth shown as indicated on Contract documents.
- E.** Provide bracing in exterior walls and at interior load-bearing walls (that are not more than 25 feet (7.6 m) from other parallel braced walls) at each end and at not more than 25 feet (7.6 m) apart, to comply with UBC Section 2326.11.3 “Bracing” and UBC Table 23-I-W “Braced Wall Panels” as required for Seismic Zone 2B.

3.5 FLOOR JOIST FRAMING

- A.** General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches (38.1 mm) of bearing on wood or metal, or 3 inches (76 mm) on masonry. Attach floor joists as follows:
1. Where supported on wood members, by toe nailing or by using metal framing anchors.

2. Where framed into wood supporting members, by using wood ledgers as shown or, if not shown, by using metal joist hangers.
- B.** Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches (1.2 m).
 - C.** Do not notch in middle third of joists; limit notches to 1/6 depth of joist, 1/3 at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 2 inches (51 mm) from top or bottom.
 - D.** Provide solid blocking of 2-inch nominal (38 mm actual) thickness by depth of joist at ends of joists unless nailed to header or band.
 - E.** Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches (102 mm) or securely tie opposing members together. Provide solid blocking of 2-inch nominal (38 mm actual) thickness by depth of joist over supports.
 - F.** Under jamb studs at openings, provide solid blocking between joists.
 - G.** Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.
 1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.
 - H.** Provide bridging of type indicated below, at intervals of 96 inches (2.4 m) o.c., between joists.
 1. Form diagonal wood bridging from bevel cut 1 by 3-inch nominal (19 by 64 mm actual) size lumber, double-crossed and nailed both ends to joists.
 2. Install steel bridging to comply with manufacturer's written instructions.

3.6 RAFTER AND CEILING JOIST FRAMING

- A.** Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
- B.** Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.
- C.** Provide collar beams (ties) as shown or, if not shown, provide 1 by 6-inch nominal (19 by 140 mm actual) size boards between every third pair of rafters, but not more than 48

inches (1219 mm) o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.

- D. Rafter Ties:** Tie straps shall be provided from each roof framing member to exterior studs, posts or other supporting members below the roof. Opposing rafters at ridges shall be aligned and connected with straps.

3.7 STAIR FRAMING

- A.** Provide stair framing members of size, space, and configuration indicated or, if not otherwise indicated, to comply with the following requirements:
1. **Stringer Size:** 2 by 12-inch nominal (38 by 286 mm actual) size minimum.
 2. **Notching:** Notch stringers to receive treads, risers, and supports; leave at least 3-1/2 inches (89 mm) of effective depth.
 3. **Stringer Spacing:** At least three (3) stringers for each 36-inch (914 mm) clear width of stair.
- B.** Provide stair framing that does not exceed the following variations between treads and risers within each flight:
1. **Adjacent Treads and Risers:** 3/16 inch (4.76 mm).
 2. **Between Largest and Smallest Treads and Risers:** 3/8 inch (9.53 mm).

3.8 INSTALLATION OF STRUCTURAL-USE PANELS

- A. General:** Comply with applicable recommendations contained in APA Form No. E30, for types of structural-use panels and applications indicated.
1. **Fastening Methods:** Fasten panels as indicated below:
 - a. **Combination Subflooring-Underlayment:** Glue subflooring and underlayment to floor joists, and screw to joists. Space panels 1/8 inch (3.18 mm) at edges and ends.
 - b. **Subflooring:** Glue subflooring to floor joists, and screw to joists. Space panels 1/8 inch (3.18 m) at edge and ends.
 - c. **Sheathing:** Nail to framing. Space panels 1/8 inch (3.18 mm) at edges and ends.
 - d. **Underlayment:** Nail to subflooring. Space panels 1/32 inch (0.8 mm) at edges and ends.

- e. Plywood Backing Panels: Nail or screw to supports.

3.9 PARTICLEBOARD UNDERLAYMENT

- A. Install to comply with the recommendations of the National Particleboard Association (NPA) for type of subfloor indicated.
 - 1. Fill and sand gouges, gaps, and chipped edges. Sand uneven joints flush.
 - 2. Glue and nail underlayment to subflooring throughout.

End of Section

SECTION 07 21 00

BUILDING INSULATION

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Perimeter and Under-Slab Insulation.
2. Frame Wall and Ceiling Insulation.
3. Pre-Engineered Building Insulation.
4. Cavity Wall and Masonry Cell Insulation.

1.2 REFERENCES

A. American Society of Testing and Materials (ASTM)

C549	Specification for Perlite Loose Fill Insulation
C578	Specification for Rigid, Cellular Polystyrene Thermal Insulation
C665	Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
C991	Specification for Flexible Glass Fiber Insulation for Pre-Engineered Metal Buildings
D4397	Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
E84	Test Method for Surface Burning Characteristics of Building Materials
E119	Test Method for Fire Tests of Building Construction and Materials
E136	Test Method for Behavior of Material In A Vertical Tube Furnace At 750 Degrees C

B. Underwriter's Laboratories, Inc. (UL)

Fire Resistance Directory

1.3 DEFINITIONS

- A. Thermal Resistivity (r-value): Temperature difference in degrees F (degrees C) between the two (2) surfaces of a material exactly one (1) inch (25 mm) thick, required to make one (1) BTU of energy flow through one (1) square foot (0.1 square meter) of the material in one (1) hour.

1.4 SUBMITTALS

- A. General: Provide submittals in accordance with Specification 01 33 23.

- B. Manufacturer’s Certifications:** Submit manufacturer’s representative certification that the proposed products comply with specified requirements, and are compatible with each other and substrates for the intended applications.
- C. Product Data Sheet:** Submit manufacturer’s catalog data and application instructions for each material proposed for use.

1.5 QUALITY ASSURANCE

- A. Single-Source Responsibility for Insulation Products:** Obtain each type of building insulation from a single source with resources to provide products complying with requirements without delaying progress of the work.
- B. Installer Qualifications:** Engage an experienced installer, with not less than two (2) years experience and certification by the manufacturer as an approved installer, who has completed building insulation applications similar in material, design and extent to that indicated for projects that have resulted in construction with a record of successful in-service performance.
- C. Fire-Test-Response Characteristics:** Provide insulation and related materials with fire-test-response characteristics indicated on Contract documents, or specified elsewhere in this Section; to be determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface Burning Characteristics: ASTM E84.
 - 2. Fire-Resistance Ratings: ASTM E119.
 - 3. Combustion Characteristics: ASTM E136.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in manufacturer’s original unopened packaging fully labeled and intact until time of use. Store materials off ground and under cover to prevent damage or contamination to materials by water, foreign matter or other causes. Promptly remove from site any materials which show evidence of damage and immediately make all replacements necessary.**

1.7 PROJECT CONDITIONS

- A. Environmental Conditions:** Do not proceed with installation of insulation under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside the limits permitted by insulation manufacturer.

2. When insulation is or is likely to become wet due to rain, frost, condensation or other causes.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, products by manufacturers that may be incorporated in the work include, but are not limited to the following. However, it is the Contractor's responsibility to provide only products compatible with the adjacent materials in the assembly.

1. Extruded Polystyrene Board Insulation
 - Amoco Foam Products Company
 - DiversiFoam Products
 - Dow Chemical Company
 - UC Industries, Inc.; Owens-Corning Fiberglass Corp.
2. Glass-Fiber Blanket/Batt Insulation
 - CertainTeed Corp.
 - Knauf Fiberglass GmbH.
 - Owens-Corning Fiberglass Corp.
 - Schuller International, Inc., Manville
3. Perlite Loose-Fill Insulation
 - Producer members of Perlite Institute, Inc.

2.2 PERIMETER AND UNDER-SLAB INSULATION

A. Extruded Polystyrene Board Insulation: Provide rigid water resistant, cellular polystyrene thermal insulation with closed-cells and integral high density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C578.

1. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 5 and 175, respectively.

2.3 FRAME WALL AND CEILING INSULATION

A. Unfaced Mineral Fiber Blanket/Batt Insulation: Provide thermal insulation produced by combining mineral glass fibers with thermosetting resins to comply with ASTM C665, Type I (blankets without membrane facing).

1. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively.

B. Faced Mineral Fiber Blanket/Batt Insulation

1. **Kraft-Faced:** Provide thermal insulation produced by combining mineral glass fibers with thermosetting resins to comply with ASTM C665, Type II, Class C (blankets with a non-reflective vapor-retarder membrane covering one principal face and not rated for flame propagation resistance - for use in non-exposed applications only).
2. **Foil-Scrim-Kraft:** Provide thermal insulation produced by combining mineral glass fibers with thermosetting resins to comply with ASTM C665, Type III, Class A (blankets with a reflective vapor-retarder membrane facing with flame spread of 25 or less); with foil-scrim-kraft vapor-retarder membrane on one face. (Only allowed in concealed spaces of Types III, IV and V construction as defined by the Uniform Building Code, and when facing is in substantial contact with the unexposed surface of the ceiling, floor or wall finish.)
 - a. **Surface Burning Characteristics:** Maximum flame spread and smoke developed values of 25 and 50, respectively.

C. Sound Attenuation Batts: Provide unfaced mineral fiber blanket/batt insulation where shown on Contract documents, to comply with requirements of ASTM C665, Type I, three (3) inches (76 mm) thick, unless indicated otherwise. Material shall be labeled as sound attenuation batts.

2.4 PRE-ENGINEERED BUILDING INSULATION

- A. Faced Mineral Fiber Blanket/Batt Insulation:** Provide thermal insulation produced by combining mineral glass fibers with thermosetting resins to comply with ASTM C991, Type II, Class A (blankets with a reflective vapor-retarder membrane facing with flame spread of 25 or less); with vinyl-faced vapor-retarder membrane on one face.
1. **Surface Burning Characteristics:** Maximum flame spread and smoke developed values of 25 and 50, respectively.

2.5 CAVITY WALL AND MASONRY-CELL INSULATION

- A. Perlite Loose-Fill Insulation:** Provide expanded perlite to comply with ASTM C549, Type II (surface treated for water repellency and limited moisture absorption) or IV (surface treated for water repellency and limited moisture absorption), r-values of 3.3 - 2.8 for densities of 4.1 - 7.4 pcf at 75 degrees F (24 degrees C).

2.6 FIRE RETARDANT VAPOR RETARDERS

- A. Provide reinforced polyethylene fire retardant vapor retarders to comply with ASTM D4397 with a maximum permeance rating of 0.13 perms, with multiple layers of polyethylene film reinforced with layers of nylon cord reinforcing, and laminated together with a rubber adhesive to produce the following product in roll form:**

1. Two (2) layers of polyethylene film and one (1) inner layer of nylon reinforcing, with a minimum overall thickness of 6.0 mils (0.15 mm).
2. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively.

2.7 MISCELLANEOUS MATERIALS

- A. Adhesive for Bonding Insulation: Provide insulation manufacturer's recommended adhesives, capable of bonding insulation to substrates indicated without damaging or corroding either insulation or substrates.
- B. Mechanical Fasteners: Provide insulation manufacturer's recommended fasteners for required substrate and application.
- C. Screens to be used with loose granular insulation: Provide suitable screens of stainless steel, properly sized and designed to permanently maintain drainage and ventilation openings.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that conditions comply with requirements of Contract documents.
- B. Verify that related work to be performed before installation of insulation within indicated spaces has been completed.
- C. Verify that substrates are in satisfactory condition to receive insulation.
 1. Masonry substrates: Verify that masonry materials have dried sufficiently and have attained optimum moisture content.
- D. Do not proceed with installation of insulation until all unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulations or vapor retarders, including removal of projections that might puncture vapor retarders, or interfere with insulation attachment.
- B. Close off openings in cavities receiving poured-in-place insulation to prevent the escape of insulation. Provide screens where openings must be maintained for drainage or ventilation.

3.3 INSTALLATION, GENERAL

- A.** Comply with insulation manufacturer's instructions applicable to products and application indicated. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with installation of insulation.
- B.** Extend insulation full thickness as indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections that interfere with placement.
- C.** Do not install insulation which is damaged, wet, soiled, or which has been covered at any time with ice or snow.
- D.** Locate vapor retarders on the warm side of assembly, unless indicated otherwise on Contract documents or manufacturer's data sheets.

3.4 INSTALLATION OF PERIMETER AND UNDER-SLAB RIGID INSULATION

- A.** On vertical surfaces, set units in adhesive applied in accordance with manufacturer's instructions.
- B.** Protect below-grade insulation on vertical surfaces from damage during back-filling, by application of protection board. Set in adhesive in accordance with recommendations of insulation manufacturer.
- C.** Cut insulation neatly as required to fit tightly around obstructions.
- D.** Install boards as indicated:
 - 1. Butt board edges and ends tightly.
 - 2. Form solid joints where insulation boards meet protrusions and between adjacent boards.
 - 3. Stagger joints.

3.5 INSTALLATION OF FRAME WALL AND CEILING INSULATION

- A.** Install per manufacturer's recommendations and installation sequence. Provide permanent placement and support of insulation.
- B.** Use blanket widths and lengths that fill cavities formed by framing members. Where more than one (1) length is required to fill cavity, provide lengths that will produce snug fit at ends.
- C.** Cut installation neatly as required to fit tightly around obstructions.

- D. Place insulation with facing oriented toward warm side of construction, unless otherwise indicated. Tape seal all penetrations in facing with manufacturer recommended tape.
- E. Fasten insulation continuously tight against framing members to completely fill all spaces. Do not install on top or within 4 inches (102 mm) of recessed light fixtures.
- F. Seal tight all joints and gaps, with tape to ensure airtight installation. Install in a manner to prevent sagging.
- G. Provide metal clips or wire bracing for supplemental support of vertical heights over 10 feet (3 m).
- H. Any insulation that does not fill the cavity width shall have support in the form of metal clips or wire bracing.

3.6 INSTALLATION OF CAVITY WALL AND MASONRY CELL INSULATION

- A. Seal holes and openings in cavities as necessary to prevent loss of insulation during construction.
- B. Install suitable screens inside cavities to maintain openings at drainage or ventilation openings.
- C. Remove any obstructions which might interfere with free flow of insulation to intended spaces during pouring. Completely fill indicated cavities and spaces. Leave no gaps or voids.
- D. During placement, do not allow insulation to fall a distance greater than one story, or 20 feet (6 m), whichever is less.
- E. Rod insulation frequently during installation to eliminate formation of air pockets.

3.7 INSTALLATION OF VAPOR RETARDERS

- A. Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure vapor retarders to substrates with mechanical fasteners or adhesives as recommended by manufacturer. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose fiber insulation.
- B. Seal vertical joints in vapor retarders over framing by lapping not less than two (2) wall studs. Fasten vapor retarders to framing at top, end, and bottom edges, at perimeter of wall openings, and at lap joints; Space fasteners 16 inches (406 mm) o.c.
- C. Seal overlapping joints in vapor retarders with adhesives or tape per vapor retarder manufacturer's printed directions. Seal butt joints and fastener penetrations with tape of type recommended by vapor retarder manufacturer. Locate all joints over framing members or other solid substrates.

- D. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor retarder manufacturer.
- E. Seal joints caused by pipes, conduits, electrical boxes and similar items penetrating vapor retarders with tape recommended by vapor retarder manufacturer to create an airtight seal between penetrating objects and vapor retarder.
- F. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with tape or another layer of vapor retarder.

3.8 PROTECTION

- A. General: Protect installed insulation and vapor retarder from damage due to harmful weather exposures and from construction damage. Provide temporary coverings or enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

3.9 CLEANING

- A. Remove all excess materials from the job site and leave the areas insulated ready for other trades.

End of Section

SECTION 26 04 02

ELECTRICAL WORK

PART 1 – GENERAL

1.1 GENERAL

- A. Include Conditions of the Contract and applicable parts of Division - 01.
- B. Examine all other sections of the specifications for requirements, which affect the work of this Section, whether or not such requirements are particularly mentioned herein.
- C. Coordinate the work of this section with the related work of other trades, and cooperate with such trades to assure the steady progress of all work of this Contract.
- D. Where the National Electrical Code appears in this specification, it shall be interrupted to mean the latest edition.
- E. The intent of this project is to require all facilities to be completed and fully operational in accordance with Codes and the Contract Documents.

1.2 SCOPE

- A. The work covered by this Section consists of furnishing all labor, materials, equipment, supplies, devices, electrical apparatus, fixtures, the necessary wiring interconnections for the new control panel, and wiring and connection of the facility ancillary equipment, and the performance of all operations necessary for the installation of electrical facilities in and about the structures and around the grounds, as indicated on the Contract Documents. This is for the facilities at the South Main Street Water Pump Station in Warren, NH. This shall include the removals of existing electrical installations that are discontinued at this site and modifications to system being modified by the new work.
- B. This work shall include all costs involved in providing new telephone and electrical utility service indicated and distribution at the facility and any costs involved with any other special utilities on the project. Without limiting the work required under this specification section, the following is included:
 - 1. Provision of new electrical and telephone services.
 - 2. Provision of and wiring of all power, alarm and data interconnections for the new pump control panel.
 - 3. Provision of lighting fixtures, Surge Protective Device, disconnects, wiring devices, conduit and wiring, VFDs, and other electrical equipment and devices.
 - 4. Intercept existing emergency well power conduit and wiring in existing building and extend to new control panel.

Horizons Engineering, Inc.

5. Provide new conduits to new wiring from control panel to new well level transducers in each of the two existing wells.
6. Any other work required to leave a fully operable facilities per Contract Documents.
7. Provide all conduit and wiring associated with alarm system provided within the new control panel and for all VFDs. The new control panel is provided under another specification section.
8. All wiring and conduit associated with the three new flow meter installations.
7. All demolition and removals of existing, discontinued electrical installations. Contractor to visit the site and determine scope of removals.
8. Any and all conduits and wiring, fully installed, to provide all systems fully operational, whether indicated in detail or not.
9. All conduit and wiring for the Standby Power Installations at the site, including connections to the generator and transfer switch as furnished under specification 26 32 13.
10. Obtain and pay for all required permits, inspections, etc.

1.3 WORK OF OTHER SECTIONS

Refer to other Sections in this specification as appropriate.

33 09 10 PROCESS INSTRUMENTATION AND CONTROLS

26 32 13 STANDBY GENERATOR SYSTEM

1.4 SUBMITTALS

A. Shop Drawings:

1. Within thirty days after award of the Contract, submit shop drawings in accordance with requirements of the General Conditions and in the manner described therein. Shop drawings shall indicate specifications section and paragraph requiring equipment indicated.
2. Shop drawings are required on all major pieces of equipment in the following list, but not necessarily limited thereto: breakers; contactors; relays of all types involved; push button stations; pull, junction, and terminal boxes; disconnect switches; wiring devices; lighting fixtures, surge protective device, panelboard, terminal boxes, VFDs, etc.

B. Samples:

1. Within thirty days after award of the Contract, submit samples of all materials requested by the Engineer. Samples shall be prepared and submitted in accordance with the requirements of General Conditions, all postage and transportation costs being paid by the Contractor submitting same.

C. Record Drawings:

Horizons Engineering, Inc.

SOUTH MAIN STREET WATER DISTRICT
PUMP STATION UPGRADES

ELECTRICAL WORK

26 04 02-2

1. In accordance with requirements of the Supplementary General Conditions, the Subcontractor shall furnish and keep on the job at all times one complete set of blackline prints of the electrical work, on which shall be clearly, neatly and accurately noted, promptly as the work progresses, all architectural and electrical changes, revisions and additions to the work. Wherever work is installed otherwise than as shown on the Contract Drawings, such changes shall be noted.
2. The Subcontractor shall indicate on these prints the daily progress by coloring in the various apparatus and associated appurtenances as they are installed.
3. No approval of requisition for payment for work installed will be given unless supported by record prints as required above.
4. At the conclusion of work, prepare record drawings in accordance with the requirements of the Supplementary General Conditions.

D. Operating Instructions and Maintenance Manual:

1. The Subcontractor shall instruct, to the Owner's satisfaction, such persons as the Owner designates in the proper operation and maintenance of systems and their parts.
2. Parties indicated above sign affidavits stating that the above instructions were given by the Electrical Subcontractor. Final Contract payment will not be released until these affidavits are delivered and accepted.
3. Furnish in accordance with General Conditions operating and maintenance manuals and forward same to the Engineer for transmittal to the Owner.
4. The operating instructions shall be specific for each system and shall include copies of posted specific instructions.
5. For maintenance purposes, provide shop drawings, parts lists, specifications and manufacturer's maintenance bulletins for each piece of equipment. Provide name, address and telephone number of the manufacturer's representative and service company, for each piece of equipment so that service or spare parts can be readily obtained.

E. Manufacturers' Data:

1. Within thirty days of award of Contract, the Subcontractor shall submit for Engineer's approval a complete list of manufacturers' names of all materials and equipment proposed for the project.
2. After approval of the above list, the Subcontractor shall submit for Engineer's approval complete detailed manufacturers' data consisting of bulletins, shop drawings, and parts lists of the materials and equipment to be furnished, as required.

3. Shop drawings and manufacturers' data submitted must bear the Electrical Subcontractor's stamp stating that the shop drawings and data have been checked and meet the plans and specifications before being submitted for Engineer's approval. If this is not done, or if the submitted shop drawings do not indicate the specific item proposed, they will not be considered and will be returned for resubmission. If the shop drawings and data show proposed variations from the requirements of the plans and specifications because of standard practice or other reason, specific mention shall be made of such variations in the letter of transmittal.
4. The Electrical Subcontractor shall assume the entire cost and responsibility for any changes in the work which may be occasioned by approval of materials other than those specified.
5. Errors, omissions, and coordination of shop drawings shall be the sole responsibility of the Subcontractor whether or not the shop drawings are approved.
6. In the event that any specified manufacturer's number has been superseded by a new number since the writing of this specification, the new manufacturer's number shall be immediately submitted to the Engineer for approval. It shall be the responsibility of the Subcontractor to notify the Engineer of any superseded manufacturers' numbers mentioned in these specifications.

1.5 QUALITY ASSURANCE

A. Applicable Standards, Permits and Codes:

1. The installation shall comply with all laws applying to electrical installations in effect in Warren, New Hampshire, and with regulations of any other governmental body or agency having jurisdiction, including OSHA; with regulations of the National Electrical Code where such regulations do not conflict with those laws, with the regulations of the electric utility involved, with the telephone utility, and with ASHRAE Standard 70, as amended.
2. File all required notices and plans. Obtain and pay for all permits, inspections, licenses, and certificates required for work under this Section.
3. If any portion of the electrical plans or specifications conflict with any utility standards, laws or ordinances with regard to type of materials, equipment, or fixtures to be used or their installation, the Electrical Subcontractor shall bring it to the Engineer's attention at least seven days before submitting the bid. Otherwise the cost of all work necessary to make the installation comply with said utility standards, laws or ordinances shall be paid by the Electrical Subcontractor and shall become a part of this Contract.

1.6 EXAMINATION OF SITE AND CONTRACT DOCUMENTS

- A.** Before submitting prices or beginning work, thoroughly examine the site and the Contract Documents.
- B.** No claim for extra compensation will be recognized if difficulties are encountered which an examination of site conditions and Contract Documents prior to executing the Contract would have revealed.

1.7 DRAWINGS

- A.** The Subcontractor shall refer to the electrical drawings and the architectural floor/ site and details for a full comprehension of the extent and detail of the work to be performed. These drawings are intended to be supplementary to the specifications, and any work indicated, mentioned, or implied in either is to be considered as specified by both.
- B.** All work shown on the drawings is intended to be approximately correct to the scale of the drawings, but figured dimensions and detailed drawings are diagrammatic and are not intended to show every detail of construction or the exact location of equipment. Where building or site work construction makes it advisable or necessary to change the location of equipment, the Subcontractor shall perform such work without cost to the Owner on written request of the Engineer. Any doubt as to the intended location of equipment shall be resolved by the Engineer before proceeding with the installation.
- C.** The intent is to obtain an electrical installation of all systems, complete in every detail within and about the building/site, and with all facilities properly interconnected with power and telephone. The Electrical Subcontractor shall furnish and install all such parts as may be necessary to complete the systems in accordance with the best trade practice and to the satisfaction of the Engineer. Upon completion, the electrical systems and all equipment throughout the structures shall operate properly and adequately and function as intended.
- D.** In any discrepancy between requirements of any Section, between notes on the drawings, between drawings, between details in the specifications, or between drawings and specifications, that which is in the best interest of the Owner shall apply.
- E.** Testing by Contractor: Provide equipment and personnel for operating test of electrical system.
- F.** Changes by Contractor: The contract drawings indicate the extent and schematic arrangement of the conduit and wiring systems. If changes from the drawings are deemed necessary by the Contractor, submit details of such changes within 30 days of award of Contract. Make no changes without written authorization of Engineer. Where conduit routings are not indicated, coordinate with Engineer, General Contractor, and other Subcontractors to insure no conflicts result from routings selected.

1.8 ELECTRICAL REFERENCE SYMBOLS

- A.** Standard symbols have been employed where such will meet the need. These are augmented and modified to illustrate as necessary. The chart on the Contract Drawings is intended to illustrate all symbols and explain the function and installation method of the device represented. When not clear, or where one has been inadvertently omitted, it shall be the responsibility of the Electrical Subcontractor to obtain a ruling on the intent before proceeding with any work.

1.9 TEMPORARY CONSTRUCTION POWER

- A.** The Contractor or Electrical Subcontractor shall furnish and install temporary feeders of proper capacity power required for the project while under construction. Sufficient outlets shall be installed at convenient locations so that extension cords of not over 50 feet will reach all areas requiring power.
- B.** The General Contractor and all subcontractors shall furnish their own extension cords and such lamps as may be required for their work, and shall pay for the cost of temporary wiring of construction offices or shanties used by them and any temporary wiring of a special nature for light and power required other than that mentioned above.

1.10 GUARANTEE

- A.** Contractor's guarantee for items furnished covers and includes:
 - 1. Faulty or inadequate design
 - 2. Improper installation
 - 3. Defective workmanship and materials
- B.** Warranties of Manufacture:
 - 1. Not less than one year
 - 2. As specified
 - 3. As normally supplied if greater than one year

1.11 ALTERATIONS

- A.** The Contractor shall execute all alterations, additions, removals, relocations or new work, etc., as indicated or required to provide a complete installation in accordance with the intent of the drawings and specifications.
- B.** Remove all existing equipment and wiring that is to be discontinued.

- C. Existing equipment to be discontinued and removed shall remain the property of the Owner and shall be carefully packed and delivered by the Contractor for storage at a site designated by the Owner. If the Owner indicates that any removed materials and/or equipment are not desired for retention by the Owner, the Contractor shall then dispose of such item in a legal and lawful manner.
- D. Any existing work disturbed or damaged by the alterations or new work shall be repaired or replaced to the Owner's satisfaction.
- E. Renovations in existing areas are not limited to those noted in Contract Documents. Review the existing facility to determine the full scope of removals and/or relocations that will be required by the Contract prior to bidding.

1.12 SCHEDULING

- A. The Electrical Subcontractor shall schedule his work in accordance with Contract Requirements re any interruption of electrical, telephone, or other services and/or the requirements to maintain project areas or spaces available for the Owner's use during construction.
- B. If required to maintain Owner's operations, work may be required to be scheduled when occupants are not in the facility or vicinity. If this occurs this contractor shall provide a suitable work force to accommodate the schedule requirements.

1.13 EQUIPMENT/MATERIAL REMOVED

- A. All electrical equipment, etc. removed shall remain the Owner's property, except for any items specifically noted herein. The Bidder is notified herewith that the design may include the reuse of certain components being removed, and possibly other equipment. Damage to items removed and indicated for reinstallation will result in the Bidder being responsible for all costs of acceptable and approved replacements of such damaged items, without added cost to the Owner.

Bidder must field verify scope of removals/demolition of electrical installations.

1.14 HAZARDOUS MATERIALS

The Contractor under this specification section shall review all associated Contract Sections and Conditions to determine whether his work will encounter hazardous materials (asbestos, lead based paint, PCB's, etc.) and shall take all steps to insure his employees are properly trained and equipped for any work he must provide where such materials are known to or found to exist within the existing facility.

If hazardous materials are encountered their removal will be by an appropriately qualified firm and the costs of such removals/abatement will not be the responsibility of the Electrical Subcontractor.

1.15 **DEFINITION**

Where the word "Owner" appears in this specification it shall mean the Town of Warren, New Hampshire as represented by its designated representative for this project .

There the word "Project Engineer" or "Engineer" appears in this specification it shall mean the firm of Horizons Engineering or their designated representative for this project.

1.16 **DIG SAFE**

The Contractor shall contact Dig Safe with adequate lead time to have all existing underground utilities located and marked prior to the initiation of any underground excavation. The Contract Drawings do NOT indicate all utilities (public utility systems and Owner's systems) that may be present.

The Contractor shall retain a utility locating service acceptable to the Project Engineer to assist in this work.

1.17 **ARC FLASH WARNING STUDY AND LABEL REQUIREMENTS**

All new and/or modified electrical equipment including control panels, switchboards, panelboards, meter socket enclosures, disconnects, etc., must have an Arc-Flash Hazard Analysis (AFHA) conducted, and shall be field marked to warn qualified personnel of potential electric arc flash hazards. Warning labels shall be clearly visible and shall be provided in accordance with NEC 110.16 and NFPA 70E.

All work shall be performed in strict compliance with all applicable local and state codes. In addition, all practices shall be in accordance with the latest editions of the National Electrical Code (NEC) of the NFPA, the National Electrical Safety Code, and OSHA.

Provide an ANSI Z535.4 compliant(size 4 in. x 6 in.) thermal transfer or equivalent type two color die cut arc flash label as provided by Dura Label or Brady for each work location analyzed and included in this project. Material type shall be suitable for the locations; ie: indoor, outdoor, chemical resistant, etc.

If the equipment will be energized prior to the application of the final labels, provide temporary labels until the final labels are applied. Temporary labels do not need to be of the materials specified above. Temporary labels shall be suitable for the environment(example: 110 pound paper or 30 pound paper in a plastic "page protector"). [Note: label information to meet required criteria outlined herein for permanent labeling. Once final labels are available, remove temporary labeling and provide permanent labels as indicated.]

The label shall have either an orange header with black lettering and the wording, "WARNING, ARC FLASH HAZARD", or red header with white lettering and the wording, "DANGER, ARC FLASH HAZARD" . Include the ANSI Safety Symbol in the header as recommended. The Danger signal wording shall be provided for all incident energy values calculated greater than 40 Cal/ sq. cm; Warning to be used for all incident energy values calculated less than 40 Cal/ sq. cm. These labels shall include the following information:

1. Location designation
2. Shock Hazard Information including: Nominal Voltage, Limited Approach, Restricted Approach, and Prohibited Approach.
3. Flash protection boundary
4. Hazard/Risk category (HRC) including PPE Category
5. Incident energy
6. Working distance
7. Reference actual listing of clothing and glove requirements.

Labels shall be machine printed, with no field markings. The size of the lettering is to be in accordance with ANSI-Z535.4 recommendations for a safe viewing distance of 3 feet minimum based on favorable viewing conditions and information to be included.

Arc Flash labels shall be provided in the following manner and all labels shall be based on recommended over-current device settings. Coordinate the data provided with the Arc Flash Study results and the ANSE labeling requirements.

Quantities outlined below are considered minimum quantities necessary. Provide additional labeling as may be required by Regulatory or Inspection Agencies at no added cost to the project.

1. For each transformer, 480 and applicable 240 and/or 208 volt panelboard, individually mounted circuit breaker and safety disconnect device, one arc flash label shall be provided.
2. For each automatic transfer switch, one arc flash label shall be provided.
3. For each low voltage switchboard, one arc flash label shall be provided at the top of each vertical section (see footnote below)
4. For each generator connection terminal enclosure with circuit breaker, one arc flash label shall be provided.

7. Additional arc flash labels to address installations and specific equipment requirements shall be provided on an individual evaluation basis
8. General Use Safety Labels shall be installed on equipment in coordination with Arc Flash Labels. The General Use Safety Labels shall warn of general electrical hazards associated with shock, arc flash, and explosions, and instruct workers to turn off power prior to work.

(Footnote: Where switchboard, or switchgear assemblies are dual-fed, provide on arc flash label at each main entrance device or section as well as at any "Tie" device location. For equipment that is front and rear accessible, provide the same labeling on the rear sections as outlined above).

Labels shall be field installed by the Contractor at the conclusion of the project.

Provide written maintenance procedures and guidelines in accordance with NFPA-70E, Latest Edition, for Owner.

At a minimum, provide a written report prepared by a Professional Engineer duly licensed to practice in the state where the project is located.. The report shall include:

1. Equipment ID
2. Available Fault Current
3. Method and software used in the calculations
4. Any other relevant data used to support the calculations
5. One Line Diagram
6. All required labels and placards, including their installation.

NOTE: The required study and label requirements under this Contract are to include all [project equipment].

PART 2 – PRODUCTS

2.1 GENERAL REQUIREMENTS

- A.** All materials, devices, and equipment, unless specifically accepted, shall be new.
- B.** Services: Electrical service voltage will be as follows:

Utility Service Voltage shall be 208/120 V, 3 phase, 4 wire, 60 Hz.

2.2 IDENTIFICATIONS

- A. All materials shall bear UL labels where such have been established for the particular device.
- B. All devices shall show make, type, serial number (where applicable), voltage, amperage, wattage, motor ratings, and all other pertinent data.
- C. All wire shall have make, type of insulation, size, and voltage rating clearly marked upon it.

2.3 SLEEVES/JUNCTION BOXES/ANCHORS

- A. The Subcontractor shall advise the Contractor of locations for all sleeves, openings, anchors, supports, conduits, and boxes, and shall provide same so that they may be built into the job wherever feasible.

2.4 ACCESS PANELS

- A. Not applicable on this project.

2.5 CONDUITS

- A. Exterior:
 - 1. Direct buried conduit and conduit in concrete or below concrete floor slabs in earth shall be Schedule 80 PVC or rigid galvanized steel. Where steel is used, it shall be double coated with bitumastic dried at least 24 hours between coats before installation. Where PVC is used, all elbows and/or offsets shall be rigid galvanized steel except that those on electrical service conduits may be PVC where run lengths permit this material by the utility company's standards. Rigid galvanized steel shall be used above grade. Telephone and signal cable conduits may be Schedule 80 PVC, separated from power conduits by not less than 12 inches or as required by the utility standards.
- B. Exterior above grade
 - 1. Exterior exposed conduits shall be rigid galvanized steel. Electrical metallic tubing (EMT) shall NOT be used.
 - 2. Fittings, boxes and related items for work shall be cast metal units as manufactured by Crouse Hinds or approved equal. Bell style boxes will NOT be accepted. Boxes shall be of the same material as the associated conduit.
 - 3. Minimum size of conduit for light and power shall be 3/4", unless otherwise specifically noted.

C. Interior:

1. Interior conduits may be rigid aluminum or rigid galvanized steel..
2. Fittings, boxes, and related items for interior work shall be manufactured by Crouse Hinds, Appleton, or approved equal.
3. Minimum size conduit for light and power wiring shall be 3/4”.

D. General:

1. The use of nonmetallic conduit or raceway within any classified area and/or within a building is not permitted, except Schedule 80 PVC may be used where conduit is installed within 3 feet of any chemical feed system.
2. Rigid galvanized conduit shall be manufactured by Youngstown Sheet and Tube Company, or approved equivalent manufacturer..
3. Liquid-tight flexible metallic conduit shall be used to tie in all motors or similar equipment within areas not classified as hazardous environments. Provide minimum 2 ft. diameter loop at all locations. The material provided must be UL labeled.
4. PVC conduit shall be Type II by Cantex Products or approved equal.
5. Rigid aluminum conduit may be used in areas noted above.
6. All terminations of conduits shall have smooth, rounded bushings. All conduit 1" and larger shall have insulation which may be integral with the bushing connector, or an insulated bushing may be added.
7. All rigid conduit joints shall be threaded. Do not use any type of clamp on fittings. All plastic joints shall be cemented or heat welded.
8. Provide expansion/deflection fittings on all conduits rising from below grade at the exterior of buildings and/or at any other structure, and elsewhere required by codes and ordinances.
9. Where conduits pass from unheated spaces to within heated spaces they shall be provided with seals in accordance with NEC Article 300.7 (A).
10. PVC coated steel conduit and associated fittings shall be approved equal to Plasti-Bond Red by Robroy Industries (if any).

2.6 WIRE AND CABLE

- A. All cable and wire shall comply with the latest requirements and specifications of the NFPA and/or the Insulated Power Cable Engineers Association (IPCEA) and shall be as manufactured by General Cable, General Electric, Anaconda, Phelps Dodge, or approval equal, unless otherwise specified or indicated.
- B. All conductors used in the wiring system shall be soft-drawn copper wire having a conductivity of not less than 98% of that of pure copper, unless otherwise indicated or specified. All conductors shall be stranded. Solid conductors are not acceptable for conductors larger than #12 AWG. Aluminum conductors are not permitted.
- C. All wire and cable shall be stamped approximately every two feet to indicate voltage, type, temperature rating, UL listing, manufacturers' name, size, etc.
- D. All underground conductors shall be installed in conduits. All underground conductors shall enter manholes, building walls, or termination points through a protective galvanized steel conduit sleeve of appropriate size.
- E. All cable and wire shall be: 600 volt; installed in approved raceways or conduit; not less than No. 12 AWG (except that No. 14 AWG may be used for control wiring).
- F. Insulation for cable and wire shall be as follows:

Wet or Moist Locations	XHHW-2, THWN-2
Feeders to Panels, Service Conductors	XHHW-2

- G. All internal wiring to fixtures (if any) shall be minimum, No. 14 AWG, silicon rubber insulated (150°C) with minimum 300 volt insulation.
- H. All branch circuit wiring from panelboards to any outlet on the circuit over 50' but under 100' shall be No. 10 AWG for the first half of the circuit, over 100' but under 175', use No. 8 AWG for the first half.
- I. The following color code shall be used for all conductors. The colors must be fast, fadeless, and capable of withstanding cleaning.

	208/120 Volt , 3 phase	
Phase A	Black	
Phase B	Red	
Phase C	Blue	
Neutral	White	

Ground	Green	
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1. Multi-conductor shielded cables shall be approved equal to GE SI-58760, #16 AWG, with individual grouping shielded or the associated equipment/ system manufacturer's recommended cable.
2. All circuit wires shall be tagged in cabinets, etc., with 1/16" thick tags securely fastened to the conductors with a heavy type of linen wrap at time wires are pulled in and tested. Circuit numbers shall be indicated on the tags. Tags shall not be removed for any reason.
3. At least 8" loops or ends shall be left at each outlet for the installation of devices or fixtures in the future. All wires in outlet boxes not for the connection to fixtures at that outlet shall be rolled up, connected together, and taped.
4. Wires and cables shall be carefully handled during installation.
5. When a lubricant is necessary for pulling wires, it must be listed by UL and be of such consistency that it will leave no obstruction or tackiness that will prevent pulling out old wires or pulling in new wires or additional wires. No soap flakes or vegetable soaps will be permitted.
6. Conductors shall be continuous from panelboard to outlet and from outlet to outlet. No splices shall be made except within junction or outlet boxes.
7. Splices and taps in wires No. 8 AWG and larger shall be made with crimp-on type connectors designed for the purpose. All connections between wires at fixtures and boxes shall be made with UL approved 600 volt pressure connectors equal to ideal "Wire-Nut" or "Wing-Nut" (for general lighting and receptacles only).
8. Type NM, NMC, AC, MC, or similar cables shall not be permitted for use on this project..
9. All conductors and connections shall be free of grounds, shorts and opens.
10. Telephone wiring shall conform to standard utility practices and applicable Code articles.

2.7 OUTLET BOXES

- A.** All boxes shall be held to wood surfaces by wood screws. On metal surface, boxes shall be held by metal-to-metal screws or by machine bolts. When within 5 feet of chemical tanks or pumps the boxes and attachment devices shall all be stainless steel.
- B.** Any outside boxes or boxes mounted exposed shall be cast metal type with integral threaded hubs (style similar to Crouse Hinds FS or FD). "Bell" style boxes will not be approved. Boxes on rigid aluminum conduit shall be aluminum.

2.8 PULL BOXES, TERMINAL BOXES, AND JUNCTION BOXES INTERIOR / EXTERIOR

- A.** Pull boxes, cabinet boxes and junction boxes shall be constructed of code gauge sheet metal to match conduit material used and of not less than the minimum size required by the National Electrical Code. Boxes shall be furnished with screw-fastening covers. Where several feeders pass through a common pull box, they shall be tagged to indicate clearly their electrical characteristics, circuit number and panel designation. Where pull boxes must be used in finished areas, the Engineer shall be consulted for the location, style of cover, and finish of box. The location shall always be as inconspicuous as possible. Where shown on the drawings, sizes of pull boxes, terminal boxes and junction boxes shall be followed or next larger standard trade size shall be used. Add pull boxes when such are deemed advantageous. Where required due to length or numbers of degrees of bends of underground conduit runs, underground cast concrete boxes shall be provided.
- B.** Pull and terminal boxes installed outdoors (if any) shall be NEMA 3R enclosed with screw fastening covers.

2.9 PULLING CABLES

- A.** All raceways are to be equipped with conductors. Swab all conduits before cable is drawn into them. Any crushed raceways shall be replaced before drawing in cable. Where cable pulling compounds are required, materials specifically intended for that purpose may be utilized.

2.10 DISCONNECTS

- A.** Where shown on the Drawings, or when NEC required whether or not shown, install disconnect switches appropriate for the application. When serving motors, they shall be motor horsepower rated. Those for equipment outdoors shall be in NEMA 3R or reinforced nonmetallic Krydon enclosures, or as otherwise indicated on Contract Drawings. Disconnect switches shall be pad lockable in “on” and “off” positions. Where noted on Contract Documents provide circuit breakers. 240 and 120 Volt circuit breakers shall have a minimum interrupting rating of 22,000 RMS symmetrical amperes at 240 volts.
- B.** Switches shall be heavy duty, quick make and break type. They may be non-fused by a solid copper bar, silver plated, heavy duty on motors over 2 HP. For small motors (1/8 HP and less), a toggle switch, motor rated, may be used; otherwise, they shall be similar to Square D Type HU in NEMA 12 or 4X SS enclosures (or as noted). Manual starters with overload protection built in are approved when NEC acceptable.

2.11 OVERCURRENT PROTECTION SERVICES

- A.** Overcurrent protection for motors is to be in the starters. There is to be protection in each phase wire. Overcurrent protection of conductors is by thermal and magnetic molded case circuit breakers in the panelboards. Where combination starters are used, the breaker is to be a

motor circuit protector with only magnetic trips. These must be supplied from a branch circuit protected by a thermal and magnetic trip breaker.

2.12 WIRE CONNECTORS AND DEVICES

- A. All wire joints shall be made with a pressure squeezed connector such as T & G Stakon and Ideal, or bolted clamp such as made by Dessert. Twist-on type wire nuts are also permitted for general lighting and receptacle circuits only. Make up to terminals shall be mechanical squeeze connector. Wherever only a screw connector is available, install a conductor terminal like T & G Stakon spade or donut and designed for the application and compression set to the conductor.
- B. Cover all joints made with non-insulated clamp devices with Scotch brand plastic electrical tape. Type #88 may be used at any joint and shall be used whenever the temperature of joint or the room is below 50°F. In the summer, or when temperature is above 60°F, new type #33 plus may be used. Triple wrap joints, each wrap having a 50% overlay.

2.13 SWITCHES AND PLATES

- A. Switches shall be specification grade, 20 amperes at 120/277 volts, with ivory handle, such as Bryant 4901-I or approved equal by Hubbell or Leviton, for SPST applications. All switches shall have clamp type terminals screw set.
- B. Mount all switches vertically and at a height of 4'-0" unless otherwise specified.
- C. All switches must have machine screw held wire and be back wired. Automatic grips will not be permitted. All switches must be classed as heavy duty.
- D. On surface boxes plates shall match the box style for the device installed.
- E. Switches and plates shall be a product of Bryant, Hubbell or Leviton.

2.14 CONVENIENCE AND OTHER OUTLETS AND PLATES

- A. Convenience outlets shall be duplex, specification grade, ivory face, side wired binding screw type, two pole, three wire, rated 20 amperes at 125 volts, Bryant 5362-I or equal. Use Bryant ivory nylon plates or equal if appropriate for the box utilized. Mount all outlets a minimum of 36" AFF. **It is the intent that ground fault protection be provided by individual Class A, 20 Ampere, 120 volt, GFI receptacles for each device indicated as "GFI" on the Contract Drawings.** They shall be equal to Bryant GFR53FT-I.
- B. Mount vertical outlets with grounding slot up. Outdoors, in damp locations, and elsewhere as shown, use weatherproof covers UL listed for conformity with National Electric Code Article 406.8(B) and approved equal to Tay Mac for receptacle "in use" when not attended and "extra duty rated".

- C. On exposed FS and FD boxes, use covers as noted above for outdoors.

2.15 MOTORS

- A. These specifications relating to motors and motor control apply to all motors and controls furnished by this Section or any other section.
- B. Each section supplying motor drive apparatus will be responsible for supplying an electric motor of sufficient size for the duty performed. These shall not be oversized beyond a normal safety factor, except that standard design ratings for next above motor size required will be used. Unless otherwise specified, all motors shall have open frames, Class A insulation and continuous duty classification based on a 40°F ambient temperature of reference.
- C. Motors 1/2 HP and larger generally shall be and those smaller may be, 200 volts, three phase or single phase as noted on Contract Documents. Motors 1/3 HP and smaller shall be 120 volts, single phase, 60 Hertz.
- D. Motor Control: Each motor, or group of motors, requiring a single control shall be provided with a suitable controller and devices, which shall perform the functions specified for the respective motors in other sections of these specifications. All controllers shall conform to the adopted standards and recommended practices of the Industrial Control Standards for the National Electrical Manufacturers Association and the Standards for Industrial Control Equipment of Underwriters' Laboratories, Inc.
- E. Thermal Overload Protection. Each motor shall be provided with an overload protective device, integral with either the motor or controller. Unless otherwise specified, the protective device shall be of the manually reset type. Manual controllers for motors shall be specifically designed for the purpose, and shall have a HP rating adequate for the motor. Automatic control devices such as thermostats or floats are satisfactory, provided they are designed for that purpose and have an adequate HP rating.
- F. All motors shall be high efficiency type, with operating efficiencies qualifying for installation credit by the participating utility company in the area. All motors that are controlled by variable frequency drives (VFD) shall be inverter duty rated.

2.16 SECONDARY SERVICE

- A. A new, overhead 208/120 volt, three phase, 4 wire, 60 Hz. electric service is required for this project.

2.17 ELECTRICAL SERVICE AND DISTRIBUTION SYSTEM

- A. The local serving electric utility will provide the electrical service of the characteristics as shown on the drawings. The Subcontractor's work will begin where the utility's work ends.

- B. The subcontractor shall furnish all labor, materials, etc. necessary for a complete approved electrical service as required by each facility, including inspection and approval by the state and local inspection departments and the serving utility.
- C. The Subcontractor shall notify the Utility in writing, with a copy to the Engineer, no later than ten days after signing construction contracts, as to when the power service will be required for the new facility.

2.18 OVERHEAD ELECTRICAL SERVICE

- A. Overhead service shall comply with all the requirements of the National Electrical Code, the standards of the serving electric utility, The National Electrical Safety Code, and state and local enforcing authority.
- B. Secondary service shall be cable in rigid conduit from the utility meter at the building, routed below the building eave, to a weatherhead near the ridge. Provide rigid galvanized conduit to the standards of the serving utility company.

2.19 PRIMARY POWER SERVICE

- A. Primary power to the site is existing and by the serving utility.
- B. The Contractor shall obtain any costs that the utility will charge for any upgrades to their equipment to accommodate this project and these costs shall be included in the bid submitted for work under this specification section.

2.20 METERING

- A. The Electrical Subcontractor shall furnish and install all equipment and meter trim for metering, in accordance with utility company requirements, except that the utility meter will be provided by the local utility.
- B. Where the local utility does not supply meter sockets, the Electrical Subcontractor shall provide them to the local utility's specifications/standards at no additional cost to the Owner.
- C. Any utility charges for poles, service cable, meters, etc., in connection with the provision of temporary building power shall be paid in full by the Electrical Subcontractor under this section.
- D. Provide any utility required cold transition meter disconnects, meter transformer enclosures, etc. to the utility's specifications and include such in the bid submitted.

2.21 PANELBOARDS

- A.** Panelboards shall be provided with main lugs or main breakers and branch circuit breakers according to the schedules on the Contract Drawings.
- B.** The general requirements for panelboards are shown on the drawings including mounting and gutters. Mount the panels 6'-6" up to the top of roughing cabinets. Gutters shall not be less than 5". Breaker frame size is shown on the drawings. Handle ties will not be permitted anywhere. Multi- pole breakers shall have common trip and one handle.
- C.** All breakers shall be trip-free, suitable for switching, and thermal magnetic. All breakers shall be bolted to bus type secured in place by a holding bolt. "Space" means provision for adding breakers. Breakers or busses shall contain terminations or tapings designed for these attachments. All points of contact between bus and sub-bus shall be copper full tin plated between all contact surfaces. All breakers shall have a minimum interrupting capacity of 22,000 amperes at 240 volts AC for panels on 208 volt systems. If the utility available interrupting current exceeds this value, provide breakers with interrupting capacities that exceed the available utility fault current at the site at no added cost to the project, and provide utility documentation of the available fault current with the shop drawing submittal.
- D.** Provide a typewritten tabulation indicating fixture outlets, devices, machines, or apparatus served by each breaker and their room location. This shall follow coding on the drawings with breakers numbered from top to bottom. Mount tabulation inside door in a frame for the purpose, with a transparent plastic cover. Panel doors shall be "door-in-door" construction. Enclosure shall be NEMA 1 with the panelboard to be installed within the addition being constructed to the existing building..
- E.** Panelboards provided under this contract shall be a product of Square D, Siemens, Cutler Hammer, or approved equal.

2.22 BALANCING OF LOADS

- A.** The Contractor shall balance all loads between phases in all panels, etc., around the neutral. Neutral conductors shall be the same size as phase conductors unless specifically noted otherwise. Common neutrals shall not be installed.
- B.** All circuits shall be distributed about the phases so as to restrict any phase load imbalance to less than 10% at any panelboard.
- C.** After completion of the installation, record under full load conditions, the current flow in each phase feeder. Submit 4 copies to the engineer giving name and location of each panel, etc.
- D.** Circuit numbers assigned to home runs and devices on the drawings are for purposes of indicating individual circuits and are intended to correspond with the circuit numbers in the

panels. The panelboard directory shall designate each circuit and its associated load. If numbers deviate from the drawings, the as-built drawing shall reflect this.

2.23 LIGHTING FIXTURES

- A.** Wire directly to an outlet box for each fixture in and on the enclosure. From outlet into fixture, use No. 14 AWG silicon rubber, color coded to make up to fixture socket or ballast supply leads.
- B.** The lighting fixtures noted on the drawings are to indicate quality, appearance, lamping, and photometric characteristics acceptable. Alternative fixtures may be proposed for the project where they provide equivalent characteristics, quality and appearance, and subject to approval by the Engineer. Proposed substitutes must be approved by the Owner and the Engineer prior to bid opening. The Subcontractor must provide manufacturer's point-by-point lighting print-outs with manufacturer's fixture cuts for any proposed fixture substitutions. Proposed substitutes must be submitted to permit an Addenda notice of the approval so they must be received by the Engineer not less than 14 working days (Monday - Friday) before bid opening, otherwise they will be rejected.

2.24 LAMPS, DRIVERS, AND ACCESSORIES

- A.** There are no fluorescent fixtures specified for this project.
- B.** LED light fixtures shall be Reduction of Hazardous Substances (RoHS) compliant and the LED drivers, modules, and housing shall be products of the same manufacturer.
- C.** LED drivers shall include the following features unless otherwise indicated:
 - a. Minimum efficiency: 85% at full load.
 - b. Minimum Operating Ambient Temperature: -20 degrees C. (-4 degrees F).
 - c. Input voltage: 120 - 277 V (+/- 10%) at 60 Hz.
 - d. Integral short circuit, open circuit, and overload protection.
 - e. Power Factor not less than 95%.
 - f. Total Harmonic Distortion: No greater than 10 %.
 - g. Comply with FCC 47 CFR Part 15.
- D.** LED modules shall include the following features unless otherwise indicated:
 - a. Comply with IES LM-79 and LM-80 requirements.

b. Minimum CRI 80 and color temperature 3000 degrees Kelvin unless otherwise indicated in the fixture schedule.

c. Minimum rated life: 50,000 hours per IES L70.

2.25 TELEPHONE /ALARM SERVICE

- A. The telephone Provider will provide the new overhead telephone service to the building as noted on the Contract Drawings. If required by the telephone provider, the Contractor under this specification section will provide any conduit between the telephone service providers demarcation terminal on the building exterior to a weatherhead adjacent to the overhead service attachment to the building.
- B. The Contractor under this specification section shall provide a conduit from the utility's demarcation terminal to the control panel mounted within the building and also shall provide all required wires to connect the alarm dialer in the control panel to the telephone provider's terminal.

2.26 EMERGENCY LIGHTS, EXIT SIGNS

- A. These items are indicated and included in the lighting fixture schedule on the Contract Drawings.

2.27 WIRING OF MECHANICAL AND OTHER EQUIPMENT

- A. The Electrical Subcontractor shall wire all power to, providing and installing local disconnects for, all mechanical equipment and equipment by other trades or provided by Owner or this section per contract Drawings. This shall include but not be limited to:

Control Panel, Flow Meters, Well and atmospheric tank level control devices, Well and Booster Pump motors, Standby generator and automatic transfer switch, chemical tank control heads, chemical feed pump, etc.

- B. Note: Review plans and specifications for all sections providing equipment to be wired to determine special wiring or control requirements to be provided for such under this specification section.

2.28 FUSES (if any)

- A. Provide a complete set of fuses for each fusible switch. Time-current characteristic curves of fuses serving motors or connected in series with circuit breakers or other circuit protective devices shall be coordinated for proper operation; submit coordination data for approval. Fuses shall have a voltage rating not less than circuit voltage.

- B. Cartridge Fuses, Current-limiting Type (Class R): UL 198E, Class RK-1 time-delay type. Associated fuse holders shall be Class R only.
- C. Cartridge Fuses, Current-limiting Type (Classes J and L): UL 198C, Class J for 0 to 600 amps and Class L for 601 to 6000 amps.

2.29 INSTRUMENTATION

- A. The subcontractor under this section shall provide all conduit for and install all signal cables for instrumentation provided under all Sections of these specifications, including provision of all required 120 volt power wiring and interconnections of signal cables.
- B. Instrumentation includes, but is not limited to: flow meters, well level transducers, etc.

2.30 BUILDING LOW TEMPERATURE THERMOSTAT

- A. Provide low temperature alarm thermostat for alarm purposes. Unit shall have an adjustable range of 40-80°F. SPST, equal to Emerson Catalog #WR-65. Provide guard over unit to prevent tampering. Wire to alarm dialer.

2.31 STAND-BY POWER SYSTEM

- A. Provision of all electrical conduit and wiring and installation of an automatic transfer switch and all connections of power wiring for the standby generator that is provided under specification section 26 32 13 of this Contract is part of the work under this specification section.

2.32 CONTROL PANEL

The Electrical Contractor shall install the control panel that is furnished under another specification section of this Contract. The Electrical Contractor under this specification section shall provide and install all conduits and wiring to provide power to the control panel, wire and interconnect interlock for chemical feed pump, wire and connect all alarms, wire and connect all field instruments to the control panel, and any other connections associated with this panel.

2.33 SURGE PROTECTIVE DEVICE

- A. Provide an SPD unit approved equal to Advanced Protection Technologies, including manufacturer's recommended service overcurrent protective device and all associate wiring, conduit, etc. and install this unit in the new electrical equipment enclosure. The unit shall have an event counter and a dry output contact for future use.
- B. The unit shall be rated 320 KA surge capacity (150K L-N, L-G, N-G) for service on 208/120 volt, 60 hertz, 3 phase, 4 wire service. Unit shall have UL suppression voltage ratings of 330

(L-N, L-G, N-G) and 700 (L-L). The maximum continuous operating voltage shall be 150. The unit shall conform to UL 1449 Third Edition, cUL, UL 1283 R/C standards. It shall have a minimum of a 10 year warranty.

2.34 VARIABLE FREQUENCY DRIVES

- A. Install and wire new variable frequency drives with appurtenant components for proper control of the two new 3 HP booster pumps.

Note: The Contractor shall provide in his Bid the VFD rated for full motor nameplate amperes plus the service factor current for the installed equipment.

1. Variable frequency controllers shall be listed by Underwriters Laboratories (UL).
2. Construct the drives with three major sections: a full wave, 3 phase diode rectifier section to convert from alternating current (ac) to direct current (dc), a dc filter section to smooth the dc voltage, and a pulse width modulated 3 phase inverter section to provide a variable voltage, variable frequency output at a constant voltage to frequency ration. The output frequency range shall be a minimum of 6 to 120 hertz (Hz). The drives shall be provided with passive harmonic filters housed inside the drive enclosure. These shall include as a minimum a separate 3% full rated input line reactor or its equivalent designed and incorporated into the manufactured drive equipment. Additionally the drive shall be rated for the selected pump motor including operation at its service factor current of 115% full load current. The drive enclosure shall include a manual service disconnect for lock-out purposes when the equipment is being serviced. The control circuit shall be configured to connect a field interlock contact in the Stop circuit to shut down the VFD if that contact is "Open". Properly rated control power transformer with fused protection shall be built into the drive enclosure, if required.
3. General:
 - a. Pump applications, constant torque.
 - b. Motor type – standard NEMA design B.
 - c. The controller shall not require an isolation transformer, even if motors are located in a damp area.
 - d. All components shall include original manufacturer's identification and part number.
 - e. High power factor input with minimal line distortion, notching or harmonics.
 - f. Basic drive design shall be pulse width modulated with carrier frequency adjustable to 10 KHZ.
 - g. The controller shall comply with Federal Communications Commission requirements under Part 15 Rules for Radio Frequency Interference and IEEE 519 for 5% maximum

- harmonics. Provide documentation of this plainly stated within the shop drawings submittal or the submittal will be rejected.
- h. All controllers shall be subjected to a 22-hour burn-in test.
4. Environmental:
 - a. Ambient operating temperature range – 10 to 40° C.
 - b. Humidity: 5 to 95%, noncondensing.
 - c. Altitude: 0 to 3300 feet above sea level.
 5. Electrical:
 - a. Input line voltage: 208 volts, 3 phase, 60 Hertz, for 3 HP nameplate motor
 - b. Motor Nameplate Voltage: 200 volts, 3 phase, 60 Hz.
 - c. Output frequency range: 0 to 120 Hz.
 - d. Minimum drive efficiency: 95% at 100% speed.
 - e. Current rating: 110% of connected motor full load ampere (output rated current) continuous at full speed, 150% for one minute.
 - f. Power loss ride through: 16 ms.
 - g. Input line fuses.
 - h. Built in control circuit voltage: 120 V AC, maximum. (to power any devices needing same)
 6. The controller shall include the following protective features with status indicators:
 - a. Overvoltage.
 - b. Undervoltage.
 - c. Overcurrent.
 - d. Ground fault.
 - e. Overtemperature.
 - f. Phase loss/blown fuse.
 - g. Running overload protection.
 - h. Common alarm contact for external user.
 - i. Line circuit breaker.
 - j. Passive harmonic filter installed in line side of the drive and housed within the VFD enclosure.
 7. The power circuit design shall be such that the following conditions will not damage the drive:
 - a. Single or three-phase fault from line-to-line or line-to-ground.
 - b. Opening of all three phases during operation by disconnect switch at motor location.
 8. Indicator light safety feature shall indicate when DC bus is energized and capacitors are charged.
 9. Internal calibration adjustments:
 - a. Minimum speed.
 - b. Maximum speed.
 - c. DC boost.
 - d. Acceleration/deceleration rates.

- e. Stop mode (ramp or coast).
 - f. Automatic restart after fault trip with lockout after five attempts to restart.
 - g. Anti-windmilling adjustable brake time.
 - h. Adjustable volts/Hertz.
10. Unit mounted operator controls:
- a. Hand-Off-Auto switch.
 - b. Speed adjust potentiometer.
 - c. Indicating speed meter.
 - d. Power ON light.
 - e. Alarm reset, lights and additional devices as shown on the drawings.
 - f. All indicating lights shall be push-to-test type.
 - g. Intrinsically safe relays.
11. Provision for remote external controls:
- a. Two wire ON-OFF control.
 - b. Speed adjust, analog input (4-20 MADC).
 - c. Remote Forward-Reverse switch input (if shown on the drawings).
12. Provide control interlocks and alarms as shown on the drawings. The drives shall disable the operation of the equipment when any associated connected alarm signal is activated. The drives shall not require a manual reset prior to restart after the alarm or interlock condition has been corrected.
13. Each VFD shall be wired for a start/stop signal from the control panel PLC system . Additional interlocks shall be accommodated as identified.
- B. Harmonic Requirements:**
- 1. Under normal operation conditions when the new VFD is operating, the line harmonics introduced into the power system from the VFD controller shall be within the distortion limits as defined in IEEE 519, latest edition.
 - 2. Total harmonic distortion (THD) for both voltage and current shall not exceed 5 percent, when measured at the point of common coupling (PCC).
- C. Enclosures.** Drive shall be mounted in NEMA 12 enclosure for stand-alone drives located in dry areas. Coat the enclosures with the manufacturer's standard color finish. Main power disconnect switches shall be provided at and built into each VFD assembly. Drive assemblies shall have the drive operator and monitor interface unit accessible from the exterior of the enclosure. Assembled units shall be UL listed and labeled as custom control assemblies.
- D.** Local disconnect switch is NOT being provided at the motor, The Owner will institute a formal "lock-Out, Tag -Out" procedure for servicing of the motor and load side equipment.
- E.** Spare parts: Provide one set of spare fuses for each voltage and each current rating for each VFD provided.

- F. Drives required for this project are:
 - a. 2, each rated for 3 HP, 200 Volt, 3 phase, 60 Hertz, motors
- G. Preferred manufacturer for the variable frequency drives is:
 - 1. Toshiba
 - 2. Alternative VFD manufacturer's must be submitted for Engineer and Owner review no later than 10 calendar days prior to the advertised bid date so an Addendum can be issued to all bidders if an alternate manufacturer is acceptable. Requests received at later dates will not be reviewed.

2.35 TRANSFORMERS

- A. This is not applicable for this project.

2.36 EQUIPMENT SUPPORTS

- A Provide all structural supports required for proper attachment of all equipment. Wall mounted equipment may be directly secured to walls with approved anchors.
- B. Maintain at least ½" air space between equipment and supporting walls. Groups or arrays of equipment may be mounted on adequately sized stainless steel channels, angles or bars. Prefabricated stainless steel channels equal to those manufactured by Unistrut or Kindorf are acceptable.
- C. Equipment suspended from ceilings shall be supported by adjustable threaded stainless steel rods of adequate strength. No hangers may be secured to furred or suspended ceilings or attached to or carried through duct work.
- D. All fasteners and hardware shall be stainless steel.

2.37 NAMEPLATES

- A. Provide nameplates for all items of equipment on all switchgear, motor control centers, panel boards, controllers, selector switches, starters, safety switches, push-button stations, feeder switches and relay and equipment enclosures.
- B. Nameplates shall be black laminated plastic or bakelite, approximately 3/4" x 2-1/2" x 1/16" with four edges neatly beveled. Lettering shall be engraved, white, with a height of approximately 3/16" x 1/4".

- C. Provide two holes in nameplate and secure to equipment with stainless steel screws. If adequate space is not available on item to which nameplate is to be affixed nameplate may be installed adjacent to and as close to the item as possible, and in a position where it is readily visible.
- D. Notations on nameplates shall be exactly the same as corresponding notations that appear on the Drawings. Submit proposed engraving list for approval before obtaining.

2.38 EXHAUST FAN CONTROL PANEL

- A. Provide and install a NEMA 12 enclosed exhaust fan/intake louver operator control panel as noted on Contract drawings.
- B. Provide all conduit and wiring for connection of all equipment and install service switches, etc. as required.
- C. The assembly shall be UL labeled as a custom assembly where such label is required by Codes, ordinances, and/or state or local authorities.

2.39 ELECTRIC UNIT HEATER

- A. Provide, install and connect a new electric unit heater in the addition to the building.
- B. Unit shall be approved equal to Berko Catalog HUH-524T, 3 KW, 208 Volt, single phase, 60 Hz., with DS-30 built-in power disconnect switch and with WB-1A wall mounting bracket

2.40 DELIVERY, STORAGE AND PROTECTION

- A. The Contractor shall be responsible for the work and equipment until finally inspected, tested and accepted. Carefully store materials and equipment, which are not immediately installed after delivery to the site. Close open ends of work with temporary covers or plugs during construction to prevent entry of obstructing material.
- B. Each Subcontractor shall protect work and material of other trades from damage that might be caused by that Subcontractor's work or workers and shall make good a damage thus caused.

PART 3 - INSTALLATION

3.1 GENERAL

- A.** The entire work provided in this specification shall be constructed and finished in every respect in a workmanlike and substantial manner.
- B.** The Contractor shall obtain detailed information from the manufacturer of apparatus as to the proper method of installing and connecting same. The Contractor shall also obtain all information from the Contractor and other Subcontractors that may be necessary to facilitate the work and the completion of the whole project.
- C.** Before installing any of the work, the Contractor shall see that it does not interfere with the clearances required for finished columns, pilasters, partitions, walls, and ceilings, as shown on the Contract Drawings and details.
- D.** Work installed by the Contractor which interferes with or modifies the facility design as shown on the Contract Drawings shall be changed as directed by the Engineer, and all costs incidental to such changes shall be paid by the Contractor.
- E.** In any and all cases of discrepancy in figures, plans or specifications the matter shall be immediately submitted to the Engineer for decision.

3.2 SITE VISITS

- A.** The Contractor will be required to visit the site as the work progresses and to carefully investigate the structural and finished conditions affecting all details of the work, and shall arrange such work required to meet such conditions.

3.3 CUTTING AND PATCHING

- A.** It is the duty of the Contractor to furnish and install all sleeves required in the performance of this Contract and to furnish to the Project Contractor the size and location of all openings required on the performance of this contract; and it shall be the duty of the Project Contractor to provide the required openings during building construction.
- B.** If this Contractor fails to provide for all sleeves and openings as required in the performance of this Contract, the Contractor shall instruct the Project Contractor, who shall do such cutting, drilling, patching and grouting and so forth necessary for the proper installation of this Contractor's work. The Project Contractor is to charge this Contractor for this work and it shall be done at no additional expense to the owner.
- C.** Should the Project Contractor, after having been fully advised by the Contractor, fail to arrange for this work, the Contractor shall promptly notify the Engineer in writing of such failure. In the event of any disagreement between the Electrical Contractor and the Project

Contractor over the foregoing, and in the absence of any written requests or agreements between the two, the decision of the Engineer shall be final.

3.4 ALUMINUM CONDUITS

- A. Aluminum conduits may be installed for installations in areas as noted in this specification section, if any..

3.5 INTERIOR CONDUIT SYSTEMS

- A. Electrical Contractor shall coordinate with Engineer as to locations, sizes and number of conduit sleeves to be installed through cast concrete.
- B. Exposed runs of conduit shall have supports not more than 6' -0" apart and shall be installed with runs parallel or perpendicular to walls, structural member, or intersections of vertical planes and ceilings with right angle turns consisting of cast metal fittings or symmetrical bends. Conduit bends and offsets shall be avoided where possible, but where necessary, shall be made with an approved hickey or conduit bending machine. Conduit which has been crushed or deformed in any way shall not be installed. Expansion fittings shall be used to provide for expansion joints. Wooden plugs inserted in masonry or concrete shall not be used to secure conduits or boxes. Conduits shall be supported on approved types of stainless steel wall brackets, ceiling trapeze, straphangers or pipe straps, secured by means of toggle bolts in hollow masonry units, expansion bolts in concrete or brick, machine screws on metal surfaces, and wood screws on wood construction. Provide stainless steel hardware for stainless steel support systems. Conduit shall be installed in such a manner as to insure against trouble from the collection of condensation, and all runs of conduit shall be so arranged as to be devoid of traps wherever possible. The contractor shall exercise the necessary precautions to prevent the lodgement of dirt, trash, or plaster in conduits, fittings, or boxes during the course of installation. A run of conduit which has become clogged shall be entirely freed of the accumulation or shall be replaced.
- C. Conduits shall be securely fastened to all sheet metal outlets, junction boxes, pull boxes, and panelboards with galvanized locknuts and bushings, care being taken to establish a firm mechanical and electrical contact between the box and the conduit.
- D. Flexible conduit shall be installed only where necessary to overcome vibration at motor connection, and shall be as short as possible between the motor terminal box and the junction box on the branch circuit rigid conduit. All flexible conduit shall be of the liquid-tight type similar to "Sealtite", with proper fittings. Provide minimum 2 ft. diameter loop.
- E. All rigid metallic conduit shall utilize threaded fittings.
- F. Pull boxes, junction boxes and cabinet boxes shall be furnished with screw fastened covers. Where pull boxes are used in finished areas, the Engineer shall be consulted as to the location, type of cover, and finish of box and cover. Locations shall be as inconspicuous as possible.

3.6 CONDUCTORS

- A. A complete system of conductors shall be installed in the raceway system, except where otherwise noted. Conductors shall be continuous from outlet to outlet, and no splices shall be made except within outlet or junction boxes. Compression type connectors properly taped shall be utilized for all splices.

3.7 OUTLETS

- A. Outlets shall be installed in locations as indicated on the Contract Drawings. The Contractor shall study the general building plans in relation to the spaces surrounding each outlet in order that the work may fit the other work required by these specifications. Where necessary, the Contractor shall relocate outlets so that installed fixtures are symmetrically located according to room layout and will not interfere with other work or equipment.

3.8 DEVICE PLATES

- A. Device plates shall be installed on each outlet to suit the device installed therein. Plates shall normally be installed vertically, with an alignment tolerance of 1/16".

3.9 GROUNDING

- A. The conduit system and the neutral conductor of the wiring system shall be grounded. The grounded connection between the electric system neutral and the conduit system shall be made at the main electrical service breaker enclosure. A bare copper conductor sized per NEC shall be installed in nonmetallic conduit from the breaker enclosure to the entrance of the water service. Connection to the water pipe shall be made by a suitable ground clamp or a lug connection to a plugged tee. If flanged pipes are encountered, the connection shall be made with the lug bolted to the street side of the flange connection. The ground shall also be connected to the reinforcing steel in the footing of the building or equipment foundation, any building framing steel (if any), and to 3/4 inch by 10 foot long copperweld ground rods spaced as noted on the Contract Drawings. Connections to the driven ground rods shall be exothermic type.
- B. If non-metallic water lines are provided on the project, the ground electrode conductor shall be connected by a process approved equal to "Cadweld" process to copperweld ground rods, 3/4" diameter by 10 feet long. Provide certified test of recognized testing agency that ground resistance does not exceed 25 ohms. Provide bonding of any metallic piping systems within the facility.
- C. Ground wires shall be grouped and bonded to panel boxes, not to system neutrals. The ground terminal or receptacles shall be bonded to outlet boxes with No. 12 AWG bare or green insulated wire, or other suitable means per the National Electrical Code.

- D. Conduit and/or raceway shall not be utilized as the bonding conductor.
- E. Where flexible metallic conduit is used, it shall be suitable for grounding service.

3.10 EXPLOSION PROOF REQUIREMENTS

- A. If encountered, equipment shall be provided with the appropriate classification for the area involved.

3.11 PULLING CABLES

- A. Cables shall be installed utilizing pulling equipment designed for the types of wireways or conduits installed. Where lubricating material is required, it shall be a material manufactured for and designated by UL label as suitable for the types of insulation involved on the conductors. Care shall be taken during cable pulling not to cause kinks or sharp bends in the conductors. If insulation on conductors is cut or nicked during pulling, the conductors involved shall be removed and replaced at no added cost to the owner. During pulling, the maximum strain applied to the conductors shall not exceed 50% of the ultimate strength of the conductors.

3.12 EXAMINATION AND APPROVAL WORK

- A. No work shall be covered before examination and approval by the Engineer and by all inspectors and authorities having jurisdiction. Replace any imperfect or condemned work with work conforming to requirements and satisfactory to the Engineer, without extra cost to the Owner. If work is covered before due inspection and approval, the Contractor shall pay all costs of uncovering and reinstating work.

3.13 CLEAN UP AND REPAIR

- A. At the completion of the work, the work area shall be left clean. Any damage caused to work of other trades by electrical installation shall be repaired at the expense of the Electrical Contractor.

3.14 GUARANTEE

- A. Attention is directed to provisions of the General Conditions regarding guarantees and warranties for work under this Contract.
- B. Manufacturer shall provide standard guarantees for work under this Section. However, such guarantees shall be in addition to and not in lieu of all other liabilities, which the manufacturer and Contractor may have by law or by other provisions of the Contract Documents.
- C. All materials, items or equipment and workmanship furnished under this Section shall carry the standard warranty against all defects in material and workmanship for a period of not less than one year from the date of final acceptance of the work. Any fault due to defective or improper

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material, equipment, workmanship or design which may develop within that period shall be made good, forthwith by and at the expense of the Contractor, including all other damage done to areas, materials and other systems resulting from this failure.

- D.** This Contractor shall guarantee that all elements of the systems are of sufficient capacity to meet the specified performance requirements as are set forth herein or as indicated.
- E.** Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the guarantee period, the affected part or parts shall be replaced by the Contractor.
- F.** This Contractor shall furnish, before the final payment is made, a written guarantee covering the above requirements.

End of Section

SECTION 26 32 13

STANDBY GENERATOR SYSTEMS

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A.** Work under this section included the furnishing and installation of a new weather enclosed LP gas/propane fuelled standby generator with noted appurtenances as noted herein at the WARREN NH, PUMP STATION UPGRADE PROJECT. Wiring and conduit, etc. are provided under specification Section 26 00 00. Review and coordinate.
- B.** Work includes General Contractor's provision of modifications to the existing generator concrete pad to accommodate new generator bond-out locations for conduit and fuel connections in accordance with the recommendations of the manufacturer of the new generator.

1.2 QUALITY ASSURANCE

- A.** Manufacturer: Provide systems for one (1) manufacturer.
- B.** Warranty: Five (5) years comprehensive warranty equal to Caterpillar's Comprehensive Extended Warranty, from date of start-up on entire standby power system by the system manufacturer, inclusive of parts, labor, travel expenses, etc. without deductibles.
- C.** NEC Compliance: Comply with applicable standby generator requirements of NEC.
- D.** NFPA Compliance: Comply with applicable requirements of NFPA requirements of NFPA 37, "Installation and Use of Stationary Combustion Engines and Gas Turbine". Also fully conform to NFPA 110, Emergency and Standby Power Systems".
- E.** UL Compliance: Provide standby generator system components, which are UL listed and labeled. System and all components shall be UL 2200 labeled.
- F.** ANSI/NEMA Compliance: Comply with applicable requirements of ANSI/NEMA MG 1, "Motors and Generators", and MG 2, "Safety Standard for Construction and Guide for Selection, Installation and Use of Electric Motors and Generators".
- G.** IEEE Compliance: Comply with applicable portions of IEEE Std. 241, "IEEE Recommended Practice for Electric Power Systems in Commercial Buildings" pertaining to standby power. Also comply with IEEE 446. "Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications".

- H. All units must conform to all EPA and State of New Hampshire emissions limitations at the site involved, and the manufacturer must provide documented certification of this conformity with shop drawing submittals or the submittals will be rejected without review.
- I. **Manufacturer's documentation confirming the proposed equipment will comply with requirements of "Technical Bulletin, December 18, 2018" Installation Requirements for Permanently Installed Generators based on the 2017 National Electrical Code" as issued by the NH Electricians Board or any updated release. The requirements stated therein are requirements for the equipment and its installation whether stated further herein or not.**

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, operation and maintenance instruction, and manufacturer's product warranty.
- B. Shop Drawings: Submit dimensioned DRAWINGS and wiring diagrams of generator units and accessories including start stop stations, and instruments, showing accurately scaled generator set layout and its spatial relationship to associated equipment, and connections to remote equipment, and connections to remote equipment. **Provide manufacturers computer size verification for unit per loads as indicated in 2.01 below.** Provide generator conforming to loading requirements noted with a maximum allowable peak voltage dip of 15% and maximum frequency dip of 8 Hertz. Shop drawings shall be highlighted or otherwise clearly marked to indicate specific components applicable for each item submitted for review and acceptance.

1.4 SCHEDULING

- A. The requirements of this project are that any part of the project shall have on site and operational standby power during any period of time when the utility service is not available due to the construction activities. Work must be scheduled to ensure existing equipment is operational or other bypass installations are operational until the improvements at this location are acceptable, commissioned, and operational.

PART 2 – PRODUCTS

2.1 GENERAL SYSTEM REQUIREMENTS

- A. Power: 208/120 volts, 3 phase, 4 wire

B. Capacity: Sized to start loads as below, in steps as noted:

Warren Water Booster Pump Station

Step #1 : One miscellaneous load, single phase, 10 KW

One Booster Pump, 3 HP, 3phase with VFD controller

Step #2 : One Pump, 1 HP, single phase , full voltage start Well

Step #3 : One Pump, 1 HP, single phase, full voltage start Well

Step #4 : One Booster Pump, 3 HP, 3 phase, with VFD controller

Provide any required larger unit/system at no added cost to the Owner to comply with the above. Sizing noted in 2.1 is not to be utilized without manufacturer's verification indicating the estimated minimum rating that will be adequate.

C. Generator shall be approved equal to Kohler or Caterpillar (size per print-out recommendation provided by manufacturer; Engineer's initial sizing indicates a 30 KW generator at the site, but this must be verified). Transfer switch shall be rated no less than 200 amperes at the site

D. System Components: Provide each entire system furnished by generator manufacturer.

1. L P Gas vapor fueled engine driven generator
2. Engine start/stop controls
3. Automatic transfer switch for automatic starting and stopping of engine and switching load
4. Mounted accessories as specified
5. Properly sized black plastic nameplates with engraved white letters to identify all relays, components, etc.
6. Manufacturer's sound attenuated outdoor enclosure, complete with all ancillary components.

E. Performance Certification: Provide certification of the following by an independent testing lab:

1. Full power rating
2. Stability
3. Voltage and frequency regulation
4. All other certification per NFPA 110.

- F. Starting Capability: Unit capable of starting after extended periods at -20°F.
- G. Harmonic Interferences: Voltage regulator & electronic governor shall be designed to be immune to SCR and other non-linear load interferences. Generator shall be capable of full capacity with load harmonic distortion caused by SCR and other non-linear loads.

2.2 STANDBY GENERATOR

- A. Provide the following Kohler or Caterpillar generator. **NOTE: Where sizing requires a larger unit than indicated to conform with 2.1 (b), the required unit shall be provided at no additional cost. If a greater rated generator is required based on the manufacturer's sizing and the noted loads, the Contractor shall, if necessary, also provide a transfer switch rated for the unit and include any larger conductors and conduits also required.**
- B. Controls: Generator mounted control panel for unit with panel lights, safety devices, and engine starting controls, which include, but are not limited to:
 - 1. Battery charge rate ammeter
 - 2. Oil pressure gauge
 - 3. Water temperature gauge
 - 4. Run-stop-remote switch
 - 5. AC voltmeter
 - 6. Voltage adjusting rheostat
 - 7. High water temperature cutout
 - 8. Low water level cutout
 - 9. Emergency latch-relay with manual reset & indicator light
 - 10. Cranking limiter
 - 11. Manual reset circuit breaker
 - 12. Automatic over-speed shutdown
 - 13. Control contacts to control inlet air damper (if required)
 - 14. Generator protective shutdown circuitry for over temperature, over speed, low water level, etc. shall provide non-energized relay outputs for wiring to activate the generator remote annunciator.
- C. Equipment: Provide the following for each unit:
 - 1. Muffler, critical (Maximum sound attenuation)
 - 2. Flexible seamless exhaust connection – insulated
 - 3. Vibration isolators
 - 4. Lube oil filter
 - 5. Oil drain plug
 - 6. Fuel filters

7. Battery cables
8. Battery rack
9. Battery charger-float type
10. Generator anti-condensation heater, thermostatically controlled
11. Air cleaner
12. 12/24 volt, heavy duty, cold weather starting battery
13. 12/24 volt Bendix fuel pumps (if required)
14. Air discharge duct adapter (if required)
15. Engine Block heater
16. Flexible fuel supply and/or return line connections
17. Fuel solenoid valve
18. Engine coolant level switch (low level stop)
19. Remote annunciator (NFPA 110, Level 2)
20. Main output circuit breaker
21. 20 A, 120 V duplex GFCI receptacle (powered from Owner's distribution)
22. Radiator fill including glycol
23. Outdoor weather enclosure – manufacturer’s super sound attenuated.
24. An Emergency Shutdown pushbutton enclosed in a NEMA 4X enclosure secured to the exterior of the generator enclosure by the manufacturer, with protection to inhibit operation by non-authorized persons (break glass or similar enclosure) shall be included.
25. Rodent and reptile screens on all openings in the enclosure
26. Fuel system refill after all testing.

2.3 AUTOMATIC TRANSFER SWITCH (1 Required)

A. General: UL listed (Standard 924) for all classes of load. Transfer switch shall transfer load within time limits required by codes. Equipment transfer switch shall not transfer loads until a minimum of 15 second delay. Transfer switch shall be ASCO Series 300 rated not less than 200 Amperes and set to operate on a 208/120 Volt, 3 phase, 4 wire, 60 Hz. power system.

B. Operation:

1. Sequence as follows: Sense complete loss of power on any phase and signal generator to start.
 - a). When emergency power attains a minimum of 90% of rated speed and voltage, transfer load to emergency power.
 - b). Transfer load to normal power when normal power is restored; signal generator to stop.

Note: It is intended that transfers shall incorporate a “dead band” time in the neutral position in all operations.

- C. Obtain operating current for load transfer from source to which load is to be transferred.
- D. Emergency Power Malfunction: Automatically disconnect load to allow generator to restart with no connected load. Reconnect emergency power when 90% of rated speed and voltage is attained.
- E. Features:
 - 1. Disconnect device: Device to electrically disconnect control section from transfer switch to permit safe access for maintenance or service during normal operation.
 - 2. Test switch: Simulate power outage for operational test of engine, alternator and load transfer control.
 - 3. Float type battery charger: Fused with adjustable charge, rate, millimeter.
 - 4. Cranking limiter: (24/12 volt, 2 wire start) fail to start protection for generator starting system.
 - 5. Operation and selector switch: (24/12 volt, 2 wire start) fail to permit operation of generator at the control site. Provide check, stop, automatic and hand crank functions.
 - 6. Undervoltage Protection: Monitor normal source and start emergency power on partial loss of power on any phase where feedback voltages exist. Provide devices: solid-state voltage sensitive, calibrated dial adjustment, temperature compensated for a maximum deviation of +/- 2 volts from -25°F to +175°F.
 - 7. Time delay to start emergency power: Provide to prevent emergency power from starting during normal voltage fluctuations, adjustable from 1.5 to 15 seconds.
 - 8. Time delay to pick up load: Provide to allow emergency power to operate for a period of time before accepting load, adjustable 5 to 50 seconds.
 - 9. Time delay to retransfer load: Provide to delay retransfer of load to normal power to override initial voltage fluctuations of returning normal power and to provide a minimum period of operating time for emergency power.
 - a). Bypass time delay if emergency power fails during delay period; retransfer load immediately to normal power.
 - b). Adjustment: 2 to 60 minutes

10. Time delay to stop emergency power: Provide to allow engine to run unloaded before being shutdown after load has been retransferred to normal power, adjustable 2 to 60 minutes.
11. Indicating lights: Provide on enclosure door, label indicate transfer switch position.

Green	-	Normal source
Red	-	Emergency source
12. Automatic engine exerciser: Provide built-in unit to exercise generator weekly for adjustable time periods. Loads to be transferred under exercise mode.
13. Provide circuitry to inhibit “Power Failure” and/or “Generator Run” alarm annunciation under automatic exerciser operation - unless other conditions do simultaneously exist.
14. Provide added auxiliary contacts for purposes required:
 - a). Alarm (1)
 - b). Future (2)
15. Note: Transfers to emergency and from emergency to normal shall have a dead-band period to ensure residual voltages have decayed before new power source is applied or the switch shall include in phase sensing to inhibit reclosing on a system not in synchronization with the unit.

F. Rating and Performance:

1. Continuous duty is a non-ventilated NEMA 1 enclosure.
2. Load: All classes of load including inductive and non-inductive at 600 volts; tungsten lamp load at 250 volts.
3. Close on inrush current of 20-time continuous rating without welding or excessive burning of the contacts.
4. Load switching capability: 15 times continuous rating.
5. Cycles of operation: 600 cycles at rated current at a rate of 6 cycles per minute. One cycle: One complete opening and closing of both sets of contracts on inrush current 10 times continuous rating.

G. Withstand Ratings:

1. Switch withstand rating based on manufacturer's published U/L listing of acceptable protective devices (which limit any fault currents to within switches published withstand rating) must be provided. Contractor and vendor must provide written certification that new (or existing) circuit protective devices ahead of the transfer switches provide proper protection. If they do not do so, the required appropriate devices will be provided and installed under this specification section. Also, there shall be a U/L service entrance breaker, per NEC, 2020 edition, ahead of the automatic transfer switch on the utility and also on the generator cables.

H. Construction:

1. General: No wearing surfaces or moving parts requiring routine lubrication or maintenance.
2. Enclosure: NEMA 1 for indoor installation; key operated door locks; swing-out service panel, pre-punched for future addition of control components.
3. Interlocking: Mechanical and electrical interlocking to prevent simultaneous energizing of load by normal and emergency power.
4. Contacts: Double break design for fast arc suppression, solid silver cadmium, completely enclosed in head resistant contact chambers.

2.4 FUEL SYSTEM

- A. The fuel system shall be provided by the Owner's propane fuel supplier to the requirements of the generator manufacturer. The tank capacity shall be adequate for provision of LPG vapor fuel to the new generator without the need for a fuel vaporizer. If the existing fuel tank is changed or if new fuel pipe is required from the existing tank (if the existing tank is reused), the Contractor shall provide a 4 " PVC pipe sleeve for such new piping to be installed in.
- B. Flexible fuel lines shall be furnished with the generator for each fuel connection to the engine.
- C. A fuel/water separator (if applicable) shall be provided and mounted on the generator set ahead of engine fuel pump to remove fuel tank condensation and to prevent any water from entering the engine fuel system. The fuel/water separator shall be as manufactured by Racor or approved equal.

2.5 GENERATOR EXHAUST

- A. Provide generator exhaust in compliance with manufacturer's recommendations. Provide solid, seamless, welded piping system compatible with ASA125 lb. pipe flange unless manufacturer recommends otherwise. Provide flexible continuous, bellows type stainless

steel interlocking joints at least 8 inches long for each engine exhaust outlet. Use long radius bends only. Provide condensate trap with drain petcock. Provide insulation on all exposed exhaust pipe surface inside the generator sound attenuated enclosure. Provide with critical sound rating.

2.6 MISCELLANEOUS

- A. Anchor Bolts: Galvanized steel, as recommended by generator manufacturer.
 - a. Concrete Base Pad: Provision of a new concrete pad to accommodate new generator bond-out locations for conduit and fuel connections in accordance with the recommendations of the manufacturer of the new generator shall be provided by the Contractor.

2.7 RADIATOR

- A. Provide initial radiator glycol fill to protect and be suitable for operation to -30°F.

2.8 SOUND ATTENUATED OUTDOOR ENCLOSURE

- A. Manufacturer's new aluminum outdoor weather enclosure, with maximum sound attenuation, shall be provided. The maximum combined full load sound level in dBA at 23 feet (7 meters) in all directions from the unit are to be noted in the shop drawing submittal. Finish paint color shall be selected by the Owner from the manufacturer's standard color options.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install as indicated, in accordance with the equipment manufacturer's written instructions, and with recognized industry practices. Comply with NFPA and NEMA standards.
- B. Coordinate with other work, including fuel tanks, piping and accessories.
- C. Connect fuel piping to standby generator equipment as indicated, and comply with manufacturer's written instructions where not otherwise indicated. Flexible connections are required.
- D. Provide initial fuel tank fill and refill after all tests are completed and accepted.

3.2 GROUNDING

- A. Provide equipment grounding of engine-generator system in accordance with applicable sections of National Electric Code and details on Contract Drawings.
- B. All assembled wiring by the manufacturer shall be grounded as required by Codes.
- C. Ground grid at the generator will be by the installing electrical contractor as will all connections to terminals on the equipment that are provided by the manufacturer.

3.3 TESTING

- A. After facility circuitry has been energized with normal power source, test engine-generator to demonstrate standby capability and compliance with requirements. Correct malfunctioning conditions, then retest to demonstrate compliance. Test shall conform to NFPA 110 requirements and shall include load bank testing. Full load test shall last a minimum of 4 hours and shall conform to the appropriate Level in NFPA 110.
- B. Copies of test reports shall be submitted, by the representatives of the generator and the automatic transfer switch manufacturers, to the Project Engineer after testing is completed and the unit is commissioned and accepted by the Owner.

3.4 SHIPPING AND FREIGHT

- A. Unloading and setting of the equipment from the delivery vehicle at the project site is part of the Contractor's work and are to be included in the bid.
- B. All freight costs charged for delivery are to be included in the Contractor's bid for the project.

End of Section

SECTION 31 08 00

RESTORATION OF SURFACES

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Work covered in this Section includes the restoration of surfaces and items disturbed during the Work.

1.2 QUALITY ASSURANCE

- A. Restoration of surfaces and items shall be done in accordance with the requirements of those authorities having jurisdiction.
- B. Existing pavements and bituminous walks shall be replaced using new pavement equal to or better than the existing in quality and thickness, except where otherwise specified. Pavements shall be free from all noticeable sags, humps, cracks, or other defects.
- C. Replacement curbing shall be of the same size, material, and appearance as adjoining curbing.
- D. Grassed and vegetated areas shall be loamed and replanted with healthy vegetation of a type and quality equal to or superior to existing vegetation.
- E. Miscellaneous items including but not limited to mailboxes, fencing, signage, etc. shall be carefully removed and replaced.

1.3 SUBMITTALS

- A. General: Provide submittals in accordance with Specification 01 33 23.

1.4 SCHEDULING

- A. All surfaces shall be restored as soon as possible after completion of that portion of the Work.

PART 2 – MATERIALS

2.1 NEW MATERIALS

- A. New materials shall comply with the requirements of the authority having jurisdiction.

2.2 REUSED MATERIALS

- A. Items such as granite curbs, fencing, signs, walks, etc. that have been disturbed during the Work may be replaced with existing materials when, in the opinion of the Engineer, such materials are in acceptable condition.

PART 3 – EXECUTION

3.1 INSPECTION

- A. Prior to restoring any surfaces, carefully inspect the Work to ensure that the work is complete. Unnecessary disturbance of restored surfaces is to be avoided.

3.2 PLANTS

- A. Replace in their original locations all surviving plants, shrubs, trees, etc. that were removed during installation of the Work.
- B. Replace with the same type and size any vegetation which does not survive moving.

3.3 GRASS AND LAWNS

- A. Grassed areas are to be restored in accordance with Section 32 92 00.

3.4 BITUMINOUS PAVING

- A. All Work shall conform to Section 32 12 16.31.
- B. Replace all pavement markings immediately after installation of new pavement.

3.5 MISCELLANEOUS

- A. Replace miscellaneous items such as fencing, gates, signage, mailboxes, etc. in the same location as soon as possible after installation of the Work.

End of Section

SECTION 31 23 16

EARTHWORK

PART 1 – GENERAL

1.1 DESCRIPTION

A. This Section includes the following:

1. Preparing subgrade, subbase and base for building slabs, walks, and pavements.
2. Excavating, trenching and backfilling of underground utilities, structures and foundations.
3. Preparing subgrade and installing earthen material courses for site projects.

B. Work performed under this Section is intended to conform with State of New Hampshire, Department of Transportation, “Standard Specifications for Road and Bridge Construction (latest revision)”.

1.3 DEFINITIONS

A. Borrow consists of approved material required for the construction of fills or other portions of the work, and shall be obtained from approved sources, which sources may be designated in the Contract.

B. Earth consists of clay, loam, sand, gravel, topsoil and other materials not otherwise classified.

C. Excavation consists of removal of material encountered to subgrade elevations or dimensions indicated and subsequent disposal of materials removed, classified as follows:

1. Earth Excavation includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.
 - a. Common Earth Excavation consists of all excavation other than Trench Earth Excavation and Rock Excavation.
 - b. Trench Earth Excavation consists of excavations for pipelines, cables, conduits, manholes and other related work where the bottom-width limit of excavation does not exceed 8 feet.

2. Rock Excavation consists of all solid rock which cannot be removed without blasting or ripping. Intermittent drilling, blasting, or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.
 - a. Site Rock Excavation consists of all rock excavation other than Trench Rock Excavation and includes the excavation of boulders and parts of masonry structures when found to measure 2 cubic yards or more.
 - b. Trench Rock Excavation consists of rock excavation where solid rock and boulders or parts of masonry structures found to measure 1 cubic yard or more are removed from trenches where the bottom-width limit of excavation does not exceed 8 feet.
 3. Unauthorized Excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be at Contractor's expense.
 - a. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Engineer.
 - b. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Engineer.
 4. Additional Excavation: When excavation has reached required subgrade elevations, notify Engineer, who will observe subgrade conditions. If Engineer believes that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Engineer.
 - a. Removal of unsuitable material and its replacement as directed will be paid on basis of Conditions of the Contract relative to changes in work.
- D.** Subgrade consists of the undisturbed earth or the compacted soil layer immediately below indicated surface treatment systems.
- E.** Structure: Buildings, foundations, slabs, tanks, curbs, or other man-made stationary features occurring above or below ground surface.
- F.** Unstable Material consists of debris, frozen materials, topsoil, quick-sand, and all wet, soft or loose material which does not provide sufficient bearing capacity to satisfactorily support pipes or other work, as determined by the Engineer.

- G. Unsuitable Material consists of excavated material which does not meet requirements for backfilling purposes and includes solid and loose rock, earth overburden, and unstable material, as determined by the Engineer.
- H. Paved Areas consist of the area which lies directly under a paved surface, whether it is asphalt, concrete, or other paving materials.
- I. Select Fill consists of Select Earth, imported sand, and/or other granular materials as specified and/or approved by the Engineer.
- J. Earth Overburden: Earth overlying solid rock and in place during blasting operations or earth not classified as Select or Common Earth.
- K. Pipe Bedding: Sand, crushed stone, or other processed granular materials as approved by the Engineer. Pipe bedding material(s) shown on the Drawings take precedence over this paragraph.
- L. Wood Sheeting and Bracing: Sound timber, free from defects which might impair its strength and effectiveness.
- M. Steel Sheeting and Bracing shall be in accordance with ASTM A328.
- N. Backfill – General: To the extent suitable materials are available, backfill shall consist of excavated material. Where excavation does not provide sufficient approved material, import additional material from off-site.
- O. Backfill – Trenches: Pipe Bedding material up to a minimum of 12 inches over the top of pipe; suitable Common Earth, Select Earth, or Select Fill for the remainder of the trench. Backfill materials shown on the Drawings take precedence over this paragraph.
- P. Backfill – Around Structures: In paved areas, Select Fill, or a better material when required, for the full depth. In unpaved areas, Select Fill for the full depth. Backfill materials shown on the Drawings take precedence over this paragraph.
- Q. Concrete for Cradles and Encasements: Class C concrete in accordance with Specification 03 30 53.

1.4 SUBMITTALS

- A. General: Provide submittals in accordance with Specification 01 33 23.
- B. Test Reports: Submit the following reports directly to Engineer from the testing laboratory with copy to Contractor:

1. Certified copies of all results of moisture-density tests and field compaction density tests.
2. Gradations of proposed materials.
3. Copies of measurements and computed volumes of unstable material removed.
4. Certification from testing laboratory that materials meet permeability requirements at required compaction.
5. Verification of suitability of each footing subgrade material, in accordance with specified requirements.
6. Report of actual unconfined compressive strength and/or results of bearing tests of each strata tested.

C. As a minimum, the laboratory testing reports shall contain the following:

1. Laboratory's name.
2. Date, time and specific location from which sample was taken and name of person who collected the sample.
3. Designation of the test method used.
4. A description of the sample, the test, and the test results.
5. The date the test was performed and the person who performed the test.
6. The Project name, identification, and Contractor's name.

1.5 QUALITY ASSURANCE

- A. All soils testing will be performed by a testing laboratory of the Owner's choice at the Owner's expense except as specified in Paragraph C below.
- B. Where soil material is required to be compacted to a percentage of relative compaction, the maximum density at optimum moisture content will be determined in accordance with ASTM D698 or ASTM D1557 as indicated, except as otherwise stated in these Specifications. Where cohesionless, free draining soil material is required to be compacted to a percentage of relative density, the calculation of relative density will be determined in accordance with ASTM D4253 and D4254. Field density in-place tests will be performed in accordance with ASTM D1556, ASTM D6938, or by other means acceptable to the Owner.
- C. When tests of fill or backfill show noncompliance with the required density, gradations, or other physical properties, Contractor shall take whatever actions are necessary and as

may be required to remedy any deficiencies and ensure conformance with specifications and requirements. Subsequent testing to show compliance shall be by a testing laboratory selected by the Owner and shall be at the Contractor's expense.

- D. All fill material shall be subject to the approval of the Engineer.
- E. Soils shall be described in accordance with ASTM D2488, Visual-Manual Procedure.
- F. Codes and Standards: Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.

1.6 PROJECT CONDITIONS

- A. Site Information: Subsurface explorations data, if made available to the Contractor, is for informational purposes only. Conditions are not intended as representations or warranties of accuracy or continuity between subsurface explorations. The Owner will not be responsible for interpretations or conclusions drawn from this data by Contractor.
 - 1. Additional test pits, borings or other explorations may be performed by Contractor, at the Contractor's option; however, no change in the Contract Sum will be authorized for such additional explorations.
- B. Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations.
 - 1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
 - 2. Do not interrupt existing utilities serving facilities occupied by Owner or others, during occupied hours, except when permitted in writing by Engineer and then only after acceptable temporary utility services have been provided.
 - a. Provide minimum of 48-hour notice to Engineer, and receive written notice to proceed before interrupting any utility.
 - 3. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff of services if lines are active.
- C. Use of Explosives: Do not bring explosives onto site or use in work without prior written permission from authorities having jurisdiction.
- D. Protection of Persons and Property: Barricade open excavations occurring as part of this work per applicable regulatory requirements.

1. Operate warning lights as recommended by authorities having jurisdiction.
 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.
 3. Perform excavation by hand within drip-line of large trees to remain. Protect root systems from damage or dry-out to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap.
- E.** Maintain excavations and trenches free of groundwater, sewage, storm water, ice and snow.
- F.** Backfilling with frozen materials or when materials already in place are frozen is not permitted. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

1.7 DELIVERY, STORAGE, AND HANDLING

- A.** Segregate topsoil, excavated materials, and other earth materials on the site to prevent contamination.
- B.** Store excavated materials meeting the requirements for backfill a sufficient distance away from excavations and trenches to avoid overloading and to prevent slides or cave-ins. Do not store materials on, over, or adjacent to structures or utilities, which may collapse or become damaged due to the added weight. Remove excess excavated material promptly and dispose of off- site.
- C.** No construction activity, access, storage or other use shall take place beyond the construction easement boundaries.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Common Earth:** Clay, loam, sand, gravel, topsoil and similar materials which may contain some stones, pebbles, lumps and rock fragments up to 6 inches in largest dimension, but does not contain debris, organic or frozen material.
- B. Select Earth:** Sand, gravel and similar materials which may contain small amounts of stones, pebbles, or lumps over 1 inch but not over 2 inches in largest dimension, but does not contain clay, silt, loam, organic material, debris and frozen material.
- C. Sand Buffer and Free Draining Sand:** Hard durable natural or washed sand free of deleterious amounts of clay, silt or organic matter.

Gradation:	Passing 3/8" Sieve	=	100%
	Passing No. 4 Sieve	=	95-100%
	Passing No. 16 Sieve	=	45-80%
	Passing No. 50 Sieve	=	10-30%
	Passing No. 100 Sieve	=	2-10%
	Passing No. 200 Sieve	=	0-5%

The calcium carbonate content shall not exceed 15%. The saturated permeability shall not be less than 1×10^{-3} cm/sec when compacted to 95% of the maximum density obtainable at optimum moisture content (as determined by ASTM D1557, Method C).

- D. Sand:** Hard durable natural or crushed sand particles free of deleterious amounts of clay, silt or organic matter, conforming to NHDOT Item No. 304.1.

Gradation:	Passing 1/2" Sieve	=	100%
	Passing No. 4 Sieve	=	70-100%
	Passing No. 200 Sieve	=	0-12%

(Based on Fraction Passing No. 4)

- E. Gravel (Bank Run):** Satisfactorily graded, free draining, hard, durable stone and coarse sand reasonably free from silt, loam, clay and organic matter, conforming to NHDOT Item No. 304.2.

Gradation:	Passing 6" Sieve	=	100%
	Passing No. 4 Sieve	=	25-70%
	Passing No. 200 Sieve	=	0-12%

(Based on Fraction Passing No. 4)

- F. Screened Gravel:** Uniformly graded, clean, hard, and durable particles free from an excess of soft, thin, elongated, laminated, or disintegrated pieces and be free from silt, loam, clay, or organic matter.

Gradation:	Passing 1-1/2" Sieve	=	100%
	Passing 3/4" Sieve	=	90-100%
	Passing 3/8" Sieve	=	0-30%
	Passing No. 4 Sieve	=	0-5%

- G. Pea Gravel:** Natural stone, washed free of clay, shale and organic matter, graded in accordance with ANSI/ASTM C136 to the following: maximum size 5/8 inch, minimum size 1/4 inch.

H. Crushed Gravel: Uniformly graded and free from silt, loam. Clay or organic matter conforming to NHDOT Item No. 304.3. At least 50% of the materials retained on the 1 inch sieve shall have a fractured face.

Gradation:	Passing 3" Sieve	=	100%
	Passing 2" Sieve	=	95-100%
	Passing 1" Sieve	=	55-85%
	Passing No. 4 Sieve	=	27-52%
	Passing No. 200 Sieve	=	0-12%
	(Based on Fraction Passing No. 4)		

I. Crushed Aggregate For Shoulders: Conforming to NHDOT Item No. 304.33.

Gradation:	Passing 1-1/2" Sieve	=	100%
	Passing 1" Sieve	=	90-100%
	Passing No. 4 Sieve	=	30-65%
	Passing No. 200 Sieve	=	0-10%
	(Based on Total Sample)		

J. Crushed Stone (Fine): Conforming to NHDOT Item No. 304.4.

Gradation:	Passing 2" Sieve	=	100%
	Passing 1-1/2" Sieve	=	85-100%
	Passing 3/4" Sieve	=	45-75%
	Passing No. 4 Sieve	=	10-45%
	Passing No. 200 Sieve	=	0-5%
	(Based on Total Sample)		

K. Crushed Stone (Course): Conforming to NHDOT Item No. 304.5.

Gradation:	Passing 3-1/2" Sieve	=	100%
	Passing 3" Sieve	=	85-100%
	Passing 1-1/2" Sieve	=	60-90%
	Passing 3/4" Sieve	=	40-70%
	Passing No. 4 Sieve	=	15-40%
	Passing No. 200 Sieve	=	0-5%
	(Based on Total Sample)		

L. Loam (Topsoil): Loam shall be the surface layer of natural workable soil containing 3% minimum to 10% maximum organic matter (determined by loss by ignition), capable of sustaining the growth of vegetation, with no admixture of refuse or material toxic to plant growth. It shall be relatively free from stones, lumps, stumps or similar objects larger than 1 inch in greatest diameter, sterile soil, roots and brush. Ordinary sods of herbaceous growth such as grass and non-noxious weeds will be permitted. The loam shall be free from subsoil. The acidity range of the loam prior to treatment as specified herein shall be between pH 5.0 and 6.0 inclusive. Not more than 65% shall pass the No.

200 Sieve as determined by the wash test in accordance with ASTM D 1140. No more than 20% of the material passing the No. 4 Sieve shall consist of clay particles.

M. Silt: Silt Loam or Silt, at least 50% of material by weight shall have a particle size less than 0.05 mm. The material shall be free of debris, frozen material, and stones greater than 3 inches in largest dimension. The saturated permeability of the compacted material shall not exceed 1×10^{-5} as determined by the U.S. Army Corps of Engineers "Falling Head Permeability Test EM1110-2-1906, Appendix 7", when compacted to 85% of the maximum density obtainable at optimum moisture content (as determined by ASTM D1557, Method C).

N. Spalls: Stones or broken rock ranging downward from the maximum size indicated.

O. Stabilization Fabric: Mirafi Filterweave FW 700 or approved equivalent.

P. Stone Filter Blanket: Clean durable fragments of either ledge rock, boulders or both, reasonably free of thin or elongated pieces and organic material.

Gradation:	Passing 5" Sieve	=	100%
	Passing 4" Sieve	=	85-100%
	Passing 1-1/2" Sieve	=	20-55%
	Passing 3/4" Sieve	=	0-25%

Q. Structural Fill: Hard durable particles or fragments of stone, gravel and natural sand free from deleterious amounts of clay, silt or organic matter. At least 30 percent of the materials retained on the No. 4 sieve shall have a fractured face.

Gradation:	Passing 2" Sieve	=	100%
	Passing 1-1/2" Sieve	=	90-100%
	Passing No. 4 Sieve	=	30-60%
	Passing No. 100 Sieve	=	0-12%
	Passing No. 200 Sieve	=	0-5%
	(Based on Fraction Passing No. 4)		

R. Embedment: Screened gravel and/or crushed stone free from organic matter, clay, and/or loam meeting ASTM C33 Stone Size No. 67.

Gradation:	Passing 1" Sieve	=	100%
	Passing 3/4" Sieve	=	90-100%
	Passing 3/8" Sieve	=	20-55%
	Passing No. 4 Sieve	=	0-10%
	Passing No. 8 Sieve	=	0-5%

2.2 CONTROLLED LOW STRENGTH MATERIAL

- A.** The 7 day compressive strength shall be not less than 100 psi or not more than 200 psi. Determine in accordance with ASTM D4832.
- B.** The soil shall meet the following requirements when tested in accordance with the designations as shown in the Eighth Edition - Revised Reprint of the Bureau of Reclamation (USBR) Concrete Manual and the Third Edition of the Bureau of Reclamation Earth Manual, Part 2.
- C.** Soil producing a color darker than the standard color in the calorimetric test for organic impurities shall be rejected until further tests are performed to determine the nature of the material and its effect on the time of set and strength of cement, refer to the USBR Concrete Manual Appendix Designation 14.
- D.** The amount of soil passing the No. 200 sieve shall not exceed 30 percent by weight, and the amount of soil passing the No. 100 sieve shall not exceed 50 percent by weight, refer to the USBR Earth Manual Designation USBR 5530). The soil shall be nonplastic or of low plasticity.
- E.** The soil shall be selected or processed so that the gradation of the soil is such that all particles will remain in suspension, or no segregation will occur, when the controlled low strength material is placed. The maximum particle size in the soil shall not exceed 1/8 of the open distance between the pipe and the trench wall or 1-1/2 inches, whichever is less.
- F.** The maximum size of any clay balls in the soil shall be one-half inch. The maximum percentage of clay balls, by wet weight of the soil, shall not exceed 10 percent.
- G.** The Water-Cement Ratio shall not exceed 3.5:1. The water content shall not exceed that required to provide a mix that will flow and can be pumped.
- H.** Provide batching equipment to obtain the proper weights of soil, cement, and water. All measuring devices shall be sensitive to a 2% variation above or below the actual weights required.
- I.** Operate mixers such that the slurry is discharged uniformly and is consistent throughout each batch.
- J.** Consistency shall be such that the controlled low strength material flows easily into all openings between the pipe and the lower portion of the trench. When trenches are on a steep slope, a stiffer mix may be required. When a stiffer mix is used, vibrate to ensure the controlled low strength material completely fills all spaces.

2.3 TRENCH PLUGS

- A.** Construct from compacted clay soils with Unified Soil Classification System classification of CL or CH and with at least 60 percent fines (passing the No. 200 sieve) and a Plasticity Index of 15 or greater. Alternatively, trench plugs may be constructed

with lean concrete, controlled low strength material, or onsite silty sand soils processed with 20 pounds of bentonite clay per cubic yard.

PART 3 – EXECUTION

3.1 EXCAVATION – GENERAL

- A. Identify and mark known underground utilities.
- B. Identify required lines, levels, contours and datum.
- C. Comply with local codes, ordinances, and requirements of agencies having jurisdiction.
- D. Do not perform rock excavation work until material to be excavated has been measured and classified by Engineer.

3.2 STABILITY OF EXCAVATIONS

- A. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
- B. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.
 - 1. Provide permanent steel sheet piling or pressure-creosoted timber sheet piling wherever subsequent removal of sheet piling might permit lateral movement of soil under adjacent structures. Unless indicated otherwise, cut off tops a minimum of 2.5 feet below final grade and leave permanently in place.

3.3 DEWATERING

- A. Prevent surface and ground water from flowing into excavations and from flooding project site and surrounding area.
 - 1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations without erosion or sedimentation.
 - 2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.

3.4 STORAGE OF EXCAVATED MATERIALS

- A. Stockpile excavated materials acceptable for backfill and fill where directed. Place, grade, shape and stabilize stockpiles as necessary to prevent storm water erosion.
 - 1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
 - 2. Dispose of excess excavated soil material and materials not acceptable for use as backfill or fill.

3.5 EXCAVATION FOR STRUCTURES

- A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete form-work, installation of services, and other construction and for inspection.
 - 1. Excavations for footings and foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.
 - 2. For pile foundations, stop excavations from 6 inches to 12 inches above bottom of footing before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
 - 3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Structures: Conform to elevations and dimensions indicated within a tolerance of plus or minus 0.10 feet; plus a sufficient distance to permit placing and removal of concrete form-work, installation of services, and other construction and for inspection. Do not disturb bottom of excavations, intended for bearing surface.

3.6 EXCAVATION FOR PAVEMENTS

- A. Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.

3.7 TRENCH EXCAVATION FOR PIPES AND CONDUIT

- A. Excavate trenches sufficiently wide to provide ample working room but not wider than the maximum width indicated on the drawings. If trench widths are exceeded, redesign with stronger pipe, concrete cradles, or other special installation procedures as required by the Engineer. All additional costs, including the cost of redesign, shall be borne by the Contractor.

- B.** Where it is necessary for pipes to be laid in fill, place Select Fill in uniform horizontal layers not over 6 inches in compacted thickness. Carry fill up to elevation at least two feet above the elevation of the top of the pipe to be laid and then excavate trench.
- C.** Bedding requirements are detailed on the plans.
- D.** Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil or compacted bedding material as indicated. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
 - 1. Where rock is encountered, carry excavation 6 inches below invert elevation and backfill with a 6-inch layer of stone bedding prior to installation of pipe.
 - 2. For pipes or conduit less than 6 inches in nominal size, and for flat-bottomed, multiple-duct conduit units, hand-excavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil or compacted bedding material as indicated.
 - 3. For pipes or conduit 6 inches or larger in nominal size, shape trench bottom or bedding to fit bottom of pipe for 90 degrees (bottom 1/4 of the circumference). Where no bedding is indicated, fill depressions with granular fill-sand and tamp. At each pipe joint, dig bell holes to relieve pipe bell of loads to ensure continuous bearing of pipe barrel on bearing surface.

3.8 COLD WEATHER PROTECTION

- A.** Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.9 REQUIREMENTS PRIOR TO BACKFILLING

- A.** Backfill excavations as promptly as work permits, but not until completion of the following:
 - 1. Acceptance of construction below finish grade including, where applicable, damp-proofing, waterproofing, and perimeter insulation.
 - 2. Inspection, testing, approval, and recording locations of underground utilities have been performed and recorded.
 - 3. Removal of concrete form-work.
 - 4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.

5. Removal of trash and debris from excavation.
6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.
7. Inspection, testing and approval of subgrade.

3.10 SUBGRADE PREPARATION

- A. Clear, grub and dispose of vegetation. Strip humus, excavate unsuitable materials and remove obstructions. Uniformly grade subgrade to indicated lines, grades and acceptable grading tolerances. Grade subgrade to be free of non-draining depressions where practical.
- B. When subgrade density is less than that specified under "Compaction" for particular area classification, break up surface, pulverize, moisture-condition to specified acceptable moisture content range, and compact to required depth and percentage of maximum density.
- C. Unless otherwise indicated, roughen sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

3.11 GENERAL BACKFILL AND FILL PLACEMENT

- A. Place backfill and fill materials in layers not more than 12 inches in loose depth for material compacted by heavy compaction equipment, and not more than 6 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.
- C. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.
 1. Do not backfill trenches until tests and inspections have been made and backfilling is authorized by Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.

3.12 PLACING SUB-PAVEMENT GRAVEL COURSES

- A. General: Sub-pavement gravel courses consist of placing subbase and base gravel materials, in layers of specified thickness, over subgrade surface to support pavements.
- B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of sub-pavement gravel courses.

- C. Shoulders: Place shoulders along edges of sub-pavement gravel courses to prevent lateral movement. Construct shoulders of acceptable soil materials, placed in such quantity to compact to thickness of each sub-pavement gravel course layer. Compact and roll at least a 12-inch width of shoulder simultaneous with the compaction and rolling of each layer of sub-pavement gravel.
- D. Placing: Place sub-pavement gravel course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain specified acceptable moisture content range for compacting sub-pavement gravel material during placement operations.
 - 1. When a compacted sub-pavement gravel course is indicated to be 6 inches thick or less, place material in a single layer. When indicated to be more than 6 inches thick, place material in equal layers, except no single layer shall be more than 6 inches or less than 3 inches in thickness when compacted.

3.13 PLACING BUILDING SLAB STRUCTURAL FILL COURSE

- A. General: Structural fill course consists of placement of structural fill material, in layers of indicated thickness, over subgrade surface to support concrete building slabs.
- B. Placing: Place structural fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain specified acceptable moisture content range for compacting material during placement operations.
 - 1. When a compacted structural fill course is indicated to be 6 inches thick or less, place material in a single layer. When indicated to be more than 6 inches thick, place material in equal layers, except no single layer shall be more than 6 inches or less than 3 inches in thickness when compacted.

3.14 BACKFILLING TRENCHES

- A. Pipe Bedding – Bedding requirements shall be as shown on the plans. Provide bedding to the spring line of the pipe. Place fill by hand in not greater than 6 inch compacted layers.
- B. 12 Inches Over Pipes – Provide 12 inches of Select Fill over the top of the pipe as detailed on the plans. Place fill by hand in not greater than 6 inch layers. Bring Select Fill up evenly on both sides of pipes and carefully and thoroughly compact.
- C. Remainder of Trench – Paved Areas – Select Fill, Select Earth, or Common Earth placed no greater than 12 inch compacted layers.
- D. Remainder of Trench – Other Areas – Select Fill, Select Earth, or Common Earth placed no greater than 12 inch compacted layers.

- E. Trench Plugs – Trench plugs shall be placed every 500 feet along the length of the pipe in wet areas, and where shown on the Drawings or as directed by the Engineer. Trench plugs shall be a minimum thickness of 2 feet as measured along the longitudinal pipe axis and replace the pipe zone material.

3.15 BACKFILLING AROUND STRUCTURES

- A. Uniformly spread and deposit backfill in horizontal layers, not over twelve inches in compacted thickness. Take special precautions to prevent damage to new construction.
- B. In paved areas, backfill with Select Fill for the full depth. In unpaved areas, backfill with Select Fill, Select Earth or Common Earth.

3.16 SHEETING AND BRACING

- A. Provide and maintain adequate sheeting and bracing as required for the safety and protection of the Work, persons and adjacent property and structures in accordance with federal, state and local laws, codes ordinances, and standards.
- B. Where sheeting is placed along side pipe and extends below mid-diameter, it shall be cut off and left in place to an elevation not less than one foot above the top of the pipe. The Engineer may, at his discretion, order sheeting and bracing to be cut-off and left in place. Where, in the opinion of the Contractor, damage may result from withdrawing sheeting, he shall immediately notify the Engineer. Sheeting ordered left in place adjacent to piping shall be cut-off at least three feet below grade but not less than one foot above the top of the pipe.
- C. Contractor is fully responsible for the design and construction of all sheeting and bracing used and for all damages resulting from improper quality, strength, placing, maintenance or removal of sheeting and bracing.

3.17 UNSTABLE MATERIALS

- A. Remove unstable materials in excavations and trench bottoms which are incapable of supporting pipes or structures, to the extent and depths directed by the engineer, and properly dispose of off-site. Refill and compact the excavation as required.
- B. Whenever the material encountered is, in the Contractor's opinion, incapable of providing adequate support, he shall immediately notify the Engineer.

3.18 DISPOSAL OF EXCAVATED MATERIALS

- A. Excavated materials which meet the requirements for embankment fill or backfill may be used for constructing embankments and backfilling, as possible. Remove excess excavated materials and dispose of off-site.

- B. The storing and stockpiling of unsuitable material on-site is not permitted.

3.19 COMPACTION AND MOISTURE CONDITIONING

- A. Compaction shall not take place in freezing weather or when materials to be compacted are frozen, too wet or moist, or too dry.
- B. Schedule the Work to allow ample time for laboratory tests and to permit the collecting of samples and the performing of field density tests during the backfilling and compaction operations.
- C. Utilize the proper compaction methods and equipment to suit the soils and conditions encountered.
- D. Verify that layers of material are no thicker than the specified maximum thickness.
- E. Control soil and fill compaction and moisture conditioning, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Engineer if soil density tests indicate inadequate compaction.
 - 1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density in accordance with ASTM D 1557 and maintaining moisture content between 1% below and 2% above optimum moisture content:
 - a. Under structures, building slabs and steps, and pavements, compact top 12 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density.
 - b. Under lawn or unpaved areas, compact top 6 inches of subgrade and each layer of backfill or fill material at 90 percent maximum density.
 - c. Under walkways, compact top 6 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density.
 - 2. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.
 - a. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

- b. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

3.20 FIELD QUALITY CONTROL

- A.** Quality Control Testing During Construction: Schedule and allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed. Provide all assistance and cooperation during testing and coordinate operations to allow ample time for the required sampling and testing.
- B.** Perform a laboratory moisture density test for each type of soil proposed for use or encountered in the Work.
 - 1. Perform field density tests in accordance with ASTM D 1556 (sand cone method) or ASTM D 2167 (rubber balloon method), as applicable.
 - a. Field density tests may also be performed by the nuclear method in accordance with ASTM D 2922, providing that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. In conjunction with each density calibration check, check the calibration curves furnished with the moisture gages in accordance with ASTM D 3017.
 - b. If field tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by the Engineer.
 - 2. Footing Subgrade: For each strata of soil on which footings will be placed, perform at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison with related tested strata when acceptable to Engineer.
 - 3. Paved Areas and Building Slab: Perform at least one field density test of subgrade for every 2,000 square feet of paved area or building slab, but in no case fewer than three tests. In each compacted fill layer, perform one field density test for every 2,000 sq. ft. of overlaying building slab or paved area, but in no case fewer than three tests.
 - 4. Foundation Wall Backfill: Perform at least one test for each foot of backfill at intervals of approximately 50 feet around the structure.
 - 5. Trenches: Perform at least one field density test for each foot of backfill at intervals of approximately 200 feet along trench.
 - 6. Embankments: In each compacted fill layer, perform at least one field density test for every 2,000 sq. ft. of embankment area, but in no case less than three tests.

7. Sidewalks: Perform at least one test at intervals of 200 feet along the sidewalk.
8. If, in the Engineer's opinion and based on testing service reports and inspection, subgrade or fills that have been placed are below the specified compaction requirements, perform additional compaction and testing until the specified compaction requirements are attained. The testing frequency in Paragraph 3.20 is at the discretion of the Engineer and may be decreased as the Project progresses.

3.21 GRADING

- A. General: Uniformly grade areas within limits of grading, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.
- B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:
 1. Lawn or Unpaved Areas: Finish areas to receive loam to within not more than 0.25 foot above or below required subgrade elevations.
 2. Walks and Athletic Fields: Shape surface of areas under walks and athletic fields to line, grade, and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation.
 3. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 0.05 foot above or below required subgrade elevation.
- C. Grading Surface of Fill under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 0.05 foot when tested with a 10-foot straightedge.
- D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative compaction for each area classification.

3.22 EROSION CONTROL

- A. Provide measures as necessary to control all erosion and sedimentation resulting from construction activities as indicated, warranted or required by authorities having jurisdiction.

3.23 MAINTENANCE

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.

- C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.
- D. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.24 DISPOSAL OF EXCESS AND WASTE MATERIALS

- A. Do not dispose of spoil materials on or off site in wetlands or other environmentally sensitive areas unless properly permitted through regulatory authorities having jurisdiction and conducted in accordance with the permit conditions thereof.
- B. Remove spoil materials and legally dispose of off site.

3.25 CONTROLLED LOW STRENGTH MATERIAL

- A. Where controlled low strength material is used for pipe zone material, the pipe shall be laid on sand or earth berms free from rocks larger than 3 inches and placed at pipe quarter points. Controlled strength material shall be placed from one side of the pipe and rodded or vibrated, if necessary, so that it flows under the pipe until it appears on the other side. Controlled strength material shall then be added to both sides of the pipe and rodded or vibrated until it completely fills the space between the pipe and the lower portion of the trench. Where required to prevent uplift, the controlled strength material shall be placed in two stages, allowing sufficient time for the initial set of the first stage before the remainder is placed. Controlled strength material shall be deposited as nearly as practicable in its final position and shall not disturb the pipe trench or cause foreign material to become mixed with the controlled strength material. Controlled strength material shall be brought to 6 inches above the top of the pipe. Backfill shall not be placed until the controlled strength material has reached the initial set. If it is anticipated that backfill will not be placed over the controlled strength material within 8 hours, a 6-inch minimum cover of moist backfill shall be placed over the controlled strength material. The moisture in the 6-inch minimum cover shall be maintained until additional backfill is placed. If the ambient temperature is 50°F or less, an additional 12-inch minimum cover of loose backfill shall be placed over the 6-inch moist backfill cover prior to the end of the working day.
- B. Controlled strength material shall not be mixed or placed when the air temperature is below 40°F. Provided, that if the temperature is 35°F or above, controlled strength material may be placed if the temperature is rising. Temperature of the controlled strength material shall be 50°F or greater at time of placement. If the Engineer

determines that weather conditions are unsuitable, controlled strength material shall not be placed.

- C. No controlled strength material shall be placed in pipe trenches when the trench bottom or walls are frozen or contain frozen materials. Backfill placed as cover over the controlled strength material shall not contain any frozen material.

End of Section

SECTION 31 25 00

EROSION CONTROL

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Work covered by this Section includes the control of erosion, siltation, and sedimentation.

1.2 PROJECT REQUIREMENTS

- A. Take every reasonable precaution and do whatever is necessary to avoid any erosion and to prevent silting of rivers, streams, lakes, reservoirs, impoundments, wetlands, drainage ditches and swales.
- B. The exposure of uncompleted cut slopes, embankments, trench excavations, and site graded areas shall be kept as short as possible. Initiate seeding and other erosion control measures on each segment as soon as reasonably possible.
- C. Adhere to all applicable local, state, and federal requirements and permits related to erosion control.

1.3 SEDIMENT CONTROL GUIDELINES

- A. New Hampshire Stormwater Manual, Volume 3 Erosion and Sediment Controls During Construction, New Hampshire Department of Environmental Services, latest edition.

1.4 SUBMITTALS

- A. General: Provide submittals in accordance with Specification 01 33 23.
- B. The Contractor shall furnish to the Engineer, in writing, its plan for controlling erosion and siltation before beginning the construction work. Said plan shall also include the methods to be utilized for protecting and stabilizing steep slopes, stream banks, and channels which will be affected by the construction work.
- C. Where earth disturbance will exceed once acre, the Contractor shall prepare a Storm Water Pollution Prevention Plan (SWPPP) that conforms to the requirements of the USEPA National Pollution Discharge Elimination System (NPDES) Construction General Permit, or agree to abide by an alternate SWPPP if one has been prepared by the Owner or their agent. In the latter instance, the signing of the SWPPP by the contractor shall constitute such an agreement.
 - 1. Contractor shall prepare and submit a Construction General Permit Notice of Intent form at least 7 days prior to beginning earth disturbance activities, and only after a

SWPPP has been prepared. Earthwork shall not commence until the Contractor has received confirmation from EPA that said Contractor has obtained coverage under the Construction General Permit.

- D. Acceptance of a plan will not relieve the Contractor of responsibility for completing the work as specified.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Dewatering Bag - Dirt Bag as manufactured by ACF or approved equal
- B. Erosion Stone - See 02341
- C. Matting for erosion control - jute mat or excelsior mat
- D. Hay bales - rectangular-shaped bales of hay or straw weighing at least 40 pounds per bale and free from primary noxious weed seeds and rough or woody materials
- E. Mulch - Cured hay free from primary noxious weed seeds and rough or woody materials
- F. Seed for erosion control shall be annual or perennial ryegrass, and NH Conservation Seed Mix
- G. Silt fence - Envirofence as manufactured by Mirafi, Inc. or approved equal
- H. Wattles - Sediment Log as manufactured by the American Excelsior Company or approved equal

PART 3 – EXECUTION

3.1 PERFORMANCE

- A. Erosion and sediment controls shall be operated to prevent violations of NH water quality standards (NH Env-Ws 1700).
- B. Diverting Surface Water:
 - 1. Perform no earthwork in flowing waters. Build, maintain, and operate all cofferdams, channels, flumes, slope drains, sumps, and other temporary diversion and protection works needed to divert stream flow, runoff, water from seeps in cut slope, and other surface water through or around the construction site and away from the construction work while construction is in progress.

2. Protect areas where existing stream banks are to be excavated by constructing hay bale dikes at the top of slope to divert storm runoff from the disturbed area and at the toe of the slope to retain sediments.
3. A diversion shall outlet to a durable surface that prevents erosion at the point of discharge.
4. Contain turbid discharge from pumped dewatering operations by a filter bag or a dike located in an upland area at least 20 feet from surface waters or wetlands and constructed to prevent silt from entering the stream and to protect the area of the outlet pipe against erosion by flowing water by the construction of a rock or timber apron.
5. Prior to removal of all sediment control dikes, remove all retained silt, filter bags or other materials at no additional cost to the Owner.

C. Erosion Prevention Provisions:

1. Limit period of time that disturbed soils are exposed to precipitation.
 - a) Apply stabilization measures within 72 hours of completing earth disturbing work adjacent to wetlands.
 - b) Apply stabilization measures within 14 days of finish grading areas that are not adjacent to wetlands.
2. Apply matting to seeded slopes steeper than 3:1. Apply mulch to all other seeded slopes.
3. Mulch:
 - a) Undertake immediately after each area has been properly prepared.
 - b) Place mulch on the seeded areas within 48 hours after seeding.
 - c) Apply hay that has been thoroughly fluffed at approximately, but not to exceed, 2 tons per acre unless otherwise ordered.
4. Matting:
 - a) Place strips lengthwise in the direction of the flow of water.
 - b) Where strips are laid parallel or meet as in a tee, overlap at least 4 inches.
 - c) Ends: Overlap at least 6 in., shingle fashion.
 - d) The up-slope end of each strip of the matting shall be turned down and buried to a depth of not less than 6 in. with the soil firmly tamped against it.
5. Install rock check dams, hay bale check dams, or other temporary grade controls structures in swales and temporary channels that receive concentrated flow.

D. Sediment Control Provisions:

1. Install silt fence and other perimeter controls at early stages of earth disturbance. As shown on plans and as directed by engineer. Avoid usage where concentrated flow may occur. Back up silt fence with wire backing or hay bales as needed.
2. Install coarse stone tracking pad at site exit to prevent sediments from being tracked onto pavement by construction vehicles. Supplement with street sweeping.
3. Avoid interim grading that concentrates runoff to unstable ground or channels. Utilize temporary water bars or other methods to interrupt long flowpaths on unfinished roads and convey runoff to stable upland areas.
4. Install temporary sediment basins in swales and temporary channels that receive concentrated flow. Locate for convenience of frequent maintenance, but do not site in areas where inadvertent basin breaching would cause safety hazards, property damage, or result in preventable environmental impacts.
5. Place erodible material stockpiles on level ground and away from drainage channels. Install silt fence along downgradient perimeter of stockpile between pile and nearest surface water or wetlands.

E. Winter Erosion Control

1. All proposed vegetative areas which do not exhibit a minimum of 85% vegetative growth by October 15th. Or which are disturbed after October 15th, 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 frozen ground and shall be completed in advance of thaw or spring melt events.
2. All ditches or swales which do not exhibit a minimum of 85% vegetative growth by October 15th, or which are disturbed after October 15th, shall be stabilized temporarily with stone or erosion control blankets appropriate for the design flow conditions.
3. After November 15th, 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.

3.2 MAINTENANCE

A. Maintain all temporarily stabilized surfaces until they are stable

1. Repair rills that form on gravel stabilized roadways until paving occurs.

2. Apply supplemental seed, fertilizer and lime as needed to achieve final stabilization; defined by NHDES as 85% vegetative growth.
- B. If any matting staples become loosened or raised or if any matting becomes loose, torn, or undermined, make satisfactory repairs immediately.
 - C. Maintain areas mulched or matted, with no extra compensation, until the completion of the Contract.
 - D. Maintain siltation fence by checking the installation for fallen segments and keep build-up of silt to less than 50% of its height.
 - E. Check all sediment capturing devices at a regular frequency, after storms, and as dictated by applicable permits. Remove sediments from sediment capturing features when 50% of the devices volume is occupied by sediment and prior to anticipated large storms.
 1. Place sediments cleaned from basins and other devices in upland area and out of drainage paths.

3.3 REMOVAL OF TEMPORARY WORKS

- A. Remove or level and grade to the extent required to present a sightly appearance and to prevent any obstruction of the flow of water or any other interference with the operation of or access to the permanent works.

End of Section

SECTION 32 92 00

LOAMING, SEEDING, AND FERTILIZING

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Work included under this Section includes furnishing all labor, materials, equipment, and incidentals necessary to place topsoil, fertilizer, seed and mulch as required.

1.2 QUALITY ASSURANCE

- A. Employ trained personnel experienced in this type of work.

1.3 PRODUCT DELIVERY AND STORAGE

- A. Fertilizer shall be delivered to the Site showing the manufacturer's guaranteed analysis and stored so that when used it shall be dry and free flowing.
- B. Lime shall be delivered and maintained in a dry, free flowing condition until used.
- C. All seed shall be delivered in sealed containers bearing the dealer's guaranteed analysis and stored in a dry, protected place.

1.4 SUBMITTALS

- A. General: Provide submittals in accordance with Specification 01 33 23.
- B. Name of subcontractor, qualifications, and experience in this type of work.
- C. A re-vegetation plan describing the type of materials proposed for reseeding, the techniques for reseeding, and a proposed schedule for reseeding.
- D. Supplier and supplier's type designation for all fertilizers and commercial products.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Loam shall be the surface layer of natural workable soil containing organic matter, or material generally humus in nature capable of sustaining the growth of vegetation. It shall be free from stones, lumps, stumps, or similar objects larger than 2 inches in greatest diameter, sterile soil, roots, and brush. The loam shall be free from subsoil.
- B. The acidity range of the loam prior to treatment as specified herein shall be between pH 5.0 and 6.0 inclusive.

C. The gradation analysis of the loam shall be as follows:

<u>Passing</u>	<u>Percentage</u>
1" Screen	100%
¼" Screen	3 % (max)
No. 100 USS mesh sieve	40 to 60 %

D. Loam shall not be delivered until representative samples proposed for use have been furnished by the Contractor and approved by the Engineer. When requested to do so, the Contractor shall furnish at his own expense, a certified analysis of the loam made by an approved soil testing laboratory.

E. Fertilizer shall be a complete commercial fertilizer, 5-10-10 grade.

F. Lime shall be ground limestone containing not less than 85% calcium and magnesium carbonate.

G. Seed shall be from the same or previous year's crop and shall have not more than 1% weed content. Seed shall also meet the following requirements:

1. Grass seed of the specified mixtures shall be furnished in fully labeled, standard, sealed containers.
2. Percentage and germination of each seed type in the mixture, purity and weed seed content of the mixture shall be clearly stated on the label.
3. Seed shall be furnished on a percentage of live seed basis.

H. Lawn areas shall be seeded with a Class A mixture of the following:

Class A (Lawn Seed)

<u>Species</u>	<u>Minimum Purity % / Minimum Germination %</u>	<u>Lbs/Acre</u>
▪ Kentucky Blue Grass (at least two varieties America, Liberty Crest, Monopoly, etc.)	97/85	105
▪ Creeping Red Fescue	96/85	44
▪ Perennial Rye Grass (Manhattan III, Envy, Fiesta II, Caliente, etc.)	98/90	<u>25</u>
TOTAL		174

I. Class B shall normally be used for all slope work. And shall conform to the following:

Class B (Slope Seed)

<u>Species</u>	<u>Minimum Purity % / Minimum Germination %</u>	<u>Lbs/Acre</u>
▪ Creeping Red Fescue	96/85	35
▪ Perennial Rye Grass	98/90	30
▪ Redtop	95/80	5
▪ Alsike Clover	97/90	5
▪ Birdsfoot Trefoil (Empire variety preferred Inoculum)	98/80	<u>5</u>
TOTAL		80

- J. Red clover and birdsfoot trefoil seed shall include not more than 25% hard seed. If necessary, to meet this requirement extra seed shall be supplied at no expense to the Owner.
- K. Inoculum specific to birdsfoot trefoil must be used with this mixture. The inoculum shall be a pure culture of nitrogen-fixing bacteria selected for maximum vitality and the ability to transform nitrogen from the air into soluble nitrates and to deposit them in the soil. The inoculum shall not be used later than the date indicated on the container or later than specified. The inoculum shall be subject to approval.
- L. Hay and straw mulch shall consist of mowed and properly cured grass or legume mowings, reasonably free from swamp grass, seeds, weeds, twigs, debris or other deleterious material. It shall be free from rot or mold.

PART 3 – EXECUTION

3.1 GENERAL

- A. Loosen any heavily compacted subsoil to a depth of 12 inches. Rake the subgrade of all areas to receive loam and remove rubbish, sticks, roots and stones larger than 2 inches in diameter. Spread and lightly compact loam to finish grade as shown on the Drawings.
- B. After the loam is placed and before it is raked to true lines and rolled, spread limestone evenly and thoroughly incorporate into the loam by heavy raking to at least one-half the depth of the loam. The amount of limestone shall be based on a soil test with recommendations from the Engineer.
- C. Uniformly spread fertilizer and immediately mix with the loam.
- D. Immediately following this preparation, uniformly apply the seed and lightly rake the seed in to the surface. Apply mulches before rolling. Lightly compact the soil using a light weight roller or a tracked dozer run parallel with the slope. Water with a fine spray on a regular basis to ensure germination.

E. Seeding and fertilizing shall be done between April 1 and June 1, between August 15 and October 15, or as directed or permitted. Seeding shall not be done during windy weather or when the ground is frozen, excessively wet, or otherwise untellable.

F. Mulching should consist of light and uniform mulch over the area as follows:

Class A areas – use straw mulch

Class B areas – use hay mulch

G. Protect seeded areas from pedestrian and vehicular traffic.

3.2 APPLICATION RATES

A. Spread loam over properly prepared areas to give a covering which will be 4 inches in compacted depth.

B. Apply lime at the recommended rate determined by the Engineer.

C. Apply fertilizer at a rate of 20 pounds per 1,000 square feet.

D. Apply mulch at a rate of 90 pounds per 1,000 square feet.

E. The Engineer reserves the right to vary the amounts of materials used, as required to produce optimum results.

3.3 MAINTENANCE

A. Keep all seeded areas watered, reseeding if and when necessary, until a healthy, uniform growth is established over the entire area.

3.4 GUARANTEE

A. The Contractor shall guarantee for a period of one year from the date of substantial completion that the new grass will be free from dead areas or washout. The Contractor shall reseed areas necessary to establish a firm, healthy stand of grass.

End of Section

SECTION 33 09 10

PROCESS INSTRUMENTATION AND CONTROLS

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Furnish, install, and test equipment for process instrumentation and controls as described in this Section.

1.2 SUBMITTALS

- A. General: Provide submittals in accordance with Specification 01 33 23.
- B. The Contractor shall confirm with the Engineer any field changes proposed on equipment including but not limited to pump horsepower ratings, line voltage, full load amp ratings of the panel(s), etc., prior to submitting shop drawings. Any field changes proposed by the Contractor that are approved by Engineer shall include additional components to make equipment operational. These changes shall be completed at no additional costs to Owner unless approved by Engineer. The panel manufacturer shall provide to the engineer for approval appropriate circuit diagrams, panel dimensions and external connection detail prior to fabrication of panels. Manufacturer shall provide narrative description (hard copy) of sequencing operation of programmable logic controller (PLC) along with record documentation.
- C. Provide operation and maintenance manuals in accordance with Specification 01 78 23.

1.3 WARRANTY AND CERTIFICATES

- A. Provide warranty documentation in accordance with Specifications 01 78 36.
- B. Any defects found during the warranty period will be reported to the Contractor by the Owner.

1.4 QUALITY ASSURANCE

- A. The control panel shall be assembled and tested by a qualified systems integrator with a minimum of 5 years' experience in water system controls. Control panel shall be fully compatible with the equipment provided. Contractor shall confirm service voltage prior to placing control panel order with system integrator.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Schedule delivery to coincide with work.

- B. Verify compliance with the Specifications at the time of delivery.
- C. Store equipment in dry enclosed areas, off the ground.

1.6 SYSTEM DESCRIPTION

- A. The following paragraph describes the design intent for operation of the South Main Street Water District (SMSWD) - Pump Station Upgrade system at the completion of the Work.
- B. There are two existing wells at the project site. **Temporary water service will be required during the completion of the new work within the existing pump station.** The existing water source and storage tank will remain in service for the purpose of continuing service to the Community. Coordination of the work with SMSWD will be required such that the Community is not without water service during the completion of the work. The contractor will submit a plan for the upgrades that is phased to minimize inconvenience to the water system users and minimize the duration of any single shutdown to an 8-hour period. **All shutdowns shall be noticed and approved by SMSWD providing a 72-hour period prior to the shutdown.**

The water from Well GRW-1 (Shallow Well) is pumped to the pump station where it will flow through a Calcite Neutralizer tank and then to the atmospheric storage. The water from Well GRW-2 (emergency well) is pumped to the pump station and will be treated for pH, iron and manganese and then flows to the storage tank. Two sample taps, water meters, and chemical injection ports, are to be installed on the source raw water piping within the pump station just before it enters treatment filters and then into the storage tanks. Additional sample taps are required before and after each treatment process.

The control system will monitor/record the storage tank water level data and start/stop the existing well pumps based upon programmable set points. The control system will provide high-level and low-level alarms for the storage tank. It shall also have a low-low level that will be interlocked to stop the booster pumps when activated. The control system shall have provisions to flow pace chlorine into the raw piping before it enters the iron and manganese filters. The water meter for Well GRW-2 will be used to flow pace the chlorine feed pump. The control system shall monitor/record the inlet flow meter data and provide alarm setpoint(s) for low raw water inflow.

The booster pump system itself will be a stand-alone system with an integrated control system. Two new variable speed constant pressure booster pumps will be installed to provide system flow at the desired outlet pressure. The booster pump system will monitor outlet pressure and adjust pump speed/operation (VFD controlled) to maintain a programmable outlet pressure. One pressure sensor will be installed for the booster pumps. The control system shall have provisions to accept any available output/alarm information from the booster pump system.

The outlet piping from the pump station to distribution will include sample taps, water meter, pressure relief valve, and chemical injection port for the purpose of chlorine injection. The control system shall have provisions to pace chlorine injection into the discharge piping flow before it leaves the pump station. The control system shall monitor/record the outlet flow meter data and provide alarm setpoint(s) for low or high outflow.

The pump station will be equipped with an automatic transfer switch and stand by generator provided under Specification Section 26 32 13.

In addition to the previous alarm conditions the control system shall monitor for flooding, temperature, and stand-by generator alarm conditions.

The control panel will contain the motor starters and required buck-boost transformers for each of the 3 well pumps. Well pump starters shall contain an auxiliary contact on the overload relay that will be wired as alarm inputs to the PLC to indicate well pump overload trip.

The control system shall consist of a control panel capable of onsite stand-alone control, alarm reporting, and data-logging. System architecture consists of a panel at the pump station for interface with local inputs/outputs (I/O). Provisions for remote communication of system and alarm/status reporting via a standard telephone connection (landline) shall be included. The PLC programming shall contain pump alternators to alternate lead and lag operation of the booster pumps on each operating cycle.

Data logging capability shall be incorporated into the control panel for onsite retrieval of data via a "thumb drive" memory device. The data logging equipment shall be capable of storing a minimum of 3 months of the standard data specified.

1.7 CONTROLS AND PROCESS INSTRUMENTATION

- A. Work under this Section includes furnishing and installation of control panel and data acquisition system capable of stand-alone control, remote monitoring, alarm reporting, and data-logging (the Control System). Provide services to include system set-up and testing. Contractor shall furnish a complete, functional control system that meets all requirements of these specifications. Furnish and provide fully configured on-site firmware for the control system, including documentation specified herein.
- B. This Section also includes furnishing, installing and set-up of all process instrumentation and sensors, including flow meters, pressure and level transducers. Contractor shall ensure the compatibility of sensors, transducers, switches, etc. with the control system.

PART 2 – PRODUCTS

2.1 CONTROL SYSTEM

- A. ENCLOSURE - Indoor control panel enclosures shall be NEMA 12. Enclosures shall be fabricated of fiberglass reinforced plastic (FRP) or 304 grade stainless steel. Enclosures shall have protective outer door with operators, alarm lamps, and PLC interface mounted on inner door, and shall be labeled for arc flash protection per NFPA 70E. Outer door shall be windowed at the pump station to allow viewing of alarm lamps. Control panel shall be factory preassembled to accommodate specified I/O with minimum 25% spare capacity. Provide certification to UL508A of assembled industrial control panels.
- B. PLC/CONTROL SYSTEM - The system architecture consists of a control panel housing a programmable logic controller (PLC), along with input/output (I/O) wiring terminals, power supplies, control relays, switches, and alarm lamps. The control panel will provide stand-alone control of treatment system operations, monitoring / data-logging of operating conditions and alarm reporting. The control panel will receive signals from process instrumentation and sensors to start / stop motor-driven equipment and regulate process parameters. Remote access to the controller from off-site locations is not required.

The control system shall include a data modem kit, 24V/15V/9V power supplies, output relays, program and log memory, 2-line LCD display and tactile keypad, with capacity for 12 digital inputs, 14 digital outputs and 8 analog inputs.

The PLC firmware shall be capable of the following:

Up to 64 simultaneous control algorithms specified by Boolean logic.

Remote reporting via telephone which indicates site origin, control system time, status of all inputs and outputs, present control state, and last system shutdown.

PLC shall allow unique messages for each alarm condition and up to 80 characters for text messages.

12-bit analog resolution.

Data-logging of all inputs, outputs, and system processes. Each logged data point shall indicate date, time to nearest second, and I/O state. Data-logging capacity shall be at least 5,000 data points per analog channel, at least 10,000 data points total for digital state changes, and at least 2,000 data points total.

Programmed startup and shutdown routines.

Flow totalization, hour meters, remote memo display, proportional and proportional-integral-derivative (PID) control capability, and password protection.

LIST OF INPUT/OUTPUT FOR PLC:

Digital Inputs

Well GW-1, Pump#1 Run
Well GW-1, Pump#2 Run
Well OW-1 (Emergency) Run
Booster Pump#1 Run
Booster pump#2 Run
Building Low Temp Alarm
Emergency Eye Wash Flow Alarm
Building Flood Alarm
Booster Pump#1 Fault Alarm
Booster Pump#2 Fault Alarm
Well Pump#1 O/L Trip
Well Pump#2 O/L Trip
Well OW-1 Pump O/L Trip

Digital Outputs

Well GW-1, Pump#1 Start/Stop
Well GW-1, Pump#2 Start/Stop
Well OW-1, Pump#1 Start/Stop
Booster Pump#1 Start/Stop
Booster Pump#2 Start/Stop
Chem Feed Pump Start/Stop
Purge Valve CL2 Contact Open/ Close
Booster Pump#1 Low Storage Lock-off
Booster Pump#2 Low Storage Lock-off
+ 8 Alarm Conditions Minimum

Analog Inputs

Well OW-1 Flow
Well GW-1 Flow
Distribution Flow
Atmospheric Tank Level
Well OW-1 Level
Well GW-1 Level
Distribution Pressure

Analog Outputs

Booster pump#1 Speed Control
Booster Pump#2 Speed Control
Chemical Feed Pump Flow Pace

2.2 CONTROL DEVICES

- A. Control voltage shall be 120V AC. Each motor shall be controlled by a hand-off-auto switch with relay output to separate motor controller and be permanently labeled as to function. Note: Booster pump HOA and lights on VFD.

2.3 CIRCUIT BREAKERS

- A. Main breaker shall be thermal-magnetic for disconnection of incoming control voltage. Each motor load shall be provided with its own thermal-magnetic breaker in the separate site breaker panel and meet NEC requirements for interrupt capacity and amp rating.

2.4 PRESSURE TRANSMITTER

- A. Pressure transmitter for water storage tank shall be polysilicon thin film pressure sensing type, with type 316SS wetted materials, NEMA 4X aluminum housing, LCD display, 24VDC excitation, 2-wire 4-20mA output, +/- 0.25% accuracy/linearity. Acceptable manufacturer: Ashcroft GC51 series or Engineer approved equal.

2.5 SUBMERSIBLE LEVEL TRANSMITTERS

- A. Well level transmitters shall be submersible piezoresistive pressure sensing type, with Type 316SS construction, welded stainless steel diaphragm, vented polyethylene cable equipped with sealed aneroid bellows for atmospheric reference, 24VDC excitation, 2-wire 4-20mA output, +/- 0.25% accuracy/linearity. Acceptable Manufacturer: Keller Levelgage or Engineer approved equal.

2.6 FLOW METERS

- A. Distribution flow meter shall be flange-mount electromagnetic inductive type with meter-mounted amplifier/display unit, 24VDC excitation, 4-20mA output, +/- 0.25% accuracy/linearity.
- B. Well flow meters to be nutating disc type meters meeting AWWA C700 standards with 4-20 ma output to control panel.

2.7 TERMINAL BLOCKS

- A. Provide screw clamp feed-through type terminal blocks mounted on DIN rail for terminating all external field wiring to the control panel, Weidmuller Type WDU or Engineer approved equal.

2.8 SURGE ARRESTORS / UPS

- A. Provide AC surge arrester for control panel, MCG Model 415 or Engineer approved equal, on primary input power. Surge arrester will have minimum 10kA surge current rating and EMI/RFI filtering. Provide minimum 350VA uninterruptible power supply (UPS) for control power circuit, providing a minimum of 4 hours' backup power during outages. Contractor is to confirm final UPS rating. UPS shall automatically recharge on power restitution with no manual actions required.

2.8 INDICATING LIGHTS

- A. Each motor shall have a "Green" run light or illuminated H/O/A switch. Provide red alarm lamps on panel for local display of designated alarm conditions. All alarm lights shall utilize LED illumination.

2.9 ALARM AUTO-DIALER

- A. Auto-dialer shall be SENSAPHONE 1800, or approved equal, connected to standard telephone line to be installed by others. Auto-dialer shall be integrated into the control panel to allow reporting of all alarm conditions.

2.10 VARIABLE FREQUENCY DRIVE

- A. All VFD's are provided under Specification Section 26 04 02 Electrical Work.

PART 3 – EXECUTION

3.1 INSPECTION

- A. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
- B. Discrepancies:
 - 1. In the event of discrepancy, immediately notify the Engineer.
 - 2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 INSTALLATION

- A. Install all equipment in strict accordance with the manufacturer's recommendations as approved by the Engineer. Equipment shall be coordinated to confirm a complete working system.
- B. Manufacturer or Manufacturer's Representative shall be onsite prior to start-up to confirm all field wiring connections are correct prior to energizing the control panel and during equipment startup to ensure proper installation, test all signal loops and perform functional testing.
- C. Owner's representative shall be trained on equipment operation in accordance with Section 01 79 00.

3.3 TESTS

- A. Each piece of equipment shall have all of its operations tested in the presence of the Engineer. All equipment failing to operate as intended shall be replaced or repaired to the Owner's satisfaction and retested.

3.4 INSTRUCTIONS

- A. When all required approval of this portion of the work has been obtained, and at a time designated by the Owner, thoroughly demonstrate to the Owner's maintenance personnel the operation and maintenance of all items installed under the work of this section.

3.5 SIGNAL WIRING

- A. All signal wiring shall be installed by a qualified electrician or technician, with minimum 5 years of experience in controls wiring.
- B. Make all wiring connections between control panel and field instrumentation.
- C. Install signal wiring from terminal to terminal with no intermediate splicing. Tie signal wire ground to panel ground at control panel end only.
- D. Loosely coil, securely cap and tape ends of unused signal wire pairs.

End of Section

SECTION 33 14 00

WATER UTILITY PIPING, VALVES, AND ACCESSORIES

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A.** Furnish all labor, materials, equipment and incidentals required to install and test pipe, fittings, and accessories complete as shown on Drawings and as specified herein.
- B.** This Specification includes all exterior water main and service piping and appurtenances to 5 feet outside of a building or vault exterior wall.

1.2 SUBMITTALS

- A.** General: Provide submittals in accordance with Specification 01 33 23.
- B.** Product data for pipe, gaskets, fittings, valves, water meters, and associated components listed herein. Pipe data shall include pipe class, wall thickness, and pressure rating.
- C.** Shop drawings for pre-cast concrete valve pits and meter pit, including frames and covers.
- D.** Shop drawings for cast-in-place concrete valve pits and meter pit, including frames and covers.
- E.** Line layout and marking diagram for all restrained joint areas.
- F.** Operation and maintenance data for valves.

1.3 QUALITY ASSURANCE

- A.** Comply with the requirements of utility supplying water to the Project.
- B.** All pressure water pipe shall be furnished by a single manufacturer. The supplier shall be responsible for the provisions of all specified test requirements as applicable. In addition, all water pipe to be installed under this Contract may be inspected at the plant for compliance with these specifications by an independent testing laboratory provided by the Owner. The Contractor shall require the manufacturer's cooperation in these inspections. The cost of plant inspection of all pipe approved for this Contract will be borne by the Owner.
- C.** Inspections of pipe may also be made by the Owner after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though sample pipes may have been accepted as satisfactory at the

place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the job at once.

1.4 DELIVERY, STORAGE, AND HANDLING

- A.** Deliver, store, and handle water mains, valves, and appurtenances in accordance with the manufacturers' recommendations and in a manner which protects the materials.
- B.** All items shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the Owner.
- C.** The use of chains, hooks or other equipment that might damage the pipe or pipe coating is not permitted. Stockpiled pipe shall be supported on sand or earth berms free of rock exceeding three inches in diameter.
- D.** Any pipe or fitting showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.
- E.** Gaskets shall be stored in a secure dry place and protected from ultraviolet light.
- F.** If any defective item is discovered after it has been installed, it shall be removed and replaced with an exact replacement item in a satisfactory manner by the Contractor, at the Contractor's own expense. All pipe and fittings shall be thoroughly cleaned before installation and the interior shall be kept clean until completion of the project.
- G.** In handling the items, use special devices and methods as required to achieve the results specified herein. No uncushioned devices shall be used in handling the item.

1.5 PROJECT CONDITIONS

- A.** Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that water service piping may be installed in compliance with the original design and referenced standards.
- B.** Contractor is responsible for compatibility between pipe materials, fittings, and appurtenances.

1.6 SEQUENCING AND SCHEDULING

- A.** Coordinate connection to public water mains with utility company.
- B.** Coordinate with interior water distribution piping.
- C.** Coordinate with other utility work.

PART 2 – PRODUCTS

2.1 WATER MAIN PIPE AND FITTINGS

- A.** Ductile Iron Pipe, 3- through 12-inch (DI). Push on joint ductile iron pipe shall conform to ANSI/AWWA C151/A21.51, ANSI/AWWA C111/A21.11, and ANSI/AWWA C104/A21.4 (cement lined). Pipe 12 inches and less shall meet Pressure Class 350, A21.51 standards.
- B.** PVC Pipe, 2- through 3-inch. Push-on joint PVC pipe shall be polyvinyl chloride (PVC) conforming to ASTM D2241 with material cell classification 12454 per ASTM D1784. Provide standard pipe having integral bell and spigot with elastomeric gasket and cast iron equivalent outside diameter. Provide pipe in standard 20-foot laying lengths. Random lengths will not be permitted. Provide DR 26 rated for 160 psi or as shown on the Drawings. Fittings shall be as follows unless specified otherwise: one-piece injection molded PVC gasketed, material cell classification 12454 per ASTM D1784, SBR gaskets, meeting ASTM D3139, and DR 21 with a 200 psi pressure rating. Provide fittings with bells and gaskets specifically designed for cast iron equivalent outside diameter PVC or HDPE pipe, as required.
- C.** PVC Pipe, 4- through 12-inch. Push-on joint PVC pipe shall be polyvinyl chloride (PVC) conforming to AWWA C900 with material cell classification 12454-B per ASTM D1784. Provide standard pipe having integral bell and spigot with elastomeric gasket and iron pipe size outside diameter. Provide pipe in standard 20-foot laying lengths. Random lengths will not be permitted. Provide DR 25 rated for 165 psi or as shown on the Drawings.
- D.** High Density Polyethylene (HDPE) Pipe, 1- through 24-inch. High density polyethylene pipe shall be manufactured from PE4710 resin, conform to ASTM D3350 and AWWA C906, and be certified per NSF/ANSI 61. Provide standard pipe having plain ends for heat welded joints and cast iron equivalent outside diameter. Provide DR 13.5 for a 160 psi pressure rating or as shown on the Drawings.
- E.** Polyethylene (PE) Pipe and Tubing for Gas Service, 1/2- through 2-inch. Pipe and tubing shall be polyethylene grade PE2406 or PE2708, minimum cell classification 234373E per ASTM D2513 and D3350. Fittings shall be socket type per ASTM D2683, butt fusion per ASTM D3261, or electrofusion per ASTM F1055. Connections to metallic piping shall meet ASTM D2513, F1973, or F2509. Install and test piping system in accordance with fuel and plumbing codes and manufacturer's written instructions.
- F.** Ductile Iron Pipe Fittings, 3- through 48-inch. Mechanical joint fittings shall be ductile iron Class 350, conforming to ANSI/AWWA C153/A21.53 or ANSI/AWWA C111/A21.11. Joints shall comply with ANSI/AWWA C111/A21.1. Fittings shall be cement lined in accordance with ANSI/AWWA C104/A21.04. Fittings shall have fully restrained joints. Provide ductile iron fittings conforming to AWWA C110 with a

minimum rated working pressure of 350 psi. Provide fittings with bells and gaskets specifically designed for cast iron equivalent outside diameter PVC or HDPE pipe, as required.

- G.** The manufacturer shall furnish all joint materials including rubber gasket and joint lubricant. Gasket shall meet ASTM F477 unless otherwise specified.
- H.** Where flanges are required as indicated in the Drawings or as specified herein, flanges shall be in accordance with ANSI B16.1 and shall be rated for the piping system's working pressure. Gaskets shall be 1/8 inch ring type full face Garlock 3200 compressed non-asbestos sheet packing or approved equal.
- I.** Dielectric Insulation. Provide dielectric insulating-flanged joints as required for cathodic protection for dissimilar metals. Provide flange insulation kits to include flange insulating gasket, flange bolt insulating sleeves and flange bolt insulating washers.
 - 1. Pipeline Seal and Insulator, Inc., Advance Products and Systems, Inc, Type E for full protection of both flange faces, or approved equal.
 - 2. Neoprene faced phenolic gaskets.
 - 3. Insulating bolt sleeves shall be the single one-piece type. Separate insulating sleeve and insulating washers are unacceptable.

2.2 WATER SERVICE LINE AND FITTINGS

- A.** Copper Tubing (COP)
 - 1. Underground installations – Soft annealed, Type K, conforming to ANSI H23.1.
 - 2. Interior and above ground installations – Hard drawn domestic Type L, conforming to ANSI H23.1.
- B.** High Density Polyethylene (HDPE) Tubing. Class 200, copper tube size (CTS), for potable water supply.
- C.** Fittings
 - 1. Heavy duty three-part couplings shall be used to join lengths of service line. Compression pack joints shall be used. Provide tubing inserts as needed.
- D.** All brass that comes in contact with potable water shall conform to AWWA C800 (UNS C89833). These products shall have the letters “NL” cast into the body for proper identification. Brass components that do not come in contact with potable water shall conform to AWWA C800 (ASTM B-62 and ASTM B584, UNS C83600-85-5-5-5).
- E.** Corporation stops shall be ball type, heavy duty brass as manufactured by Ford Meter Box Company, Mueller or equal. Only compression joints may be used.

- F.** Service saddles on 4-inch and larger mains shall be double strap, epoxy coated with stainless steel hardware, and used for all taps. Services on 3-inch and smaller mains shall use deep bell ductile iron fittings meeting ASTM A536 with joints meeting AWWA C111 and coating meeting AWWA C153.
- G.** Curb stops shall be ball type, heavy duty brass as manufactured by Ford Meter Box Company, Mueller, McDonald or equal. Only compression pack joints may be used. The curb stops shall not have a drain. Provide each curb stop with a valve box as specified herein.

2.3 VALVES

- A.** Gate Valves 2- to 12-inch: Conform to AWWA C509 latest revision. Gate valves shall be resilient seated with an encapsulated disc with elastomer seat which, in the closed position, creates a seal on the cast iron body resulting in a bubble tight seal across this disc at 200 psi. Buried valves shall operate with a 2" square wrench nut and shall open counter-clockwise. Valves shall have non-rising stem, mechanical joints on both sides (except that tapping valves shall be mechanical joint on one side and flanged on the other side), and shall have fusion bonded epoxy coating on all exterior and interior surfaces. Valve stem shall seal with two "O" rings, each of which shall be designed to allow replacement under full line pressure when the valve is in the open position. Valve bolts shall be Type 18-8 stainless steel.
- B.** Buried Operators
 - 1. Buried service operators on valves larger than 2-1/2 inches shall have a 2-inch AWWA operating nut. Buried operators on valves 2 inches and smaller shall have cross handle for operation by forked key unless specified otherwise. Enclose moving parts of valve and operator in housing to prevent contact with the soil.
 - 2. Design buried service operators for quarter-turn valves to withstand 450 foot-pounds of input torque at the FULLY OPEN or FULLY CLOSED positions, grease packed and gasketed to withstand a submersion in water to 10 psi.
 - 3. Buried valves shall have extension stems, bonnets, and valve boxes. Where the depth of the valve is such that its centerline is more than 3 feet below grade, furnish an operating extension stem with 2-inch operating nut to bring the operating nut to a point 6 inches below the surface of the ground and/or box cover.

2.4 VALVE BOXES

- A.** Cast iron valve boxes and covers shall be provided on all buried gate valves. The boxes shall be adjustable and extend from the valve to the ground surface, with an 18-inch minimum overlap. Minimum diameter of valve boxes shall be six (6) inches. Provide a minimum of one (1) 8-foot long valve key T-handle operating wrench or approved equal.
- B.** Cast iron curb stop boxes shall be "Erie" type with 9/16" diameter rod and plug cover, cotter pin at base of rod shall be stainless steel. For any valve larger than 1", a properly

sized foot piece shall also be installed. Provide a minimum of two (2) 4-foot long curb stop wrenches, Trumbull 367-4294 or approved equal.

2.5 PRESSURE REDUCING VALVES – 1” AND SMALLER

A. None

2.6 PRESSURE REDUCING VALVES – 1-1/2” AND LARGER

A. None

2.7 RESIDENTIAL WATER METERS

A. None

2.8 METER PITS

A. None

2.9 FLUSHING HYDRANTS

A. Flushing hydrants shall be furnished and installed by the Contractor and shall be Eclipse #2 Post Hydrant manufactured by Kupferle Company, or equal.

B. Nozzles, Operating Nuts, and Direction to Open: One (1) 2-3/16 inch outlet. Threads on nozzles and caps and operating nuts shall be National Fire Hose Coupling Screw Threads, 1-1/2 inch point to flat pentagon operating nuts, and the direction to open shall be to the left (counter-clockwise). A direction to open arrow shall be cast in hydrant adjacent to operating nut. Furnish chains for outlet caps.

C. Pipe Connection: 2 inch FIP.

2.10 FLEXIBLE COUPLINGS

A. Not allowed unless the product and application are approved by Engineer.

2.11 TAPPING SLEEVES

A. Tapping sleeves shall be cast iron or ductile iron, mechanical joint, with outlet flange conforming to AWWA C-110.

2.12 ANCHORAGES

A. Clamps, Straps, and Washers: ASTM A 506, steel.

B. Rods: ASTM A 575, steel.

- C. Rod Couplings: ASTM A 197, malleable iron.
- D. Bolts: ASTM A 307, steel.
- E. Cast-Iron Washers: ASTM A 126, gray iron.
- F. Concrete Reaction Backing: Portland cement concrete mix, 3000 psi.
 - 1. Cement: ASTM C 150, Type I.
 - 2. Fine Aggregate: ASTM C 33, sand.
 - 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 - 4. Water: Potable
- G. Mechanical joint restraints shall be manufactured of ductile iron in accordance with ASTM A536 with the following additional requirements or exceptions:
 - 1. Mechanical joint restraints shall be incorporated into the design of a follower gland. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts in accordance with AWWA C111 and C153.
 - 2. The restraint mechanism shall consist of numerous individually activated gripping surfaces to maximize restraint capability. The gripping surfaces shall be wedges that are designed to spread the bearing surfaces on the pipe. Twist-off nuts, sized the same as tee-head bolts, shall be used to ensure the proper actuating of restraining devices. When the nut is sheared off, a standard hex nut shall remain.
 - 3. The mechanical joint restraint device shall be rated for a maximum working pressure of 350 psi, with a factor of safety of 2.
 - 4. Mechanical joint restraint for 2- to 3-inch PVC pipe shall be uni-flange type.
 - 5. Mechanical joint restraint for 4-inch and larger PVC and HDPE pipe shall be provided.
 - 6. Mechanical joint restraint for ductile iron pipe shall be provided.

2.13 IDENTIFICATION

- A. Plastic Underground Warning Tapes: Polyethylene plastic tape, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in black letters "CAUTION - WATER LINE BURIED BELOW."
- B. Metallic-Lined Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in black letters "CAUTION - WATER LINE BURIED BELOW."
- C. Nonmetallic Piping Label: Engraved plastic laminate label, for installation on the main electrical meter panel; not less than 1 inch by 3 inches, with caption "CAUTION - THIS STRUCTURE HAS A NONMETALLIC WATER SERVICE."

2.14 TRACER WIRE

- A. 10 gauge solid strand copper tracer wire shall be installed with all PVC and/or HDPE pipe. Splicing of tracer wire shall be per manufacturer's recommendation.
- B. Wire shall be run along main and service alignments and terminated at the top of valve boxes and curb stop boxes in accordance with manufacturer's recommendations.

PART 3 – EXECUTION

3.1 PREPARATION OF BURIED PIPE FOUNDATION

- A. Excavate to a depth that provides a minimum finished grade pipe cover of 6-feet.
- B. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation throughout the length of the piping.
- C. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill with clean sand or pea gravel to indicated level.
- D. Shape bottom of trench to fit bottom of piping. Fill unevenness with tamped sand backfill. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.

3.2 INSTALLATION OF PIPE AND PIPE FITTINGS

- A. As soon as the excavation is complete to normal grade of the bottom to the trench, bedding shall be placed, compacted, and graded to provide firm, uniform, and continuous support for the pipe. Bell holes shall be excavated so that only the barrel of the pipe bears upon the bedding. The pipe shall be laid accurately to the lines and grades indicated on the Drawings. Blocking under the pipe will not be permitted. Bedding and backfill shall be placed in accordance with Specification 31 23 16. Generally the compaction shall be done evenly on each side of the pipe and compaction equipment shall not be operated directly over pipe until sufficient backfill has been placed to ensure that such compaction equipment will not have a damaging effect on the pipe.
- B. Ductile-Iron Pipe: Install with cement-mortar-lined, ductile-iron or cast-iron, mechanical joint or push-on joint fittings and rubber gaskets in accordance with AWWA C600.
 - 1. Polyethylene Encasement: Install in accordance with AWWA C105.
- C. PVC (Polyvinyl Chloride) Pipe: Install with cement-mortar-lined, ductile-iron or cast-iron, mechanical joint or push-on joint fittings and rubber gaskets in accordance with AWWA M23.

- D. HDPE Pipe:** Sections of polyethylene pipe should be joined into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400-450 degrees Fahrenheit, alignment, and an interfacial fusion pressure of 75 psi. The butt fusion joining will produce a joint with weld strength equal to or greater than the tensile strength of the pipe itself. All welds will be made using a data logger to record temperature, fusion pressure, with a graphic representation of the fusion cycle shall be part of the quality control records. Mechanical joining will be used where the butt fusion method cannot be used. Mechanical joining will be accomplished by either using a HDPE flange adapter with a ductile iron back-up ring or HDPE mechanical joint adapter with a ductile iron back-up ring. Socket fusion, hot gas fusion, threading, solvents, and epoxies will not be used to join HDPE pipe. Inspect the pipe for defects before installation and fusion. Defective, damaged, or unsound pipe will be rejected.
- E. Copper Tube:** Install with compression pack joint fittings.
- F. PB (Polybutylene) Pipe:** Install with brass or bronze, barbed insert fittings, and 2 strap-type stainless steel clamps over pipe at each insert in accordance with manufacturer's installation instructions.
- G. PB (Polybutylene) Tubing:** Install with brass or bronze, flared joint or compression joint fittings in accordance with manufacturer's installation instructions.
- H. PE (Polyethylene) Pipe and Tubing:** Install with copper alloy or nylon, barbed insert fittings, and 2 strap-type stainless steel clamps over pipe at each insert in accordance with manufacturer's installation instructions.
- I. Depth of Cover:** Provide six (6.5) feet of minimum cover over piping.
- J. The Owner may examine each bell and spigot end to determine whether any preformed joint has been damaged prior to installation. Any pipe having defective joint surfaces shall be rejected, marked as such and immediately removed from the job site.**
- K. Before any joint is made, the pipe shall be checked to assure that a close joint with the next adjoining pipe has been maintained and that the inverts are matched to conform to the required grade. The pipe shall not be driven down to the grade by striking it.**
- L. Whenever the pipe is left unattended, temporary plugs shall be installed at all openings. Temporary plugs shall be watertight and of such design as to prevent debris, children, and animals from entering the pipe. If water accumulates in the trench, the plugs shall remain in place until the trench has been pumped out and is sufficiently dry to permit the continuance of work.**

3.3 INSTALLATION OF VALVES

- A. General Application: Use mechanical joint end valves for 3-inch and larger buried installation. Use flanged end valves for installation in pits and inside building. Use bronze corporation stops and valves with ends compatible to piping for 2-inch and smaller installations.
- B. Count and record number of turns to open and close each valve; account for any discrepancies with manufacturer's data.
- C. AWWA-Type Gate Valves: Comply with AWWA C600. Install buried valves with stem pointing up and with cast-iron valve box.
- D. Bronze Corporation Stops and Curb Stops: Comply with manufacturer's installation instructions. Install buried curb stops with head pointed up and with cast-iron curb box.

3.4 INSTALLATION OF ANCHORAGES

- A. Anchorages: Provide anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches.

3.5 APPLICATION OF PROTECTIVE COATINGS

- A. Apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of installed ferrous anchorage devices.

3.6 INSTALLATION OF HYDRANTS

- A. Install hydrants in locations shown on the plans or as directed by the Engineer. Hydrants shall be installed in accordance with the manufacturer's recommendations. Hydrant drains shall be plugged.

3.7 INSTALLATION OF VALVE PITS AND WATER METER PITS

- A. Construct poured-in-place or pre-cast concrete of dimensions indicated, with manhole frame and cover, ladder, and drain. Provide sleeves with waterproof sleeve seals for pipe entry and exit.
- B. Water Meter: Install water meter in accordance with AWWA M6, in meter pit, in location and with support as indicated. Provide 3-valve bypass around meter, full size of water service piping.

3.8 INSTALLATION OF IDENTIFICATION

- A. Install continuous plastic underground detectable warning tape during back-filling of trench for underground water service piping. Locate approximately 18 inches above pipe, directly over centerline of piping.

3.9 RECORD DRAWINGS

- A. The following record drawings must be prepared by the Contractor:
 1. Precisely measured dimensions to all on-line gate valves.
 2. Precisely measured dimensions to all blow-offs.
 3. Precisely measured dimensions to all house service shut-offs.
 4. Precisely measured dimensions to all house service taps to primary mains.
 5. Precisely measured dimensions to all distribution piping at approximately 200-foot intervals.
 6. Precisely measured dimensions to any principal changes in pipe direction or size.
 7. Precisely measured dimensions of vertical depths of pipes and appurtenances, shown on the profiles.
 8. Red-Line Site Plan showing As- Built Conditions

3.10 CLEANING AND DISINFECTION

- A. Mains and appurtenances shall not be put in service until satisfactory disinfection and leakage testing has been performed. Testing shall be completed between main line gate valves, with a maximum length of 2,000 linear feet. Clean and disinfect water distribution piping as follows:
 1. Purge all new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired, prior to use.
 2. Use the purging and disinfecting procedure prescribed by the authority having jurisdiction or, in case a method is not prescribed by that authority, use the procedure described in AWWA C651-14, or as described below:
 - a. Fill the system or part thereof with a water/chlorine solution containing at least 50 parts per million of chlorine.
 - b. Isolate (valve off) the system or part thereof and allow to stand for 24 hours. At the end of the 24 hour period, the treated water in all portions shall contain a residual of not less than 10 mg/l free chlorine.
 - c. Operate all gate valves within the test section to disinfect.
 - d. Following the allowed standing time, flush the system with clean, potable water from the system in accordance with AWWA C651-14.
 - e. Submit water samples to a laboratory approved by the Engineer for bacteriological analysis in accordance with AWWA C651-14.

- B. Furnish copies of laboratory test results to the Engineer for review prior to placing the mains in service.
- C. Heterotrophic plate count (HPC) testing may be required at the discretion of the Owner.
- D. The Contractor is responsible for all costs associated with disinfection and testing, including any and all costs for re-chlorination and re-testing necessary due to failed tests.
- E. After a failed disinfection test, the Contractor shall flush, re-chlorinate, and re-test the main until such time as a satisfactory test result is obtained.

3.11 HYDROSTATIC TESTING

- A. The Contractor shall notify the Engineer and the Owner at least 48 hours in advance of beginning testing or disinfection. The Contractor shall utilize the services of a certified subcontractor to perform hydrostatic, conductivity, and other tests on the completed water main in accordance with AWWA C600-17 Specifications. This third-party will provide a certified report to the Owner and Engineer. The Contractor may assist the subcontractor and furnish all necessary equipment.
- B. The pipe shall be subjected to hydrostatic pressure of one (1) and one-half (1-1/2) times the design pressure (at least 100 psi) at the lowest elevation of the test section, and this pressure maintained for at least two hours. The test pressure shall not exceed the thrust restraint design pressures or 1.5 times the pressure rating of the pipe or joint, whichever is less (as specified by the manufacturer).
- C. The leakage test shall be conducted at a pressure as determined by the Engineer and this pressure shall be maintained for at least 120 minutes during the test. The amount of leakage which will be permitted shall be in accordance with the Specifications for Installation of Water Mains by AWWA C600. For flanged joints, no leakage shall be allowed. The allowable rate of leakage shall be less than the number of gallons per hour determined by the following formula:

$$L = \frac{SD (P)^{1/2}}{148,000}$$

- L= Allowable leakage in gallons per hour
- S= Length of pipe tested, feet
- D= Nominal diameter of the pipe in inches
- P= Average test pressure maintained during the leakage test in pounds per square inch gauge

The testing procedure shall include the continued application of the specified pressure to the test system for the two-hour period by way of a pump taking supply from a container suitable for measuring water loss. The amount of loss shall be determined by measuring the volume displaced from said container. When hydrants are in the test section, the test

shall be made against the main valve in the hydrant.

- C. Any exposed pipe, fittings, valves, hydrants, and joints shall be examined during the test. Any damaged or defective pipe fittings, valves, or hydrants that are discovered following the pressure test shall be repaired or replaced with sound material, and all tests shall be repeated.
- D. The pressure shall not vary by more than ± 5 psi from the required pressure for the duration of the test. If at any point during the test the pressure loss exceeds 5 psi, the test is considered failed. Should the test fail, the Contractor shall accomplish necessary repairs and the test repeated until within the established limits.
- E. Tests to be made only after partial or complete backfilling of trenches. Position of valves (fully opened or closed) in section of line to be tested shall be checked in the presence of the Engineer to ensure that:
 - 1. All hydrant branch connections are open to the hydrant (hydrant closed, branch connection valve open).
 - 2. All main line valves are properly positioned for section of line being tested.
- F. Tests not to be performed for at least seven (7) days after last concrete block or anchor has been cast.
- G. Expel air from pipelines, fittings and appurtenances prior to performing tests. If permanent air vents are not located at all high points, the Contractor shall install corporation stops at his expense at such points so that the air can be expelled as the line is filled with water. These stops shall be protected with a masonry bridge to prevent breakage during backfilling.
- H. Examination under pressure: All exposed valves, hydrants and joints shall be examined carefully during the hydrostatic and leakage tests.
- I. Evaluation of Results/Corrective Actions:
 - 1. Examination of leakage: If any leakage test of section of the system discloses a leakage greater than that specified herein, the Contractor shall, at his own expense, locate and repair or replace the defective or damaged materials. He shall then repeat the entire test and make additional repair and test and continue to repeat until the leakage is within specified allowance.
 - 2. All visible leaks are to be repaired by the Contractor, at his own expense, regardless of the amount of leakage.

End of Section

SECTION 33 14 43

PACKAGED PUMPING SYSTEMS FOR WATER UTILITY SERVICE

PART 1 – GENERAL

1.1 SUMMARY

- A.** Work under this section includes but is not limited to furnishing and installing a factory built booster pumping system as indicated on the project drawings, as specified herein, and with all ancillary items and equipment necessary to provide a complete functioning system. Refer to Specification 26 04 02 Electrical Work for information and additional requirements.

1.2 SUBMITTALS

- A.** General: Provide submittals in accordance with Specification 01 33 23.
1. Submittals shall provide dimensioned layout of mechanical equipment, anchor bolt locations, pipe penetrations, and maintenance access clearances.
 2. Submittals shall provide pump performance or equipment headloss curves and data, marked to indicate the operating limits recommended for stable operation between which the equipment may be operated without surge, cavitation, or vibration. The performance curves shall indicate each specified operation point showing head, power, efficiency, and NPSH required on the ordinate plotted against capacity on the abscissa. The performance curves shall indicate performance over the entire operating range of the pump from shutoff to maximum capacity for full and reduced speeds.
- B.** Provide operations and maintenance manuals in accordance with Specification 01 78 23.
1. Operation and maintenance instructions must be specific to equipment supplied in accordance with these specifications.
 2. Manuals shall be in accordance with written instructions provided by the pump system manufacturer. Comprehensive instructions supplied at time of shipment shall enable personnel to properly operate and maintain all equipment supplied. Content and instructions shall assume operating personnel are familiar with pumps, motors, piping and valves, but lack experience with the exact equipment supplied.
 3. Documentation shall be specific to the system supplied and collated in functional sections. Each section shall combine to form a complete system manual covering all aspects of equipment supplied by the system manufacturer. Support data for any equipment supplied by others, even if mounted or included in overall system design, shall be provided by those supplying the equipment. Instructions shall include the following as a minimum:

- a. Functional description of each major component, complete with operating instructions.
 - b. Instructions for operating pumps and pump controls in all modes of operation.
 - c. Calibration and adjustment of equipment for initial start-up or as required for routine maintenance.
3. Support data for commercially available components not produced by the system manufacturer, but supplied in accordance with the specifications, shall be supported by literature from the prime manufacturer and incorporated as appendices.
 4. Electrical schematic diagram of the pump system circuits. Schematics shall illustrate, to the extent of authorized repair, pump motor branch, control, and alarm system circuits including interconnections. Wire numbers and legend symbols shall be shown. Schematic diagrams for individual components, not normally repairable by the system operator, need not be included. Details for such parts shall not be substituted for an overall system schematic.
 5. Mechanical layout drawing of the pump system and components, prepared in accordance with good commercial practice, shall provide installation dimensions and location of all pumps, motors, valves, and piping.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications

1. The manufacturer shall be one who has been regularly engaged for at least the past 5 years in the manufacture of equipment of the size and type specified herein and specifically for the specified intended use.
2. Upon request from the Engineer, the pump system manufacturer shall prove financial stability and ability to produce the system within the specified delivery schedules. Evidence of facilities, equipment and expertise shall demonstrate the manufacturer's commitment to long-term customer service and product support.

B. Service Conditions

1. The equipment specified herein will be used to pressurize potable water from a storage tank for distribution to a residential community.
2. The equipment will be installed indoors in a new pump station building.
3. The equipment shall be designed for continuous (24-hours per day) service.

C. Manufacturer's Start-up Services: The manufacturer's technical representative shall inspect the completed installation, correct or supervise the correction of any defect or malfunction, and instruct operating personnel in the proper operation and maintenance of the equipment as described in Part 3 of this section.

1.4 MANUFACTURER'S WARRANTY

- A. All components of the pump systems shall be manufactured, assembled, and tested as a unit by a single supplier. The systems must be a standard catalog item with the manufacturer. The supplier must assume system responsibility. The complete pump system assembly must be warranted by the manufacturer. Individual component warranties are desirable. However, individual warranties honored solely by the manufacturer of each pump system component will not be acceptable.
- B. The pump system manufacturer shall warrant all equipment to be of quality construction, free of defects in material and workmanship.

PART 2 – PRODUCTS

2.1 GENERAL

- A. The booster pumping system has been designed based on two pumps, each with a variable frequency drive, and will use new hydropneumatics tanks. The system shall maintain a constant discharge water pressure of 60 psi (140 feet) at 50 gpm using one of the two pumps. The second pump will serve as a backup and alternate to distribute wear between the two pumps. Minimum suction pressure = 0.5 psi.
- B. The booster pumping system shall be a standard product factory built by a single manufacturer. Non-standard, “one of a kind” packaged pump systems shall not be considered equal. The manufacturer shall provide all components of the system to enhance compatibility, ease of construction, and efficient maintenance. The manufacturer shall coordinate selection and design of all system components such that all equipment is compatible and operates properly to achieve the specified performance requirements.
- C. The complete packaged water booster pump system shall be certified and listed by UL for conformance to U.S. standards. Systems that have only the sub-assemblies certified and listed by UL for conformance to U.S. standards and/or UR recognized components shall not be considered equal.

2.2 MANUFACTURER

- A. The Specifications and project Drawings depict equipment and materials which are deemed most suitable for the service anticipated. They are not intended, however, to eliminate other products of equal quality and performance. The Contractor shall prepare its bid based on the specified equipment for purposes of determining low bid. Award of a contract shall constitute an obligation to furnish the specified equipment and materials.
- B. After execution of the contract, the Contractor may offer substitutions to the specified equipment for consideration. The equipment proposed for substitution must be equal in construction and performance to that specified in the contract, and quality must be demonstrated by a list of current users of the proposed equipment in similar installations.

- C. In event the Contractor obtains Engineer's approval for equipment substitution, the Contractor shall, at its own expense, make all resulting changes to the enclosures, buildings, piping or electrical systems as required to accommodate the proposed equipment. Revised detail drawings illustrating the substituted equipment shall be submitted to the Engineer prior to acceptance.
- D. It will be assumed that if the cost to the Contractor is less for the proposed substitution, then the contract price shall be reduced by an amount equal to the savings.
- E. Reference to a manufacturer's name and model number or catalog number is for the purpose of establishing the standard of quality and general configuration desired. Acceptable manufacturers include R E Prescott (REPCO), Armstrong Fluid Technology Company 6800 Series, QuantumFlo Inc. Genius V3, SyncroFlo Inc. SFIM3-3P140-VMS70, or approved equal.

2.3 PUMP DESIGN

- A. The pumps shall be Goulds Model 10SV-03, 3 HP, 208 volt, 3 phase, 60 hertz or approved equal.
- B. The pumps shall be vertical multi-stage centrifugal design. The materials of construction shall be as follows:
 - Pump casing = Cast Iron
 - Impeller = 304 stainless steel, fully enclosed type
 - Pump shaft = Stainless steel
 - Mechanical seal = Carbon rotating face, silicon carbide stationary seat, FPM secondary seal
 - Headers, base, and panel support = 304 stainless steel
 - Nuts and bolts = 304 stainless steel
- C. The entire packaged pumping system shall be mounted on a 304 stainless steel fabricated skid.
- D. The suction and discharge manifolds shall be designed to attach to the system piping at either end of the manifold. Each manifold shall include a liquid filled pressure gauge. The suction manifold shall have as standard a pressure switch or pressure sensor to detect low suction pressure. The discharge manifold shall include a stainless steel pressure transducer with a 4-20 mA output. The pressure transducer shall be factory installed and wired.
- E. Isolation valves shall be installed on the suction and discharge of each pump. A check valve shall be installed on the discharge of each pump.
- F. All systems shall be factory tested for performance and hydrostatic tested to 300 psi.

2.4 MOTORS

- A.** Motors shall be 3 hp, 3 phase, 208 V, 60 Hz, NEMA premium efficiency, rated for inverter duty. The motors shall operate with a minimum service factor of 1.15. Drive-end motor bearings shall be designed to absorb thrust and shall be adequately sized to ensure long motor life. The motor shall be rated for operation in a 40 degree C ambient temperature.
- B.** The motor and integrated variable frequency drive shall be designed and built by a single manufacturer. The integrated motor/variable frequency drive combination shall be capable of operating the pump at varying RPMs to maintain the system design pressure with varying flows from 0 gpm to the design flow rate. The variable frequency drive enclosure shall include a PI controller and dry contact fault output relay contacts along with analog and digital inputs. The motor shall detect and protect itself against under voltage, over voltage, excessive temperature, excessive phase shift and set-point signal fault. The motor/drive enclosure shall be rated IP55 and 95% relative humidity. The motor windings shall be class F rated.

2.5 ELECTRICAL CONTROL COMPONENTS

- A.** The system controller shall operate the pumps to maintain the design pressure while using minimum energy and alternating between pumps to maintain relatively equal pump operating hours. Pumps will changeover automatically to maintain the system pressure depending on demand, time, and fault. When water demand is zero, the system shall shut off. If the system runs continuously, the lead pump shall alternate every 24 hours. The controller shall accept a low-suction pressure or other suction fault input to shut down the system. The controller shall have a keypad and minimum 7-inch LCD color display screen. System functions will be programmable through the keypad or touchscreen interface. The programmable functions and information shall include, but not be limited to:
 - 1. Pump status
 - 2. Elapsed running hours for each pump
 - 3. Discharge pressure setpoint
 - 4. Actual discharge pressure
 - 5. Pump speed (percent)
 - 6. Pump minimum and maximum speed (percent)
 - 7. System faults
 - 8. On-screen alarms for the following:
 - a. Low and high system pressure shutdown
 - b. Low suction pressure or level shutdown
 - c. Pump failure
 - d. Drive fault
 - e. Suction and discharge pressure sensor failures

9. Pressure transducer design settings
 10. Pump priority
 11. Current pump rotation order
 12. High and low discharge pressure shutdown limits
 13. Low suction pressure shutdown limit
 14. Analog input for remote setpoint control
 15. Digital input for remote stop/start
 16. Clock program (multiple setpoints)
- B.** The controller shall include non-volatile factory set parameters must be capable of being restored at any time in the field without requiring any programming device or connection to an external source.
- C.** The controller shall store software in FLASH memory storage which prevents accidental loss of data due to voltage surge or spike.
- D.** All controls to be factory pre-wired and tested in accordance with provisions of the national electrical code. All control wires shall be individually numbered and each component shall be labelled accordingly. All internal wiring shall be copper stranded A.W.G. with a minimum 90°F rating.
- E.** The controller shall be mounted in a control cabinet with a NEMA 1 enclosure with the keypad and display screen mounted through the outer door. The control cabinet assembly shall be UL 508 listed. In addition to the electronic pump controller, the control cabinet shall include circuit breakers for each pump and the control circuit and control relays for alarm functions. Control cabinet options shall include, but not be limited to:
1. Dry run protection
 2. Lightning protection
 3. Sequential startup of the lead and lag booster pumps in the event of a power outage so as to not overload the emergency generator
 4. Digital alarm output

PART 3 – EXECUTION

3.1 EXAMINATION

- A.** Contractor shall deliver and offload equipment at installation site using equipment of sufficient size and design to prevent injury or damage. Immediately after off-loading, Contractor shall inspect the complete pump system and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in written claim with shipper prior to accepting delivery. Validate all serial numbers and parts lists with shipping documentation. Notify the manufacturer's representative of any unacceptable conditions noted with shipper.

3.2 INSTALLATION

- A.** Install, level, align, and lubricate pump system as indicated on project drawings. Installation must be in accordance with written instructions supplied by the manufacturer at time of delivery.
- B.** Check motor and control data plates for compatibility to site voltage. Install and test the system ground prior to connecting line voltage to the system's control panel.
- C.** Prior to applying electrical power to any motors or control equipment, check all wiring for tight connection. Verify that protective devices (fuses and circuit breakers) conform to project design documents. Manually operate circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnects before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.

3.3 FIELD QUALITY CONTROL

- A.** Operational Test
 - 1. Lubricate before operating as per manufacturer's recommendations.
 - 2. Prior to acceptance by Owner, an operational test of all pumps, drives, and control systems shall be conducted to determine if the installed equipment meets the purpose and intent of the specifications. Tests shall demonstrate that all equipment is electrically, mechanically, structurally, and otherwise acceptable; it is safe and in optimum working condition; and conforms to the specified operating characteristics.
 - 3. Observe and record operation of pumps, suction and discharge gage readings, ampere draw, and pump controls. Check calibration of all instrumentation and test manual and automatic control systems. Address any undue noise, vibration, or other operational problems.
- B.** Manufacturer's Start-up Services. Coordinate equipment start-up with manufacturer's authorized technical representative or factory service technician. The representative or technician will inspect the completed installation, calibrate and adjust instrumentation, correct or supervise correction of defects or malfunctions, and instruct operating personnel in proper operation and maintenance procedures.

3.4 CLEANING

- A.** Prior to acceptance, inspect the equipment for dirt, splashed material, or damaged paint. Clean or repair accordingly. Remove from the job site all tools, surplus materials, scrap, and debris.

3.5 PROTECTION

- A. The pump system should be placed into service immediately. If operation is delayed, drain water from pumps and piping. Open motor circuit breakers and protect system controls and interior equipment from cold and moisture.

End of Section

SECTION 33 14 44

IRON AND MANGANESE TREATMENT SYSTEM

PART 1 – GENERAL

1.1 SUMMARY

- A. Work under this section includes but is not limited to furnishing and installing a complete iron and manganese well water treatment system as indicated on the project drawings, as specified herein, and with all ancillary items and equipment necessary to provide a complete functioning system. The system shall meet the requirements of the State of New Hampshire for the treatment and operation of Small Public Water Systems.

1.2 SUBMITTALS

- A. General: Provide submittals in accordance with Specification 01 33 23.
1. Submittals shall provide dimensioned layout of mechanical equipment, piping and fitting locations, pipe penetrations, and maintenance access clearances.
 2. Submittals shall provide product information for all process equipment, piping, chemical pump performance and data, flow meters, unions, fittings, chemical injection ports, pressure gauges, and other equipment necessary for the complete system.
 3. Submittals shall include a description of the treatment process and how the system will be controlled, including chemical injection rates, filter loading, and backwash rates.
- B. Provide operations and maintenance manuals in accordance with Specification 01 78 23.
1. Operation and maintenance instructions must be specific to equipment supplied in accordance with these specifications.
 2. Manuals shall be in accordance with written instructions provided by the system manufacturer. Comprehensive instructions supplied at time of shipment shall enable personnel to properly operate and maintain all equipment supplied. Content and instructions shall assume operating personnel are familiar with filter equipment, pumps, motors, piping, and valves, but lack experience on exact equipment supplied.
 3. Documentation shall be specific to the system supplied and collated in functional sections. Each section shall combine to form a complete system manual covering all aspects of equipment supplied by the system/ product manufacturer. Support data for any equipment supplied by others, even if mounted or included in overall system design, shall be provided by those supplying the equipment. Instructions shall include the following as a minimum:
 - a. Functional description of each major component, complete with operating instructions.

- b. Instructions for operating pumps and pump controls in all modes of operation.
- c. Calibration and adjustment of equipment for initial start-up or as required for routine maintenance.
3. Support data for commercially available components not produced by the system manufacturer, but supplied in accordance with the specifications, shall be supported by literature from the prime manufacturer and incorporated as appendices.
4. Electrical schematic diagram of the system circuits.
5. Mechanical layout drawing of the system and components, prepared in accordance with good commercial practice, shall provide installation dimensions and location of all filter equipment, controls, pumps, valves, and piping.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications

1. The manufacturer/ equipment supplier shall be one who has been regularly engaged for at least the past 5 years in the manufacture of equipment of the size and type specified herein and specifically for the specified intended use.
2. Upon request from the Engineer, the system manufacturer / supplier shall prove financial stability and ability to produce the system within the specified delivery schedules. Evidence of facilities, equipment and expertise shall demonstrate the manufacturer's commitment to long term customer service and product support.

B. Service Conditions

1. The equipment specified herein will be used to treat potable water from a well for distribution to a residential community.
2. The equipment will be installed indoors in a new pump station building.
3. The equipment shall be designed for continuous (24-hours per day) service.

C. Manufacturer's Start-up Services: The manufacturer's technical representative shall inspect the completed installation, correct or supervise the correction of any defect or malfunction, and instruct operating personnel in the proper operation and maintenance of the equipment as described in Part 3 of this section.

1.4 MANUFACTURER'S WARRANTY

- A.** All components of the systems shall be manufactured, assembled, and tested as a unit by a single supplier. The systems must be a standard catalog item with the manufacturer. The supplier must assume system responsibility. The complete filtration system assembly must be warranted by the manufacturer.
- B.** The system manufacturer/ supplier shall warrant all equipment to be of quality construction, free of defects in material and workmanship.

PART 2 – PRODUCTS

2.1 GENERAL

- A.** The iron and manganese filtration system shall be able to treat 10 gallons per minute (gpm) peak flow. Contractor to verify existing well pump peak flow prior to final system design.
- B.** Existing iron and manganese levels as measured after the pumping test were 4 mg/l and .05 mg/l, respectively.
- C.** The iron and manganese filtration system will use pH adjustment, chlorine addition, greensand plus pressure filters in parallel, piping, valves, pressure gauges, flow measurement devices, and ancillary materials and equipment as necessary to provide a functional system that meets the requirements as specified in the project documents. The manufacturer shall coordinate selection and design of all system components such that all equipment is compatible and operates properly to achieve the specified performance requirements.
- D.** The complete system shall be certified and listed by UL for conformance to U.S. standards. Systems that have only the sub-assemblies certified and listed by UL for conformance to U.S. standards and/or UR recognized components shall not be considered equal.

2.2 MANUFACTURER

- A.** The Specifications and project Drawings depict equipment and materials which are deemed most suitable for the service anticipated. They are not intended, however, to eliminate other products of equal quality and performance. The Contractor shall prepare its bid based on the specified equipment for purposes of determining low bid. Award of a contract shall constitute an obligation to furnish the specified equipment and materials.
- B.** After execution of the contract, the Contractor may offer substitutions to the specified equipment for consideration. The equipment proposed for substitution must be equal in construction and performance to that specified in the contract, and quality must be demonstrated by a list of current users of the proposed equipment in similar installations.
- C.** In event the Contractor obtains Engineer's approval for equipment substitution, the Contractor shall, at its own expense, make all resulting changes to the enclosures, buildings, piping or electrical systems as required to accommodate the proposed equipment. Revised detail drawings illustrating the substituted equipment shall be submitted to the Engineer prior to acceptance.
- D.** It will be assumed that if the cost to the Contractor is less for the proposed substitution, then the contract price shall be reduced by an amount equal to the savings.
- E.** Reference to a manufacturer's name and model number or catalog number is for the purpose of establishing the standard of quality and general configuration desired.

2.3 EQUIPMENT

- A.** The greensand filters and chlorine contact to be Pentair Composite Pressure Vessels, rated for 150 psi max pressure, 100% composite fiberglass construction for use in water filtration, or approved equal. The tanks are to be fitted with a base.
- B.** The pressure filter control valves to be manufactured by Clack Corporation and shall be a Water Specialist Control Valve selected to match the flow and intended application, or an approved equal. Control valve shall have a solid-state microprocessor, front panel display with all the normal functionality of the control valve, including time of day, days until next backwash, flow rate and totalizer, 4 methods of initiating backwash, adjustable cycle times for slow rinse, backwashing, and brining, and 8 hour battery backup.
- C.** Chemical pumps for hypochlorite injection use flow paced Stenner Pump Company pumps, or approved equal.
- D.** Chemical tanks to be Stenner Pump Company polyethylene, 50-gallon tank, or approved equal and compatible with pump selected.
- E.** Filter media to be Greensand Plus with 12" anthracite top layer, or an approved equal.
- F.** Process piping to be 1 1/2" and 2"-inch pvc, schedule 80, glued joints.
- G.** Calsite Neutralizer shall be a Pentair Composite Pressure Vessel, reinforced fiberglass construction, or approved equal. The control valves shall be by Clack Corporation and shall be a Water Specialist Control Valve selected to match the flow and intended application, or an approved equal. Control valve shall have a solid-state microprocessor, front panel display with all the normal functionality of the control valve, including time of day, days until next backwash, flow rate and totalizer.

PART 3 – EXECUTION

3.1 EXAMINATION

- A.** Contractor shall deliver and offload equipment at installation site using equipment of sufficient size and design to prevent injury or damage. Immediately after off-loading, Contractor shall inspect the complete system and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in written claim with shipper prior to accepting delivery. Validate all serial numbers and parts lists with shipping documentation. Notify the manufacturer's representative of any unacceptable conditions noted with shipper.

3.2 INSTALLATION

- A.** Install, level, align, and lubricate system as indicated on project drawings. Installation must be in accordance with written instructions supplied by the manufacturer at time of delivery.
- B.** Prior to applying electrical power to any motors or control equipment, check all wiring for tight connection. Verify that protective devices (fuses and circuit breakers) conform to project design documents. Manually operate circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnects before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.

3.3 FIELD QUALITY CONTROL

A. Operational Test

1. Lubricate before operating as per manufacturer's recommendations.
2. Prior to acceptance by Owner, an operational test of all equipment and control systems shall be conducted to determine if the installed equipment meets the purpose and intent of the specifications. Tests shall demonstrate that all equipment is electrically, mechanically, structurally, and otherwise acceptable; it is safe and in optimum working condition; and conforms to the specified operating characteristics.
3. Greensand filters are to be placed into service only after conditioning and disinfecting as specified by the manufacturer of the media.
4. Prior to the placing the system into service all components, including equipment, tanks, and piping shall be disinfected in accordance with the appropriate AWWA Standard as referenced by the State of New Hampshire Code of Administrative Rules Env-Dw 407.

- B. Manufacturer's Start-up Services.** Coordinate equipment start-up with manufacturer's authorized technical representative or factory service technician. The representative or technician will inspect the completed installation, calibrate and adjust instrumentation, correct or supervise correction of defects or malfunctions, and instruct operating personnel in proper operation and maintenance procedures.

3.4 CLEANING

- A.** Prior to acceptance, inspect the equipment for dirt, splashed material, or damaged paint. Clean or repair accordingly. Remove from the job site all tools, surplus materials, scrap, and debris.

3.5 PROTECTION

- A.** The system should be placed into service immediately. If operation is delayed, drain water from pumps and piping. Open motor circuit breakers and protect system controls and interior equipment from cold and moisture.

End of Section

SECTION 40 23 00

WATER PROCESS PIPING, VALVES, AND ACCESSORIES

PART 1 – GENERAL

1.1 SUMMARY

- A. Furnish all labor, materials, equipment and incidentals required to install and test pipe, fittings, and accessories complete as shown on the Drawings and as specified herein.
- B. This Specification includes all interior piping, piping under structures, and buried piping within 5 feet of a building or vault exterior wall. Also included are pressure gauges, small valves, hose bibs, and floor drains.
- C. The mechanical details on the Drawings are diagrammatic in character and exact locations of the elements of the system, the measurement or cutting and installing pipe, and dimensions of the equipment, shall be determined based on the structure and equipment installed. Space requirements and locations of connections of equipment the Contractor proposes to furnish shall be investigated by him prior to ordering. The Contractor shall not scale off the Drawings to cut pipe or make connections to equipment selected. Equipment which will not enter the final, finished openings or that will not fit the assigned space will not be acceptable. All Drawings relating to the construction, including architectural, structural, electrical, plumbing, piping, heating, and ventilating, together with the Specifications shall be considered collectively.

1.2 SUBMITTALS

- A. General: Provide submittals in accordance with Specification 01 33 23.
- B. Manufacturers' product data and shop drawings on piping, fittings, valves, and accessories with installation details. Shop drawings shall be approved prior to installation of the components.
- C. Pipe support plan, refer to paragraph 3.1.G.
- D. Operation and maintenance data for valves, pressure gauges, water meters, and other accessories in accordance with Specification 01 78 23.

1.3 QUALITY ASSURANCE

- A. This Specification contains references to industry and trade group standards, including the following. They are a part of this section as specified and modified. The latest version of the standard references shall apply. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

1. American Water Works Association (AWWA).

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle water mains, valves, and appurtenances in accordance with the manufacturers' recommendations and in a manner which protects the materials.

B. Pipe

1. Protect, support, and handle in a manner to prevent damage to the products, especially linings and coatings.
2. When necessary, provide shelter to store pipe and apply water to prevent excessive drying.
3. During cold weather, store pipe on supports to prevent coating from freezing to the ground.
4. Do not store pipe on rock or other hard surface.
5. Use implements, tools, facilities, and equipment suitable for proper and safe protection and handling of piping; do not drop or dump pipe into trenches.
6. Use heavy canvas or nylon slings, not chains or cables, to lift pipe and fittings.
7. Cement-Mortar Lined Pipe: Tightly close ends with polyethylene plastic wrap to protect cement-mortar lining during shipment; leave plastic wrap on pipe until installation.
8. Remove pipe that, in the opinion of the Engineer, is damaged beyond repair.

C. Gaskets

1. Store in a cool, well-ventilated area.
2. Do not expose to the direct rays of the sun.
3. Do not allow contact with oils, fuels, or petroleum solvents.

1.5 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that water service piping may be installed in compliance with the original design and referenced standards.

- B. Contractor is responsible for compatibility between pipe materials, fittings, and appurtenances.

PART 2 – MATERIALS

2.1 PIPE AND FITTINGS

- A. Ductile Iron Pipe, Below Ground, 3- through 12-inch (DI1). Mechanical joint ductile iron pipe shall conform to ANSI/AWWA C151/A21.51, AWWA C111, and AWWA C104 (cement lined). All ductile-iron pipe shall comply with ANSI A21.1 and shall be pressure class 350. All fittings shall be restrained. Piping below slabs shall be polyethylene wrapped in accordance with AWWA C105.
- B. Ductile Iron Pipe, Above Ground, 3- through 12-inch (DI2). Flanged joint ductile iron pipe shall conform to ANSI/AWWA C151/A21.51, AWWA C110, and AWWA C104 (cement lined). All ductile-iron pipe shall comply with ANSI A21.1 and shall be pressure class 350.
- C. Ductile Iron Pipe Fittings, 3- through 12-inch (DI1 and DI2). Provide ductile iron fittings conforming to AWWA C110 with a minimum rated working pressure of 350 psi. Mechanical joint fittings shall be ductile iron Class 350, conforming to ANSI/AWWA C153/A21.53 or ANSI/AWWA C111/A21.11. Fittings shall be cement lined in accordance with AWWA C104. Fittings shall have fully restrained joints. Flanged fittings shall be drilled to a 125 pound template. Provide fittings with bells and gaskets specifically designed for cast iron equivalent outside diameter PVC or HDPE pipe, as required.
- D. Cast Iron Pipe Fittings. All cast-iron fittings shall conform to ANSI specification A21.10 or B16.1. All flanges on cast-iron pipe and on cast-iron fittings shall be drilled to a 125 pound template. All push-on or mechanical joints shall conform to ANSI specification A21.11. The exterior surfaces of all fittings shall be foundry-coated with a bituminous coating (except those inside which may be provided without a bituminous coating) and the interior shall be Portland cement lined in accordance with ANSI specification A21.4. Exposed pipe shall be provided with flanges and buried pipe shall be provided with mechanical joints unless indicated otherwise on the Drawings. With the approval of the Engineer, cast-iron fittings as specified above can be substituted for ductile-iron fittings as specified above.
- E. Carbon Steel, 2-inch and smaller (CS). Carbon steel pipe shall be Schedule 40 Grade B type ERW or seamless per ASTM A53 or ASTM A106. Carbon steel fittings shall be 2,000 pound forged socket weld or taper threaded per ASTM A105, ANSI B16.1, and ANSI B1.20.1. Carbon steel unions shall be 3,000 pound forged socket welded with steel seats per ASTM A105. No lining for air or gas service.

- F.** Stainless Steel (SS). Standard weight Schedule 40S type 304 stainless steel conforming to ASTM A312 and ASTM A182. Threaded connections shall be made by wrapping male thread with Teflon tape.
- G.** Copper (COP). Seamless hard drawn copper tube, Type L, rigid, conforming to ASTM B88 and ANSI H23.1. Use with cast-bronze or wrought copper solder fittings and 95-5 tin antimony solder.
- H.** Brass (BR). Seamless “regular” red brass conforming to ASTM B43. Use brass threaded fittings.
- I.** Cast Iron Soil Pipe (CISP). CISP for floor drains and at locations shown on the Drawings shall conform to Federal Specification WW-P-401 for extra heavy weight. Above slab fittings shall be hubless, below slab fittings shall be hub and spigot per CISPI 301, CISPI 310, ASTM A74, ASTM A1277, ASTM C564, and ASTM C1540. For gaskets use neoprene sealing sleeves series 300 AISI stainless steel shield and clamp for a neoprene gasket compression joint per ASTM C564 and ASTM C1563. All pipe and fittings shall bear the trademark of the Cast Iron Soil Pipe Institute or as approved by the Engineer.
- J.** Polyvinyl Chloride (PVC). Pipe shall be Schedule 80 conforming to ASTM D1785. Fittings shall be solvent welded per ASTM D2467 with solvent meeting ASTM D2564.
- K.** High Density Polyethylene (HDPE). High density polyethylene pipe shall be manufactured from PE4710 resin, conform to ASTM D3350 and AWWA C906, and be certified per NSF/ANSI 61. Provide standard pipe having plain ends for heat welded joints and cast iron equivalent outside diameter. Provide DR 9 class 250 pressure rating or as shown on the Drawings.
- L.** Where flanges are required as indicated in the Drawings or as specified herein, flanges shall be in accordance with ANSI B16.1 and shall be rated for the piping system’s working pressure. Gaskets shall be 1/8 inch ring type full face Garlock 3200 compressed non-asbestos sheet packing or approved equal. Use rubber compound gaskets that are not affected by the fluid service of the pipeline.
- M.** Dissimilar Pipe Connections. Supply dielectric coupling EPCO Model HA or EA when connecting pipes of different metals to provide electrical insulation.
- N.** Insulation. Wrap hot water supply lines with fiberglass insulation using J-M Micro-Lok HP with ASJ-SSL jacket and closure system or approved equal.

2.2 SMALL WATER VALVES, SIZE LESS THAN 3 INCHES

- A. GENERAL.** Small piping valves shall be suitable for use with liquid being transported. Water valves under 3 inches shall be bronze complying with ASTM B62 with screwed end connections.

- B. AIR RELEASE VALVE.** Air release valves shall be cast and/or ductile iron bodied, 1” NPT threaded joint, float operated, and designed for the intended service. Furnish valves with stainless steel float and mechanism, all working parts removable through the top of the valve, 200 psi min working pressure. Max temperature of 200°F. Valves shall be as manufactured by GA Industries, Val-Matic, Cla-Val, or approved equal.
- C. BACKPRESSURE VALVE.** Direct-operated, spring controlled, PVC body, zinc plated spring, PTFE wetted diaphragm, stainless steel lock nut and screw, and a non wetted u-cup TKM seal that isolates the spring. Valve shall have a maximum inlet capacity of 150 psi and a relief setting between 5 and 100 psi. Valve shall come with a fail dry safety vent that indicates a failure of the valve seal. Valve shall have NSF 61 certification for use in a water treatment facility. Valve shall be as manufactured by Plast-o-matic RVDT, or approved equal.
- D. BALL VALVES, PVC.** Vented ball for sodium hypochlorite solution use. Rated 150 psi at 73 degrees F, with ASTM D1784, Type I, Grade 1 polyvinyl chloride body, ball, and stem, end entry, double union design, ANSI Schedule 80 solvent-weld socket ends, Viton trim. If seal type recommended by manufacturer for the specific chemical or solution varies from those specified, submit recommendation with submittals and highlight for the attention of the Engineer. Spears True Union 2000 Industrial Vented or approved equal.
- E. CHECK VALVES, BRONZE SWING.** Bronze check valves shall be swing check disc type with integral disc and hinge, and 125-pound rating, Crane Figure No. 37 or approved equal. Confirm proper application for drain lines and air lines.
- F. CHECK VALVES, PVC BALL.** Valve body shall be PVC per ASTM D1784 with dimensions that conform to either ASTM D2467 or F439 for Schedule 80 pressure fittings for socket or threaded end connections. Valve shall have True Union fittings. Valve shall come clearly marked with flow direction, material designation, and NSF-61 certification. Valve shall be rated for a minimum of 150 psi at 73 degrees F. Provide manufacturer’s recommendation for seal material compatible with the piped fluid if different from that specified. Nibco Chemtrol Ball Check Valve or approved equal.
- G. CORPORATION STOPS.** Corporation stops to be all bronze with tapered inlet threads and iron-pipe outlet threads; both inlet and outlet shall be male nipples; stops shall be Mueller Co. H-10003 or approved equal. Saddles will be required in all A-C and PVC pipe. Saddles will be required on ductile-iron pipe in accordance with the standards established by the Ductile-Iron Pipe Research Association.
- H. DOUBLE CHECK VALVE.** Threaded end connections, lead free cast copper silicon body, silicone elastomers, stainless steel springs, conforming to AWWA C510, rated to 175 psi working pressure, union ball valves on both ends, NSF 61 certified for drinking water. Valve shall be Febco LF850U or approved equal.

- I. GATE VALVES. Bronze gate valves shall be of rising stem solid wedge disc type. Stuffing box repackable while under pressure, 125-pound rating. Gate valves shall be Crane Figure No. 428 or approved equal.
- J. GLOBE VALVES. Bronze globe valves shall be of bronze disc type with 125-pound rating and repackable while under pressure, and shall be Crane Figure No. 1 or approved equal.
- K. HOSE BIBB ANTI-SIPHON (HB1). Wall-mounted hose valve with integral vacuum breaker, cast bronze body with NPT screwed ends, union bonnet, rising stem, Buna-N rubber or composition disc, hand-wheel, and ¾ inch diameter threaded NPT x NST hose thread outlet connection. Valve shall be rated for 125 psi. Furnish and install an isolation valve immediately upstream of the hose bibb. Woodford model 101 or approved equal.
- L. HOSE BIBB ANTI-SIPHON FREEZEPROOF (HB2). Wall-mounted freezeproof hose valve with integral vacuum breaker, cast bronze body with NPT screwed ends, union bonnet, rising stem, Buna-N rubber or composition disc, hand-wheel, and ¾ inch diameter threaded NPT x NST hose thread outlet connection. Valve shall be rated for 125 psi. Install per manufacturer's instructions. Furnish and install an isolation valve immediately upstream of the hose bibb. Woodford model 19 or approved equal.

2.3 LARGE WATER VALVES, SIZE EQUAL TO OR GREATER THAN 3 INCHES

- A. BUTTERFLY VALVE (3" – 12"), AWWA. AWWA butterfly valves shall be cast and/or ductile iron bodied, flanged joint and lever actuated, unless otherwise note on the plans, and meet the requirements of AWWA C504. Offset disc design, corrosion-resistant shaft, stainless steel disc edge, and self-compensating shaft. Molded-in body seat with disc Class 250B, 250 psi min working pressure, max temperature of 200°F. Valves shall be as manufactured by DeZurik, Pratt, Val-Matic, or approved equal.
- B. CHECK VALVE, DOUBLE DOOR, WAFER. The check valve shall be the double door style and designed to fit between ANSI flanges.
 1. The check valve doors shall be spring loaded, normally closed, by means of one or more heavy duty stainless steel torsion springs. Flow from the upstream side shall cause the doors to open and upon flow source shut down, the torsion spring will shut the doors before reverse flow starts and at a point of zero velocity for non-slam closure.
 2. Seating shall be resilient and water tight. The sealing element shall be Buna-N molded to the body.
 3. All materials of construction must be certified in writing to ASTM specifications as follows:

Body	Ductile-iron ASTM A536
Doors	Ductile-iron ASTM A536
Sealing Element	Buna-N
Torsion Spring	Stainless Steel T316
Hinge Shaft	Stainless Steel T316
Stop Shaft	Stainless Steel T316
Exterior Paint	Phenolic primer red oxide

4. Double door check valves shall be APCO series 9000 or approved equal.

- C. CHECK VALVE, LEVER AND WEIGHT SWING (3” – 12”).** Flanged end, cast iron body, metal to metal seating, bronze mounted swing type, solid bronze hinges, stainless steel hinge shaft (keyed to disc and lever), adjustable outside lever and weight, rated 125-pound SWP, 200-pound WOG. NSF 61 certified for drinking water. Valves shall be as manufactured by Golden Anderson, APCO, or approved equal.
- D. GATE VALVE (3”-12”), AWWA.** AWWA gate valves shall be cast and/or ductile iron bodied, flanged joint and hand wheel operated, unless otherwise noted on the plans, and meet the requirements of AWWA C509/515. Furnish valves with resilient wedge and bronze stem, Class 250B, 250 psi min working pressure. Max temperature of 200°F. Valves shall be as manufactured by Kennedy, Mueller, American, or approved equal.
- E. PRESSURE REDUCING VALVE.** Pressure reducing valves shall be iron bodied, pilot operated piston or diaphragm valves designed to maintain a constant or minimum downstream pressure under a range of flow and pressure conditions indicated on the Drawings. Pistons shall be bronze or stainless steel with resilient seal rings and diaphragms shall be resilient with stainless steel or bronze removable seats. All valve materials in contact with water shall be non-corrosive in water and be safe for potable water use. Valves shall be flanged, Class 250B, 250 psi min working pressure. Max temperature of 200°F. Valves shall be as manufactured by ClaVal, Ross, GA Industries, Flomatic, or approved equal.
- F. PRESSURE SUSTAINING VALVE.** Pressure sustaining valve shall be iron bodied, pilot operated piston or diaphragm valves designed to maintain a high downstream pressure under a range of flow of 50 – 300 gpm, downstream pressure of 40 – 60 psi (set at 50 psi), upstream pressure of 130 psi. Pistons shall be bronze or stainless steel with resilient seal rings and diaphragms shall be resilient with stainless steel or bronze removable seats. All valve materials in contact with water shall be non-corrosive in water and be safe for potable water use. Valves shall be flanged, Class 125B, 200 psi min working pressure. Max temperature of 200°F. Valves shall be as manufactured by ClaVal, Ross, GA Industries, Flomatic, or approved equal.

2.4 PRESSURE GAUGES

- A.** Each pressure gauge installation shall include the gauge, a piston snubber, and a shut-off valve. Gauges shall be mounted vertically.

- B. Pressure gauges shall have aluminum cases, back flanged with screwed ring cover, 4-inch dial, nonreflecting white face, bronze socket and tube, and minimum 1/2 inch male NPT bottom connection. Pressure range for the gauges shall be 0 to 200 psi unless specified otherwise. Pressure gauges shall be Wika 9833434 or approved equal.
- C. Piston snubbers shall be Ray 023S or approved equal.

2.5 TURBINE WATER METER

- A. Turbine water meters shall be flanged, Class 125B, 200 psi min working pressure. The measuring chamber shall consist of a measuring element, removable housing, and all-electronic register. The measuring element shall be mounted on a horizontal, stationary stainless steel shaft with sleeve bearings and be essentially weightless in water. The measuring chamber shall be capable of operating within 98% accuracy limits for 2-20% of the flow range and 99% accuracy limits for 20-100% of the flow range. Measuring element shall maintain accuracy without calibration when transferred from one main case to another of the same size. The direct magnetic drive shall occur between the motion of the measuring element blade position and the electronic register. Additional intermediate, magnetic or mechanical, drive couplings are not acceptable. The meter's register shall be all-electronic and does not contain any mechanical gearing to display flow and accurate totalization. The electronic register shall provide Automatic Meter Reading resolution units fully programmable, pulse output frequency fully programmable, integral data logging capability, integral resettable accuracy testing feature, LCD display and 10-year battery life guarantee. Meter pressure castings shall be hydrostatically tested at a minimum of 1.5 times (depending on material) the maximum rated working pressure stated on the meter body manufacturer's badge. Meters shall be as manufacturer by Sensus, Badger, Mueller, or approved equal.

2.6 WALL PENETRATIONS

- A. Where pipes penetrate precast or cast-in-place concrete walls, a positive closure shall be provided that will form a completely water tight seal. The closure shall be comprised of a steel sleeve cast in the wall and a mechanical seal to fill the annulus between the pipe and the wall sleeve.
- B. The wall sleeve shall be manufactured from heavy wall steel pipe with a full circle continuously welded water stop plate. The sleeve shall be coated to prevent corrosion. Sleeves shall be two pipes sizes larger than the nominal pipe size penetrating wall and shall be cast in place at locations as shown on the Drawings.
- C. The seal shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening. Links shall be loosely assembled with type 316 stainless steel bolts, nuts, and pressure plates to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the

bolts shall cause the rubber sealing elements to expand and provide an absolutely water-tight seal between the pipe and wall opening. The seal shall be constructed so as to provide electrical insulation between the pipe and wall. The seal shall not leak under water pressure of up to 40 feet.

D. The modular sealing system shall be Link-Seal by GPT Industries or approved equal.

2.7 PIPE SUPPORTS

A. All pipelines shall be supported so that all lines are at a uniform slope or level as required herein or as shown on the Drawings. All pipe shall be supported so that there are no sags in the lines.

B. In absence of details shown on the Drawings, pipes over 4 feet above the floor shall be supported with clevis type hangers from above or brackets from an adjacent wall. Pipes nearer the floor shall be supported by use of a pipe or concrete saddle. Where concrete saddles or thrust blocks are required, there shall be a polyethylene bond breaker between concrete and pipe.

C. The materials used for piping support shall be similar and equal to those manufactured by ITT Grinnell or Eaton B-Line for the appropriate uses.

D. Pipe supports shall be no more than 10 feet apart and each fitting or valve shall have supports on either side. Pipe manufacturers shall approve of the type of support and spacing to prevent local over-stressing of pipes. All pump and equipment piping shall be supported in a manner that prevents any loading or stress on the connections.

E. Slotted standard Unistrut shall be used for pipe that is to be mounted to the wall. All strut system components shall be manufactured by Unistrut Corporation or approved equal as determined by Engineer.

F. All channel members shall be fabricated from structural grade steel conforming to one of the following specifications unless specified otherwise: ASTM A1011 structural steel grade 33, ASTM A653 grade 33. All fittings shall be fabricated from steel conforming one of the following specifications unless specified otherwise: ASTM A575, ASTM A576, ASTM A36, or ASTM A635.

1. Type 304 or 316 stainless steel for following locations: Submerged or less than 1 foot above the liquid surface; below tops of channel walls; under covers or slabs of channels and tanks; in other damp locations.

G. Strut system components shall be finished in accordance with one of the following standards unless specified otherwise:

1. Perma-Green III-Rust inhibiting epoxy enamel when tested in accordance to ASTM B117.

2. Electro-galvanized-electrolytically zinc coated per ASTM B633 Type III SC 1.
3. Pre-galvanized-zinc coated by hot dipped process prior to roll forming. The zinc weight shall be G90 conforming to ASTM A653.
4. Hot-dipped galvanized-zinc coated after all manufacturing operations are complete. Coating shall conform to ASTM A123 or ASTM A153.

PART 3 – EXECUTION

3.1 GENERAL PIPE INSTALLATION

- A.** Due to the small scale of the Drawings, it is not possible to indicate all of the piping systems nor to show all offsets, fittings, etc., which may be required.
- B.** Prior to ordering materials, expose all existing pipes that are to be connected to new pipelines. Verify the size, material, joint types, elevation, horizontal location, and pipe service of existing pipes. Inspect the size and location of structure penetrations to verify the adequacy of wall pipes, sleeves, and other openings before installing connecting pipes.
- C.** All piping shall be installed as closely as possible to walls, ceilings, columns, beams and equipment (consistent with proper space requirements for maintenance and operational appurtenances) so as to occupy the minimum of space. All offsets, fittings, etc. required to accomplish this must be furnished.
- D.** Provisions for maximum flexibility are not always shown and the Contractor may add flexible joints where required, and approved, by the Engineer. All piping shall be installed plumb and square.
- E.** Exposed pipe shall be run parallel with or at right angles to the adjacent walls and floors.
- F.** Piping shall be run in a straight grade between elevations shown on the plans, except when not possible due to conflict with other facilities. Pipelines carrying liquid shall be installed without high points that could trap gases or air and shall be kept below the static water level in the items to which they connect.
- G.** All pipe shall be properly supported so that all pipes are in a uniform slope or level, as required by the Drawings. All pipe shall be supported so that there are no sags in the line. At the pumps, the pipe shall be supported so that no weight of the pipe will be supported by the pumps. In general, required pipe hangers, supports, bracing, or thrust blocks are not shown on Drawings.
- H.** The Contractor shall submit to the Engineer his proposed plan of supporting of piping, except for pipe supports specifically detailed on the Drawings. Except where shown

otherwise on the Drawings, all supports and hangers shall be a standard manufactured type. Hanger supports that are located and embedded in concrete must be an adjustable type that will allow the piping to be located in straight lines and slopes, where required, at a uniform grade without sagging. Pipe type floor supports are acceptable for piping up to 3 feet above the floor; however, the supports must be properly anchored and coated. Concrete thrust blocks for bracing pressure pipe shall have reinforcement and shall be tied into the concrete floor or wall. Wall brackets and braces shall be sufficiently anchored to the wall in an approved manner.

- I. No anchors or attachments will be permitted in precast concrete tee stems except during the casting. Chair or perforated strap hangers for pipes running parallel and vertically adjacent. Supports shall not be spaced over 10 feet and at least two supports are required for individual sections of pipes between joints.
- J. All pipes, fittings, and valves delivered to the work site shall be clearly marked to identify the material, class, and thickness. All material shall be new and free of blemishes.
- K. Provide the manufacturer's required straight runs of piping upstream and downstream of each flow measuring device.
- L. Apply coatings, color coding, directional arrows, and related components as specified in Section 09 91 00.

3.2 PIPES THROUGH CONCRETE WALLS

- A. Unless otherwise specifically detailed on the plans, when a pipe (except copper or wrought steel) passes from concrete to earth or from earth to concrete, provide bell and spigot, ringtite, wedgelock, or other restrained flexible-type joints unless otherwise specifically indicated on the Drawings, or restrained coupling, shall be installed. Particular care shall be taken to secure full support of the pipe in the earth. Unless otherwise specifically indicated on the Drawings, where pipes terminate in or pass through concrete sections below finished grade, they may be set in place or a block out opening may be made in the concrete. Location of the openings shall be accurately determined, and each opening shall be of sufficient size to permit passage of flanges and bells to allow satisfactory closure and sealing of the opening. Block out openings may not be used in tank walls, floors, or areas where liquid is contained or where pipes allow possible groundwater entry.
- B. Provide flexible joints at the face of all structures, whether or not shown on the Drawings. Install the first joint flush with structure face or up to one pipe diameter away from face, but not further than 18 inches away from face. Install the second joint within 18 inches of the first joint.
- C. After pipe installation, the opening around the pipe shall be closed by pouring with non-shrink grout in accordance with the manufacturer's instructions.

- D. Where grout is placed in openings through vertical walls, a “spout” 6-inches above the highest point in the opening shall be provided and filled with grout to assure filling the entire opening. The grout shall be thoroughly mixed and shall be poured in place immediately after mixing.
- E. On exposed external surfaces, the finished surface of the grout shall be left not less than 3/4 inch below the adjacent surfaces and a 3/4 inch coat of 3:1 Portland cement plaster applied after the grout has set. The exterior face of the grouted opening and the joint between the grouting and the wall shall be painted with 3 coats of emulsified asphalt.
- F. Whenever the pipelines extend through structural walls or through successive walls, or through a roof slab and adjacent wall, the Contractor shall provide a sufficient number of unions, flanges, or similar couplings to permit the dismantling of sections of pipelines within the structure without disturbing adjacent lines or portions within the concrete.

3.3 CHASES, SLEEVES, AND WALL PIPES

- A. Galvanized iron or cast-iron pipe sleeves shall be provided for pipes passing through floors, ceilings and partitions at the time are such being constructed. Where the pipes run through footings, iron pipe sleeves shall be in place before the concrete is placed. Where pipes pass under footings, the holes shall be grouted with concrete. Pipe runs encased in concrete shall be properly supported so that they will not be disturbed during concrete placement operations. The Contractor shall supervise the installation of all chases and recesses for the installation of piping, plumbing, ventilation ducts, and heating pipes.
- B. Cutting for the installation of the mechanical work shall be done at times most suitable for other crafts and as directed by the Owner. Coordination of this work shall be the responsibility of the Contractor. Where necessary to cut chases in walls, they shall be reinforced as directed. After the work is installed, all holes shall be patched to match the finish of the adjacent surface.

3.4 SMALL PIPE INSTALLATION

- A. All threads on steel pipes shall be cut with sharp dies to standard depth, left clean-cut and tapered. All screwed pipe joints shall be properly sealed with a potable water safe approved joint paste or Teflon tape applied on the male threads only. Expansion joints shall be provided as required.
- B. All copper piping shall have solder-type fittings. The joints in the copper pipe shall be properly cleaned, flux applied, and then soldered, all applied in accordance with the manufacturer’s directions. All parts to be soldered shall be thoroughly cleaned before the flux is applied. All copper piping where the pipe is in direct contact with the pipe hangers or other metal supports shall be protected with a copper saddle soldered to the underside of the pipe. Saddles may be made of split copper pipe.

- C. All PVC pipe threads shall be cut with proper tools and connections shall be sealed correctly and completely with Teflon tape.
- D. For small size piping in structures not holding water, sleeves shall be provided for pipes passing through floors, ceilings and partitions at the time the structure is being constructed. After installation, all sleeves shall be caulked with approved appropriate material.
- E. In all small size piping, unions must be installed at all equipment so that the equipment can be removed without dismantling the piping.
- F. At each piece of equipment using water, valves must be installed in each water line connection whether or not shown on the Drawings.
- G. All piping shall be reamed and cleaned of all dirt and scale before being installed. All concealed piping shall be tested in the presence of the Engineer before being concealed. Changes in direction shall be made with fittings. Pipe showing kinks or wrinkles will not be accepted. All joints shall be made watertight or airtight depending on their use.

3.5 LARGE PIPE INSTALLATION

- A. All pipe and valves shall be carefully aligned and shall be installed in a neat manner. The bolts in the flange joints shall be drawn up uniformly and tightly around the flange without overstraining the flanges. All joints must be made watertight. If any joint, pipe, fittings or valve is found defective upon testing, it shall be immediately repaired or replaced by the Contractor at no additional cost to the Owner. Make-up piping and closure pieces shall be sized and measured after equipment selection has been completed and located, and all permanent parts of the structure are in place. Couplings may be used when locations are approved by the Owner. In general, the location of the piping has been fixed on the Drawings, but variations will be permitted to suit the type or make of approved equipment purchased by the Contractor. However, the general plan of fittings and connections is expected to be followed unless variations are approved by the Owner.

3.6 FLEXIBILITY IN PIPING

- A. The Drawings show the location of pipe couplings in piping. All mechanical joints or pipe couplings shall be restrained whether or not shown on the Drawings.
- B. Joint restraint rods shall be diametrically opposed. When restraining pipe couplings, the rods shall be bolted between adjacent flanges.
- C. The use of restrained mechanical joint connections at interior sides of wall pipes will be considered instead of flanged joint; the Contractor shall submit the proposed configuration to the Engineer for review. Additional pipe couplings with tie rod restraint can be used; however, coupling location must be approved by the Owner. Restraint shall be sufficient for the test pressure of the system.

3.7 CLEANUP

- A. After each of the systems has been installed, the Contractor shall thoroughly clean all parts of the installation. All equipment, piping, valves, and fittings shall be cleaned of grease, metal cuttings and other debris. Any stoppage, discoloration or other damage to any of the work due to the Contractor's failure to properly install or to properly clean the systems shall be repaired without additional cost to the Owner.

3.8 TESTING

- A. Following the cleaning, each system shall be completely tested in the presence of the Owner. All piping that will be subjected to internal pressures for transporting liquids or gases shall be tested for leaks in accordance with the instructions of the Owner. In general, tests shall comply with the Uniform Plumbing Code. In the absence of a specific code requirement, the lines shall be capable of withstanding and holding without leakage a pressure equal to 150 percent of the working pressure for that particular line, except that no test pressure shall be in excess of 100 psi for raw water lines and 150 psi for potable lines. Air lines will be tested for 175 psi. For hydrostatic tests, maintain test pressure continuously for 120 minutes minimum and for such additional time as necessary to conduct examinations for leakage. In the event the line tested should fail, repairs shall be made and the line retested until it does comply.

3.9 DISINFECTION

- A. All potable water lines shall be disinfected in accordance with AWWA C651 and C653.

3.10 PLUMBING FIXTURES INSTALLATION

- A. All plumbing fixtures and equipment described in this Specification shall be installed in strict conformance with the manufacturer's written instructions.

3.11 VENTS AND DRAINS

- A. Provide hose bibbs or approved system for venting high points and draining low points.

End of Section