

# CONTRACT DOCUMENTS



## TOWN OF ENFIELD

### NH ROUTE 4A SEWER EXTENSION PROJECT

### SHAKER LANDING PUMP STATION REPLACEMENT

**(REBID)**

**ENFIELD, NEW HAMPSHIRE  
GRAFTON COUNTY**

**NHDES CWSRF PROJECT NUMBER CS-330167-04**

**JULY 31, 2017**



### **ISSUED FOR BIDDING**

**ENGINEERS PROJECT NO. 10068-05**

**PREPARED BY PATHWAYS CONSULTING, LLC**

**ELECTRICAL SPECIFICATIONS PREPARED BY LEE CARROLL ELECTRICAL CONSULTANTS**

### **PATHWAYS CONSULTING, LLC**

Planning • Civil & Environmental Engineering • Surveying • Construction Assistance

240 Mechanic Street • Suite 100

Lebanon, New Hampshire 03766

(603) 448-2200 • Fax: (603) 448-1221

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# PROJECT SPECIFICATIONS

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## **A. BIDDING REQUIREMENTS**

**ADVERTISEMENT FOR BIDS**

Town of Enfield

Owner

23 Main St (PO Box 373)  
Enfield, New Hampshire 03748

Address

Separate sealed BIDS for the construction of The Town of Enfield, NH Route 4A Sewer Extension Project, "Shaker Landing Pump Station Replacement" (Rebid).

This project includes connection of the municipal sewer service to six buildings of the Shaker Landing Home Owner's Association (Shaker Landing) by decommissioning the existing septic tanks, and replacing the effluent pump station with a new solids handling pump station.

Bids will be received by The Town of Enfield, 23 Main Street, Enfield, NH 03748  
at the office of Town Manager  
until 1:30 pm, (Standard Time-Daylight Savings Time) September 11, 2017 and  
then at said office publicly opened and read aloud.

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

60 Calendar days for substantial completion (Winter Shutdown)

81 Calendar days for final completion (Expected in Spring of 2018)

Liquidated damages will be in the amount of \$ 400 for each calendar day of delay from the date established for substantial completion, and \$ 200 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 amount of their BID.**
3. The successful Bidder must furnish 100% Performance and Payment Bonds for the total contract amount and will be required to execute the Contract 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:

[ X ] a loan from the NH State Water Pollution Control Revolving Loan Fund (CWSRF)

5. The successful Bidder on this work is required to comply with the President's Executive Order No. 11246 entitled "Equal Employment Opportunity" as amended by Executive Order 11375, and amendments or supplements thereto, and as supplemented in Department of Labor Regulations (41 CFR Part 60). The requirements for bidders and contractors under this order are explained in the Information for Bidders.

6. Utilization of Minority and Women's Business Enterprises (MBEs and WBEs)  
The successful Bidder on this work must demonstrate compliance with the U.S. Environmental Protection Agency's MBE/WBE policy in order to be deemed a responsible bidder. The requirements for bidders and contractors covered by this policy are explained in the Information for Bidders.
7. The successful Bidder on this work is subject to U.S. Department of Labor's Davis Bacon wage provisions.
8. The successful bidder on this work is subject to the "American Iron and Steel (AIS)" requirements of the CWSRF and DWSRF programs.
9. No Bidder may withdraw a Bid within 60 days after the actual date of opening thereof. The Town of Enfield reserves the right to reject all bids.
10. Pre-Bid Meeting: A **NON-MANDATORY** pre-bid meeting will be held for this project at 2:00 pm on Wednesday, August 23, 2017, at the Enfield Public Works Building meeting room (74 Lockehaven Road, Enfield, New Hampshire).

**PLANS AND SPECIFICATIONS:** Plans and specifications may be viewed at the offices of: Pathways Consulting, LLC, 240 Mechanic Street, Suite 100, Lebanon, NH 03766 and the Town of Enfield, Department of Public Works, 74 Lockehaven Drive, Enfield, NH 03748 We have also provided PDF documents for viewing with the following plan rooms: Construction Summary of NH; (603) 627-8856; [www.constructionsummary.com](http://www.constructionsummary.com); Works in Progress; (802)-658-3797; [www.constructionjournal.com](http://www.constructionjournal.com)

**Project Contract Documents and Plans, FOR BIDDING PURPOSES, shall be obtained at the office of Pathways Consulting, LLC, for NINETY DOLLARS (\$90) NON-REFUNDABLE. An additional FIFTY DOLLARS (\$50) will be charged for standard shipping fees NON-REFUNDABLE. Bidders must obtain Contract Documents and Plans from Pathways Consulting to be eligible for bidding.** Checks should be made payable to "Pathways Consulting, LLC." Send check with project name and No. to Pathways Consulting, LLC, 240 Mechanic Street, Suite 100, Lebanon, NH, 03766. PDF Plan may be provided to the Contractor upon purchase of the Hard Copy documents.

**INFORMATION FOR BIDDERS**

Please be advised that a pre-bid meeting will be held on Wednesday, August 23, 2017 at the Town of Enfield Department of Public Works Building meeting room (74 Lockehaven Road, Enfield, New Hampshire) at 2:00 pm. All bidders are asked to attend, but attendance is not mandatory.

**QUESTIONS:** Bidders should act promptly and submit all questions on the Project in writing to Jeff Durell at [jeff.durell@pathwaysconsult.com](mailto:jeff.durell@pathwaysconsult.com) by 5:00 pm on Friday September 1, 2017. No phone calls or faxes will be accepted. Addendums will be distributed as necessary to answer bidder questions no later than five (5) calendar days before the bid opening.

BIDS will be received by The Town of Enfield  
(herein called the "OWNER"), at 23 Main Street, P.O. Box 373, Enfield NH 03748  
until 1:30 pm on September 11, 2017.

Bids will be opened at 1:30 pm. on September 11, 2017 at the Town of Enfield, 23 Main Street, Enfield, NH 03748 and publicly read aloud.

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

The Town of Enfield at 23 Main Street, P.O. Box 373, Enfield, NH 03748

Each sealed envelope containing a BID must be plainly marked on the outside as BID  
Town of Enfield, NH Route 4A Sewer Extension Project "Shaker Landing Pump  
for Station Replacement" (Rebid) 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

23 Main Street, P.O. Box 373, Enfield, NH 03748

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

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

BIDDERS must satisfy themselves of the accuracy of the estimated quantities in the BID SCHEDULE by examination of the site and a review of the drawings and specifications including

ADDENDA. After BIDS have been submitted, the BIDDER shall not assert that there was a misunderstanding concerning the quantities of WORK or of the nature of the WORK to be done.

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

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

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

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

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

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

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

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

The OWNER may make such investigations as deemed 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 his BID.

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

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

#### OWNER'S PROTECTIVE LIABILITY INSURANCE ADDITIONALLY INSURED REQUIREMENTS.

The Town of Enfield is defined herein as the Project Owner and shall be listed as additionally insured on all Contractor Insurances. However work on the project is being completed on the private lands of Shaker Landing. The awarded contractor shall include the Shaker Landing Condominium Association as additionally insured on all required insurances.

#### MANUFACTURERS EXPERIENCE

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

#### MANUFACTURER'S AND PRODUCTS:

Specific manufacturer's and products specified in these contract documents are for basis of design only. Equipment/Product selection shall be competitive. Equivalent products (as accepted by the Engineer) to the ones specified in these documents are acceptable on this project.

#### SRF PROJECT SIGN

The Contractor shall construct a sign in accordance with the Standard Detail included in these specifications. The sign shall be erected in a location selected by the Engineer. The Contractor shall maintain the sign throughout the duration of the contract. (See Section D Attachment D)

## SAFETY AND HEALTH REGULATIONS

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

## NON-DISCRIMINATION IN EMPLOYMENT

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

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

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

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

## DAVIS BACON WAGE RATES

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

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

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

The “**Heavy**” General Wage Decision (GWD) for Grafton County NH22, Publication Date 01/06/17 applies to this project.

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

**The following guidance is for classifications/rates missing from the Heavy GWD:**

**Skilled trade classifications: the minimum that may be approved is \$21.90 + \$3.32 fringe or a total rate of \$25.22 an hour.**

**Equipment operator classifications: the minimum that may be approved is \$22.50 + \$2.33 fringe or a total rate of \$24.83 an hour.**

**Flaggers must be paid a minimum of \$18.71 + \$2.74 fringe; or a total rate of \$21.45 an hour.**

**A copy of the applicable DOL wage determination(s) is included in Attachment B in PART D – FEDERAL PROVISIONS, RULES, REGULATIONS AND FORMS** in these project documents. Bidders shall refer to the above-referenced PART D for additional information on Davis Bacon requirements.

#### AMERICAN IRON AND STEEL (AIS) PROVISIONS

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

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

Bidders shall refer to PART D - FEDERAL PROVISIONS, RULES, REGULATIONS AND FORMS for additional information.

#### STATE INSPECTION

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

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

#### COPIES OF THE CONTRACT

There shall be at least Six (6) executed copies of the Contract to be distributed as follows:

- a) Two (2) copies to the Owner
- b) One (1) copy each to the Engineer, and Contractor.
- c) Two (2) copies to the NH Department of Environmental Services.

#### NON-RESIDENT CONTRACTORS

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

The successful bidder, if not a resident of New Hampshire, and not a corporation, shall file, at the time of execution of the contract, with the Owner a written appointment of a resident of the state of New Hampshire, having an office or place of business therein, to be his true and lawful attorney

upon whom all lawful processes in any actions or proceedings against him may be served; and in such writing, which shall set forth said attorney's place of residence, shall agree that any lawful process against him which is served on said attorney shall be of the same legal force and validity as if served on him and that the authority shall continue in force so long as any liability remains outstanding against him in New Hampshire.

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

A Non-resident Contractor shall be deemed to be:

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

#### DBE RULE PROGRAM REQUIREMENTS (MBEs and WBEs)

Bidders on this project are required to demonstrate compliance with the United States Environmental Protection Agency's MBE/WBE policy in order to be deemed responsive. The existing Fair Share Goals are .77% MBE and 6.22% WBE.

The requirements for bidders and contractors are as follows:

State Revolving Fund loan recipients and their contractors must comply with the following DBE Rule Program requirements until the project period for the SRF loan has ended:

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

Bidders shall refer to PART D - FEDERAL PROVISIONS, RULES, REGULATIONS AND FORMS for additional information.

#### BIDDERS QUALIFICATIONS

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

- A. He shall not have defaulted nor turned the work over to the bonding company on any contract within three years prior to the bid date.
- B. He shall maintain a permanent place of business.
- C. He shall have adequate personnel and equipment to perform the work expeditiously.
- D. He shall have suitable financial status to meet obligations incidental to the work.
- E. He shall have appropriate technical experience satisfactory to the Engineer and the Division in the class of work involved.

- F. He shall be registered with the Secretary of State to transact business in New Hampshire.
- G. He shall have performed to the satisfaction of the Engineer and the Division on previous contracts of a similar nature.
- H. He shall not have failed to complete previous contracts on time, including approved time extensions.

#### SUSPENSION AND DEBARMENT

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

#### WITHDRAWAL OF BIDS

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

#### BASIS FOR DETERMINATION OF SUCCESSFUL BIDDER

Successful Bidder determination shall be based on a review of the Total Based Bid price, as provided in the "Bid Proposals" and all other information provided in the "Bid". Award will be made to the lowest responsive and responsible Bidder. Determination of the Successful Bidder shall be made on the basis of the lowest total cost for the bid that allows the Owner to complete the maximum amount of work possible with the available budget.

Owner reserves the right to base determination of the successful bidder and "Notice of Award" on available information or that provided by the bidder, including but not limited to the following:

- 1) qualifications of bidder;
- 2) experience or expertise of the bidder;
- 3) business standing of bidder and/or any listed subcontractors;
- 4) full disclosure and accuracy of all information provided by bidder;
- 5) bidder's fulfillment of any and all conditions set forth in bid or contract documents
- 6) any other pertinent information that might affect bidder's ability to successfully complete the contract work.

#### PROPANE TANK CLARIFICATION

- A. The propane tank to be installed for the Generator at Shaker Landing shall be coordinated with Irving Oil.

#### PERMITS

The following permits have been applied for by the Owner, or need to be applied for by the Contractor. All conditions contained within the approved permit documents that are part of the responsibility of the Contractor during work installation shall be strictly complied with.

- A NHDES Shoreland Protection Permit by Notification

PROJECT CONTACTS

- A. Town of Enfield, Department of Public Works, 74 Lockehaven Road, Enfield, New Hampshire 03748. Jim Taylor, Public Works Director, 603-632-4605
- B. Pathways Consulting, LLC. 240 Mechanic Street Suite 100, Lebanon, New Hampshire, 03766. Rod Finley, P.E., Project Manager; Jeff Durell, CPESC, Project Engineer/Contract Administrator 603-448-2200.

**BID**

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

To the Town of Enfield (hereinafter called "OWNER").

In compliance with your Advertisement for Bids, BIDDER hereby proposes to perform all WORK For the construction of Town of Enfield, NH Route 4A Sewer Extension Project, "Shaker Landing Pump Station Replacement" (Rebid) in strict accordance with the CONTRACT DOCUMENTS, within the time set forth therein, and at the prices stated below.

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

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

- 60 Calendar days for substantial completion (Winter Shutdown)
- 81 Calendar days for final completion (Expected in Spring of 2018)

Liquidated damages will be in the amount of \$ 400 for each calendar day of delay from the date established for substantial completion and \$ 200 for each calendar day of delay from the date established for final completion, as provided in Section 18 of the General Conditions.

BIDDER acknowledges receipt of the following ADDENDUM:

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

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

## A-3.2

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

1. Name of Bidder.
2. Permanent Main Office address.
3. When organized?
4. Where incorporated?
5. Is bidder registered with the Secretary of the State to do business in New Hampshire?
6. For how many years has your firm engaged in the contracting business under its present name? Also state names and dates of previous firm names, if any.
7. Contracts on hand. (Schedule these, showing gross amount of each contract and the approximate anticipated dates of completion.)
8. General character of work performed by your company.
9. Have you ever failed to complete any work awarded you in the scheduled contract time, including approved time extensions? \_\_\_(Yes) \_\_\_(No).  
If so, where and why?
10. Have you ever defaulted on a contract? \_\_\_(Yes) \_\_\_(No).  
If so, where and why?
11. Have you ever had liquidated damages assessed on a contract? \_\_\_\_\_(Yes) \_\_\_\_\_(No).  
If so, where and why?
12. List the more important contracts recently executed by your company, stating approximate cost for each, and the month and year completed.
13. List your major equipment available for this contract.
14. List your key personnel such as Project Superintendent and foreman available for this contract.
15. List any subcontractors whom you would expect to use for the following (unless this work is to be done by your own organization):
  - a. Civil Engineering
  - b. Utility Installation
  - c. Other work



16. With what banks do you conduct business?

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

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

Respectfully submitted:

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Address

\_\_\_\_\_  
Title

\_\_\_\_\_  
Date

\_\_\_\_\_ Being duly sworn, deposes and says that he is

\_\_\_\_\_ of \_\_\_\_\_  
(Name of Organization)

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

Sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_\_

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

My commission expires \_\_\_\_\_

(Seal - If BID is by Corporation)

ATTEST: \_\_\_\_\_

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

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

A-3.4  
**BID SCHEDULE**

Please find attached Bid Proposal following this form.

Notes:

1. All prices must be written in ink. Unit prices must be written in words as well as figures for the entire proposal. In case of discrepancy, the amount written in words shall govern.
2. Measurement and Payment for all bid items shall be in accordance with section 01 15 00 "Measurement and Payment".
3. BIDS for this WORK will be compared on the basis of the aggregate sums of the products of the various unit prices and lump sum items multiplied by the quantities given in the Bid Schedule. Equal items in all sections of each individual bid proposal shall have the same unit price. All work depicted on the drawings or required by the Contract Documents that does not have a specific pay item shall be considered subsidiary and incidental to the contract.
4. Successful Bidder determination shall be based on a review of the Total Base Bid as provided in the "Bid Proposal" and all other information provided in the "Bid". Award will be made to the lowest responsive and responsible Bidder. Determination of the Successful Bidder shall be made on the basis of the lowest total cost for the bid that allows the Owner to complete the maximum amount of work possible with the available budget.

The BIDDER must submit the following additional documents with the bid:

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

- Bid Bond (or certified check) (Pages A-4.1 and A-4.2)
- Bidder's American Iron and Steel acknowledgement (Page D-7.4)

**TOWN OF ENFIELD NH ROUTE 4A SEWER EXTENSION PROJECT**  
**BASE BID (SHAKER LANDING PUMP STATION REPLACEMENT REBID)**  
**BID PROPOSAL**

BID ITEM	EST. QUANT.	DESCRIPTION	UNIT PRICE IN FIGURES	AMOUNT IN FIGURES
		UNIT BID PRICE IN WORDS		
SH1.01	1	PUMP STATION (SHAKER LANDING)		
	LS		\$	\$
SH1.02	1	DECOMMISSIONING EXISTING WASTEWATER COMPONENTS (SHAKER LANDING)		
	LS		\$	\$
SH1.03	140	FINE CRUSHED STONE (NHDOT ITEM 304.4)		
	CY		\$	\$
SH1.04	30	¾" BLUESTONE SUREPAK/HARDBAK FROM LOCAL SOURCE		
	CY		\$	\$
SH1.05	360	WOVEN FILTER FABRIC (BELOW ACCESS ROAD)		
	SY		\$	\$
SH1.06	160	COMMON EXCAVATION (ACCESS ROAD)		
	CY		\$	\$
SH1.07	250	8" SDR35 PVC SEWER MAIN		
	LF		\$	\$
SH1.08	315	4" FORCEMAIN (DR11 HDPE DIPS OR SDR 21 PVC)		
	LF		\$	\$
SH1.09	1	REMOVE EXISTING STONE WALL AND STAIRS		
	LS		\$	\$
SH1.10	35	12" HDPE CULVERT PIPE		
	LF		\$	\$
SH1.11	4	STONE MASONRY HEADWALLS		
	EA		\$	\$
SH1.12	1	RESTORATION OF GROWTH OF LAWNS AND GRASSES		
	LS		\$	\$

**TOWN OF ENFIELD NH ROUTE 4A SEWER EXTENSION PROJECT  
BASE BID (SHAKER LANDING PUMP STATION REPLACEMENT REBID)  
BID PROPOSAL**

BID ITEM	EST. QUANT.	DESCRIPTION	UNIT PRICE IN FIGURES	AMOUNT IN FIGURES
		UNIT BID PRICE IN WORDS		
SH1.13	113	SHAKER LANDING PUMP STATION FENCE (4' HIGH)		
	LF		\$	\$
SH1.14	1	SHAKER LANDING PUMP STATION FENCE GATE (4' HIGH)		
	EA		\$	\$
SH1.15	1	RELOCATE EXISTING PATH LIGHT (NEW POLE BASE)		
	EA		\$	\$
SH1.16	2	CORE AND BOOT EXISTING STRUCTURE		
	EA		\$	\$
SH1.17	1,000	SILT FENCE		
	LF		\$	\$
SH1.18	300	EROSION BLANKET		
	SY		\$	\$
SH1.19	2	4' DIAMETER SEWER MANHOLE WITH FRAME AND COVER		
	EA		\$	\$
SH1.20	1	MOBILIZATION/DEMOBILIZATION		
	LS		\$	\$
SH1.21	1	MISCELLANEOUS WORK AND CLEANUP		
	LS		\$	\$
SH 1.22	10	ROCK EXCAVATION		
	CY			
SH1.23	1	STANDBY GENERATOR ( COMPLETE WITH PROPANE FUEL SUPPLY)		
	LS		\$	\$

**TOWN OF ENFIELD NH ROUTE 4A SEWER EXTENSION PROJECT**  
**BASE BID (SHAKER LANDING PUMP STATION REPLACEMENT REBID)**  
**TOTAL BID SUMMARY**  
**BID PROPOSAL**

**BASE BID (SHAKER LANDING PUMP STATION REPLACEMENT) SHEET SUMMARY**

Subtotal, Page 3.5	\$ _____
Subtotal, Page 3.6	\$ _____
TOTAL SHAKER LANDING BASE BID PRICE	\$ _____

\_\_\_\_\_

Total Base Bid Price in Words

\_\_\_\_\_  
(Signature of BIDDER)

\_\_\_\_\_  
(Title of BIDDER)

\_\_\_\_\_  
(Business Address of BIDDER)

\_\_\_\_\_  
(Town)                      (State)                      (Zip Code)

Dated at:                      this                      day of                      , 2017

\_\_\_\_\_

A-3.8  
BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, \_\_\_\_\_  
\_\_\_\_\_ as Principal, and  
\_\_\_\_\_ as Surety, are hereby  
held and firmly bound unto \_\_\_\_\_ as OWNER  
in the penal sum of \_\_\_\_\_  
for the payment of which, well and truly to be made, we hereby jointly and severally bind  
ourselves, successors and assigns.

Signed, this \_\_\_\_\_ day of \_\_\_\_\_

The Condition of the above obligation is such that whereas the Principal has submitted to  
\_\_\_\_\_  
a certain BID, attached hereto and hereby made a part hereof to enter into a contract in writing, for  
the \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

NOW, THEREFORE,

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

A-3.9

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

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

\_\_\_\_\_  
Principal

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

\_\_\_\_\_  
Surety

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

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

A-3.8  
BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, \_\_\_\_\_  
\_\_\_\_\_ as Principal, and  
\_\_\_\_\_ as Surety, are hereby  
held and firmly bound unto \_\_\_\_\_ as OWNER  
in the penal sum of \_\_\_\_\_  
for the payment of which, well and truly to be made, we hereby jointly and severally bind  
ourselves, successors and assigns.

Signed, this \_\_\_\_\_ day of \_\_\_\_\_

The Condition of the above obligation is such that whereas the Principal has submitted to  
\_\_\_\_\_  
a certain BID, attached hereto and hereby made a part hereof to enter into a contract in writing, for  
the \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

NOW, THEREFORE,

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



A-3.9

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

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

\_\_\_\_\_  
Principal

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

\_\_\_\_\_  
Surety

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

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

## **B. CONTRACT**

**NOTICE OF AWARD**

Dated \_\_\_\_\_, 20 \_\_\_\_

TO: \_\_\_\_\_  
(BIDDER)

ADDRESS: \_\_\_\_\_

OWNER'S PROJECT NO: \_\_\_\_\_

PROJECT: TOWN OF ENFIELD NH ROUTE 4A SEWER EXTENSION PROJECT "SHAKER  
LANDING PUMP STATION REPLACEMENT"

OWNER'S CONTRACT NO: \_\_\_\_\_

CONTRACT FOR: TOWN OF ENFIELD

\_\_\_\_\_  
(Insert name of contract as it appears in 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 ten 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.

B-1.2

3. (List other conditions precedent).

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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 ten 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.

Town of Enfield  
(OWNER)

By \_\_\_\_\_  
(AUTHORIZED SIGNATURE)

\_\_\_\_\_  
(TITLE)

ACCEPTANCE 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 Town of Enfield, hereinafter called "**OWNER**"  
(Name of Owner)  
and \_\_\_\_\_ doing business as (an individual,) or (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

Town of Enfield, NH Route 4A Sewer Extension Project "Shaker Landing Pump Station Replacement  
(Project)

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 10 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:

60 Calendar days for substantial completion (Winter Shutdown)

81 Calendar days for final completion (Expected in Spring of 2018)

Liquidated damages will be in the amount of \$ 400 for each calendar day of delay from the date established for substantial completion and \$ 200 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 \_\_\_\_\_

No. \_\_\_\_\_ , dated \_\_\_\_\_ , 20 \_\_\_\_\_

B-2.3

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 7 copies, each of which shall be deemed an original on the date first above written.

**OWNER:** \_\_\_\_\_

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

Name: \_\_\_\_\_  
(Please type)

(SEAL)

ATTEST: \_\_\_\_\_

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

Title: \_\_\_\_\_

**CONTRACTOR:** \_\_\_\_\_

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

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

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

\_\_\_\_\_

(SEAL)

ATTEST: \_\_\_\_\_

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

Title: \_\_\_\_\_

**PAYMENT BOND**

**KNOW ALL MEN BY THESE PRESENTS:** that

\_\_\_\_\_

(Name of Contractor)

\_\_\_\_\_

(Address of Contractor)

a \_\_\_\_\_, hereinafter called Principal,  
(Corporation, Partnership or Individual)

and \_\_\_\_\_  
(Name of Surety)

\_\_\_\_\_

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto

\_\_\_\_\_

(Name of Owner)

\_\_\_\_\_

(Address of Owner)

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.



## B-3.2

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.

B-3.3

IN WITNESS WHEREOF, this instrument is executed in \_\_\_\_\_ counterparts, each one of  
(number)  
which shall be deemed an original, this \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_ .

ATTEST:

By: \_\_\_\_\_  
(Principal) Secretary

(SEAL)

\_\_\_\_\_  
Principal

BY

\_\_\_\_\_

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

By: \_\_\_\_\_  
Witness as to Principal

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

\_\_\_\_\_  
(Surety)

ATTEST:

BY

\_\_\_\_\_  
Attorney - in - Fact

By \_\_\_\_\_  
Witness as to Surety

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

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
(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

\_\_\_\_\_

(Name of Contractor)

\_\_\_\_\_

(Address of Contractor)

a \_\_\_\_\_, hereinafter called Principal,  
(Corporation, Partnership or Individual)

and \_\_\_\_\_  
(Name of Surety)

\_\_\_\_\_

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto

**TOWN OF ENFIELD, NEW HAMPSHIRE**

\_\_\_\_\_

(Name of Owner)

23 Main St (PO Box 373) Enfield, New Hampshire 03748

\_\_\_\_\_

(Address of Owner)

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.

B-4.2

**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  
(number)  
which shall be deemed an original, this \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_ .

**ATTEST:**

By: \_\_\_\_\_  
(Principal) Secretary

(SEAL)

\_\_\_\_\_  
Principal

**BY**

\_\_\_\_\_

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

By: \_\_\_\_\_  
Witness as to Principal

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

\_\_\_\_\_  
(Surety)

**ATTEST:**

By \_\_\_\_\_  
Witness as to Surety

\_\_\_\_\_

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

**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 17

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

ADDRESS: \_\_\_\_\_  
\_\_\_\_\_

OWNER'S PROJECT NO. \_\_\_\_\_

TOWN OF ENFIELD, NH ROUTE 4A SEWER EXTENSION PROJECT  
PROJECT: "SHAKER LANDING PUMP STATION REPLACEMENT"

OWNER'S CONTRACT NO. \_\_\_\_\_

CONTRACT FOR: TOWN OF ENFIELD, NEW HAMPSHIRE

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:

\_\_\_\_\_  
(add other requirements)

Copy to ENGINEER

(Use certified Mail, return Receipt Requested)

Town of Enfield

\_\_\_\_\_  
(owner)

By

\_\_\_\_\_  
(Authorized Representative)

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

**ACCEPTANCE OF NOTICE**

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

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

Employer Identification

this the \_\_\_\_\_, 20 \_\_\_\_\_

Number: \_\_\_\_\_

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

**CHANGE ORDER**

No. \_\_\_\_\_

PROJECT: NH Route 4A Sewer Extension  
Project "Shaker Landing Pump  
Station Replacement." DATE OF ISSUANCE: \_\_\_\_\_  
 OWNER: 23 Main St (PO Box 373)  
Enfield, NH 03748  
 (Address)  
 CONTRACTOR: \_\_\_\_\_ OWNER's Project No. \_\_\_\_\_  
 CONTRACT FOR: Town of Enfield ENGINEER \_\_\_\_\_  
 ENGINEER's Project No. 10068-05

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 or date)
Previous Change Orders \$ _____	Net change from previous Change Orders _____ (days)
Contract Price prior to this Change Order \$ _____	Contract Time prior to this Change Order _____ (days or date)
Net Increase (Decrease) of this Change Order \$ _____	Net Increase (decrease) this Change Order _____ (days)
Contract Price with all approved Change Orders \$ _____	Contract Time with all Change Orders _____ (days or 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: APPROVED: APPROVED: APPROVED:  
 By: \_\_\_\_\_ By: \_\_\_\_\_ By: \_\_\_\_\_ By: \_\_\_\_\_  
 Engineer Owner Contractor NHDES  
 \_\_\_\_\_  
 Date Date Date Date



B-7.2

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 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
NH DEPARTMENT OF ENVIRONMENTAL SERVICES
CLEAN WATER STATE REVOLVING FUND (CWSRF)



Owner's Project No. \_\_\_\_\_ Engineer's Project No. 10068-05
Project Town of Enfield, NH Route 4A Sewer Extension Project
"Shaker Landing Pump Station Replacement"
Owner: Town of Enfield, New Hampshire
Contractor: \_\_\_\_\_
Engineer: Pathways Consulting, LLC

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: \_\_\_\_\_

**CONTRACTOR'S AFFIDAVIT**

STATE OF: \_\_\_\_\_

COUNTY OF: \_\_\_\_\_

Before me, the undersigned, a \_\_\_\_\_  
(Notary Public, Justice of Peace, Alderman)

in and for said County and State personally  
appeared,

\_\_\_\_\_ who being duly sworn according to law  
(Individual, Partner or duly  
authorized representative of corporate contractor)

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

and \_\_\_\_\_ of \_\_\_\_\_  
(Contractor) (Owner)  
(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/Owner

Contractor

Project: NH Route 4A Sewer Extension Project  
“Shaker Landing Pump Station Replacement”

Name \_\_\_\_\_

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

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

\_\_\_\_\_  
City State Zip

\_\_\_\_\_  
City State Zip

Owner: Town of Enfield, NH  
\_\_\_\_\_

Contractor License: \_\_\_\_\_

Contract Date: \_\_\_\_\_

**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 \_\_\_\_\_

**CERTIFICATE OF SUBSTANTIAL COMPLETION**

OWNER's Project No.: \_\_\_\_\_ ENGINEER's Project No.: 10068-05

Project: Town of Enfield, NH Route 4A Sewer Extension Project  
"Shaker Landing Pump Station Replacement"

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: Town of Enfield, NH  
(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

\_\_\_\_\_  
(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 date of Substantial Completion.

B-7.2

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 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
NH DEPARTMENT OF ENVIRONMENTAL SERVICES
CLEAN WATER STATE REVOLVING FUND (CWSRF)



Owner's Project No. \_\_\_\_\_ Engineer's Project No. 10068-05
Project Town of Enfield, NH Route 4A Sewer Extension Project
"Shaker Landing Pump Station Replacement"
Owner: Town of Enfield, New Hampshire
Contractor: \_\_\_\_\_
Engineer: Pathways Consulting, LLC

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: \_\_\_\_\_

**CONTRACTOR'S AFFIDAVIT**

STATE OF: \_\_\_\_\_

COUNTY OF: \_\_\_\_\_

Before me, the undersigned, a \_\_\_\_\_  
(Notary Public, Justice of Peace, Alderman)

in and for said County and State personally  
appeared,

\_\_\_\_\_ who being duly sworn according to law  
(Individual, Partner or duly  
authorized representative of corporate contractor)

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 \_\_\_\_\_ 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/Owner

Contractor

Project: NH Route 4A Sewer Extension Project  
“Shaker Landing Pump Station Replacement”

Name \_\_\_\_\_

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

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

\_\_\_\_\_  
City State Zip

\_\_\_\_\_  
City State Zip

Owner: Town of Enfield, NH  
\_\_\_\_\_

Contractor License: \_\_\_\_\_

Contract Date: \_\_\_\_\_

**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 \_\_\_\_\_



**EXHIBIT 1**

**GENERAL APPLICATION FOR PAYMENT FORM**

# APPLICATION AND CERTIFICATE FOR PAYMENT

TO (OWNER): **Town of Enfield, NH**  
**23 Main Street**  
**Enfield, NH 03748**

PROJECT: **Town of Enfield NH Route 4A**  
**Sewer Extension Project**  
**"Shaker Landing Pump Station**  
**Replacement Project"**

APPLICATION NO.:   1  

FROM (CONTRACTOR): **Name**  
**Mailing Address**  
**Town/City, State, Zip**

VIA (ENGINEER): **Pathways Consulting, LLC.**

PERIOD TO:

OWNER PROJECT NO:  
**10068-05**

CONTRACT FOR: **Town of Enfield, NH**

## CONTRACTOR'S APPLICATION FOR PAYMENT

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total Change Orders approved	\$ _____	\$ _____ -
previous months by Owner	\$ _____ -	\$ _____ -
Total Approved this Month	\$ _____ -	\$ _____ -
<b>TOTALS</b>	\$ _____	\$ _____ -
NET APPROVED CHANGES	\$ _____	

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

BY: \_\_\_\_\_ DATE: \_\_\_\_\_

State of: \_\_\_\_\_ County of: \_\_\_\_\_

Subscribed and swore before me on:

Notary Public:

My Commission expires:

Application is made for payment, as shown below, in connection with the Contract.

**Continuation Sheets are attached.**

1. ORIGINAL CONTRACT SUM.....	\$ _____
2. NET CHANGE BY CHANGE ORDER.....	\$ _____
3. CONTRACT SUM TO DATE (LINE 1+ 2).....	\$ _____
4. TOTAL COMPLETED & STORED TO DATE.....	\$ _____
5. RETAINAGE:	
a. <u>  10%  </u> of Contract Sum to Date	\$ _____
Completed Total on Backup Sheet	
b. <u>  5%  </u> of Stored Material	\$ _____
Stored Total on Line 4b	
Total Retainage (Line 5a + 5b <b>or</b>	
Total Retainage from Backup Sheets.....	\$ _____ <b>0.00</b>
6. TOTAL EARNED LESS RETAINAGE.....	\$ _____ <b>0.00</b>
(Line 4 less Line 5 Total)	
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT.....\$	_____ <b>0.00</b>
(Line 6 from prior Certificate)	
8. CURRENT PAYMENT DUE.....	\$ _____ <b>0.00</b>
9. BALANCE TO FINISH, PLUS RETAINAGE.....	\$ _____ <b>0.00</b>
(Line 3 less Line 6)	

## ENGINEERS CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Engineer certifies to the Owner that to the best of the Engineer's knowledge, information, and belief, the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT RECOMMENDED.

AMOUNT RECOMMENDED FOR PAYMENT..... \$ \_\_\_\_\_

Engineer: **Pathways Consulting, LLC**

BY: \_\_\_\_\_ DATE: \_\_\_\_\_

Owner: **Town of Enfield, New Hampshire**

BY: \_\_\_\_\_ DATE: \_\_\_\_\_

THIS CERTIFICATE IS NOT NEGOTIABLE. THE AMOUNT RECOMMENDED IS PAYABLE ONLY TO THE CONTRACTOR NAMED HEREIN. ISSUANCE, PAYMENT AND ACCEPTANCE OF PAYMENT ARE WITHOUT PREJUDICE TO ANY RIGHTS OF THE OWNER OR CONTRACTOR UNDER THIS CONTRACT.



## **C. GENERAL CONDITIONS**

**May 2015**

## GENERAL CONDITIONS

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3. Additional Instructions and Detail Drawings
4. Shop or Setting Drawings
5. Materials, Services, Facilities and Workmanship
6. Contractor's Title to Materials
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**GENERAL CONDITIONS**

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## GENERAL CONDITIONS

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.

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.

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.

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.
- 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 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 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 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.

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. On such work an additional percentage of the reasonable cost (before addition of the 15 percent) will be paid to the Contractor for his work in directing the operations of the Subcontractor, for administrative supervision, and for any overhead costs. Such percentage shall be in accordance with the following schedule: reasonable cost up to and including \$50,000—10 percent; next \$50,000 to and including \$100,000—7½ percent; greater than \$100,000—5 percent.

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.

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.

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 shall make an equitable adjustment and 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.

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 it is submitted, 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 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 58.

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 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 has been completed to the extent that the Owner may occupy and/or make use of the work 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.

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.

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.
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 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.
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 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 can not 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.

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.

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.

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.

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 of 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.

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 other wise 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 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.

**D. FEDERAL PROVISIONS, RULES  
REGULATIONS AND FORMS**

**CWSRF/DWSRF  
January 2017**

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



### Pertinent Federal Acts

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

### Forms

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

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

### Links for more Information

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

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

**(To be submitted with each application for payment)**

Name of Contractor: \_\_\_\_\_

Address of Contractor: \_\_\_\_\_

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

Project Number: \_\_\_\_\_

Project Location: \_\_\_\_\_

Payment Application No.: \_\_\_\_\_

Payment App. End Date: \_\_\_\_\_

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

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

CONTRACTOR: \_\_\_\_\_  
Name of Responsible Official

\_\_\_\_\_  
Title

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

**NOTICE TO LABOR UNIONS OR OTHER ORGANIZATIONS OF WORKERS**

**NONDISCRIMINATION IN EMPLOYMENT**

To: \_\_\_\_\_  
(Name of union or organization of workers)

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

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

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

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

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

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

C/S/

\_\_\_\_\_  
(Contractor or Subcontractor)

\_\_\_\_\_  
Date

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

## D-4.1

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

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

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

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

1. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.
2. The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.
3. The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.
4. The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
5. The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

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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

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- (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

#### D-4.4

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.

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- 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



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Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).
10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.
11. The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.
12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.
13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.
14. The Contractor shall designate a responsible official to monitor all employment-related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, Contractors shall not be required to maintain separate records.
15. Nothing herein provided shall be construed as a limitation upon application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

**ENVIRONMENTAL PROTECTION AGENCY**

**OFFICE OF WATER PROGRAMS OPERATIONS**

**CERTIFICATION OF NONSEGREGATED FACILITIES**

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

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

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

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

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

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

---

Signature

Date

---

Name and Title of Signer (Please Type)

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

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

## **DBE Rule- Program Requirements**

### Purpose

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

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

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

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

### **1. Fair Share Objectives (MBE/WBE goals)**

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

#### Current Fair Share Objectives/Goals:

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

### **2. Good Faith Efforts**

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

- (a) Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities; including placing DBEs on solicitation lists and soliciting them whenever they are potential sources.
- (b) Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. This includes,

whenever possible, posting solicitation for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date.

- (c) Consider in the contracting process whether firms competing for large contracts could be contracted with DBEs. This will include dividing total requirements when economically feasible into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.
- (d) Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.
- (e) Use the services and assistance of the Small Business Administration and the Minority Business Development Agency of the U. S. Department of Commerce.

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

### **3. Annual Reporting of MBE/WBE Accomplishments**

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

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

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

#### **{NOTE TO ENGINEER**

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

### **4. Contract Administration Requirements**

The Contractor shall:

- (a) Pay all subcontractors for satisfactory performance no more than 30 days from the prime contractor's receipt of payment from the loan recipient.
- (b) Notify Owner in writing prior to the termination of any DBE subcontractor for Contractor's convenience.
- (c) Employ the good faith efforts when soliciting a replacement subcontractor if a DBE subcontractor fails to complete work under the subcontract for any reason.

- (d) Employ the good faith efforts even if the prime contractor has achieved its fair share objective
- (e) Comply with the following term and condition, as required by 40 CFR, Section 33.106:

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

## **5. Bidders List Requirements**

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

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

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

## **6. Other Reporting**

- (a) DBE Subcontractor Performance and Utilization Forms

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

- (b) Bidders List Reporting

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



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 Approved: 8/13/2013  
 Approval Expires: 8/31/2015

**Disadvantaged Business Enterprise (DBE) Program  
 DBE Subcontractor Participation Form**

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

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

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

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

<sup>2</sup> 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.





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 Approved: 8/13/2013  
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**Disadvantaged Business Enterprise (DBE) Program  
 DBE Subcontractor Performance Form**

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

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

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

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

<sup>2</sup> 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.





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**Disadvantaged Business Enterprise (DBE) Program  
 DBE Subcontractor Performance Form**

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

<b>Prime Contractor Signature</b>	<b>Print Name</b>
<b>Title</b>	<b>Date</b>

<b>Subcontractor Signature</b>	<b>Print Name</b>
<b>Title</b>	<b>Date</b>

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.



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 Approval Expires: 8/31/2015

**Disadvantaged Business Enterprise (DBE) Program  
 DBE Subcontractor Utilization Form**

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

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

I have identified potential DBE certified subcontractors	<input type="radio"/> YES	<input checked="" type="radio"/> NO	
If yes, please complete the table below. If no, please explain:			
		<input type="radio"/>	
		<input type="radio"/>	
<b>Subcontractor Name/ Company Name</b>	<b>Company Address/ Phone/ Email</b>	<b>Est. Dollar Amt</b>	<b>Currently DBE Certified?</b>

\_\_\_\_\_ Continue on back if needed \_\_\_\_\_

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

<sup>2</sup> 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.



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**Disadvantaged Business Enterprise (DBE) Program  
 DBE Subcontractor Utilization Form**

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

<b>Prime Contractor Signature</b>	<b>Print Name</b>
<b>Title</b>	<b>Date</b>

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

**D-6.10**  
**New Hampshire State Revolving Fund**  
**BIDDERS LIST**

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

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

<b>Firm Name, Contact, &amp; Address</b>	<b>Phone/ E-mail/Fax</b>	<b>Contract Item No. and Description of Work to be Performed</b>	<b>Bid or Quote Date</b>	<b>Entity Status as Certified MBE/WBE?</b>
<i>Name &amp; Contact</i>	<i>Phone</i>			YES <input type="checkbox"/> WBE; or <input type="checkbox"/> MBE
<i>Address</i>	<i>E-mail</i>			<input type="checkbox"/> NO
<i>City State Zip</i>	<i>Fax (optional)</i>			
<i>Name &amp; Contact</i>	<i>Phone</i>			YES <input type="checkbox"/> WBE; or <input type="checkbox"/> MBE
<i>Address</i>	<i>E-mail</i>			<input type="checkbox"/> NO
<i>City State Zip</i>	<i>Fax (optional)</i>			
<i>Name &amp; Contact</i>	<i>Phone</i>			YES <input type="checkbox"/> WBE; or <input type="checkbox"/> MBE
<i>Address</i>	<i>E-mail</i>			<input type="checkbox"/> NO
<i>City State Zip</i>	<i>Fax (optional)</i>			
<i>Name &amp; Contact</i>	<i>Phone</i>			YES <input type="checkbox"/> WBE; or <input type="checkbox"/> MBE
<i>Address</i>	<i>E-mail</i>			<input type="checkbox"/> NO
<i>City State Zip</i>	<i>Fax (optional)</i>			
<i>Name &amp; Contact</i>	<i>Phone</i>			YES <input type="checkbox"/> WBE; or <input type="checkbox"/> MBE
<i>Address</i>	<i>E-mail</i>			<input type="checkbox"/> NO
<i>City State Zip</i>	<i>Fax (optional)</i>			



## American Iron and Steel

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

### **1. EPA AIS GUIDANCE**

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

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

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

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

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

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

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

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

#### **(c) Primarily Iron or Steel** [EPA guidance dated 3-20-2014, Question 12]

*Primarily iron or steel places constraints on the list of products above. For one of the listed products to be considered subject to the AIS requirements, it must be made of greater than 50%*

## American Iron and Steel

*iron or steel, measured by cost. The cost should be based on the material costs. [See example at EPA guidance dated 3-20-2014, Question 13]*

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

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

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

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

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

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

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

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

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

*The exemption above only applies to coatings on the external surface of iron and steel components. It does not apply to coatings or linings on internal surfaces of iron and steel products, such as the lining of lined pipes. All manufacturing processes for lined pipes,*

## American Iron and Steel

*including the application of pipe lining, must occur in the United States for the product to be compliant with AIS requirements.*

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

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

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

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

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



## American Iron and Steel

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

*Construction materials are those articles, materials, or supplies made primarily of iron and steel, that are permanently incorporated into the project, not including mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered “structural steel”. This includes, but is not limited to, the following products: wire rod, bar, angles, concrete reinforcing bar, wire, wire cloth, wire rope and cables, tubing, framing, joists, trusses, fasteners (i.e., nuts and bolts), welding rods, decking, grating, railings, stairs, access ramps, fire escapes, ladders, wall panels, dome structures, roofing, ductwork, surface drains, cable hanging systems, manhole steps, fencing and fence tubing, guardrails, doors, and stationary screens.*

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

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

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

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

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

*The following examples (including their appurtenances necessary for their intended use and operation) are NOT considered construction materials: pumps, motors, gear reducers, drives (including variable frequency drives (VFDs)), electric/pneumatic/manual accessories used to operate valves (such as electric valve actuators), mixers, gates (i.e., common sluice and slide gates), motorized screens (such as traveling screens), blowers/aeration equipment [<sup>+</sup>], compressors, meters [<sup>++</sup>], 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*

## American Iron and Steel

*systems, metal office furniture, shelving, laboratory equipment, analytical instrumentation, and dewatering equipment.*

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

<sup>++</sup> [From EPA guidance dated 9-10-2014, Q/A No. 14 on meters]  
*“Meters” includes any type of meter, including: flow meters, wholesale meters, and water meters/service connections*

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

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

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

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

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

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

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

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

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

## American Iron and Steel

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

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

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

*Valves and actuators, while often purchased and shipped together, are two unique products that are manufactured separately and typically attached together during the final step of the process. Valves are included in the definition of "iron and steel products" in the AIS requirement. Actuators, whether manual, electric, hydraulic or pneumatic, are not listed as an "iron and steel product" under the AIS requirement of the Consolidated Appropriations Act of 2014, nor are they considered construction materials. Therefore, they do not need to be domestically produced in the U.S. in order to comply with the requirement.*

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

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

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

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

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

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

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

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

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

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

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

*The AIS guidance does not address reuse of items. Reuse of items that would otherwise be covered by AIS is acceptable provided that the item(s) was originally purchased prior to January 17, 2014, the reused item(s) is not substantially altered from original form/function, and any restoration work that may be required does not include the replacement or addition of foreign iron or steel replacement parts. EPA recommends keeping a log of these reused items by including them on the assistance recipient’s de minimis list, and stating therein that these items are reused products. The donation of new items (such as a manufacturer waiving cost for certain delivered items because of concerns regarding the origin of a new product) is not, however, considered reuse.*

## **2. CERTIFICATION**

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

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

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

## **3. DE MINIMIS WAIVER**

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

## American Iron and Steel

**and up-to-date De Minimis Report in each application for payment.** The Contractor shall also provide the report to the Owner upon request.

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

*There is no broad exemption for fasteners from the American Iron and Steel (AIS) requirements. Significant fasteners used in SRF projects are not subject to the de minimis waiver for projects and must comply with the AIS requirements. Significant fasteners include fasteners produced to industry standards (e.g., ASTM standards) and/or project specifications, special ordered or those of high value. When bulk purchase of unknown-origin fasteners that are of incidental use and small value are used on a project, they may fall under the national de minimis waiver for projects. The list of potential items could be varied, such as big-box/hardware-store-variety screws, nails, and staples. The key characteristics of the items that may qualify for the de minimis waiver would be items that are incidental to the project purpose (such as drywall screws) and not significant in value or purpose (such as common nails or brads). See the following: [http://water.epa.gov/grants\\_funding/upload/Deminimis-Waiver-04-15-14.pdf](http://water.epa.gov/grants_funding/upload/Deminimis-Waiver-04-15-14.pdf).*

#### **4. INSTALLATION**

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

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American Iron and Steel Manufacturer Certification

Date \_\_\_\_\_

Manufacturer Name \_\_\_\_\_

Manufacturer Address \_\_\_\_\_

City, State Zip \_\_\_\_\_

Project Name \_\_\_\_\_

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

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

Item, Products and/or Material \_\_\_\_\_

Item, Products and/or Material \_\_\_\_\_

Item, Products and/or Material \_\_\_\_\_

Such process took place at the following location: \_\_\_\_\_

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

Item, Products and/or Materials \_\_\_\_\_

Item, Products and/or Materials \_\_\_\_\_

Item, Products and/or Materials \_\_\_\_\_

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

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

\_\_\_\_\_  
(Signature of Authorized Manufacturer Representative)

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

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### American Iron and Steel

#### Required Subcontract and Purchase Agreement Language

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

*“\_\_\_\_\_ (Subcontractor/Supplier) acknowledges to and for the benefit of the \_\_\_\_\_ (Owner) and the State of New Hampshire (State) that it understands the goods and service under this contract or purchase agreement (Agreement) are being funded with monies that are subject to statutory requirements commonly known as “American Iron and Steel;” (P.L. 113-76, Consolidated Appropriation Act, 2014, Water Resources Reform and Development Act of 2014, the Consolidated and Further Continuing Appropriations Act, 2015 and P.L. 114-113, the Consolidated Appropriations Act, 2016) that requires all of the iron and steel products used in the project to be produced in the United States (“American Iron and Steel Requirement”) including iron and steel products provided under this contract or Agreement. The Subcontractor/Supplier hereby represents and warrants to and for the benefit of the Owner and the State that (a) the Subcontractor/Supplier has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Subcontractor/Supplier will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Owner or the State.”*

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BIDDER'S AMERICAN IRON AND STEEL ACKNOWLEDGEMENT

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

Project Name: \_\_\_\_\_
City/Town/Entity: \_\_\_\_\_
Bidder Name: \_\_\_\_\_
Bidder Address: \_\_\_\_\_

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

The Bidder hereby presents and warrants to and for the benefit of the Owner and State that (a) the Bidder has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Bidder will provide any further verified information, certification or assurance of compliance with this Acknowledgement, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Owner or the State

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

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

"\_\_\_\_\_ (Subcontractor/Supplier) acknowledges to and for the benefit of the \_\_\_\_\_ (Owner) and the State of New Hampshire (State) that it understands the goods and service under this contract or purchase agreement (Agreement) are being funded with monies that are subject to statutory requirements commonly known as "American Iron and Steel;" (P.L. 113-76, Consolidated Appropriation Act, 2014, Water Resources Reform and Development Act of 2014, the Consolidated and Further Continuing Appropriations Act, 2015 and/or P.L. 114-113, the Consolidated Appropriations Act, 2016) that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel Requirement") including iron and steel products provided under this contract or Agreement. The Subcontractor/Supplier hereby represents and warrants to and for the benefit of the Owner and the State that (a) the Subcontractor/Supplier has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Subcontractor/Supplier will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Owner or the State.

(Signature of Certifying Bidder Representative)

(Date)



## American Iron and Steel

### DE MINIMIS WAIVER



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

OFFICE OF WATER

#### DECISION MEMORANDUM

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

**FROM:** Nancy K. Stoner  
Acting Assistant Administrator

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

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

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

## American Iron and Steel

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

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

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

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

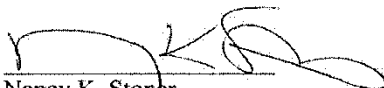
Assistance recipients who wish to use this waiver should in consultation with their contractors determine the items to be covered by this waiver and must retain relevant documentation (i.e., invoices) as to those items in their project files.

D-7.14

## American Iron and Steel

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

Issued on: APR 15 2014

Approved by:   
Nancy K. Stoner  
Acting Assistant Administrator

**D-7.15  
American Iron and Steel**



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



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

Owner: \_\_\_\_\_ Project Name: \_\_\_\_\_

Contractor: \_\_\_\_\_ CWSRF/DWSRF Project #: \_\_\_\_\_

1. Has Contractor purchased or used AIS materials that will be covered under this waiver? <input type="checkbox"/> yes <input type="checkbox"/> no (If "yes, continue to box 2. If "no", sign below in box 3.)
--

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

2. Total cost of materials used in and incorporated into the project: _____ De Minimis 5% Limit : _____  Have all materials been delivered? <input type="checkbox"/> yes <input type="checkbox"/> no
--

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

**Total Cost of De Minimis Components \*\*:**

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

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

3.	Contractor Signature: _____ Title: _____  Printed Name: _____ Date: _____
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**D-7.16**  
**American Iron and Steel**

**AMERICAN IRON AND STEEL PROJECT CERTIFICATION**  
**NEW HAMPSHIRE CLEAN WATER STATE REVOLVING FUND (CWSRF) AND**  
**DRINKING WATER STATE REVOLVING FUND (DWSRF)**

**Instructions**

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

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

City/Town/Entity: \_\_\_\_\_

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

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

Name/Title of Contractor Certifying Representative: \_\_\_\_\_

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

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

OR

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

\_\_\_\_\_

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

Signature of Certifying Contractor Representative: \_\_\_\_\_

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

Acknowledged by Authorized Owner Representative: \_\_\_\_\_

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

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

(1) Minimum Wage

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

Wage determinations may be obtained from the U.S. Department of Labor's web site, [www.wdol.gov](http://www.wdol.gov).

(ii)(A) The Loan recipient, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the Loan recipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the Loan recipient(s) to the State award official. The State award official will transmit the request, to the Administrator of the Wage and

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

Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the Loan Recipient (s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding.

The Loan recipient(s), shall upon written request of the Contracting Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

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

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the Loan recipient, that is, the entity that receives the sub-grant or Loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the Loan recipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the Loan recipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. **It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the Loan recipient(s).**

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:



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

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees-

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work

**Attachment A**  
**NH Department of Environmental Service**  
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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.

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(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.

**Attachment A**  
**NH Department of Environmental Service**  
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29 CFR 5.5(a)

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (a)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The Loan recipient, upon written request of the Contracting Official or an authorized representative of the Department of Labor, shall withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (a)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (a)(1) through (4) of this section.

(b) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Prime Contractor shall insert a clause requiring that the subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Prime Contractor shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the subcontractor for inspection, copying, or transcription by authorized representatives of NH DES and the Department of Labor, and the subcontractor will permit such representatives to interview employees during working hours on the job.

## **Attachment B Davis-Bacon Wage Rates**

The “Heavy” General Wage Decision (GWD) for Grafton County NH22, Publication Date 01/06/17 applies to this project.

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

The following guidance is for classifications/rates missing from the Heavy GWD:

**Skilled trade classifications: the minimum that may be approved is \$21.90 + \$3.32 fringe or a total rate of \$25.22 an hour.**

**Equipment operator classifications: the minimum that may be approved is \$22.50 + \$2.33 fringe or a total rate of \$24.83 an hour.**

**Flaggers must be paid a minimum of \$18.71 + \$2.74 fringe; or a total rate of \$21.45 an hour.**

General Decision Number: NH170022 01/06/2017 NH22

Superseded General Decision Number: NH20160022

State: New Hampshire

Construction Type: Heavy

County: Grafton County in New Hampshire.

HEAVY CONSTRUCTION PROJECTS

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.20 for calendar year 2017 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.20 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 calendar year 2017. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number 0 Publication Date 01/06/2017

\* SUNH2011-018 02/22/2011

	Rates	Fringes
CARPENTER, Includes Form Work....	\$ 21.90	3.32
LABORER: Common or General, Including Pipelaying.....	\$ 18.71	2.74
OPERATOR: Backhoe.....	\$ 25.00	6.00
OPERATOR: Bulldozer.....	\$ 25.00	1.91
OPERATOR: Excavator.....	\$ 22.50	2.33
OPERATOR: Loader.....	\$ 20.00	0.38
TRUCK DRIVER.....	\$ 17.50	1.82

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

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including

preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

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

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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.

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### WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

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

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

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

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

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

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

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material,



etc.) that the requestor considers relevant to the issue.

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

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

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

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END OF GENERAL DECISION



**ATTACHMENT C**

**USDOL CERTIFIED PAYROLL FORM**

**PAYROLL**

(For Contractor's Optional Use; See Instructions at [www.dol.gov/whd/forms/wh347instr.htm](http://www.dol.gov/whd/forms/wh347instr.htm))



Rev. Dec. 2008

Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number.

OMB No.: 1235-0008  
Expires: 02/28/2018

NAME OF CONTRACTOR <input type="checkbox"/> OR SUBCONTRACTOR <input type="checkbox"/>	ADDRESS
---	---------

PAYROLL NO.	FOR WEEK ENDING	PROJECT AND LOCATION	PROJECT OR CONTRACT NO.
-------------	-----------------	----------------------	-------------------------

(1) NAME AND INDIVIDUAL IDENTIFYING NUMBER (e.g., LAST FOUR DIGITS OF SOCIAL SECURITY NUMBER) OF WORKER	(2) NO. OF WITHHOLDING EXEMPTIONS	(3) WORK CLASSIFICATION	OT/RSST	(4) DAY AND DATE							(5) TOTAL HOURS	(6) RATE OF PAY	(7) GROSS AMOUNT EARNED	(8) DEDUCTIONS					(9) NET WAGES PAID FOR WEEK
				HOURS WORKED EACH DAY										FICA	WITH- HOLDING TAX	OTHER	TOTAL DEDUCTIONS		
				S	S	S	S	S	S	S									
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While completion of Form WH-347 is optional, it is mandatory for covered contractors and subcontractors performing work on Federally financed or assisted construction contracts to respond to the information collection contained in 29 C.F.R. §§ 3.3, 5.5(a). The Copeland Act (40 U.S.C. § 3145) contractors and subcontractors performing work on Federally financed or assisted construction contracts to "furnish weekly a statement with respect to the wages paid each employee during the preceding week." U.S. Department of Labor (DOL) regulations at 29 C.F.R. § 5.5(a)(3)(ii) require contractors to submit weekly a copy of all payrolls to the Federal agency contracting for or financing the construction project, accompanied by a signed "Statement of Compliance" indicating that the payrolls are correct and complete and that each laborer or mechanic has been paid not less than the proper Davis-Bacon prevailing wage rate for the work performed. DOL and federal contracting agencies receiving this information review the information to determine that employees have received legally required wages and fringe benefits.

**Public Burden Statement**

We estimate that it will take an average of 55 minutes to complete this collection, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. If you have any comments regarding these estimates or any other aspect of this collection, including suggestions for reducing this burden, send them to the Administrator, Wage and Hour Division, U.S. Department of Labor, Room S3502, 200 Constitution Avenue, N.W. Washington, D.C. 20210



**ATTACHMENT D**

**PROJECT SIGN**

Blue  
#333399

Green  
#336633

Blue  
#333399



Black

Blue  
#1050B7

Blue  
#3799FF

Green  
#0033CC



# POLLUTION CONTROL PROJECT

Yellow  
#FFFF00

PROJECT NUMBER CS-330 \_\_\_\_ - \_\_\_\_

Blue  
#000080

## PROJECT NAME

Funds Provided by NHDES State Revolving Fund

Black

Loan Amount: \$ \_\_\_\_\_

4'-0" x 8'-0" x 3/4" HIGH DENSITY OVERLAY  
PLYWOOD SIGNBOARD OR OTHER APPROVED  
MATERIAL SUITABLE FOR SIGNS

PROVIDE 4" x 4" SIGN POSTS OR OTHER  
ADEQUATE SUPPORTS TO MOUNT SIGN AT  
APPROVED LOCATION

## **DIVISION 01**

### **GENERAL REQUIREMENTS**

<u>Section No.</u>	<u>Title</u>	<u>No. of Pages</u>
01 10 00	Summary	2
01 10 10	Mobilization	2
01 10 30	Miscellaneous Work and Cleanup	2
01 10 40	Specifications and Drawings	2
01 10 90	Abbreviations and Terms	2
01 15 00	Measurement and Payment	14
01 32 00	Preconstruction Conference	2
01 32 50	Progress Schedules	2
01 40 00	Quality Requirements	5
01 42 00	Structure Leakage Testing	3
01 58 50	Project Signs	1
01 60 10	Submittals	2
01 70 00	Execution and Closeout Requirements	3
01 80 00	Performance Requirements	1

## SECTION 01 10 00

### SUMMARY

#### PART 1 - GENERAL

##### 1.01 PROJECT IDENTIFICATION

The project name is Town of Enfield, NH Route 4A Sewer Extension Project "Shaker Landing Pump Station Replacement" and is being completed in and for the Town of Enfield New Hampshire.

The project is being funded by the New Hampshire Department of Environmental Services CWSRF Program Loan.

Engineers Project Number is 10068-05.  
NHDES CWSRF Project No. is CS-330167-04.

These contract documents and the project drawings have been prepared by Pathways Consulting, LLC, Lebanon, New Hampshire who is acting as the Town's Engineer and Agent on the Project.

##### 1.02 DESCRIPTION OF WORK

###### A. Project Summary

Work includes:

1. Connection of the municipal sewer service to six buildings of the Shaker Landing Home Owner's Association (Shaker Landing) by decommissioning the existing septic tanks, and replacing the effluent pump station with a new solids handling pump station with backup generator. Installation of gravity sewer line and connecting this to the gravity sewer system.
- B. The Contractor shall provide a complete system installed, restored, ready for use and accepted by the Engineer and Owner in accordance with the Drawings and Contract Documents.

##### 1.03 COORDINATION

- A. The requirements of this Contract include complete coordination with the property owner, Municipal officials, NHDES officials, and local utility companies.
- B. This Contract also requires coordination and cooperation with all others working within the site area, including but not limited to, local municipal departments, various Contractors, local residents that live adjacent to the project areas, State and local regulatory personnel, and all others to whom access may not be restricted.



#### 1.04 PERMITS

The following permits have been applied for by the Owner, or need to be applied for by the Contractor. All conditions contained within the approved permit documents that are part of the responsibility of the Contractor during work installation shall be strictly complied with.

- A NHDES Shoreland Protection Permit by Notification 2017-00328

#### 1.05 PROJECT CONTACTS

- A. Town of Enfield, Department of Public Works, 74 Lockhaven Road, Enfield, New Hampshire 03748. Jim Taylor, Public Works Director, 603-632-4605
- B. Pathways Consulting, LLC. 240 Mechanic Street Suite 100, Lebanon, New Hampshire, 03766. Rod Finley, P.E., Project Manager; Jeff Durell, CPESC, Project Engineer/Contract Administrator 603-448-2200.

END OF SECTION 01 10 00

## SECTION 01 10 10

### MOBILIZATION

#### PART 1 – GENERAL

##### 1.01 DESCRIPTION

- A. This item shall consist of preparatory work and operations, including, but not limited to, those necessary to the movement of personnel, equipment, supplies, and incidentals to the site of the work; and for all other work and operations which must be performed or for costs which must be incurred prior the beginning work on the various items.

#### PART 2 – PRODUCTS

(Not Applicable)

#### PART 3 - EXECUTION

##### 3.01 BASIS OF PAYMENT

- A. Partial payments for this item will be made approximately as follows:
  - (a) When 5 percent of the original Contract amount is earned, the accumulated total to be paid will be 25 percent of the amount bid, or 2-1/2 percent of the original Contract amount, whichever is the lesser.
  - (b) When 10 percent of the original Contract amount is earned, the accumulated total to be paid will be 50 percent of the amount bid, or 5 percent of the original Contract amount, whichever is the lesser.
  - (c) When 25 percent of the original Contract amount is earned, the accumulated total to be paid will be 60 percent of the amount bid, or 6 percent of the original Contract amount, whichever is the lesser.
  - (d) When 50 percent of the original Contract amount is earned, the accumulated total to be paid will be 100 percent of the amount bid, or 10 percent of the original Contract amount, whichever is the lesser.
- B. Upon completion of all work, payment of any amount bid for this item in excess of 10 percent of the original Contract amount will be paid.
- C. Upon written request by the Contractor made within 30 days of the Award of Contract, an amount equal to 25 percent of the amount bid for this item or 1 percent of the Contract amount, whichever is lesser, will be paid.

- D. The total sum of all payments will not exceed the original Contract amount bid for this item, regardless of the fact that the Contractor may have, for any reason, shut down his work on the project or moved equipment away from the project and then back again.

END OF SECTION 01 10 10

## SECTION 01 10 30

### MISCELLANEOUS WORK, CLEANUP AND RECORDS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION OF WORK

Provide all labor, materials, and equipment necessary to complete miscellaneous items and cleanup not specified elsewhere. This section includes the following:

1. Temporary Facilities, Storage, Staging and Controls. For Contractor and Engineer. Field office shall be in accordance with section 01 10 45.
2. The cost of all bonds and insurances.
3. Coordination and cooperation with the NHDOT, other Contractor's working in the area, the local Public Works Department, Project Abutters, local utility companies, and other State and Local officials.
4. Protection of materials delivered to the site, stored on-site, and work which is in the process of or that has been completed on the project.
5. Collection and maintaining daily records of construction progress; drawings and survey, and completion of final records in accordance with section 01 70 00.
6. Excavation and work around existing utilities within the Project limits.
7. Temporary maintenance/bypass (including necessary pumping) of all existing drainage flows and sewer flows pertaining to the project scope.
8. Maintenance and installation construction lay down area.
9. Trench boxes, shoring, bracing, sheeting and all miscellaneous materials and equipment necessary to complete the project.
10. Development and distribution of utility disturbance and shutdown notices and coordination with abutting property owners throughout the project.
11. Shimming roadway to pavement grade from pavement sub-grade if trenches are not paved at the end of each day, gravel material, placement, hauling, storing, stockpiling, removal, grading, Disposal off site, maintenance, and all else necessary to complete is subsidiary.
12. Maintenance and implementation of daily erosion and sediment controls, inclusive of daily sweeping, dust control, ditch checks, daily cleanup of roadways, temporary mulching/seeding, maintenance of installed BMP's, erosion repairs and

all else necessary to comply with local, state, and federal regulations. Silt fence and erosion blanket shall be paid for under separate unit cost items.

13. Maintenance and implementation of daily traffic control, inclusive of all necessary barriers, cones, flaggers, signs, and notices.
14. Maintenance and implementation of daily traffic control, inclusive of all necessary barriers, cones, flaggers, signs, and notices.
15. All work and cost associated with dewatering groundwater within the work area and pre-treatment and discharge controls adjacent to the Lake.

#### PART 2 - PRODUCTS NOT USED

#### PART 3 – COOPERATIONS WITH OTHERS

##### 3.01 COOPERATION WITH OTHERS

Delays in the Work caused by the actions of others shall be expedited as promptly as possible by the Owner(s). The Contractor shall notify the Owner of any delays caused by circumstances beyond his control.

##### 3.02 SCHEDULE OF VALUES

- A. Contractor shall submit a detailed breakdown of miscellaneous work items in the form of a schedule of values with the Bid Proposal for review by the Engineer and the Owner prior to signing the Agreement. This breakdown will be used for partial payment of the included miscellaneous work items.
- B. Failure to comply with the requirements of related Sections or of items listed herein shall be cause for the withholding of sums defined in the lump sum breakdown schedule of values.

END OF SECTION 01 10 30

## SECTION 01 10 40

### SPECIFICATIONS AND DRAWINGS

#### PART 1 - GENERAL

##### 1.01 CONTRACT DOCUMENT DRAWINGS

The Specifications and Drawings referenced in this section may be modified by addenda and will be issued for construction purposes. The Drawings may be supplemented or suspended by such additional general and detail Drawings as may be necessary as the work progresses. The Drawings issued for construction at that time or after the signing of the Contract Documents will become the Contract Drawings.

##### 1.02 EXISTING AND ADJACENT CONDITIONS

Existing conditions and construction not intended as part of the Work are shown for informational purposes only. Before starting any work affected by such existing conditions, the Contractor shall have made himself familiar with all conditions affecting his work, and shall not be entitled to extra compensation for any work or expense arising from or caused by his failure to have verified all existing conditions.

##### 1.03 DIMENSIONS

In general, the Drawings are made to scale, but working dimensions shall be taken only from calculated dimensions or by actual measurements at the site. The Contractor shall compare all Drawings and verify all figures before laying out or constructing the work and shall be responsible for any and all errors in the work resulting from his failure to do so. Deviations from the Drawings and the dimensions given thereon shall be made only after corrected revision is obtained in writing from the Engineer. The Contractor shall take all measurements of existing established conditions regardless of the figured dimensions on the Drawings. When figured dimensions are not in agreement with the Contractor's measurements, the Contractor will adjust the measurement as necessary and provide the Engineer with justification for said revisions.

##### 1.04 DISCREPANCIES

Any discrepancies discovered during the Work between the Drawings, Specifications, and actual conditions shall be immediately brought to the attention of the Engineer. Work performed after such discovery, without the Engineer's knowledge, shall be at the risk of the Contractor. If discrepancies are discovered by the Contractor and the Engineer is properly notified, the Engineer shall be given reasonable time to correct the issue prior to the Contractor continuing with work.

1.05 DIAGRAMMATIC DRAWINGS

- A. Plans or Drawings where work is shown diagrammatically indicate general working systems. Drawings of a purely representational nature shall not be used to take off the specific items of the Work. To carry out the true intent and purpose of the Contract Documents, correct working systems or installations shall be included as if detailed on the Drawings.
- B. The location of equipment shown on the Drawings, unless exactly dimensioned, shall be considered as approximate only. The Contractor shall adjust the position of the equipment in accordance with good working practices to avoid interferences, provide proper clearance and space for operation and maintenance.

1.06 TYPICAL DETAILS

Where shown on the Drawings, typical details shall apply to each and every item of the Contract Work where such items are incorporated and the detail is applicable.

1.07 COPIES OF DRAWINGS FURNISHED

- A. The Engineer or the Owner will furnish the Contractor, without charge, up to four (4) copies of the Drawings and Specifications for execution of the Contract Work. Additional copies will be furnished at the Contractor's expense when requested.
- B. All Drawings and Specifications are the property of the Engineer or of the Owner. The Contractor shall return all copies if so requested.

PART 2 - PRODUCTS      NOT USED

PART 3 – EXECUTION      NOT USED

END OF SECTION 01 10 40

SECTION 01 10 90

ABBREVIATIONS AND TERMS

PART 1 - GENERAL

1.01 ABBREVIATIONS AND REFERENCES

A. The following abbreviations may be used in these Specifications:

AA	-	Aluminum Association
AAMA	-	Architectural Aluminum Manufacturers Association
AASHO	-	The American Association of State Highway Officials
ACI	-	American Concrete Institute
AGA	-	American Gas Association, Inc.
AGMA	-	American Gear Manufacturers Association
AIEE	-	American Institute of Electrical Engineers
AISC	-	American Institute of Steel Construction, Inc.
AITC	-	American Institute of Timber Construction
AMCA	-	- Air Moving and Conditioning Association
API	-	American Petroleum Institute
ARI	-	Air Conditioning and Refrigeration Institute
ASA	-	American Standards Association
ASCE	-	American Society of Civil Engineers
ASHRAE	-	American Society of Heating, Refrigeration, Air Conditioning Engineers
ASME	-	American Society of Mechanical Engineers
ASTM	-	American Society of Testing Materials
AWI	-	Architectural Woodwork Institute
AWPB	-	American Wood Preserves Bureau
AWS	-	American Welding Society, Inc.
AWWA	-	American Water Works Association
CIPRA	-	Cast Iron Pipe Research Association
CISPI	-	Cast Iron Soil Pipe Institute
CRSI	-	Concrete Reinforcing Steel Institute
CVEC	-	Connecticut Valley Electric Company
CVPS	-	Central Vermont Public Service Corporation
DIPRA	-	Ductile Iron Pipe Research Association
Fed.Spec	-	Federal Specifications
FO&M	-	Facilities Operations & Maintenance - Dartmouth College
GSE	-	Granite State Electric Co.
Milspec	-	Military Specifications
NAAMM	-	National Association of Architectural Metal Manufacturers
NEC	-	National Electrical Code
NEES	-	New England Electric Service



NEMA	-	National Electrical Manufacturers Association
NEMI	-	New England Masonry Institute, Inc.
NET	-	NYNEX (formerly New England Telephone Co.)
NEWWA	-	New England Water Works Association
NFPA	-	National Fire Protection Association
NHDES	-	New Hampshire Department of Environmental Services
NHDOT	-	New Hampshire Department of Transportation
NYNEX	-	Bell Atlantic (formerly NYNEX)
SCPI	-	Structural Clay Products Association
SDI	-	Steel Door Institute
SMACNA	-	Sheet Metal and Air Conditioning CONTRACTORs National Association
U.L.	-	Underwriters Laboratory
VAOT	-	Vermont Agency of Transportation

- B. Where reference is made to a specification by one of the above mentioned or other organizations, it is understood that the latest revision thereof shall apply.
- C. In case of conflict, this Contract Specification shall take precedence over the above-noted specifications.
- D. Intention of Terms: In order to avoid cumbersome and confusing repetition of expressions in these specifications, it is provided that whenever anything is, or is to be, done, determined, directed, specified, authorized, ordered, given, designated, indicated, considered necessary, deemed necessary, permitted, reserved, suspended, established, suitable, accepted, satisfactory, unsatisfactory, sufficient, insufficient, rejected, or condemned, it shall be understood as if the expression were followed by the words "by the Engineer" or "to the Engineer".

PART 2 – PRODUCTS      NOT USED

PART 3 – EXECUTION      NOT USED

END OF SECTION 01 10 90

## SECTION 01 15 00

### MEASUREMENT AND PAYMENT

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. This section describes the measurement and payment for the Work to be completed under each bid item in the Proposal. Work that is specified or shown on the drawings but not specifically designated as a Bid Proposal Item is considered incidental to the Contract.
- B. Payment Procedures are described in the Agreement, General Conditions and related sections.
- C. Individual bid items referencing NHDOT item No.'s in the bid item name shall comply with the NHDOT Specifications for Road and Bridge Construction 2016 for the material referenced.

##### 1.02 SUBMITTALS

- A. Within 7 days of the date of the Agreement, submit a schedule of values for all lump sum items. Break the items down in detail sufficient to determine the value of work at any degree of completion. Partial payment of lump sum items is based on the schedule of values as approved by the OWNER.
- B. Monthly applications for payment shall be on forms provided in these documents.

##### 1.03 SCHEDULING

- A. Notify the Engineer, as far in advance as possible, of the making of measurements so that the Engineer may observe existing conditions, work being performed, and measurements being made.
- B. Allow for and afford Engineer ample time, space and equipment to complete measurements and to verify contractor's measurements and elevations. If the contractor does not allow for the Engineer to make their measurements, the Engineer's calculated quantities will govern.

##### 1.04 PRODUCTS

- A. Provide all labor, materials, facilities, levels, measuring devices and all other equipment and items necessary to properly and accurately perform all measurements for payment purposes with the Engineer.

## 1.05 GENERAL REQUIREMENTS

### A. GENERAL REQUIREMENTS AND STIPULATION

1. Perform all measuring required under this section.
2. No separate payments will be made for work under the contract. All costs in connection with the Work shall be included in one or more of the pay items as appropriate.
3. Each pay item shall be full compensation for all costs in connection with the item including but not limited to:
  - a. The furnishing of all materials, labor, equipment, tools, and all incidentals
  - b. The installation of all materials, equipment, tools, and incidentals.
  - c. The proper share of overhead and profit.
  - d. Any excavation, trenching, backfilling, dewatering, shoring, or testing required.
  - e. The restoration of unpaved surfaces.
  - f. Any temporary facilities or controls required or found necessary.
  - g. Protection of all work being installed from damage.
  - h. Cost of shipping, handling, storing necessary for all materials.
  - i. All required testing of work and materials on the project.
  - j. All required recordkeeping (record drawings) for work installed.
  - k. All related and incidental work and items necessary or required to complete the work and to provide completely connected and operational and approved systems capable of performing as required.
4. Each pay item which specifically involves excavation shall be considered to include full compensation for:
  - a. Excavation in earth.
  - b. Disposal of any surplus.
  - c. Handling of water/dewatering as required.
  - d. Installation and removal of sheeting and bracing.
  - e. Required, bedding and backfill materials.
  - f. Furnishing and installing insulation as required.
  - g. Compaction
5. If solid rock excavation is required in accordance with section 31 23 16.26, additional compensation will be paid under the item "Rock Excavation" with the exception of items that specifically include payment for rock excavation.

## 1.06 EXECUTION

- A. The names of the following items may or may not be abbreviated form of the Bid items as contained in the Bid Proposal forms. The names, as shown below or on the Bid Form, shall not be construed to represent a complete description of all the work included under such items are provided only as a means of identification and for ease of conversation.

## PART 2 – MEASUREMENT AND PAYMENT

### 2.01 DESCRIPTION OF PAY ITEMS

#### A. Item SH1.01– Pump Station

1. Payment: shall be at the lump sum price as stated in the Bid Proposal. Inclusive of all excavation work, furnishing, installing, and testing structures, anti-flotation slabs, all miscellaneous components and piping, all required components (mechanical and electrical), and all else necessary to furnish and install a working pump station and approval by the Engineer in accordance with the Contract Documents and Drawings.
2. Measurement for payment shall be the percentage of work completed based on the schedule of values provided by the Contractor and accepted by the ENGINEER and/or OWNER.

#### B. Item SH1.02 - Decommissioning Existing Wastewater Components

1. Payment: shall be at the lump sum price as stated in the Bid Proposal. Inclusive of all necessary work in accordance with the drawings and specifications to decommission all existing onsite wastewater components. Work must be approved by the Engineer and Owner. Includes removal and disposal of concrete structure tops (as necessary) to place the structure to be abandoned below grade as required.
2. Measurement for payment shall be the percentage of work completed based on the schedule of values provided by the Contractor and accepted by the Engineer and/or Owner.

#### C. Item SH1.03, SH1.04 - Aggregate Base Courses

1. Payment: shall be at the unit price per cubic yard as stated in the Bid Proposal. Inclusive of furnishing and installing specified materials in accordance with the drawings and specifications. Payment shall include, but not limited to furnishing and installing select materials as required on the Drawings, compacting, dewatering, and all other work required for or incidental to the satisfactory completion of this item. All work shall comply with NHDOT standards.
2. Measurement shall be by in-place compacted section and average end-area calculation to limits depicted on the drawings as measured by the Engineer. Base thickness shall be as shown on the Drawings. Material weight slips and conversion calculations will not be accepted. Measurement will be made to the nearest ½ cubic yard.

D. Item SH1.05 - Woven Filter Fabric

1. Payment: shall be at the unit price per square yard as stated in the bid Proposal. Inclusive of furnishing and installing the item in accordance with the manufacturer's specifications as locations required by the Drawings and approved by the Engineer.
2. Measurement shall be per square yard of surface area covered in place and approved by the engineer.

E. Item SH1.06- Common Excavation

1. Payment: shall be at the unit price per cubic yard as stated in the Bid Proposal. Shall be full compensation for excavation of areas not included elsewhere in the contract to subgrade required for grading outside of utility trench work payment limit areas.
2. Measurement shall be for the actual number of cubic yards excavated or installed measured by method of average-end-area to the limits and depths required by the contract and drawings. Measurement will be made to the nearest ½ cubic yard.

F. Item SH1.07– SDR 35 PVC Gravity Sewer Main

1. Payment: shall be at the unit price per linear foot as stated in the Bid Proposal. Inclusive of the type of pipe specified, flexible rubber coupling connections on services, shipping, storing, handling, excavation (except rock and boulder excavation), separating rocks from excavated material for backfill, dewatering and dewatering equipment, shoring, bedding, sand cushion, locatable sewer tape, backfilling and compacting, blue board insulation, cleaning, flushing and testing, removal of excess material and rocks not meeting the requirements of rock and boulder removal from the site, equipment and labor, furnishing and installing and all else necessary to complete the item. Trenching limits shall comply with limits depicted on the drawings and as listed herein.
2. Measurement shall be for the actual number of linear feet of Gravity Sewer Line installed and approved by the Engineer. Measurement shall be along the centerline of the pipe to the nearest foot. No deductions shall be made for adapters, fittings, and other pipe appurtenances.

G. Item SH1.08– 4" Forcemain (DR11 HDPE DIPS or SDR 21 PVC)

1. Payment: shall be at the unit price per linear foot as stated in the Bid Proposal. Piping furnished and installed in the locations depicted on the drawings and approved by the Engineer. Inclusive of the type of pipe specified, fittings, shipping, storing, handling, excavation (except rock and boulder excavation), separating rocks from excavated material for backfill, dewatering and dewatering equipment, shoring, bedding, sand cushion,

tracer wire and locatable sewer tape, backfilling and compacting, blue board insulation, cleaning, flushing and testing, removal of excess material and rocks not meeting the requirements of rock and boulder removal from the site, equipment and labor, furnishing and installing and all else necessary to complete the item. Trenching limits shall comply with limits depicted on the drawings and as listed herein.

2. Measurement shall be for the actual number of linear feet of pipe installed and approved by the Engineer. Measurement shall be along the centerline of the pipe to the nearest foot. No deductions shall be made for adapters, fittings, and other pipe appurtenances.

H. Item SH1.09 - Remove Existing Stone Wall and Stairs

1. Payment: shall be at the lump sum price as stated in the Bid Proposal. Includes complete removal of steps and wall and approval by the Engineer and Owner.
2. Measurement: Item shall not be measured, and will be paid for following completion of the work and acceptance by the Engineer.

I. Item SH1.10 - 12" HDPE Culvert Pipe

1. Payment: shall be at the unit price per linear foot as stated in the Bid proposal. Inclusive of the type of pipe specified, shipping, storing, handling, excavation (except rock and boulder excavation), separating rocks from excavated material for backfill, dewatering and dewatering equipment, shoring, bedding, sand cushion, backfilling and compacting, cleaning, flushing, removal of excess material and rocks not meeting the requirements of rock and boulder removal from the site, equipment and labor, furnishing and installing and all else necessary to complete the item.
2. Measurement shall be for the actual number of linear feet of pipe installed and approved by the Engineer. Measurement shall be along the centerline of the pipe to the nearest foot.

J. Item SH1.11 - Stone Masonry Headwalls

1. Payment: shall be at the unit price per each as stated in the Bid Proposal. Inclusive of furnishing and installing stone masonry headwalls in accordance with the plans and specifications and approved by the Engineer.
2. Measurement shall be per each headwall installed complete.

K. Item SH1.12 - Restoration of Growth of Lawns and Grasses

1. Payment: shall be per the lump sum price as stated in the Bid Proposal. Payment includes rough and finish grading, furnishing and installing topsoil (4" minimum thickness or as shown on drawings), hauling,

handling, raking to grade, liming, fertilizing, seeding, following seed application rates, rolling, mulching, water (as required), and all else necessary to establish a healthy stand of grass and all else necessary to complete the item. Screening of on-site stripped loam is acceptable as long as loam complies with specifications.

2. Measurement for payment shall be the percentage of work complete as determined by the Engineer.

L. Item SH1.13 – Shaker Landing Pump Station Fence

1. Payment: shall be at the unit price per linear foot as stated in the Bid Proposal. Inclusive of furnishing and installing new 4 foot high fence matching the existing lattice fence on the adjacent building. Includes painting fence to match existing colors. All components incidental.
2. Measurement shall be for the actual number of linear feet of fence installed and approved by the engineer. Measurement shall be along the centerline of the fence to the nearest foot.

M. Item SH1.14 – Shaker Landing Pump Station Fence Gate

1. Payment: shall be at the unit price per each as stated in the Bid Proposal. Inclusive of furnishing and installing new Fence Gate to match chosen fence to match the existing lattice fence on the adjacent building. Includes painting the fence to match existing colors. All components incidental.
2. Measurement shall be for the actual number gates installed and approved by the Engineer.

N. Item SH1.15 - Relocate Existing Path Light (New Pole Base)

1. Payment: shall be at the unit price per each as stated in the Bid Proposal. Inclusive of furnishing and installing all necessary conduit, hand holes, wiring, pole bases, labor, equipment, tools, etc. to complete the work by a licensed electrician in the state of New Hampshire.
2. Measurement shall be per each path light relocated and accepted by the Engineer

O. Item SH1.16- Core and Boot Existing Manhole

1. Payment: shall be at the price per each as stated in the Bid Proposal. Item Inclusive of concrete coring, furnishing and installing flexible rubber boot and bands, and all necessary labor, tools, and equipment to complete the work. Rebuilding of manhole invert is incidental to this item.
2. Measurement shall be for the actual number of structures cored and boots installed water tight and approved by the Engineer.

P. Item SH1.17 - Silt Fence

1. Payment: shall be at the unit price per linear foot as stated in the Bid Proposal. Inclusive of furnishing and installing the item in accordance with the manufacturer's specifications, anchoring/key-in, supports, observation and maintenance, relocation as needed for work, and removal after work is complete. Silt fence will not be paid for if not installed correctly and approved by Engineer.
2. Measurement shall be along the top of the silt fence to the nearest foot.

Q. Item SH1.18 - Matting for Erosion and Sediment Control

1. Payment: shall be at the unit price per square yard as stated in the Bid Proposal. Inclusive of furnishing and installing the item in accordance with the manufacturer's specifications, anchoring, supports, observation and maintenance.
2. Measurement shall be per square yard of surface area covered and approved by the engineer. Use of erosion matting shall be coordinated and approved by the Engineer prior to installation. Erosion matting to only be utilized where slopes exceed 3:1 and where channel or concentrated flow locations exist.

R. Item SH1.19- Gravity Sewer Manholes

1. Payment: shall be at the unit price per each as stated in the Bid Proposal. Shall be full compensation for furnishing and installing sewer structures, inclusive of all excavation (except rock and boulder excavation), backfill, compaction, frames and covers, connection to forcemain outside structures with fittings; all internal components in accordance with the plans and specifications and approved by the Engineer.
2. Measurement shall be for the actual number of structures installed in accordance with the approved plans and approved by the Engineer.

S. Item SH1.20 – Mobilization/Demobilization

1. Payment: shall be at the lump sum price as stated in the Bid Proposal. Payment shall be in accordance with specification section 01 10 10.
2. Measurement shall be in accordance with specification section 01 10 10.

T. Item SH1.21 – Miscellaneous Work and Cleanup

1. Payment: shall be at the lump sum price as stated in the Bid Proposal. Item shall be in accordance with the drawings and specifications and approved by the Engineer and Owner. Payment includes all work specified in section 01 10 30.



2. Measurement for payment shall be the percentage of work completed based on the schedule of values provided by the Contractor and accepted by the Engineer and/or Owner. The final 25% of this lump sum item will not be paid until the project reaches final acceptance and acceptable records are provided to the Engineer by the Contractor.

L. Item 1.22 – Rock Excavation

1. Payment: shall be at the unit price per cubic yard price as stated in the Bid Proposal. Shall be full compensation for the actual number of cubic yards of ledge or boulders excavated and measured and approved by the Engineer. Payment shall include, but not limited to the cost of the pre-construction survey, drilling, explosives, blasting caps, ledge removal, hydraulic hammering, and transportation and disposal of ledge, and boulders and all other work required for or incidental to the completion of this item.
2. Measurement shall be for the actual number of cubic yards of ledge and boulders removed within the payment limits as measured and approved by the Engineer. "Payment Limits" - Measurement shall be made to the nearest 1/4 cubic yard. Depth of ledge or boulder excavation shall be measured from original ledge surface to twelve (12) inches below the bottom crown of the pipe to twelve (12) inches below the bottom surface of structures. The minimum width measured shall be the sum of the nominal pipe diameter plus two (2) feet for pipelines. The maximum width shall be four (4) feet. The measured area of excavation around structures shall be no more than the outside structural dimension plus two (2) feet. No boulders less than two (2) cubic yards (in average-end-area volume) shall be measured and are considered incidental to the excavation work.

V. Item SH 1.23 – Standby Generator

1. Payment: shall be at the lump sum price as stated in the Bid Proposal. Inclusive of furnishing and installing a working generator with weather tight enclosure adjacent to the proposed Shaker Landing Pump Station in accordance with these documents. All necessary components, including the concrete pad and mounting are incidental to this item. Coordination and installation of new propane tank and supply line to the Generator is also incidental to this item.
2. Measurement for payment shall be the percentage of work completed based on the schedule of values provided by the Contractor and accepted by the ENGINEER and/or OWNER.

## SECTION 01 32 00

### PRECONSTRUCTION CONFERENCE

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS INCLUDED

The Prime Contractor and any major subcontractors (directional drilling, plumber, etc.) shall participated in a preconstruction conference.

##### 1.02 PRECONSTRUCTION CONFERENCE

- A. The Engineer will schedule the preconstruction conference within ten (10) calendar days after execution of the Contract by all parties (Effective Date of Contract).
- B. Attendance: Owner, Engineer, local authorities, Prime Contractor, and major Subcontractors.
- C. Agenda:
  - 1. Designation of responsible personnel and introductions.
  - 2. Submittal list of subcontractors, list of products for installation, schedule of values, and progress schedule.
  - 3. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal requests, change orders, and Contract closeout procedures.
  - 4. Payroll and Federal Labor Compliance requirements for Contractor and Subcontractors.
  - 5. Discuss Schedule. Inclusive of critical work sequencing.
  - 6. Discuss traffic controls and submittal of traffic control plans, flagging, etc.
  - 7. Coordination with other contracts and/or work.
  - 8. Use of premises by Owner and Contractor.
  - 9. Construction facilities and controls provided by Contractor.
  - 10. Preconstruction Survey.
  - 11. Major equipment deliveries and priorities.

12. Project Observation.
13. Rights-of-way and easements.
14. Winter Maintenance.
15. Security and housekeeping procedures.
16. Procedures for Testing.
17. Procedures for maintaining Record Documents.
18. Requirements for Startup of Equipment/ Acceptance of equipment put into service during construction period.
19. Substantial completion of work.
20. Final completion of work.

PART 2 - PRODUCTS      NOT USED

PART 3 – EXECUTION      NOT USED

END OF SECTION 01 32 00

## SECTION 01 32 50

### PROGRESS SCHEDULES

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS INCLUDED

Procedures for preparation and submittal of construction Progress Schedules and periodic updating.

##### 1.02 FORMAT

- A. Prepare Schedules as a horizontal bar chart or network with separate bar or node for each major portion of Work or operation, identify first work day of each week and identifying each portion of the work that is critical to timely project completion. All project scheduling shall be prepared using the critical path method.
- B. Sequence of Listings: The chronological order of the start of each item of Work.
- C. Scale and Spacing: Provide space for notations or revisions.
- D. Sheet Size: Multiple of 11 x 17 inches.

##### 1.03 CONTENT

The CPM schedule shall show:

- Planned start to finish dates for each activity.
- Duration of each activity in workdays.
- Finish-to-start relationships among activities (i.e. which activities must be completed before following can start).
- Interim and final completion dates specified in the contract.
- Activities related to the procurement of critical materials, equipment, and items of special manufacture.
- Activities related to the submission of shop drawings and other items needing approval by the Engineer.
- Activities related to consultant inspections.
- Activities related to specified activities by the sponsor or third parties.
- Contractors shall not engage in float manipulations that have the net effect of sequestering float time. Examples of networking techniques disallowed under this provision includes such strategies as extending time durations and estimates, and scheduling items required for final completion as though they were prerequisites to substantial completion.

#### 1.04 REVISIONS TO SCHEDULES

- A. Indicate progress of each activity to date of submittal, and projected completion date of each activity.
- B. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
- C. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken or proposed, and its effect.

#### 1.05 SUBMITTALS

- A. Submit initial schedules at the preconstruction conference. After review, resubmit required within ten (10) days).
- B. Submit revised progress schedules monthly and whenever work progress warrants a timely update for review and approval.
- C. Submit six (6) copies; three (3) copies of which will be retained by the Engineer; the other three (3) copies will be returned to the Contractor.

#### 1.06 DISTRIBUTION

- A. Distribution copies of reviewed schedules to job site file, subcontractors, suppliers, and other concerned entities.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

#### 1.07 PENALTY

- A. Contractor shall submit progress schedules as specified within ten (10) days of request by Engineer. Penalty for not submitting a schedule on time will be in the amount of \$250 per each calendar day after the ten (10) day grace period.

PART 2 - PRODUCTS      NOT USED

PART 3 – EXECUTION      NOT USED

END OF SECTION 01 32 50

## SECTION 01 40 00

### QUALITY REQUIREMENTS

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. This Section specifies administrative and procedural requirements for quality control services.
- B. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by the Engineer, Owner, or Project Superintendent.
- C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.
- D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.
  - 1. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as installation procedures.
  - 2. Inspections, test and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.
  - 3. Requirements for the Contractor to provide quality control services required by the Owner, Engineer or Superintendent, or authorities having jurisdiction are not limited by provisions of this Section.

##### 1.02 RESPONSIBILITIES

- A. Contractor Responsibilities: The Owner shall provide inspections, tests and similar quality control services, specified in individual Specification Sections and required by governing authorities, except where they are specifically indicated to be the Contractor's responsibility, or are provided by another identified entity; these services include those specified to be performed by an independent agency and not by the Contractor.

1. The Owner shall employ and pay an independent agency, to perform specified quality control services.
  2. Retesting: The Contractor is responsible for retesting costs where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.
    - a. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility.
  3. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:
    - a. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
    - b. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
    - c. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
    - d. Security and protection of samples and test equipment at the Project site.
- B. Duties of the Testing Agency: The independent testing agency engaged to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections shall cooperate with the Engineer, Owner, Project Superintendent and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.
1. The agency shall notify the Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents, or approve or accept any portion of the Work.
  3. The agency shall not perform any duties of the Contractor.
- C. Coordination: The Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for scheduling times for inspections when the Engineer is not on site, tests, taking samples and similar activities.

### 1.03 SUBMITTALS

- A. The testing agency shall submit a certified written report of each inspection, test or similar service, to the Engineer. If the Contractor is responsible for the service, they must submit a certified written report of each inspection, test or similar service to the Engineer. The Contractor will provide copies of all testing reports.

1. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:

- a. Date of issue.
- b. Project title and number.
- c. Name, address and telephone number of testing agency.
- d. Dates and locations of samples and tests or inspections.
- e. Names of individuals making the inspection or test.
- f. Designation of the Work and test method.
- g. Identification of product and Specification Section.
- h. Complete inspection or test data.
- i. Test results and an interpretation of test results.
- j. Location of sample or test in project.
- k. Ambient conditions at the time of sample-taking and testing.
- l. Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements.
- m. Name and signature of laboratory inspector.
- n. Recommendations on retesting.

### 1.04 QUALITY ASSURANCE

- A. Qualification for Service Agencies: The Owner will engage inspection and testing service agencies, including independent testing laboratories, which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the State in which the Project is located.

### 1.05 TRADESMEN & WORKMANSHIP

Ensure that tradesmen performing work at site are skilled and knowledgeable in methods and craftsmanship needed to produce required quality levels for workmanship in completed work. Remove and replace work which does not comply with workmanship standards as specified and



as recognized in the construction industry for applications indicated. Remove and replace other work damaged or deteriorated by faulty workmanship or its replacement.

#### 1.06 COORDINATION

Coordination: The Contractor shall coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.

- A. 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.
- B. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
- C. Make adequate provisions to accommodate items scheduled for later installation.

#### 1.07 REPAIR AND PROTECTION

- A. General: Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore to eliminate deficiencies, including deficiencies in visual qualities of exposed work.
- B. Protect construction exposed by or for quality control service activities, and protect repaired construction.
- C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

#### 1.08 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 installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.
- 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 movement.
- E. Recheck measurements and dimensions, before starting each installation.
- F. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent damage.
- G. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

#### 1.09 REPLACEMENT OF WORK

Within 24 hours after rejection of work pursuant to the General Conditions, remove all materials and equipment so rejected and immediately replace work, at the Contractor's cost, to the satisfaction of the Engineer and Owner. Should the work of the Owner or other Contractors be damaged by such removal or replacement, the Contractor shall reimburse the Owner or other Contractors for all costs incurred for correcting damage.

PART 2 - PRODUCTS      NOT USED

PART 3 – EXECUTION      NOT USED

END OF SECTION 01 40 00

## SECTION 01 42 00

### STRUCTURE LEAKAGE TESTING

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED

- A. This section covers the requirements for performing leakage tests on pump station structures, and appurtenances, and is one of the several bases for acceptance of the work.
- B. Perform leakage tests on all pump station structures, and appurtenances which will hold or convey a liquid.
- C. All testing shall be furnished by the Contractor.

##### 1.02 WORK INCLUDED

- A. Prior to final acceptance of the work, all structures, tanks and appurtenances shall meet specific leakage requirements. These leakage requirements must be satisfied by the basic materials alone. Where joint fillers and the like have been specified, primarily to protect jointing materials, and secondarily to provide a factor of safety, they shall not be applied until after leakage tests have been completed and have been accepted by the Engineer. Also, do not apply epoxy coatings until tests have been completed. No epoxy coating shall be applied.
- B. Every test must be witnessed by the Engineer and any test not so witnessed will be considered as not having been performed. Pretest the work until it is reasonable certain that the test will yield results within acceptable limits prior to contacting the Engineer.

##### 1.03 SEQUENCING AND SCHEDULING

- A. Notify the Engineer at least 48 hours in advance of a scheduled test so that the test may be witnessed.
- B. Do not apply epoxy coatings or joint fillers until leakage tests have been completed, passed and accepted by Engineer.
- C. If any pretest does not meet the leakage requirements, cease installations until reasons for failure are determined, the conditions rectified, and the test rerun are satisfactorily passed.
- D. No structure or tank shall be insulated, concealed or furred in until it has passed all tests.

## PART 2 – PRODUCTS

### 2.01 TESTING APPARATUS

- A. Provide labor, pumps, plugs, measuring equipment and other apparatus, complete, and as required to perform testing.
- B. Provide testing fluid, air, and other materials as required to accomplish testing.
- C. Provide plugs and caps capable of withstanding the test pressures.
- D. Provide temporary flanges, plugs, bulkheads, thrust blocks, weighing, bracing and other items necessary to prevent joints from separating, and to prevent any injuries or damage.

## PART 3 – EXECUTION

### 3.01 PREPARATION

- A. Observation: Given ample Notice, Engineer will conduct a site visit to observe structures and tanks prior to leakage tests. If the observations are not completed before leakage testing, and subsequent modifications are made to a structure or tank, the item shall be retested for leakage.
- B. Bracing for pressure: Provide bracing as required so that items to be tested safely withstand the pressures developed under the tests and so that no damage or injury will occur to the Work, people or property.
- C. Protection: Before tests are conducted, isolate or remove any regulator, gauge, trap or other apparatus or equipment which may be damaged by test pressures.

### 3.03 TEST METHODS AND ALLOWABLE LEAKAGE

- A. The Wet Wells and Valve Vaults must be filled with water prior to backfilling to allow for a visual leakage test of the exterior of the structure by the Engineer. All permanent pipe penetrations shall be installed and supported prior to filling with water. At the same time the structures should be tested for exfiltration by using testing method ACI 350.1 Method HST-NML in effect at the time the structure is installed. The NML standing for "No Measurable Loss". See attached testing standards in Appendix V "Hydrostatic Test, HST, For Open or Covered Tanks.

### 3.04 REPAIRS/REPLACEMENT/RETESTING

- A. Structures not passing the tests shall have defects corrected to the satisfaction of the Engineer, and shall be retested and corrected as often as is necessary until the test requirements have been met.

- B. It is the intent of this contract to obtain work meeting test requirements on their own and solely through the use of the normal integral sealing components. However, in certain instances, the Engineer may approve the use of epoxy coatings, epoxy injections, or other long-term solutions for eliminating or reducing leakage.
- C. Methods of rejoining, or replacing joint seals shall require the written approval of the Engineer.

END OF SECTION 01 42 00

SECTION 01 58 50

PROJECT SIGNS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Contractor shall provide project sign as shown in Section D attachment D.
- B. Contractor shall be responsible for maintaining project sign throughout duration of project.
- C. Contractor shall remove sign at appropriate time at the end of the project.

1.02 PROJECT SIGN CONSTRUCTION

- A. Sign: Construct sign in accordance with the referenced detail.
- B. Location: Locate, position and align where directed by Engineer.
- C. Sign Supports: Provide adequate support for the sign.
- D. Maintenance: Maintain sign, in good condition, at all times, for the duration of construction.
- E. Removal of Sign: Remove the sign, in good condition, from the construction site at the completion of construction, when approved by Engineer.

1.03 ADVERTISING SIGNS

- A. No commercial advertising signs will be allowed on the site of Work or on public property in the vicinity of the Work.

PART 2 - PRODUCTS      NOT USED

PART 3 – EXECUTION      NOT USED

END OF SECTION 01 58 50

## SECTION 01 60 10

### SUBMITTALS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION OF REQUIREMENTS

- A. Submittal requirements specified in this section include shop drawings, product data, samples, and miscellaneous work-related items. Refer to other Contract Documents for the requirements of administrative submittals.
- B. Work-related submittals of this Section are categorized as follows:
  - 1. Shop Drawings include specially prepared technical data, including drawings, diagrams, data sheets, schedules, and instructions.
  - 2. Product Data include standard printed information on materials, products, and systems not specially prepared for this Project, other than the designation of selections from among products specified herein.
  - 3. Samples include fabricated examples of materials, natural materials, products, and units of work either for limited visual inspection or for testing and analysis to determine compliance with other Sections of the Specifications.
- C. Miscellaneous submittals related directly to the Work include warranties, maintenance agreements, workmanship bonds, construction schedules, survey data and reports, quality control testing and reports, copies of industry standards, operations, and maintenance reports and other similar information, devices, and materials applicable to the Work.

##### 1.02 GENERAL SUBMITTAL REQUIREMENTS

- A. Coordination and sequencing of submittals shall be scheduled to precede work performance to avoid undue delays. Submittals that cover differing types of materials, but represent a complete part of the Work should be submitted as a whole, rather than as a unit.
- B. Submittal identification shall be consistent throughout the Project. Each submittal or group of submittals shall bear Project name, date, specification number, Contractor, Subcontractor, submittal name and information to distinguish it from other submittals. Show the Contractor's executed review stamp and provide space for the Engineer's review marking. Submittals received without the Contractor's review marking will be returned to the Contractor without action.

- C. Grouping of submittals to signify similar information or related parts of a whole is required. Partial submittals may be rejected as not complying with the Provisions of the Contract Documents.
- D. Transmittal forms shall be attached to indicate Project, date, names of Subcontractor's, suppliers, manufacturers, category and type of submittal, purpose, copy routing, and signature of Contractor, agent, or supplier.
- E. Submit six (6) copies of each submittal. The Contractor may alternately submit submittals in an electronic form with all appropriate transmittal and routing documents.

### 1.03 SPECIFIC-CATEGORY SUBMITTAL REQUIREMENTS

- A. Shop Drawings shall be information of the latest revision, on reproducible sheets, with graphic information at accurate scale, with name of preparer indicated (firm name). Show dimensions and note those based on field measurement. Identify materials and products in the work shown. Indicate compliance with standards. Submit blue-line or black-line prints.
- B. Product Data: Collect required data into one submittal for each unit of work or system; and mark each copy to show which choices and options are applicable to project. Include manufacturer's standard printed recommendations for application and use, compliance with standards, application of labels and seals, notation of field measurements which have been checked, and special coordination requirements. Maintain one set of product data (for each submittal) at project site, available for reference by the Owner and others.
- C. Construction Schedule: Submit within 10 days of signing the Agreement a detailed schedule of construction activities and anticipated monthly payments.

PART 2 - PRODUCTS      NOT USED

PART 3 – EXECUTION      NOT USED

END OF SECTION 01 60 10



## SECTION 01 70 00

### EXECUTION AND CLOSEOUT REQUIREMENTS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION OF WORK

- A. Definitions: "Closeout" is defined as a checklist of general requirements near the Contract deadline, in preparation for final acceptances, final payment, normal contract completion or occupancy by the Owner and similar actions evidencing completion of work.
- B. "Closeout" is directly related to "substantial completion" and may be a single time period or a succession of time periods for segments of the work which have been certified by the OWNER as substantially complete on varying dates.

##### 1.02 REQUIREMENTS FOR SUBSTANTIAL COMPLETION

- A. General: Prior to a request for Owner's inspection for certification of substantial completion, complete the following list and include known exceptions in the request:
1. Progress Payment Request: Show either 100% completion for work claimed, and value, or show incomplete items, value and reason for being incomplete.
  2. Include supporting documentation for completion as required by these Contract Documents.
  3. Advise Owner of impending insurance change-over requirements.
  4. Submit specific warranties, maintenance bonds and agreements, final certification and related documents.
  5. Deliver tools, spare parts, materials, O&M manuals, stocks and equipment to the Owner.
  6. Remove temporary facilities and utility services.
- B. Inspection Procedures: The Owner will proceed with Final Inspection upon receipt of Contractor's request or notification of completion of above requirements. Following inspection, the Owner will either issue Certification of Substantial Completion or Punch List detailing work to be done prior to issuance of Certificate.

### 1.03 REQUIREMENTS FOR FINAL ACCEPTANCE

- A. General: Prior to requesting the OWNER'S final inspection for Certification of Final Acceptance and final payment as defined by General Conditions, satisfy the following criteria and list exceptions:
1. Submit final payment request with final releases, invoices and supporting documentation. Include Certificates of Insurance for products and equipment, if required.
  2. Submit updated final statement, accounting for final changes to Contract sum.
  3. Submit final punch list with corrected items endorsed by Engineer.
  4. Submit Record Drawing(s) on reproducible washable mylar.
  5. Submit, if applicable, final liquidated damages statement, endorsed by Owner.
  6. Revise and submit evidence of final continuing insurance coverage meeting insurance requirements (General Conditions, etc.).
- B. Reinspection Procedure: Upon Contractor's notice that punch list work toward Certificate of Final Acceptance has been completed, Engineer will observe the work. Engineer will either prepare Certificate of Final Acceptance or order re-working of punch list items found deficient or not fulfilled as required for final acceptance.

### 1.04 RECORD DOCUMENTS SUBMITTALS

- A. General: See individual sections of these Specifications for specific requirements. Provide access to records for Owner's reference.
- B. Record Drawings: Maintain a field set of red-line Contract Drawings and Shop Drawings in clean, undamaged condition with mark-up of all items installed utilities depicting depth and record locations.
1. The Contractor must provide proper instrumentation to record accurate coordinates as well as elevations to within 0.01' for all pipe (inverts), fittings, cleanouts, crossings, structures (rim and inverts), propane tank, and building corners. This information must be submitted in AutoCAD format to the Engineer prior to final completion and acceptance by the Owner. The Contractor is required for checking the accuracy of this information throughout construction. If the Contractor does not have the

capability of completing the record work listed above, they must contract this work to an appropriate party that has the capability as subsidiary to this work. Final Completion will not be awarded if this is not completed and the Contractor will be subject to liquidated damages in accordance with the Contract.

2. Organize Red-Line Record Drawings into a cohesive, bound set with suitable dates, titles and locations shown clearly on front sheet and submit to the Engineer at substantial completion.

- C. Record Specifications: Where required, maintain one copy of notated Specifications showing Addenda and Change Orders. Show substitutions, options selected and similar information on work that is concealed. Cross reference to other documents.
- D. Record Product Data: Maintain one copy of each product data submittal. If a change occurs from the original submittal, include both submittals for comparison. Pay particular attention to documenting concealed items, not readily identified at a later date.

#### 1.05 OPERATION AND MAINTENANCE MANUALS

- A. General: The Contractor shall provide four (4) copies of each manufacturer's detailed instruction for maintenance and operation of all major equipment, machinery, instrumentation and monitoring devices, controls and incidentals provided under this Contract. Prepare all such manuals in durable binders approximately 8½" x 11" in size in accordance with NHDES Env-Wq- 705.10.

PART 2 - PRODUCTS      NOT USED

PART 3 – EXECUTON      NOT USED

END OF SECTION 01 70 00

SECTION 01 80 00

PERFORMANCE REQUIREMENTS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Related Requirements Specified Elsewhere:

1. General Conditions

B. Recommended Standards:

1. All work must be in accordance with local Standards and Specifications.
2. In general, conform to the provisions of the provisions of the New Hampshire Department of Environmental Services Code of Administrative Rules Env-Wq 700.
3. Conform to NHDOT "Standard Specifications for Road and Bridge Construction, 2016."
4. Conform to all AWWA Standard Specification and Guidelines.
5. Conform to all manufacturers' recommendations for the installation of components to be furnished and installed on the project unless detailed or specified in the Contract Documents. Deviations from the manufacturer's recommendations for installation are not permitted unless approved by the Engineer in writing.

PART 2 - PRODUCTS      NOT USED

PART 3 - EXECUTION      NOT USED

END OF SECTION 01 80 00

**DIVISION 03**

**CONCRETE**

<u>Section No.</u>	<u>Title</u>	<u>No. of Pages</u>
03 30 53	Concrete	12
03 37 15	Flowable Fill	3

## SECTION 03 30 53

### CONCRETE

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION OF WORK

Provide cast-in-place concrete work as depicted on the Drawings.

##### 1.02 QUALITY ASSURANCE AND REFERENCES

- A. Codes and Standards: Comply with the provisions of the following codes and standards:
- ACI 301 - "Specifications for Structural Concrete for Buildings"
  - ACI 318 - "Building Code Requirements for Reinforced Concrete"
  - ASTM C94 - "Specification for Ready-Mix Concrete"
  - CRSI - "Specifications for Placing Reinforcement"
  - NHDOT - "NHDOT Standards for Road and Bridge Construction"
- B. Testing and Services by Contractor: By an approved testing laboratory at the Contractor's expense:
1. Aggregate tests.
  2. Concrete mix designs.
  3. All tests not specifically indicated as the responsibility of the Owner, including retesting of rejected work or materials in-place.
  4. Furnish equipment, buckets, shovels, wheelbarrows necessary for sampling of concrete mix, molds for compression test cylinders, curing and storing facilities, and labor to assist test technician. Testing shall be completed in accordance with 01 40 00.
- C. Materials in-place may require testing or retesting during the progress of the work. Allow free access to material stockpiles and facilities. Retesting of substandard work or materials is to be done by an approved independent laboratory at the Contractor's expense.
- D. Testing by Owner: An independent testing laboratory will conduct field test of concrete mix and materials. Tests for slump, air content, temperature and compression test cylinders will be paid for by the Owner.
- E. Tests for Small Placements: Placement of 15 cubic yards or less will require a digression from standard ASTM requirement of sampling the middle portion of a

batch for testing. In order to prevent defective first portion of a defective batch from being placed, devise a first portion sampling and testing procedure acceptable to the Engineer.

### 1.03 SUBMITTALS

- A. Mix Design and Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test as specified.
- B. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials including reinforcement, forming accessories, admixtures, patching compounds, curing compounds, waterstop, chairs, inserts, finish materials, and others as requested by the Engineer.
- C. Shop Drawings, Reinforcement: Submit shop drawings for fabrication, bending and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures", showing bar schedules, stirrup spacing's, diagramming of bent bars and arrangement of concrete reinforcement, including special reinforcement at structure openings.
- D. Samples: Submit samples of materials specified or as otherwise requested by the Engineer. Include product names, sources and descriptions.
- E. Material Certificates: Provide material certificates in lieu of laboratory test reports when permitted by the Engineer. Material certificates shall be signed by the manufacturer and Contractor, certifying that each material meets, or exceeds, specified requirements.

## PART 2 - PRODUCTS

### 2.01 FORM MATERIALS

- A. Forms for Exposed-Finish Concrete: Construct formwork in accordance with ACI 347 "Recommended Practice for Concrete Formwork". For exposed concrete surfaces with plywood, metal or other acceptable panel type form materials, provide continuous, straight, smooth surfaces. Minimize the number or conform to joint systems shown on the Drawings.
- B. Forms for Unexposed Finish Concrete: Form concrete surfaces which will not be exposed with plywood, lumber, metal or other acceptable material.
- C. Form Coatings: Provide commercially formulated form-coating compounds that will not bond with, stain or physically change concrete surfaces, nor impair subsequent concrete surface treatments.
- D. Form Ties: Removable or Snap-off type, galvanized metal, fixed or adjustable length, with waterproofing washer, free of defects capable of leaving holes larger than 1 inch.

- E. Spreaders: Standard, non-corrosive metal form clamp assembly, of type acting as spreaders and leaving no metal within 1 inch of concrete face. Wire ties, wood spreaders or through bolts are not permitted.
- F. Form Anchors and Hangers:
1. Do not use anchors and hangers leaving exposed metal at concrete surface.
  2. Symmetrically arrange hangers supporting forms from structural steel members to minimize twisting or rotation of member. Penetration of structural steel members is not permitted.
- G. Form Release Agent: Colorless mineral oil which will not stain concrete, or absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete. Accepted products include:
1. "Arcal-80"; Arcal Chemical Corporation.
  2. "Synthex"; Industrial Synthetics Company.
  3. "Nox-Crete Form Coating"; Nox-Crete Company.
  4. Substitutions; Section 01600 - Product Requirements.
- H. Corners: Fillet or Chamfer, rigid plastic or wood strip.
- I. Bituminous Joint Filler: ASTM D 1751.
- J. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength, and character to maintain formwork in place while placing concrete.
- K. Waterstops: Polyvinyl chloride, as shown on the plans or NHDOT Standard Specifications.

## 2.02 REINFORCING MATERIALS

- A. All concrete reinforcement materials shall be new, free from rust.
- B. Welded Wire Fabric: ANSI/ASTM A185 and AASHTO M55, welded steel wire fabric in the sizes and gages shown on the Drawings.
- C. Bar Reinforcement: ASTM A615 and AASHTO M31, Grade 60, new deformed billet steel bars in the sizes shown on the Drawings.
- D. Fiber Reinforcement: The fibers shall be discontinuous discrete fibers made from plastic, glass, and other acceptable materials. Material and applications shall conform to ACI 544.1R.
- E. Supports: Provide supports for reinforcement including bolsters, chairs, spacers, and other required devices for spacing, supporting, or fastening wire fabric in place.
- F. All other materials not specifically described but required for a complete and



proper installation of concrete reinforcement shall be as selected by the Contractor subject to the approval of the Engineer.

## 2.03 CONCRETE MATERIALS

- A. Portland Cement: ANSI/ASTM C150, AASHTO M85, Type II, unless directed otherwise by the Engineer. Use a single cement manufacturer and type throughout the Project, unless otherwise permitted by the Engineer.
- B. Normal Weight Aggregates: ANSI/ASTM C33 and as specified herein. Provide aggregates from a single source for exposed concrete.
  - 1. Local aggregates not complying with ASTM C33 but which have shown by test and historical use to produce concrete of adequate strength and durability may be used when acceptable to the Engineer.
- C. Water: Potable.
- D. Air-Entraining Admixture: ANSI/ASTM C260.
- E. Water-Reducing Admixture: ANSI/ASTM C494, Type A with not more than one percent chloride ions.
- F. High-Range Water-Reducing (HRWR) Agent (Super-Plasticizer): ASTM C494 Type F or G with not more than one percent chloride ions.
- G. Calcium Chloride: Not permitted.
- H. General Concrete Joint Filler: Where used with caulking or sealants, the joint filler shall be non-extruding, self-expanding filler strips conforming to ASTM D1752, Type III, and ASHTO M153, Type III, as manufactured by Celotex Corporation, W.R. Meadows, Inc., W.R. Grace and Company, or equal approved by the Owner. Where no sealant or caulking is required, strips may be non-extruding bituminous type in accordance with ASTM D1751.
- I. Sidewalk Expansion Joint Filler: The expansion/contraction joint filler shall be a resilient, non-extruding cellular fiber joint, uniformly saturated with asphalt, conforming to ASTM D1751 and AASHTO M213.
- J. Sealant: Polyurethane or polysulfide elastomeric sealant. Color: Concrete gray or in a color to closely match the color of the concrete.
- K. Dowels: Smooth stainless steel dowels and sleeves in sizes indicated on the Drawings or as specified in Section 3.03.D.a.

## 2.04 PROPORTIONING AND DESIGN OF MIXES

- A. Design concrete mixes to provide normal weight concrete with the following

properties:

1. Sidewalks, Ramps, and Slabs:

Minimum 28 day compressive strength: 4000 psi  
Maximum water/cement ratio: 0.40  
Minimum cement content: 660 lbs./cubic yard  
Slump: General use concrete: 2 inch minimum  
4 inch maximum

Foundations/slabs: 1 inch minimum  
3 inch maximum

Concrete  
w/HRWR admixture: 8 inch maximum

Maximum coarse aggregate size: ¾ inch  
Air content: 6% plus or minus 1% by  
volume.

2. Concrete Fill and Other Concrete:

Minimum 28 day compressive strength: 3000 psi  
Maximum water/cement ratio: 0.49  
Minimum cement content: 564 lbs./cubic yard  
Slump: General use concrete: 1 inch minimum  
4 inch maximum

Concrete w/HRWR admixture: 8 inch maximum

Maximum coarse aggregate size: ¾ inch  
Air content: 5.0% plus or minus 1% by  
volume.

B. Adjustment to Concrete Mixes: Mix design adjustments may be requested by the Contractor when material characteristics, job requirements, weather, test results or other circumstances dictate; adjustments submitted and accepted by the Owner shall be accomplished at no additional cost to the Owner. Laboratory test results of adjusted mixes must be submitted to, and accepted by, the Owner before use in the Work.

2.05 CONCRETE MIXES

A. Ready-mixed concrete: Truck-mixed concrete shall be batched, mixed and transported in accordance with ASTM C94.

B. Truck mixes shall be capable of combining the ingredients into a thoroughly mixed, uniform mass within industry-specified times or revolutions per load. Concrete shall be centrally dry-batched with final truck mixing at the job site.

Provide batch ticket with each batch discharged and accepted in the work. Indicate project name; job number; date; mix type and volume of water introduced. Batches not placed within one hour of batching time shall be rejected for placement.

- C. Job-site mixing: Mix materials for concrete in an appropriate drum-type batch machine mixer. Minimum mixing times for 1 cubic yard, or smaller shall be 1½ minutes after initial mixing has become homogenous. For mixers of capacity greater than 1 cubic yard increase mixing beyond homogeneity by 15 seconds per fraction over 1 cubic yard.

### PART 3 - EXECUTION

#### 3.01 FORMS

- A. Design and fabricate formwork to withstand the weight of concrete during preliminary curing period.
- B. Tolerances for Formed Surfaces: Maintain formwork tolerances as required by ACI 347, Recommended Practice for Concrete Formwork.
- C. Place formwork for thrust blocks to assure the proper surface bearing for the soil encountered. Refer to the "Thrust Block Bearing Area" schedule shown on the Drawings.
- D. Earth forms are not permitted.
- E. General:
1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.
  2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.
  3. Camber forms where necessary to produce level finished soffits unless otherwise shown on Drawings.
  4. Carefully verify horizontal and vertical positions of forms. Correct misaligned or misplaced forms before placing concrete.
  5. Complete wedging and bracing before placing concrete.
- F. Forms for "Smooth Finish" Concrete:
1. Use steel, plywood or lined board forms.
  2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
  3. Install form lining with close-fitting square joints between separate sheets

- without springing into place.
4. Use full size sheets of form lines and plywood wherever possible.
  5. Tape joints to prevent protrusions in concrete.
  6. Use care in forming and stripping wood forms to protect corners and edges.
  7. Level and continue horizontal joints.
  8. Keep wood forms wet until stripped.
- G. Forms for Surfaces to Receive Membrane Waterproofing: Use plywood or steel forms. After erection of forms, tape form joints to prevent protrusions in concrete.
- H. Erect formwork, shoring, and bracing to achieve design requirements.
- I. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- J. Obtain Contractor's/Engineer's approval before framing openings in structural members that are not indicated on Drawings.
- L. Install fillet and chamfer strips on external corners of all exposed concrete components.
- M. Install void forms in accordance with manufacturer's recommendations.
- N. Do not reuse wood formwork more than three times for concrete surfaces to be exposed to view. Do not patch formwork.
- O. Application of Form Release Agent:
1. Apply form release agent on formwork in accordance with manufacturer's recommendations.
  2. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
  3. Do not apply form release agent where concrete surfaces are indicated to receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.
  4. Reuse and Coating of Forms: Thoroughly clean forms and reapply form coating before each reuse. For exposed work, do not reuse forms with damaged faces or edges. Apply form coating to forms in accordance with manufacturer's specifications. Do not coat forms for concrete indicated to receive "scored finish." Apply form coatings before placing reinforcing steel.
- P. Inserts, Embedded Parts, and Openings:
1. Provide formed openings where required for items to be embedded in passing through concrete work.

2. Locate and set in place items required to be cast directly into concrete.
3. Coordinate with Work of other sections in forming and placing openings, slots, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.
4. Install waterstops continuous without displacing reinforcement.
5. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
6. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.
7. Form Ties:
  - a. Use sufficient strength and sufficient quantity to prevent spreading of forms.
  - b. Place ties at least one inch away from finished surface of concrete.
  - c. Leave inner rods in concrete when forms are stripped.
  - d. Space form ties equidistant, symmetrical and aligned vertically and horizontally unless otherwise shown on Drawings.
8. Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.
9. Construction Joints:
  - a. Install surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints.
  - b. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.
  - c. Show no overlapping of construction joints. Construct joints to present same appearance as butted plywood joints.
  - d. Arrange joints in continuous line straight, true and sharp.
10. Embedded Items:
  - a. Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, waterstops, and other features.
  - b. Do not embed wood or uncoated aluminum in concrete.
  - c. Obtain installation and setting information for embedded items furnished under other Specification sections, or as directed.
  - d. Securely anchor embedded items in correct location and alignment prior to placing concrete.
  - e. Verify conduits and pipes, including those made of coated aluminum, meet requirements of ACI 318.
  - f. Install accessories straight, level, and plumb. Ensure items are not disturbed during concrete placement.
11. Openings for Items Passing Through Concrete:
  - a. Frame openings in concrete where shown on Drawings. Establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections.
  - b. Coordinate work to avoid cutting and patching of concrete after

placement.

- c. Perform cutting and repairing of concrete required as result of failure to provide required openings. Use a core drilling process or sawing process which produces clean, sharp edges and the minimum hole size which accommodates the piping, conduit, or equipment requiring the opening. Locations of holes and payment for this work will be by other trades and must be approved by the Engineer.

12. Screeds:

- a. Set screeds and establish levels for tops of concrete slabs and levels for finish on slabs.
- b. Slope slabs to drain where required or as shown on Drawings.
- c. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms. Remove freestanding water.

13. Screed Supports:

- a. For concrete over waterproof membranes and vapor barrier membranes, use cradle, pad or base type screed supports which will not puncture membrane.
- b. Staking through membrane is not permitted.

14. Cleanouts and Access Panels:

- a. Provide removable cleanout sections or access panels at bottoms of forms to permit inspection and effective cleaning of loose dirt, debris and waste material.
- b. Clean forms and surfaces against which concrete is to be placed. Remove chips, saw dust, and other debris. Thoroughly blow out forms with compressed air just before concrete is placed.

Q. Form Cleaning:

1. Clean forms as erection proceeds, to remove foreign matter within forms.
2. Clean formed cavities of debris prior to placing concrete.
3. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
4. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

R. Form Removal:

1. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads and removal has been approved by Engineer. Apply curing compound immediately after removing forms.

2. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
3. Store removed forms in a manner such that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.
4. Leave forms in place for minimum number of days as specified in ACI 347 or minimum of 7 days if no curing is to be done.

### 3.02 PLACING REINFORCEMENT

- A. Comply with CRSI recommended practice for placing reinforcing steel, supports, and details.
- B. Clean reinforcement of loose rust, mill scale, earth, ice, and any other materials which effect the bond with concrete.
- C. Accurately position, support or secure reinforcing steel against displacement by formwork, construction procedures or concrete placement operations. Secure reinforcement with appropriate ties, metal chairs, bolsters, hangers, or spacers as required.
- D. Position reinforcement to obtain required coverages. Set wire ties with ends directed inward away from exterior concrete surfaces.
- E. Install welded wire fabric in lengths as long as practicable and lap adjoining pieces a minimum of two full meshes. Lace splices with wire. Support welded wire fabric on 1½ inch with cement brick. Offset end laps in adjacent widths to prevent continuous laps in any direction.
- F. Fiber reinforcement shall be furnished in conjunction with of welded wire fabric for sidewalks and other applications approved by the Owner. The fiber reinforcement per volume of concrete shall be 1.5 pounds per cubic yard.
- G. Bending:
  1. Fabricate all reinforcement in strict accordance with the approved Shop Drawings.
  2. Do not use bars with kinks or bends not shown on the Drawings or on the approved Shop Drawings.
  3. Do not bend or straighten steel in a manner that will injure the material.
- H. Placing: No concrete shall be placed before the placing and typing of reinforcement has been inspected and approved by the Engineer. Contractor shall notify the Engineer not less than 48 hours prior to placing of concrete.
- I. Splicing:
  1. Horizontal Bars:
    - a. Place bars in horizontal members with minimum laps at splices sufficient to develop the strength of the bars.

- b. Lapped ends of bars may be placed in contact and securely wired or may be separated sufficiently to permit the embedment of the entire surface of each bar in concrete.
  - c. Wherever possible, stagger the splices of adjacent bars.
  - d. Splice 40 bar diameters minimum.
2. Wire Fabric: Make all splices in wire fabric at least two squares.
  3. Other Splices: Make only those other splices that are indicated on the approved Shop Drawings or specifically approved by the Engineer.
  4. Dowels: Place all required steel dowels and securely anchor them into position before the concrete is placed.
  5. Obstructions: In the event conduits, piping, inserts, sleeves, or any other items interfere with placing reinforcement as indicated on the Drawings or as otherwise required, immediately consult the Engineer and obtain approval of new procedure before placing concrete.

### 3.03 CONCRETE PLACEMENT

- A. Consolidate concrete by rodding or spading to prevent voids forming between concrete and undisturbed soils or fitting.
- B. Provide low-slump concrete for sloped sidewalk.
- C. Wrap fitting glands and bolts with roofing paper or polyfilm to prevent concrete from adhering.
- D. Expansion joints shall be placed along the building foundations and curbing materials. Expansion joints, shall be placed at a maximum interval of twenty feet (20'), unless otherwise directed by the Owner. For longer lengths, place sections alternately with a minimum of 24 hours of curing time between sections.
- E. Construction joints shall have 18" long smooth stainless steel dowels, 9" penetration into each slab, 12" o/c, with dowels 6" in from each side.
- F. Sidewalks shall have light broom finish perpendicular to normal pedestrian traffic to provide a non-skid surface. Handicap ramps shall have a heavy broom finish to allow for better traction.
- G. Furnish trowel finished borders 1½ inch wide, or as shown on the Drawings.

### 3.04 CONCRETE CURING AND PROTECTION

- A. Comply with ACI 308. Protect freshly placed concrete from excessive cold or hot temperatures.
- B. Provide curing of thrust block concrete by prompt backfill after initial curing



period or as directed by the Owner.

- C. Protect from destruction by vehicle and pedestrian traffic or vandals until concrete has set-up.
- D. Water-cure sidewalks with burlap and soaker hoses for the first 24 hours. Curing compounds are not permitted for sidewalks.

### 3.05 DEFECTIVE WORK AND REMEDIES

- A. Any work which fails to comply with the requirements of this section, Chapters 17 and 18 of ACI 301, or the "Thrust Block Bearing Area" schedule shall not be accepted.
- B. Deficient work shall be removed and replaced at the Contractor's expense.

END OF SECTION 03 30 53

## SECTION 03 37 15

### FLOWABLE FILL

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

This section specifies the requirements for flowable fill used for trenches, support for pipe structures, culverts, utility cuts and other works where cavities exist and where firm support is needed for pavements and structural elements. Flowable fill may also be used to fill abandoned water and sewer lines, abandoned fuel tanks, and where any granular compacted fill is needed as is approved by the Engineer.

##### 1.02 QUALITY ASSURANCE

Materials shall meet the following requirement:

1. Portland Cement, Type I, II, or III ASTM C150
2. Fine Aggregate/Mineral Filler \*
3. Air Entraining Admixtures As Per Manufacturer's Specifications
4. Light Weight Cellular Admixture As Per Manufacturer's Specifications
5. Water potable

\* Any ASTM or non-ASTM sands or mineral fillers with 100% passing the 1/2" sieve may be considered which produce an acceptable flow and desired performance characteristic.

#### PART 2 - PRODUCTS

##### 2.01 PROPORTIONING AND DESIGN OF MIXES

- A. The contractor and/or the material supplier shall be responsible for producing a flowable mixture using these guidelines and adjusting the mixture design as called for by the circumstances or as directed by the Engineer.
- B. For excavatable mixes, the flowable fill material should be proportioned to produce a 28-day compressive strength of 75-100 psi (not a specification requirement).
- C. Typical mix design proportions for normal weight flowable fill are as follows:
  1. Portland Cement 30-70 lbs/yd<sup>3</sup>
  2. Mineral Filler 2000-3000 lbs/yd<sup>3</sup>
  3. Water 800 lbs/yd<sup>3</sup>

Note: Weights or volumes of each material should be adjusted to approximate one cubic yard of flowable fill.

- D. The percentage of cement may be increased above these limits only when early strength is required and future removal of the product is not required. The mix proportions shall be adjusted for removability, pumpability, flowability, and

setting characteristics. Set times are a product of consolidation of the flowable fill due mainly to dehydration. A decrease in soil permeability, an increase in air content, or excessive fine material will cause an increase in the setting time of flowable fill.

## 2.02 TESTING

- A. Testing of flowable fill in the field is not usually necessary. In the event that testing is required, follow the recommendations of ACI 229.
- B. Modified Slump Test Apparatus:
  - 1. Testing equipment to include scoop, measuring tape, flat edge, 3" x 6" cylinder mold open at both ends, and a flat non-absorbent surface.
  - 2. Procedure:
    - a. Set mold upright on flat surface.
    - b. Scoop representative sample of flowable fill.
    - c. Fill mold with sample without tamping and then strike off the top with flat edge to form a flat surface.
    - d. Clear any residue from around the bottom of the mold.
    - e. Lift the mold straight up for a duration of three seconds, allowing sample to spread on the flat surface.
    - f. Measure the spread's diameter to the nearest ½". A spread of 7 inches to 9 inches is considered flowable.
- C. Air Content: Use ASTM C231 procedures where applicable. Unit weight method may also be desirable with high air content mixtures.
- D. Compressive Strengths: No testing shall be done for compressive strengths in the field.

## PART 3 - EXECUTION

### 3.01 PRODUCTION AND PLACING

Flowable fill shall be produced and delivered using standard concrete construction equipment and practices. Placement of flowable fill shall be by chute, pumping, or other method approved by the Engineer.

### 3.02 CONSTRUCTION REQUIREMENTS

The flowable fill shall be discharged directly from the mixer truck into the space to be filled. No compaction or vibration of the material is required. The mix may be placed part depth or full depth as conditions dictate. Care is to be taken to prevent pipe from floating. Formed walls or other bulkheads shall be constructed to withstand hydrostatic pressure exerted by the plastic flowable fill. All necessary means to confine the material within a designated space shall be provided. Curing of the flowable fill is not required.

### 3.03 LIMITATION OF OPERATION

No flowable fill shall be placed on frozen ground. Mixing and placing of the material is acceptable in freezing temperatures. At the time of placement the flowable fill shall have

a temperature of at least 40 degrees F. When flowable fill is placed in freezing temperatures, the material should be covered with blankets overnight. When paving over flowable fill in cold weather, any frozen material on the surface can be scraped off and removed prior to paving.

#### 3.04 ACCEPTANCE

- A. The flowable fill shall be proportioned and placed as specified herein. In general, the strength desired is the maximum hardness that can be excavated at a later date using conventional excavating equipment. Failure to do so will result in non-compliance.
- B. The flowable fill shall be left undisturbed until the material obtains sufficient strength. Sufficient strength for paving is achieved when the flowable fill can support the weight of foot traffic without apparent deformation. Sufficient strength for supporting vehicular traffic is 2.5 tons per square foot as measured by a pocket penetrometer.

END OF SECTION 03 37 14

**DIVISION 26**

**ELECTRICAL**

<u>Section No.</u>	<u>Title</u>	<u>No. of Pages</u>
26 01 50	Electrical Codes and Fees	1
26 05 10	Pump Station Electrical Work	19
26 20 10	Standby Generator System	8

## SECTION 26 01 50

### ELECTRICAL CODES AND FEES

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. The work shall meet the requirements and recommendations of applicable portions of the latest editions of these standards:
  - 1. National Electric Code (NFPA 70)
  - 2. Life Safety Code (NFPA 101).
  - 3. National Electrical Safety Code (ANSI C2).
  - 4. NEMA Standards (NEMA).
  - 5. Underwriters' Laboratories (UL).
  - 6. Institute of Electrical and Electronic Engineers (IEEE).
  - 7. Certified Ballast Manufacturers (CBM).
  - 8. Regulation No. 15 of the Tennessee Department of Insurance.
  - 9. Lighting Protection Code (NFPA 78 and UL 96A).
- B. In the event of a conflict between the drawings, specifications, and codes, request a ruling from the A/E.

#### PART 2 - PRODUCTS (Not Applicable)

#### PART 3 - EXECUTION

##### 3.01 INSTALLATION

- A. Comply with state and local electrical and building codes and with special codes having jurisdiction over specific portions within the complete project.
- B. Observe ordinances pertaining to electrical work.
- C. Complete work so that it will pass the tests required by agencies having authority over this work.
- D. Obtain and pay for permits, certificates, and materials required by local and state laws , ordinances, and the local utility company.

END OF SECTION 26 01 50

## SECTION 26 05 10

### PUMP STATION ELECTRICAL WORK

#### PART 1 GENERAL

##### 1.01 GENERAL

- A. Include Conditions of the Contract and applicable parts of Division 1.
- 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 the work of this Contract.

##### 1.02 SCOPE

- A. The work covered by this Section consists of furnishing all labor, materials, equipment, supplies, devices, electrical apparatus, and the performance of all operations necessary for the installation of electrical facilities in and about the structures and around the grounds, as indicated in the Contract Documents. This project only involves modifications and installations in association with the installation of the new standby generator and automatic transfer switch at this site only.

##### 1.03 WORK OF OTHER SECTIONS

- A. Temporary lights and power
- B. Excavation and backfill for underground distribution
- C. Stand-by Generator

##### 1.04 SUBMITTALS

- A. Shop Drawings
  - 1. Within thirty days after award of the Contract, submit shop drawings in accordance with the requirements of the General Conditions and in the manner described therein. Shop drawings shall indicate specification 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; pull, junction, and terminal boxes conduit, wire and cable, etc.

B. Samples

1. 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

1. In accordance with requirements of the Supplementary General Conditions, the Contractor shall furnish and keep on the job at all times one complete set of blue-line 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. However work is installed otherwise than as shown on the Contract Drawings, such changes shall be noted.
2. The Contractor 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 Contractor shall instruct, to the Owners, satisfaction, such persons as the Owner designates in the proper operation and maintenance of the systems and their parts.
2. Parties indicated above shall sign affidavits stating that the above instructions were given by the Contractor.
3. Furnish in accordance with the General Conditions operating and maintenance manuals and forward same to the Engineer for transmittal to the Owner. The operating instructions shall be specific for each system and shall include copies of posted specific instructions.
4. For maintenance purposes, provide shop drawings, parts listed, 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 Contractor shall submit for Engineer's approval a complete list of manufacturer's names of all materials and equipment proposed for the project.
2. After approval of the above list, the Contractor shall submit for Engineer's approval complete sets of detailed manufacturer's 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 Contractor'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, or 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 Contractor shall assume the entire cost and responsibility for any changes to 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 Contractor 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 these specifications, the new manufacturer's number shall be immediately submitted to the Engineer for approval. It shall be the responsibility of the Contractor to notify the Engineer of any superseded manufacturer's numbers mentioned in these specifications.

1.05 QUALITY ASSURANCE

A. Applicable Standards, Permits And Codes

1. The installation shall comply with all laws applying to electrical installations in effect in Enfield, New Hampshire with regulations of any other governmental body or agency having jurisdiction, with regulations of the National Electrical Code where such regulations do not conflict with those

laws, with the regulations of the electrical utility company 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 laws or ordinances with regard to type of materials, equipment, or fixtures to be used, the Contractor 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 laws or ordinances shall be paid by the Contractor and shall become a part of this Contract.
4. Testing by Contractor: Provide equipment and personnel for operating testing of the electrical system.

#### 1.06 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.

#### 1.07 DRAWINGS

- A. The Contractor shall refer to the electrical drawings and architectural floor plans 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 figures dimensions and detailed drawings are in all cases to assume precedence over them. The electrical drawings are diagrammatic and are not intended to show every detail of construction or the exact location of equipment. Where building construction makes it advisable or necessary to change the location of equipment, the Contractor 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, and with all facilities properly interconnected with power and telephone. The Contractor 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.

#### 1.08 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 methods of the devices represented. When not clear, or where one has been inadvertently omitted, it shall be the responsibility of the Contractor to obtain a ruling on the intent before proceeding with any work.

#### 1.09 TEMPORARY WORK

- A. The Contractor shall furnish and install temporary feeders of proper capacity power required for the project while under construction. All necessary poles, accessories, transformers, meters, cables, panelboards, and switches required shall be provided and necessary permits procured. 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 Contractor will pay for the cost of energy consumed by all trades.
- C. The Contractor 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 requiring other than that mentioned above.

#### 1.10 BID ALTERNATES (if any)

- A. Provide additive or deductive bids for such work as is noted as Bid Alternative work, if any.

#### 1.11 ALTERATIONS (Shaker Landing)

- A. The Contractor shall execute all alterations, additions or new work, etc., as indicated or required to provide a complete installation in accordance with the intent of the drawings and specifications.

- B. Any existing work disturbed or damaged by the alterations or new work shall be repaired or replaced to the Engineer's and the Owner's satisfaction at no added cost to the Owner.
- C. Modifications in the existing facility may not be limited to those noted in the Contract Documents. Review the existing site to determine the full scope or removals and/or relocations required by the Contract prior to bidding.
- D. Any existing wiring and/or exposed conduits discontinued under this Contract shall be completely removed.

#### 1.12 SCHEDULING

- A. The Contractor shall schedule his work in accordance with the Contract Requirements regarding any interruption of electrical or other services and/or the requirements to maintain the equipment and site areas or spaces available for the Owner's use during construction.
- B. All work must be scheduled to maintain the operation of the existing equipment while the new installations are being undertaken. If this requires the Contractor to have to provide installations during other than standard hours of work, such requirement will be an acceptable reason for additional compensation for the work so required.
- C. Coordinate with the Owner as to equipment outages, etc. required. Provide any and all needed equipment to maintain the pump station operational during the progress of the work. All equipment must be fully operational at the end of any Contract work day.

#### 1.13 SEISMIC RESTRAINT FOR ELECTRICAL SYSTEMS AND EQUIPMENT

The electrical installations shall be provided with seismic restraints for all conduits and equipment in accordance with requirements of the IBC or other applicable building codes. The Contractor shall retain a Professional Engineer duly licensed to practice in New Hampshire to provide and require design in conjunction with this and shall include all associated costs in his bid. Use nationally recognized methods of complying with this requirement and provide submittal drawings of these details to the Project Manager with shop drawing submittals. These are subject to review and acceptance or rejection by the Project Manager. The Contractor shall retain the design Professional Engineer to inspect the installations and provide written certification that installations so conform to design.

#### 1.14 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

## PART 2 - MATERIALS AND METHODS

### 2.01 GENERAL

- A. All materials, devices, and equipment, unless specifically noted, shall be new.

### 2.02 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.

### 2.03 SLEEVES/JUNCTION BOXES/ANCHORS

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

### 2.04 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. All underground conduit shall be concrete encased if not within or below concrete floor slabs. Where PVC is used all offsets and elbows shall be rigid galvanized steel. PVC shall not extend above finish grade or floors.

2. Exterior conduits above grade shall be rigid galvanized steel.
3. Minimum size conduit for light and power wiring, where required, shall be 3/4".

B. General

1. The use of nonmetallic conduit or raceway above finish grade or above floors within a building is not permitted.
2. Rigid galvanized conduit shall be manufactured by Youngstown Sheet and Tube Company, Republic Steel, or equivalent.
3. Liquid-tight flexible metallic conduit shall be used to tie in all motors.
4. PVC conduit shall be Type II Cantex Products or approved equal.
5. Aluminum conduits shall not be used on this project.
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 seals per NEC Article 300.7(A) where conduits pass from the building exterior to the interior.
9. Provide expansion fittings for all conduits rising from below grade at the exterior of any building or structure and/or elsewhere as required by the NEC.
10. Provide seal fittings properly rated for classified areas where conduits enter and/or exit classified areas.

2.05 WIRE AND CABLE

- A. All wire and cable 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 Triangle, General Cable, General Electric, Carol, American, or approved equal, unless otherwise specified or indicated.
- B. All conductors used in this wiring system shall be soft-drawn copper wire having a conductivity of not less than 98 percent of that of pure copper, unless otherwise

indicated or specified. Wire No. 10 AWG and smaller may be solid and wire No. 8 AWG and larger shall be stranded.

- 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 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).
- E. Insulation for cable and wire shall be as follows
  - Service conductors XHHW-2
  - General distribution circuits XHHW-2, THWN-2
- F. 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.
- G. The following color code shall be used for all conductors. The colors must be fast, fadeless, and capable of withstanding cleaning.

	120/240 Volt, single phase	240 Volt, 3 phase
Phase A	Black	Black with color stripe
Phase B	Red	Red with color stripe
Phase C	-----	Blue with color stripe
Neutral	White	
Bond	Green	Green
- H. 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.
- I. 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.
- J. Wires and cables shall be carefully handled during installation.
- K. 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.

- L. Conductors shall be continuous from panelboard to outlet and from outlet to outlet. No splices shall be made except within junction or outlet boxes.
- M. Splices and taps in wires No. 8 AWG and larger shall be made with Burndy "Polytap" or equal solderless connectors designed for the purpose. All connection 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 receptacles and lighting only and only in dry locations).
- N. Type NM, NMC, AC, or similar cables shall not be installed on this project. All wiring shall be installed in conduit in all areas. All conductors and connections shall be free of grounds, shorts, and opens.
- O. Aluminum conductors shall not be used on this project.
- P. All underground conductors shall enter manholes, building walls or termination points through a protective galvanized steel conduit sleeve of appropriate size.

## 2.06 OUTLETBOXES

- A. All boxes shall be held to wood surfaces by wood screws. On metal surfaces, boxes shall be held by metal-to-metal screws or by machine bolts.
- B. All boxes at exterior locations (if any) shall be cast metal type approved equal to Crouse Hinds FS and FD series. Bell style boxes will not be approved.

## 2.07 PULL BOXES AND JUNCTION BOXES

- A. Pull boxes, cabinets and junction boxes shall be without knock-outs for conduits and shall be constructed of code gauge galvanized sheet metal of not less than the minimum size recommended by the National Electric Code. Covers shall be screw fastening type. The Contractor is responsible for the proper physical size of all pull and junction boxes for the conduits and conductors involved, and for utilizing appropriate tools to provide properly sized knock-outs for entering conduits. Pull and junction boxes shall be provided without factory prepared knock-outs for conduit entry and the Contractor shall punch appropriate sized openings in the field.

## 2.08 PULLING CONDUCTORS

- B. All raceways are to be equipped with conductors. Swab all conduit 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.



## 2.09 DISCONNECTS, MAIN BREAKERS

- A. Where shown on the Drawings, or when NEC required whether or not shown, install disconnect switches appropriate for the application. In general, all circuits are protected by breakers in panels and all disconnect switches are to be non-fused. When serving motors, they shall be motor rated. Those for equipment (if any) outdoors or in unheated areas shall be in NEMA 4X SS enclosures.
- B. Switches shall be heavy duty quick make and break type. They are to 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 General Electric Type TH in NEMA 12 enclosures where installed indoors (or other NEMA designations noted on the Contract Drawings). Manual starters with overload protection built in are approved when NEC acceptable. Those in classified locations shall be rated for the location classification involved.
- C. Main electric service breaker at Shaker Landing shall be NEMA 4X stainless steel enclosure. The breaker shall have an interrupting rating that exceeds the utility available fault current at the installation location, and the Contractor shall provide the utility's documentation of the available fault current with shop drawings for this equipment. Units installed outdoors shall have a padlockable cover over the breaker handle. Provide lightning/surge protection at each service with Surge Protective Devices as specified elsewhere in this specification section.

## 2.10 OVERCURRENT PROTECTION DEVICES

- 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.

## 2.11 WIRE CONNECTORS AND DEVICES

- A. All wire joints shall be made with a pressure squeezed connector such as T & B Stakon and Ideal, or bolted clamp such as made by Dossert or equivalent. Make up to terminals shall be by mechanical squeeze connector. Whenever only a screw connector is available, install a conductor terminal like T & B Stakon spade or donut designed for the application and compression set to the conductor.
- B. Cover all joints made with non-insulated clamp devices with 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 summer, or when the

temperature is above 60°F, new type #33 plus may be used. Triple wrap joints, each wrap having a 50% overlay.

## 2.12 SWITCHES AND PLATES

- A. Switches shall be specification grade, 20 amperes at 120/277 volts, with ivory handle, such as Bryant 4901-I, for SPST applications. All switches shall have clamp type terminals screw set.
- B. Mount all switches vertically, wall surface, 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. Plates shall be cast, waterproof type with gasketed cover in the valve pit and may be sheet metal to match the switch enclosure when within the electrical equipment enclosure.. Plates in wet or damp areas shall match boxes.
- F. Switches and plates shall be a product of Bryant or Hubbell.

## 2.13 CONVENIENCE AND OTHER OUTLETS AND PLATES

- A. Ground Fault Receptacles shall be Bryant GFR 53FT-I or equivalent, 20 Ampere, 120 Volt, Class A, NEMA 5-20 configuration, ivory color. Each device indicated as "GFI" is an individually protected device.
- B. Outdoors and elsewhere where noted as 'waterproof' or 'weatherproof' use "extra duty" weatherproof "in - use while not attended" covers, Tay Mac or approved equal.
- C. Automatic grip set outlets are not permitted.
- D. Outlets and plates shall be a product of Bryant or Hubbell or equivalent.

## 2.14 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 driven 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 B insulation, and continuous duty classification based on a 40° F ambient temperature of reference.

- C. Motors 1/2 HP and larger shall generally be, and those smaller may be, 230 volts, three phase, 60 Hertz. Motors 1/3 HP or smaller shall be 120 volt, single phase, 60 hertz. All motors shall have oversized terminal boxes. Pump motors will be 3 phase to operate with VFD -Phase Convertor included in the pump control panel and provided as part of the pump equipment.
- 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 as 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 of the National Electrical Manufacturers Association and the Standards for Industrial Control Equipment of Underwriter's 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 float switches that control motors directly 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 participating utility companies in the area. Any utilized in conjunction with VFD's or Solid State Soft Starters shall be inverter duty rated.

## 2.15 PANELBOARDS

- A. Panelboard providing power service to the new installation is existing. Contractor shall provide new branch circuit breakers for the added loads noted for this project if there are not existing "spare" breakers in the existing panel. Contractor must field confirm and no added costs will be accepted if the Contractor has to purchase and install these.. Breakers shall be of the same manufacturer and with the same interrupting rating as those existing in the panel.
- B. Provide new typewritten panel directory.
- C. New panel board at the new electrical equipment enclosure shall be provided with main lugs or main breakers and branch circuit breakers, according to the scheduled on the Drawings.
- D. The general requirements for the panels are shown on the Drawings including mounting and gutters. Mount the panels 6'-6" up to 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.

- E. All breakers shall be trip-free, suitable for switching, and thermal magnetic. All breakers shall be bolted to bus type secured in place by holding bolt. "Space" means provisions 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 of copper full silvered between all contact surfaces. All breakers shall have a minimum interrupting capacity of not less than 22,000 amperes at 240 volts AC (symmetrical RMS amperes) for 240/120 volt panel boards. If the utility documentation indicates an available utility fault current greater than 22,000 AIC for the 240 volt service, the Contractor shall provide the panel board and breakers with a manufacturer's rating that exceeds the utility's available fault current at no added cost to the Owner. A copy of the utility's documented AIC requirements at 240 volts, single phase must be provided with shop drawings or they will not be approved.
- F. Note that the breakers supplying the receptacles in damp/wet locations and outdoor receptacles are not the ground fault interrupter type. Design requires GFI receptacles, specifically.
- G. 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 the door in a frame for the purpose, with a transparent plastic cover. Panel door shall be "door-in-door" construction.
- H. Panelboards provided under this Contract shall be Square D , Cutler Hammer, or General Electric
- I. Panel boards shall be NEMA 1 enclosed.

## 2.16 BALANCING OF LOADS

- A. The Contractor shall balance all loads between phases in all panels etc., ground the neutral. Where common neutral is run for branch circuits, the phase wires of the home run shall be connected to separate phase legs in order that the neutral will carry only the unbalanced current in the phase circuits. Neutral conductors shall be the same size as phase conductors unless specifically noted otherwise.
- B. All circuits shall be distributed among the phases so as to restrict any line 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. Upon request, submit four 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 the numbers deviate from the Drawings, the as-built Drawings shall reflect this.

## 2.17 LIGHTING FIXTURES

- A. Wire directly to an outlet box for each lighting fixture in and on the structures. General building wire is to be used to these outlets. From outlet to fixture use minimum No. 14 AWG silicon rubber insulated, color coded wire to connect to the fixture socket, ballast, or driver supply leads. Add a bond wire to ground all fixtures.
- B. The lighting fixtures listed on the Drawings are to indicate quality, appearance, lamping and photometric characteristics acceptable. Alternative fixtures may be proposed for the project where they provide the equivalent characteristics, quality and appearance, and subject to the Engineer's approval. 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 approved by Addenda no less than 14 working days (Monday - Friday) before bid opening, otherwise they will be rejected.

## 2.18 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

#### 2.19 STAND-BY GENERATOR AND AUTOMATIC TRANSFER SWITCH

- A. Provide all conduit, wire, and appurtenant items and labor to completely install, connect and test the Stand by Generator and Automatic Transfer Switch as specified in specification Section 26 20 10 of the Contract at the Shaker Landing Pump Station.
- B. Provide concrete base pad for new generator in accordance with the generator manufacturer's recommendations. Excavate and provide suitable base backfill, compacted, to a depth of not less than 36 inches below the bottom of the concrete base. Top of base is to be approximately 2 inches above finished grade.

#### 2.20 SECONDARY SERVICES

- A. At Shaker Landing the new pump station service shall be obtained from the Owner's existing metered service for House Power in the Building 33 Mechanical Room and installed underground as indicated on contract drawings to the new electrical enclosure adjacent to the new pump station.

#### 2.21 CELLULAR ALARM DIALER

- A. Shaker Landing shall have added alarm input from the new transfer switch wired to the existing alarm dialer.
- B. Shaker Landing shall have the existing alarm dialer relocated from the Building 43 Mechanical Room to the new electrical enclosure. Provide new telephone connection from the Building 33 Mechanical Room and connect. Coordinate with the Owner and the Project Engineer as to which alarm inputs are to be combined if the dialer can not accept all individual alarm inputs indicated.

## 2.22 FUSES (if any)

- A. Provide a complete set of fuses for each fusible switch. Time-current characteristics curves of fuses serving motors or connected in a series with circuit breakers or other circuit protective devices shall be coordinated for longer operation; submit coordination data for approval. Fuses shall have a voltage rating not less than the circuit voltage.
- B. Cartridge Fuses, current-limiting type (Class R): UL 198E, Class RK-1 time-delay type. Associated fuse holders should be Class R only.

## 2.23 NAMEPLATES

- A. Provide nameplates for all items of equipment on all switchgear, motor control centers, panelboards, 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 non-ferrous 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.
- E. Provide placards per NEC at the utility service breaker, ATS, and generator service breakers indicating where all means of disconnect for power to the facility are physically located.

## 2.24 EQUIPMENT SUPPORTS

- A. Provide all structural supports required for proper attachment of all equipment. Wall mounted equipment may be directly secured to vertically orientated strut that is secured to the walls with approved anchors.

- B. Maintain at least 1/2" 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 hardware items shall be stainless steel.

#### 2.25 SURGE PROTECTIVE DEVICE (SPD)

- A. Provide an install a new SPD connected to the main power distribution panel.. The SPD shall be Type 1 with manufacturer's recommended overcurrent protection and disconnect device and it shall be UL 1449 Third Edition Listed, UL 1283 R/C. It shall have form C contacts for future use and shall include a surge counter, 6 digit LCD, with test function, reset and no-maintenance Eprom memory. Units shall be NEMA 1 enclosed and as manufactured by Advanced Protection Technologies or an approved equal manufacturer.
- B. The unit at Shaker Landing shall be rated for 240/120 volt, single phase, 3 wire, 60 Hz. service and connected to a feeder breaker in the power distribution panelboard. The unit shall have a surge capacity of 300 kA/phase, 150 kA L-N, L-G, N-G.

#### 2.26 TELEPHONE

- A. Provide new underground telephone conduit complete with wiring from existing distribution in the Building 33 mechanical room telephone terminal to the new electrical enclosure adjacent to the new Shaker Landing Pump Station. Extend wiring to relocated alarm dialer.

#### 2.27 SEWAGE PUMP CONTROL PANEL - PCP

- A. Install, wire and connect PCP, wet well high and low level alarm float switches, and wet well level controls in full accordance with manufacture's recommendations. Equipment is provided under another section of the project specifications. Include all conduit and wiring for the two pumps that have seal leak and over-temperature sensors at each site. All wiring in the pump chamber (wet well) is to be to Class 1, Division 1 requirements. Wiring and devices within the Code defined distance from the wet well vent and hatch will be Class 1, Division 1 or 2 rated based on requirements in NFPA 820. Install wire and conduit for alarms from the PCP to the facility Alarm dialer.



## 2.28 SERVICE AND DISTRIBUTION EQUIPMENT ENCLOSURE

Provide new stainless steel electrical equipment enclosure per Contract Drawings to house new panelboard, SPD, automatic transfer switch, main service disconnect, heater, receptacle, etc. The enclosure shall be sized to provide not less than 20% future space. The heater provided shall be thermostatically controlled and sized to minimize condensation within the enclosure. Coordinate color of exterior with the Owner and Engineer. Final enclosure size must be coordinated by the Contractor, to insure all items installed are accommodated and accessible per Code and that the noted future space is provided and accessible for future equipment.

Provide all conduit and wiring for connection of all equipment and install services as required.

The enclosure shall be hinged door, free standing, NEMA insulated, UL listed, with manufacturer's standard interior paint color. It shall be fabricated from 12 gauge minimum sheet metal with seams continuously welded and ground smooth. Stainless steel Unistrut (or approved equal) mounting channels shall be welded horizontally to the interior body sides, top, bottom, and center.

The door shall be mounted on a heavy gauge continuous hinge with removable continuous pin. A hasp and staple shall be welded to the door and frame for padlocking and shall have a removable print pocket on the inside of the door. Weather tightness shall depend on an oil resistant closed cell gasket retained by stainless steel clips. Door hardware shall provide three point latching. All hardware and fasteners shall be stainless steel.

The enclosure shall be provided with a built-in heater and adjustable thermostat. The heater shall be sized to maintain 40 degrees F. inside the enclosure with an outside temperature of -15 degrees F. and a 15 MPH wind. The heater shall include a means of mechanically circulating air within the enclosure to prevent hot spots. Heater shall be approved equal to Hoffman Engineering Co. series D-AH.

The enclosure shall be by Barber Electrical Associates, North Attleboro, MA. or approved equal. The Contractor shall provide final layout drawings confirming appropriate size with the shop drawing submittal. If required by any State or Local Authority(ies) Having Jurisdiction, or by any Codes and/or Ordinances, the final assembly shall have a UL label as a custom assembly.

The enclosure shall be insulated on the inside of all exterior surfaces with a minimum 3/4 inch thick rigid, non-combustible insulation having a maximum thermal conductivity ("K" value) of 0.35 BTU in/hr-Ft<sup>2</sup>-degrees F. The insulation shall be furnished with

manufacturer's standard all service jacket (ASJ) covering. Utilizing electrically conductive materials will not be acceptable.

All electrical equipment mounted on the exterior of the enclosure shall be mounted on strut, vertically oriented to minimize moisture accumulation.

## 2.29 DELIVERY, STORAGE AND PROTECTION

- A. The Subcontractor 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

### 3.01 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 manufacturers of apparatus as to the proper method of installing and connecting same.
- C. Before installing any of the work, the Contractor shall see that it does not interfere with the clearances required by code and/or as shown on the Contract drawings and details.
- D. Work installed by the Contractor which interferes with or modifies the Engineering design as shown on the Contract Drawings shall be changed as directed by the Engineer, and all costs incident 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 decisions.

### 3.02 SITE VISITS

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.

### 3.03 CUTTING AND PATCHING

It is the duty of the Contractor to furnish and install all sleeves required in the performance of this Contract.

### 3.04 ALUMINUM CONDUITS

A. Aluminum conduits shall not be installed.

### 3.05 CONDUIT SYSTEMS

A. 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 8'0" apart and shall be installed with runs parallel or perpendicular to walls, structural members, 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 wall brackets, ceiling trapeze, straphangers or pipe straps, secured by means of toggle bolts in hollow-masonry units, expansion bolts in concrete or brick and machine screws on metal surfaces. 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 outlets, junction boxes, pull boxes, and panelboards with galvanized locknuts and bushings, care being taken to establish a firm mechanical and electrical contract 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.
- E. All rigid metallic conduit shall utilize threaded fittings. All electrical metallic tubing fittings shall be of the compression type.
- F. Pull boxes, junction boxes and cabinet boxes shall be constructed of code gauge galvanized sheet steel of not less than the minimum size recommended by the National Electrical Code. 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, style of cover, and finish of box and cover. Locations shall be as inconspicuous a possible.

### 3.06 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.

### 3.07 OUTLETS (if any)

- 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.

### 3.08 DEVICE PLATES (if any)

- 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".

### 3.09 GROUNDING

- A. The facility main grounding electrode system and grounding electrode conductor are existing and shall remain.
- B. Ground wires shall be grouped and bonded to panel boxes, not to system neutrals. The ground terminals or receptacles shall be bonded to outlet boxes with #12

AWG bare or green insulated wire, or other suitable means per the National Electrical Code.

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

### 3.10 EXPLOSION PROOF REQUIREMENTS

- A. Any installations in Classified Areas shall conform to the area classification and installation requirements in the National Electrical Code.

### 3.11 PULLING CABLES

- A. Cables shall be installed utilizing pulling equipment designed for the types of wireways or conduits installed. Where lubricating materials are 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 OF 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 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 guarantee 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 provision of the Contract Documents.
- C. All materials, items of 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 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. The Contractor shall guarantee that all elements of the systems are of sufficient capacity to meet the specified performance requirements as set forth herein or as indicated.
- E. Upon receipt of notice from the Owner of failure of any part of the systems or equivalent during the guarantee period, the affected part or parts shall be replaced by the Contractor.
- F. The Contractor shall furnish, before the final payment is made, a written guarantee covering the above requirements.

END OF SECTION

## SECTION 26 20 10

### STANDBY GENERATOR SYSTEM

#### PART 1 GENERAL

##### 1.01 DESCRIPTION OF WORK

Work under this Section includes the furnishing of a standby generator system for the Enfield, NH, Waste Water Pump Station at Shaker Landing. Wiring and conduit, etc. are part of this project specification and are included in another specification section.

##### 1.02 QUALITY ASSURANCE

Manufacturer: Provide systems from one (1) manufacturer.

Warranty: Five (5) years comprehensive extended warranty, equal to Caterpillar's Comprehensive Extended Warranty, from date of start up of the entire standby power system by the system manufacturer.

NEC Compliance: Comply with applicable standby generator requirements of NEC Electrical Code.

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 Stand-by Power Systems".

UL Compliance: Provide standby generator system components, which are UL listed and labeled. System and all components shall be UL 2200 labeled.

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".

IEEE Compliance: Comply with applicable portions of IEEE Std. 241, "IEEE Recommended Practice for Electric Power Systems in Commercial Buildings" pertaining to standby power.

All units must conform to all EPA emissions limitations at the sites involved, and the manufacturer must provide documented certification of this conformity with shop drawing submittals or the submittals will be rejected without review.

##### 1.03 SUBMITTALS

Product Data: Submit manufacturer's product data, operation and maintenance instruction, and manufacturer's product warranty.

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. Provide manufacturer's computer sizing verification for the unit per loads indicated in 2.01 below. Maximum voltage dip shall not exceed 15%. Maximum frequency dip shall not exceed 6 Hertz.

#### 1.04 SCHEDULING

The Contractor must schedule the work under this specification section in coordination with the overall project schedule and the work of all Contractors and Subcontractors involved.

### PART 2 PRODUCTS

#### 2.01 GENERAL SYSTEM REQUIREMENTS

Power: 240/120 volts, single phase, 3 wire, 60 Hertz.

Capacity: Size for all indicated equipment, sequentially in the steps noted started as follows:

Step #1: One Waste Water Pump: 3 HP, 240 Volts, 3 phase: with VFD phase converter controller

One miscellaneous Load: 7 KW start; 5 KW run

NOTE: Operation is designed such that only one 3 HP pump can operate at any time.

Provide any required larger unit/system at no added cost to the Owner to comply with the above. Sizing noted in 2.02 is not to be utilized without manufacturer's verification indicating the estimated minimum rating that will be adequate. If vendor's sizing calculation permits a unit with a rating lower than that noted in 2.02, such unit may be proposed, but must be submitted as an Alternate Bid amount, with the indicated rated unit also being quoted as a Base Bid amount. If manufacturer sizing indicates a greater rating is required, the Bid shall include the cost of the greater rated unit, including any added costs if the transfer switch requires an increased rating. Note any effect such a change in rating may/will have on associated conduits and wiring so those can be included in the appropriate specification area.

Generators shall be provided Caterpillar as represented by Milton CAT, Onan as represented by Cummins Northeast, or Kohler as represented by Power Products (size per print-out recommendation is required by manufacturer for this project based on above load information as part of the shop drawing submittal).



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

- Propane fueled engine driven generator
- Engine start/stop controls
- Duct Adapter for radiator (if required)
- Mounted accessories as specified.
- Outdoor weather Enclosure with Sound Attenuation
- Properly sized black plastic nameplates with engraved white letters to identify all relays, components, etc.
- New 70 Ampere automatic Transfer Switch

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

- Full power rating
- Stability
- Voltage and frequency regulation
- All other certifications per NFPA 110.

Starting Capability: Unit capable of starting after extended periods at -20°F.

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.

## 2.02 STANDBY GENERATORS

Provide the following:

Engine Generator set with an output rated not less than 15 KW, 240/120 volts, single phase, 3 wire, 60 Hz.. Generator shall be constructed as reconnectable in the future for 3 phase voltages, and nameplate shall indicate the future voltage connections available. Engine shall be 1800 rpm design.

Controls: Generator mounted control panel for unit with panel lights, safety devices, and engine starting controls, which include, but are not limited to:

- Battery charge rate ammeter
- Oil pressure gauge
- Water temperature gauge
- Run-stop-remote switch
- AC voltmeter
- Voltage adjusting rheostat
- High water temperature cutout
- Low water level cutout
- Emergency latch-relay with manual reset & indicator light

Cranking limiter  
Manual reset circuit breaker  
Automatic over-speed shutdown  
Control contacts to control inlet and outlet air dampers, and control interlock to insure 2 pumps do not run when operating on generator power, etc.

Equipment: Provide the following for unit

Muffler, critical (maximum sound attenuation)  
Flexible seamless exhaust connection - insulated  
Vibration isolators  
Lube oil filter  
Oil drain plug  
Fuel filters  
Battery cables  
Battery rack and battery  
Battery charger - float type  
Air cleaner  
12/24 volt, heavy duty, cold weather starting battery  
12/24 volt Bendix fuel pumps (if required)  
Air discharge duct adapter (if required)  
Engine Block heater  
Flexible fuel supply and/or return line connections and solenoid valve  
Engine coolant level switch cut out  
Main output power circuit breaker  
Radiator fill including glycol  
Fuel tank fill after all testing.  
Sound attenuated outdoor weather enclosure

2.03 AUTOMATIC TRANSFER SWITCH - 70 Ampere, 240/120 volt, single phase, 4 wire, 60 Hz., 2 pole, Asco Series 300 or approved equal by Russelectric..

General: UL listed (Standard 1008) for all classes of load.

A. Operation:

1. Sequence as follows: Sense complete loss of power on any phase and signal generator to start.

When emergency power attains a minimum of 90% of rated speed and voltage, transfer load to emergency power.

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.

2. Obtain operating current for load transfer from source to which load is to be transferred.
3. 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.

B. 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. Under voltage 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.

Bypass time delay if emergency power fails during delay period; retransfer load immediately to normal power.

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.

Provide circuitry to inhibit "Power Failure" and/or "Generator Run" alarm annunciation under automatic exerciser operation - unless other conditions do simultaneously exist.

13. Provide added auxiliary contacts for purposes required:
  - a. Pump Controls interlock
  - b. Alarm: Time delayed (power failure - utility)
  - c. Alarm: time delayed for alarm for utility power failure and generator fail to pick-up load
  - d. Future (2)

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.

#### Rating and Performance

Continuous duty in a non-ventilated NEMA 3R enclosure, lockable and including thermostatically controlled anti-condensation heater.

Load: All classes of load including inductive and non-inductive at 600 volts; tungsten lamp load at 250 volts.

Close on inrush current of 20 time continuous rating without welding or excessive burning of the contacts.

Load switching capability: 15 times continuous rating.

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 contacts on inrush current 10 times continuous rating.

#### Construction

General: No wearing surfaces or moving parts requiring routine lubrication or maintenance.

Enclosure: NEMA 3R, key operated door locks; swing-out service panel, pre-punched for future addition of control components.

Interlocking: Mechanical and electrical interlocking to prevent simultaneous energizing of load by normal and emergency power.

Contacts: Double break design for fast arc suppression, solid silver cadmium, completely enclosed in heat resistant contact chambers.

## 2.04 FUEL SYSTEM

The fuel system shall be provided by this contract to be installed by the Contractor. This is inclusive of a new above ground properly sized buried propane tank with line to the new generator. Sizing and installation of the tank shall be coordinated with Irving Oil (Owners fuel supplier) and must comply with NHDES Env-Wq 705.11(i) to provide enough fuel to the generator at a minimum of two days under peak load or four days under normal load. This Contractor is to provide a PVC conduit, properly sized with proper minimum radius bends, to permit the installation of the fuel line from the propane tank to the generator. Connection to the Generator shall also be coordinated with the Owner's propane fuel supplier to meet the requirements of the generator manufacturer.

Flexible fuel lines shall be furnished with the generator for each fuel connection to the engine.

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.

## 2.05 GENERATOR EXHAUST

Provide generator exhaust in compliance with manufacturer's recommendations. Provide flexible continuous, bellows type stainless steel interlocking joints exhaust pipe at least 8 inches long for each engine exhaust outlet. The pipe outlet connections shall

be compatible with ASA 125 lb. pipe flange. Provide insulation where located within the sound attenuated enclosure.

## 2.06 SOUND ATTENUATED ENCLOSURE

Provide manufacturers super sound attenuated enclosure for new generator installations, complete with lockable access doors, etc. Indicate maximum sound level at 23 feet with shop drawing submittal. The expected sound level is less than 65 dB A.

Color of enclosure will be as selected by the Owner from manufacturer's standard color options.

## 2.07 MISCELLANEOUS

Anchor Bolts: Galvanized steel, by others at time of installation. Generator manufacturer shall note recommended size, etc., in shop drawings.

Concrete Base Pad: Concrete pad sized for unit with properly located bond-outs for conduits and fuel connections is part of the contract requirements. This will be by the Contractor under this specification section..

Provide initial radiator fill with glycol mixture set for minus 20 degrees F or lower.

## PART 3 EXECUTION

### 3.01 INSTALLATION

All installation is part of this contract.

### 3.02 GROUNDING

All grounding to NEC requirements and installation are part of this contract.

All assembled wiring by manufacturer shall be grounded as required by codes.

### 3.03 TESTING

After installations have been energized with normal power source, test engine-generator to demonstrate standby capability and compliance with requirements. Correct malfunctioning units, then retest demonstrate compliance. Test shall conform to NFPA 110 requirements.

The vendor shall include in his equipment proposal for the provisions of start-up testing.

3.04 MAINTENANCE

The unit shall be installed indoors on a concrete pad. The automatic transfer switch will be installed indoors.

END OF SECTION 26 20 10

**DIVISION 31**

**SITE WORK**

<u>Section No.</u>	<u>Title</u>	<u>No. of Pages</u>
31 14 00	Site Clearing and Grubbing	3
31 23 00	Excavation and Fill	6
31 23 16.13	Trenching	6
31 23 16.26	Rock Removal	4
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## SECTION 31 14 00

### SITE CLEARING AND GRUBBING

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

This section includes clearing of trees, grubbing and earth stripping loam where required to assure necessary quality of the work and conservation of topsoil. Removal of individual trees is incidental to clearing in this section.

##### 1.02 QUALITY ASSURANCE

- A. Confine clearing and grubbing operations to within the following limits:
  - 1. Within grading limits as shown on the drawings.
  - 2. Within easements and property lines of the Owner.
  - 3. Within all areas where work is required but to the minimum extent possible to install the work.
- B. Requirements of regulatory agencies: State and local codes shall control the disposal of organic material. No cutting or disturbing of trees or shrubs in a public way shall be performed until such time as the Contractor has obtained a permit from the local governing authority.
- C. Protect the area beyond the limit of clearing from damage by erecting barricades, fencing, wrapping, or other erosion control methods.

##### 1.03 JOB CONDITIONS

- A. No burning shall be allowed.
- B. Locations of trees, shrubs, and other items shown on the drawings have been determined through aerial and ground surveys at the time the surveys were made. Since that time, it is possible that job conditions may have changed. It is the Contractor's responsibility to fully acquaint himself with the site and existing conditions, as the bid price shall include all costs associated with the removal and replacement of all obstacles, whether or not these items are shown on the drawings.

#### PART 2 - PRODUCTS

##### 2.01 EQUIPMENT

Equipment shall be at the Contractor's option and acceptable to the Engineer. The Contractor shall furnish all labor, materials, equipment, for completion of the work defined in this section.

#### PART 3 - EXECUTION

##### 3.01 CLEARING

- A. Clearing shall consist of the felling, trimming, and cutting into sections and the satisfactory disposal of such trees, brush, and limbs as well as the cutting and

satisfactory disposal of bushes, brush, and other vegetation. This work shall also include the removal and disposal of down timber, rubbish, and debris found existing within the areas to be cleared. All materials as stated above shall become the property of the Contractor.

- B. Clearing shall include the removal and storage of fences, signs, walks, curbs, trees, shrubs, and other items to be restored.
- C. Clearing as required to accommodate the construction shall be performed. When clearing is performed in advance of trench excavation, it shall be performed within the construction easement limits. Clearing is inclusive of individual tree pruning where trees are to remain but trimming is necessary to complete the work.
- D. Certain trees within the project limits may be designated by the Engineer to be saved. All trees to remain shall be flagged and protected from damage as specified in section 31 13 00.
- E. Gross and unnecessary removal of trees is strictly prohibited.

### 3.02 GRUBBING

- A. Grubbing shall consist of the removal and disposal of stumps, roots larger than three (3) inches in diameter and matted roots from areas to be grubbed. This material, together with other organic matter and other debris which is not suitable for subgrade or foundation purposes, shall be excavated to a depth of not less than 18 inches below original ground surface.
- B. The limits of grubbing shall coincide with the limits of clearing. All stumps and trees shall be removed by the Contractor.
- C. Clear undergrowth and deadwood, without excavating topsoil or subsoil.
- D. Use only hand methods for grubbing inside drip lines of trees that remain in place.

### 3.03 STRIPPING

Strip topsoil from all areas that will be substantially disturbed by or during construction. Avoid mixing topsoil with subsoil and stockpile it in areas on the site as approved by the Engineer. Topsoil shall be stockpiled free from brush, trash, stones and other extraneous material and protected until it is placed. Any topsoil remaining after all work is in place shall remain the property of the Owner and shall be disposed of by the Contractor as directed by the Engineer.

### 3.04 PRUNING TREES

- A. Carefully and cleanly cut roots and branches of trees indicated to remain, where such roots and branches obstruct the construction.
- B. Prune trees in accordance with standard horticultural practice. Do not cut tree leaders.
- C. Repair, paint tree wounds in accordance with standard horticultural practice.

### 3.05 PROTECTION

- A. Protect plant growth and features remaining as final landscaping.

- B. Protect bench marks and existing work from damage or displacement.
- C. Maintain designated site access for vehicle and pedestrian traffic.
- D. Protect existing trees and other vegetation to remain in place against unnecessary cutting, breaking, skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line and excess foot or vehicular traffic, or parking of vehicles within drip line.

### 3.06 DISPOSAL

- A. All organic material, rubbish, and debris of whatever nature shall be removed from the site daily. Ultimate disposal shall be provided as part of the work.
- B. All disposal methods shall conform to applicable federal, state, and local requirements.

### 3.07 RESTORATION OF SURFACES

All surfaces are to be restored in accordance with Sections 32 01 00 Operation and Maintenance of Exterior Improvements

END OF SECTION 31 14 00

## SECTION 31 23 00

### EXCAVATION AND FILL

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

A. Work included in this Section:

1. Clearing, grubbing, and stripping of Work areas as shown or noted on the Drawings and as specified in Section 31 14 00.
2. Excavating, stockpiling, and handling of common fill materials.
3. Disposal and handling of unsuitable materials.
4. Placing, shaping, and compacting of fill areas.
5. Grading and fine grading of subbase for roadways and parking areas.
6. Placement, fine grading, and compacting of crushed gravel surface, slopes, and shoulders in roadways and parking areas.
7. Excavating, shaping and compacting of drainage ditches.

##### 1.02 QUALITY ASSURANCE

- A. Compaction testing shall be conducted as indicated in Section 01 40 00 Quality Requirements. Aggregate gradation analyses shall be paid for by the Owner. Moisture maximum density tests and compaction test fees shall be paid by the Owner. Retesting for any failed tests shall be paid by the Contractor.
- B. Surfaces under paved areas shall be shaped to grade, line and cross-section within ½-inch positive or negative tolerance relative to subgrade elevations.
- C. Source Quality Control: Where materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to the site. If tests indicate materials do not meet specified requirements, change material and retest.

##### 1.03 REFERENCE STANDARDS

- A. Reference Standard shall be the New Hampshire Department of Transportation, Standard Specifications for Road and Bridge Construction, hereinafter called NHDOT Standard Specifications.
- B. AASHTO T 180 - Standard Specification for Moisture - Density Relations of Soils Using a 10-lb Rammer and a 18 in. Drop; American Association of State Highway and Transportation Officials; 2001 (2004).
- C. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2005.
- D. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>); 2000a.
- E. ASTM D 2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2004.

- F. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2004.
- G. ASTM D 4318 - Standard Test Methods for Liquid Limit; Plastic Limit; and Plasticity Index of Soils; 2000.

#### 1.04 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 60 10 Submittals.
- B. Test reports of results of material gradations.
- C. Compaction test reports.

#### 1.05 JOB CONDITIONS

- A. Site information data on subsurface conditions are not intended as representations or warranties of accuracy or continuity between borings or test pits. It is expressly understood that the Owner will not be responsible for interpretations or conclusions drawn there from by the Contractor. Additional test borings or test pits may be made by the Contractor with prior approval of the Engineer. Payment for exploratory excavations approved by the Engineer shall be paid for under the contract unit price.
- B. Exploratory test pits shall be excavated where shown on the Drawings or as directed by the Engineer. Comply with the requirements for backfilling and compacting under this Section.
- C. Dust control shall be practiced in work areas and adjacent off-site stockpile areas. Dust shall be controlled by water or calcium chloride.
- D. Traffic control shall be maintained by the use of approved barricades, lights and signs to protect life and property until work areas are filled and graded to a condition acceptable, to the Engineer, for traffic.
- E. Provide sufficient quantities of fill to meet the project schedule and requirements. When necessary, store materials on site in advance of need.
- F. When fill materials need to be stored on site, locate stockpiles where indicated.
  - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
  - 2. Prevent contamination.
  - 3. Protect stockpiles from erosion and deterioration of materials.
- G. Verify that survey benchmarks and intended elevations for the work are as indicated.

### PART 2 - MATERIALS

#### 2.01 DEFINITIONS

- A. Common Excavation or Fill shall consist of all excavation other than rock excavation, which is not specifically classified. Common Fill shall be free of trees, roots, frozen matter or rubble where the greatest stone size does not exceed

ten inches (10") in greatest dimension. It shall be capable of being readily spread and compacted.

- B. Subgrade soils made unstable by error or negligence of the Contractor shall be removed and replaced by Select Backfill at the Contractor's expense.
- C. Unsuitable Material shall consist of deposits of saturated or unsaturated mixtures of soils and organic matter not suitable for foundation material regardless of moisture content. Unsuitable material shall also consist of any material containing excessive plastic silt, vegetation, debris, pavement, stones or boulders over ten inches (10") in greatest dimension, which, in the opinion of the Engineer, will not provide a suitable foundation or subgrade.
- D. Base course materials shall consist of hard, durable particles or fragments of stone or gravel. Materials that break up when alternately frozen and thawed or wetted and dried shall not be used for aggregate base course materials. Fine particles shall consist of natural or processed sand. The materials shall be free of harmful amounts of organic material. Unless otherwise specified, the percent wear of base course material shall not exceed 50 percent as determined by AASHTO T 96, Grading A.
- E. Crushed stone shall be processed material obtained from a source that has been stripped of all overburden. The processed material shall consist of clean, durable fragments of ledge rock of uniform quality and reasonably free of thin or elongated pieces. Acceptable sand may be blended as necessary to obtain the proper gradation for the fine aggregate portion.
- F. Gravel (NHDOT Item 304.2): The maximum size of stone particles shall not exceed three-fourths of the compacted thickness of the layer being placed but in no case larger than 6 inches. Gravel is characterized as hard, durable stone with coarse to fine sand. Sieve analysis by weight as follows:
- | <u>Sieve Size</u> | <u>% Passing by Weight</u> |
|-------------------|----------------------------|
| 6"                | 100%                       |
| No. 4             | 25-70%                     |
| *No. 200          | 0-12%                      |
- \*(Based on the fraction passing No. 4)
- G. Sand (NHDOT Item 304.1): The maximum size of any stone or fragment shall not exceed three-fourths of the compacted depth of the layer being placed but in no case larger than 6 inches. Sand shall consist of clean, sharp mineral particles free of organic matter. Sieve analysis by weight as follows:
- | <u>Sieve Size</u> | <u>% Passing by Weight</u> |
|-------------------|----------------------------|
| 6"                | 100%                       |
| No. 4             | 70-100%                    |
| *No. 200          | 0-12%                      |
- \*(Based on the fraction passing No. 4)
- H. Crushed Gravel (NHDOT Item 304.3): At least 50 percent of the material retained on the 1 inch sieve shall have a fractured face. Sieve analysis by weight as follows:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
3"	100%
2"	95-100%
1"	55-85%
No. 4	27-52%
*No. 200	0-12%

\*(Based on fraction passing No. 4)

- I. Crushed Aggregate for Shoulders (NHDOT Item 304.33): Sieve analysis by weight as follows:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
1 1/2"	100%
1"	90-100%
No. 4	30-65%
*No. 200	0-10%

\*(Based on fraction passing No. 4)

- J. Coarse Crushed Stone (NHDOT Item 304.5) and Fine Crushed Stone (NHDOT Item 304.4): Shall be clean angular rock fragments obtained by breaking and crushing rock material. Sieve analysis by weight as follows:

<u>Sieve Size</u>	<u>% Passing by Weight</u>	
	<u>Fine Stone (304.4)</u>	<u>Coarse Stone (304.5)</u>
3 1/2"	--	100%
3"	--	85-100%
2"	100%	--
1 1/2"	85-100%	60-90%
1"	--	--
3/4"	45-75%	40-70%
#4	10-45%	15-40%
#200	0-5%	0-5%

- K. Pea Stone: Shall be naturally round aggregate, 1/4" nominal size. Sieve analysis by weight:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
1/2"	100%
3/8"	90-100%
No. 4	20-55%
No. 8	5-30%
No. 16	0-10%
No. 50	0-5%

- L. All material not herein specified, but necessary for completion of the Work shall conform to the requirements of the NHDOT Standards and Specifications for Roadway and Bridge Construction.

- M. Refill material for excavation below grade in ledge shall be crushed gravel or as shown on the Drawings or approved by the Engineer. For refill of unsuitable

material removed at the direction of the Engineer, Common, or Select Backfill shall be used as directed by the Engineer.

- N. Select Backfill, where required, shall be crushed gravel as specified above, unless directed otherwise by the Engineer.
- O. Class "A", "B", and "C" Stone Fill: Refer to Section 31 23 23.63 Stone Fill.

### PART 3 EXECUTION

#### 3.01 EXCAVATION

- A. Common excavation to subgrade shall be done so that the subgrade material does not become saturated with water or contaminated with organic matter to a degree that subgrade is unstable.
- B. Subgrade surfaces shall be dry and firm before placing granular surface materials. Subgrade material disturbed during excavation shall be thoroughly compacted in accordance with section 31 23 23.23.

#### 3.02 FILL

- A. Scarify subgrade surface to a depth of 6 inches to identify soft spots.
- B. Fill to contours and elevations indicated using unfrozen materials.
- C. Fill up to subgrade elevations unless otherwise indicated.
- D. Employ a placement method that does not disturb or damage other work.
- E. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet frozen or spongy subgrade surfaces.
- F. Maintain optimum moisture content in fill materials to attain required compaction density.
- G. Correct areas that are over-excavated; use common fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density.
- H. Compaction density unless otherwise specified or indicated.
- I. Reshape and re-compact fills subjected to vehicular traffic.

#### 3.03 PLACING EMBANKMENTS

- A. Fill material shall be placed as specified by the NHDOT Standard Specifications. Lifts shall be thoroughly compacted to the required density prior to placing the next lift. Continuous grading and shaping shall be done simultaneously with compaction procedures to ensure uniform density throughout fill areas.
- B. Embankments shall be graded to ensure run-off of water. Areas saturated by water shall be corrected as indicated in 3.01B.



- C. No embankments shall be constructed on frozen earth materials. Fill materials shall be free of ice and frozen particles. When fill is free of frost and subgrade is frozen, the frozen layer may be removed prior to placement of the suitable layer.
- D. Sustained freezing temperatures shall result in the suspension of all embankment work, unless directed otherwise by the Engineer.

#### 3.04 FINE GRADING

- A. Fine grading shall consist of the final grading required to level the subgrade, base and surface course to limits within the specified tolerances indicated in paragraph 1.02B.
- B. Gravel base courses shall be placed in 8 inch maximum lifts and thoroughly compacted as required prior to successive lifts. Care shall be taken to prevent separation of granular materials during placement. Segregated materials shall be removed and replaced using methods calculated to reduce the separation of aggregates.

#### 3.05 DISPOSAL OF EXCESS MATERIAL

- A. Disposal of surplus materials shall be at the express direction of the Engineer. Surplus excavated materials shall be stockpiled at an approved location.
  - 1. Unsuitable excavated materials such as boulders, rock, muck, and fill contaminated with stumps, roots, and organic debris shall be disposed of at the direction of the Engineer.
  - 2. Disposal, stockpiling and re-use of excavated material shall be considered a cost incidental to Common Excavation.

END OF SECTION 31 23 00

## SECTION 31 23 16.13

### TRENCHING

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

A. Work covered by this Section includes excavating, trenching and backfilling for the installation of underground lines, piping, structures and foundations as related to the site work.

B. Definitions:

1. Trench Common Excavation or Fill: Consists of all excavation other than rock excavation, that is not specifically classified. Common Fill shall be free of trees, roots, frozen matter or rubble where the greatest stone size does not exceed ten inches (10") in greatest dimension. It shall be capable of being readily spread and compacted.
2. Crushed Stone: Approved, imported aggregate, ASTM C33, Size 67 ( 3/4" A No. 4).

<u>Gradation:</u>	<u>% Passing by Weight</u>
1" Sieve	100%
3/4" Sieve	90 - 100%
3/8" Sieve	20 - 55%
No. 4 Sieve	0 - 18%
No. 8 Sieve	0 - 5%

3. Select Fill: Consists of imported sand or other granular materials as approved by Engineer.
4. Sand Bedding and Blanket: Sand conforming to ASTM C33, fine aggregate. Material shall be obtained from approved sources, and shall consist of satisfactorily graded, free draining material. Reasonably free from Loam, Silt, Clay, and Organic Material.

<u>Gradation:</u>	<u>% Passing by Weight</u>
No. 4 Sieve	100%
*No. 200 Sieve	0 - 12%

\*(Based on Fraction Passing No. 4)

5. Earth Overburden: Earth overlying solid rock and in place during blasting operations or earth not classified as Common Earth.
6. Unstable Material: Debris, frozen materials, topsoil, quicksand, and all wet, soft, or loose material which does not provide sufficient bearing capacity to satisfactorily support pipes or other work.
7. Unsuitable Material: Excavated material which does not meet requirements for backfilling purposes and includes solid and loose rock, earth overburden, and unstable material.

8. Topsoil: Surface layer of soil and sod suitable for use in seeding and planting and not containing debris, subsoil, stumps, roots, brush, stones, clay lumps, and similar objects greater than 2" in largest dimension and material toxic to plant growth.
9. Paved Areas: The area which lies directly under a paved surface whether it be asphalt, concrete, or other paving material.
10. Class "A" and Class "B" Stone Fill: Refer to Section 31 23 23.53 Stone Fill.
11. Definitions not found herein may be found in Section 31 23 00 Excavation and Fill.

#### 1.02 QUALITY ASSURANCE

- A. All fill material shall be subject to the approval of the Engineer.
- B. If trench widths are exceeded, redesign with stronger pipe, concrete cradles or other special installation procedures may be required. All additional costs, including the cost of redesigns, shall be borne by Contractor.
- C. Moisten or dry backfill to the proper moisture content as determined in accordance with ASTM D1557, Method C (Modified Proctor).
- D. Do not restrict access to any private road or driveway for more than one (1) hour. Provide and maintain suitable temporary crossings over open ditches where required to meet this condition.
- E. When excavating in or adjacent to the traveled portion of highways, take whatever measures are necessary to protect the road surfaces.

#### 1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 60 10 Submittals.
- B. Test Reports of all results of moisture-density tests and field compaction density tests.
- C. Gradations of all materials proposed for use in the Work.
- D. Results of grain size analyses, as required in these Specifications or as required by the Engineer.

#### 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store topsoil separately from all other excavated materials on the site and preserve for reuse.
- B. Store excavated materials meeting the requirements for backfill in an orderly manner at a sufficient distance away from banks of 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 away from the site.
- C. Promptly remove materials not specified to be stored or reused.

- D. Obstruction of roads, driveways, sidewalks, or interference's with drainage along gutters, ditches, or drainage channels with stored material is not permitted. If materials cannot be stored at the site to avoid such obstructions and interference's, they shall be stored away from the site and brought back when and as needed.
- E. Contactor shall protect all stock pile areas with required erosion prevention and sediment control measures.
- F. No construction activity, access, storage, or other use shall take place beyond the construction easement boundaries. The Engineer may require the Contractor to install and maintain snow-type fences along the boundaries, where such boundaries could be violated.

#### 1.05 JOB CONDITIONS

- A. Maintain excavations and trenches free of groundwater, sewage, storm water, ice and snow during the progress of the Work and until the finished Work is safe from injury.
- B. Protect subgrades against freezing by means of insulated blankets, hay, or other methods.
- C. Backfilling with frozen materials or when materials already in place are frozen is not permitted.

#### 1.06 SCHEDULING AND SEQUENCING

- A. Do not backfill until the following conditions are met:
  - 1. Manholes: Manholes are to be given and to pass leakage tests prior to backfilling.
  - 2. Concrete: Concrete has had adequate time to cure, as specified in Division 03 Concrete.
  - 3. Mortar Plaster and Masonry: Mortar has set, but no sooner than three (3) days after the mortar was applied.
  - 4. Damp-proofed, Waterproofed, and Coated Surfaces: Only after materials have properly cured.
  - 5. Work in General: Engineer and testing laboratory have completed all inspections and tests.
- B. Except as noted above, or required by other Sections, or when approved or directed by the Engineer, backfill pipe and cable excavations within one day after installation. Backfill other excavations as soon as possible after all inspections and tests have been completed.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS

- A. Wood Sheeting and Bracing: Sound timber, free from defects which might impair its strength and effectiveness.
- B. Steel Sheeting and Bracing: ASTM A328.

- C. 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.
- D. Backfill - Trenches: Select Fill from pipe bedding material up to a minimum of 12" over the top of pipe or top of sand encasement; suitable Common Earth or Select Fill for the remainder of the trench. Backfill materials shown on the Drawings and on the Drawing details take precedence over this paragraph.
- E. 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 and on the Drawing details take precedence over this paragraph.

### PART 3 - EXECUTION

#### 3.01 PREPARATION

- A. Prior to Work of this Section, become thoroughly familiar with the site conditions and all portions of the Work covered by this Section.
- B. Verify that topsoil has been stripped to its full depth and stockpiled for subsequent reuse.
- C. Ascertain and verify the locations and character of structures, underground lines and subsurface conditions and verify that the work will not adversely affect them.

#### 3.02 TRENCHING

- A. Excavate to the widths and depths shown on the Drawings, specified or directed by the Engineer. Trenches of narrower widths are permitted provided that the smaller widths do not adversely affect the proper installation of the Work.
- B. Where it is necessary for pipes to be laid in fill, place Select Fill in uniform horizontal layers not over 6" in compacted thickness. Compact each layer in accordance with Section 31 23 23.23 Compaction. Carry fill up to an elevation at least two feet above the elevation of the top of the pipe to be laid and then excavate the trench.
- C. Limit each day's trench excavation to the length of pipe that will be installed that day, and then to no more than 100' ahead of the pipe laying.

#### 3.03 TRENCH BOTTOMS

The bedding required for each type of pipe is detailed on the Drawings.

#### 3.04 EXCAVATING

Excavate for structures to the elevations indicated on the Drawings and extend a sufficient distance from foundation walls, piers, and footings to provide adequate clearances for construction operations, including sheeting and bracing, if required, and for inspection purposes.

### 3.05 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. The Engineer may, at his discretion, order sheeting and bracing to be cutoff and left in place. Where, in the opinion of 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 not less than 12" over 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.

### 3.06 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 or trench as required, with Granular Fill, Stone Fill, or concrete.
- B. Whenever the material encountered is, in the Contractor's opinion, incapable of providing adequate support, he shall immediately notify the Engineer.

### 3.07 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 applicable. Remove excess excavated materials and dispose of off-site.
- B. The storing or stockpiling of unsuitable material on-site is not permitted.

### 3.08 PREPARATION FOR BACKFILLING

Immediately prior to backfilling, remove all rubbish, debris, forms, and similar materials from the excavation.

### 3.09 BACKFILLING TRENCHES

- A. 12" Over Pipes - Provide 12" of sand bedding over the top of the pipe as detailed on the Drawings. Place fill by hand in not greater than 6" layers. Bring sand bedding up evenly on both sides of pipes and carefully and thoroughly compact under the pipe haunches. Do not displace pipe.
- B. 12" Over Sand Bedding - Provide 12" of Select Fill over the top of the sand. Place fill by hand in not greater than 6" compacted layers.
- C. Remainder of Trench - Paved Areas - Select Fill or Common Earth placed in not greater than 12" compacted layers.
- D. Remainder of Trench - Other Areas - Select Fill or Common Earth, placed in not greater than 12" compacted layers.

### 3.10 BACKFILLING AROUND STRUCTURES

- A. Uniformly spread and deposit backfill in horizontal layers, not over 8" 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 or Common Earth.

### 3.11 GRANULAR FILL UNDER SLABS & FOOTINGS

- A. Prior to placing granular fill, all organic material, topsoil, debris, and any other deleterious material shall be removed.
- B. Place material in maximum 8" lifts and compacted to 95% of maximum density at optimum moisture content, as determined by ASTM D1557 Method C (Modified Proctor).

### 3.12 GRANULAR FILL AS EMBANKMENTS

- A. Remove organic material, topsoil, and other deleterious material prior to placing granular fill.
- B. Place materials in maximum one (1) foot lifts compacted to 95% of maximum density at optimum moisture content as determined by ASTM D1557, Modified Proctor.

### 3.13 TOP OF BACKFILL

- A. Paved Areas: Carry backfill up to pavement subgrade ready to receive pavement. If paving is to be done at a later date, carry backfill up so as to provide a slightly mounded surface with edges flush with the existing pavement surface.
- B. Concrete Sidewalks: Carry backfill up to concrete subgrade.
- C. Unpaved Areas: Carry backfill up to adjacent finished grade, minus the depth of any required topsoil or topsoil and sod finish, and so as to provide a finished surface slightly mounded over the trench.
- D. Cover Over Pipe: Immediately notify the Engineer when the depth of cover over any pipe is less than 5 feet 6 inches

### 3.14 COMPACTION REQUIREMENTS

See Section 31 23 23.23 Compaction.

### 3.15 ADJUST AND CLEAN

- A. Any trenches or excavations which have been backfilled and show any evidence of settlement or being improperly backfilled, or have been tested and failed, shall be re-excavated to the depth required for proper compaction and then properly refilled and compacted.
- B. Replace or repair any pipe or structure which has been damaged or displaced.

END OF SECTION 31 23 16.13

## SECTION 31 23 16.26

### ROCK REMOVAL

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. Work covered by this Section includes the excavation, disposal, and replacement of boulders and rock from the construction site, excavations, and trenches.
- B. Definitions:
1. Solid Rock: Naturally deposited rock material which requires for its removal continuous drilling and blasting and includes boulders and reinforced concrete pavement exceeding two (2) cubic yard in volume.
  2. Loose Rock: Shale, slate, soft sandstone, nested boulders, and other rock material which is decomposed, stratified, or shattered to such an extent that it can be removed without the need for drilling or blasting.
  3. Trench Loose Rock Excavation: Loose Rock excavation where Loose Rock is removed from trenches (for pipelines, cables, conduits, manholes and other related, confined work) where the bottom width of the installed item does not exceed 4'. Includes Loose Rock and reinforced concrete pavement exceeding Two (2) cubic yard in volume. Removal, disposal, and separation of rocks in trench less than two (2) cubic yards and greater than the maximum specified rock size is subsidiary to the utility or trenching item.
  4. Trench Rock and Ledge Excavation: Rock excavation where Solid Rock or Ledge is removed from the trenches by method of blasting or hammering (for pipelines, cables, conduits, manholes, and other related, confined work). A Pre-blast Survey must be completed prior to completion of any blasting, and may be required by the Engineer for hammering.
  5. Site Rock Excavation: Removal and disposition of solid rock only which is encountered within the specified payment limits of excavations other than trenches.
  6. Site Loose Rock Excavation: Loose Rock excavation where Loose Rock is removed from areas other than trenches. Loose Rock must exceed two (2) cubic yards in volume. Removal and disposal of Loose Rock less than two (2) cubic yards in volume shall be subsidiary to common excavation.
  7. Common Excavations: Removal and disposition of all materials except solid rock, which are encountered within the required widths and depths of excavations. May be subsidiary with trenching and utility items.

##### 1.02 QUALITY ASSURANCE



- A. Perform all blasting operations using experienced blasters and comply with all applicable Federal, State, and local laws, ordinances, codes, and regulations. Blasting shall be done only by qualified, reputable persons regularly engaged in this type of work and in accordance with current NHDOT Standards and Specifications for Road and Bridge Construction.
- B. Charges shall be of such power, spacing, and timing that the blasts will not make excavations unduly large, shatter adjoining rock, nor damage or endanger life, property, work completed or in progress, adjacent utilities, and other structures. The Contractor shall be fully liable for all damage or nuisance caused by the blasting operations and shall promptly repair all damages and settle all claims at his expense.
- C. Method of measurement for solid rock/ledge removal will be the actual amount of solid rock/ledge excavated and removed to complete the Work within the specified and/or detailed limits shown on the Drawings. Overburden will be measured and paid for separately under a common excavation or similar item. Over blasting to remove solid rock/ledge to specified depths will be at the Contractor's own expense

#### 1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 60 10 Submittals.
- B. Names of blasters, qualifications, experience records, certificates of insurance, and copies of licenses.
- C. Prior to construction, the Contractor shall at his own expense have prepared by an independent agency approved by the Engineer, a survey of all existing structures and utilities on the site and within 500 feet of the site. Said survey shall address the structural integrity of all existing structures and utilities. The survey shall satisfy the insurance requirements of the Contractor and provide all necessary background data to assess damages to public and private property as a result of blasting operations.
- D. The Contractor shall obtain sufficient information to conduct blasting without damage to person or property and be fully aware of subsurface conditions in sensitive areas. The Engineer and Owner shall not be responsible for the accuracy or adequacy of the pre-construction survey. The Contractor shall bear full responsibility for damage claims on surveyed or unsurveyed property caused by blasting operations.

#### 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Handle and store explosives in strict accordance with applicable Federal, State, and local laws, ordinances, codes, and regulations.
- B. Keep explosives on site only in such quantity as may be needed for the work under way and only during such time as they are to be used.
- C. Disposal of rock shall be by one of the following:

1. If rock is suitable in nature and of the proper size, it may be used as stone fill, where stone fill is required in the work.
2. If the Contract Documents permit or require the use of rock in embankments, fills, or other areas, it may be incorporated into the work accordingly.
3. If the Contract Documents designate a spoil or stockpile area, deliver and neatly place the rock in the designated area.
4. Deliver to an area designated by Owner or Engineer.
5. If none of the above apply, remove the rock from the project site and dispose of off-site at an approved location.

#### 1.05 SCHEDULING

- A. Notify Construction Superintendent, Engineer and Home Owners in the immediate vicinity at least 48 hours prior to blasting operations.
- B. Provide notification to persons in the vicinity of blasting operations immediately prior to blasting by use of a horn or other means acceptable to the Engineer.

#### PART 2 - PRODUCTS

##### 2.01 CONCRETE

Concrete used to fill excavations which have been over-excavated shall be Flowable Fill as specified in Section 03 27 15.

#### PART 3 - EXECUTION

##### 3.01 INSPECTION

- A. Verify that all limiting boundaries of temporary and permanent easements and property lines are clearly marked in the field and that blasting operations will not violate these boundaries.
- B. Ascertain and verify the locations and character of structures, underground lines, and subsurface conditions and verify that blasting operations will not adversely affect them.
- C. Do not begin operations until conditions are satisfactory.

##### 3.02 PREPARATION

- A. When ledge rock is encountered, the material shall be uncovered and the Engineer notified. The Engineer will take cross sections of the ledge rock surface. If the Contractor uncovers ledge, but fails to notify the Engineer and allow ample time for cross sectioning the undisturbed material, the Contractor shall have no right-of-claim to any classification other than that allowed by the Engineer.
- B. Verify the classification of the rock with the Engineer; i.e., whether it is Solid Rock or Loose Rock.

- C. When blasting is required for work within 20 feet of a paved roadway, the Contractor shall establish the elevation of the nearest edge of pavement at 25 foot (maximum) intervals in order to verify any uplift or settlement of the pavement. This information shall be delivered to the Engineer before blasting takes place.

### 3.03 PERFORMANCE

- A. Remove rock to the limits shown on the drawings, specified or directed by Engineer.
- B. Excavation in rock shall be performed, unless otherwise directed, so that no projection shall come within vertical planes 24 inches outside of the structure being built, or within the 12 inches of the base of the structure or as shown on the Drawings. In trenches, the rock shall be removed to a point 12 inches below the underside of the barrel of the pipe being laid therein or 24 inches from the centerline of the pipe being installed. These are also the payment limits for rock removal on this project. Where excavation is carried below the above-determined limits, the additional space shall be refilled at the Contractor's expense with additional concrete or other selected material, as directed by the Engineer.
- C. Cut subgrades in rock where concrete is to be placed, to a firm level surface and clear off all loose material. Make rock surfaces sufficiently rough to insure adequate bonding of concrete.
- D. Excavations which are made wider than shown on the drawings, specified or authorized by Engineer, may necessitate redesigns and stronger materials for which all costs shall be borne by Contractor.
- E. Should settlement or uplift of paved surfaces occur after blasting, the roadway shall be returned to its original condition, to the satisfaction of the Owner.

END OF SECTION 31 23 16.26

## SECTION 31 23 19

### DEWATERING

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED

- A. Work covered by this section includes the maintenance of trenches and excavations free of water, snow, ice, and other liquids.
- B. Liquids, as used in this section, means sewage, water, stormwater, groundwater, or other liquid or fluid material.
- C. Furnish, operate and maintain dewatering equipment for the control, collection, and disposal of ground and surface water entering trenches and excavations.

##### 1.02 QUALITY ASSURANCE

- A. Conduct operations in a manner which will keep the work free of standing and flowing liquids, snow, and ice, and dispose of these materials in an approved manner so as not to damage or create a nuisance to the Work, the public, surface and ground waters, and adjacent properties.
- B. The accumulation of liquids, ice and snow in excavations, trenches, areas to be graded and adjacent areas during construction is not permitted.
- C. Unless otherwise noted or approved by engineer, the placement of work in a liquid is not permitted.
- D. The use of installed pipes, or pipes under construction, to drain excavations, trenches, and adjacent areas is prohibited, except in the case of drainage pipes where it is necessary to maintain flow from watercourses.
- E. Obtain all discharge and water quality permits from the State of New Hampshire applicable agencies. Fines resulting from noncompliance with the statutes, regulations and permit conditions set by the State of New Hampshire will be the sole responsibility of the Contractor.
- F. Prior to excavation in areas where dewatering may be required, submit the dewatering methods which are to be utilized to the Owner's representative for review.
- G. All dewatering activities shall be in accordance with the requirements included in Section 31 25 00 Erosion and Sedimentation Controls, and must comply with all permits.

## PART 2 - PRODUCTS

### 2.01 GENERAL

Provide, operate and maintain a dewatering system to remove all water from excavations and trenches containing pumps, drains, wellpoints, piping, and any other facilities necessary to keep the excavations and trenches free of water, including spare units available for immediate use in the event of equipment breakdowns.

## PART 3 - EXECUTION

### 3.01 PERFORMANCE

#### A. General:

1. Perform all ditching, diking, pumping, well pointing and bailing, and construct all drains and channels necessary to keep all work areas clear of liquids, ice and snow during the progress of the work and until the finished work is safe from injury.
2. Do not permit any liquid to rise over any work in place until such work is adequately protected.
3. Locate noise producing dewatering equipment as far from residences, businesses, and the public in general, so as to minimize noise pollution. When required, or directed by Engineer, provide acoustical enclosures or barriers to reduce noise to an acceptable level.

#### B. Dewatering Practices:

1. Discharging accumulated groundwater or storm water removed from excavations, trenches, foundations, vaults, or other similar points of accumulation are prohibited unless waters are first managed by appropriate controls. These include sediment basins, sediment traps, sediment socks, dewatering tanks, tube settlers, weir tanks, filtration systems (e.g., bag or sand filter) or other measures designed to remove sediment.
2. Uncontaminated, non-turbid dewatering flows can be discharged without being routed to a control.
3. Discharge shall not include visible floating solids or foam.
4. If dewatering flow is found to contain oil, grease, or other products, an oil-water separator or suitable filtration device specifically designed to remove the contaminate must be used.
5. Vegetated upland areas should be used to infiltrate dewatering flows prior to discharge, to the extent feasible. Surface waters shall not be considered part of the treatment area.

6. Velocity dissipation devices, such as check dams, sediment traps, riprap, grouted riprap, diversion ditches and berms, must be used at all points where dewatering flows are discharged.
7. Backwash water must be hauled away for disposal or returned to the beginning of the treatment process.
8. The filter media used in dewatering devices must be cleaned and/or replaced when the pressure differential equals or exceeds the manufacturer's specifications.
9. Dispose of water pumped or drained from the construction site in a suitable manner to avoid public nuisance, injury to public health, damage to public and private property, and damage to the work completed or in progress.
10. Do not allow ground or surface water to enter piped utilities.
11. The Contractor shall secure all permits and/or obtain written permission from landowners and appropriate government agencies prior to the disposal of any liquids.

C. Erosion and Sediment Control: All dewatering activities should be discharged on-site to the designated constructed sediment basins, or other approved measures. The use of silt bags is recommended during dewatering operations to reduce silt transportation to the sediment basin areas. The following are some additional considerations for dewatering practices:

1. Only "clean" water, free of sediment or contaminants, shall be allowed to flow downstream.
2. All contaminated water flow will be collected and treated using an approved treatment method at the outlet end of the discharge.
3. Regardless of whether water quality treatment is required, the discharge points for pumped or diverted water shall be stabilized with stone and/or check dams to prevent scouring and to decrease the velocity of the water downstream.
4. Locate sediment basins or other treatment devices on the upland, away from wetlands or jurisdictional areas.
5. Locate away from areas where water flow could impact vehicular or pedestrian travel, or flow onto adjacent properties outside the right-of-way or project area.
6. Line treatment area with stone fill, geo-textile material or other scouring protection.
7. Contain area with adequate perimeter controls, such as hay bales, silt fence, stone check dams, or other acceptable sediment trapping measures.
8. Set back as far as possible from wetlands and surface waters, and in all cases, with a minimum of 20 feet of undisturbed vegetated buffer from discharge point to downstream water bodies or wetlands.

D. Damage:

1. All damage resulting from the dewatering operations, or the failure of the

Contractor to maintain the work in a suitable dry condition, shall be repaired by the Contractor, at no additional cost to the Owner.

2. Take all necessary precautions to protect new work from flooding during storms or from other causes.
3. Thoroughly brace or otherwise protect all pipelines and structures which are not stable, against flotation when necessary.

E. Disposal:

1. DO NOT permit liquids containing sewage, sludge, gas, oil, sediments, and other deleterious, poisonous, toxic, or oxygen demanding substances to enter streams, lakes, other surface waters or into the groundwater.
2. Dispose of all liquid, ice, and snow in a manner which will not create a hazard to public health, nor cause injury to public or private property, lives, work installed or in progress, or public streets, nor cause any interference in the use of streets and roads by the public, nor cause erosion
3. Secure written permission from the appropriate agency before utilizing a storm drain for the disposal of liquids. Do not overload sewers. Terminate the use of storm drains during any storm where the combined runoff and dewater will result in flooding.

3.02 PROTECTION

- A. Provide adequate protection from the effect of possible uplift due to storm or groundwater where buoyancy might lift installed work or cause joint or structure failure during construction.
- B. Protect the interior of installed work from the entering and accumulation of liquids, ice and snow. Immediately remove and dispose any accumulation which may occur.

3.03 REMOVAL OF TEMPORARY WORKS

- A. After the temporary works have served their purposes, remove them, or level and grade them to the extent required to present a slightly 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. Adjust, repair, replace, or clean all surfaces and property which may have been damaged as a result of any dewatering operation.

END OF SECTION 31 23 19

## SECTION 31 23 23.23

### COMPACTION

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

This Section covers the requirements for soils compaction.

##### 1.02 QUALITY ASSURANCE

- A. The taking of samples and the performing of field compaction density tests shall be done by an independent testing laboratory. Testing shall be completed in accordance with Section 01 40 00.
- B. Provide at least one qualified person who shall be present at all times during the soil compaction operations and who shall be thoroughly familiar with the various types of compaction equipment, proper compacting techniques and methods, and soils behavior, and who shall direct the compaction operations.

##### 1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 60 10 Submittals.
- B. List and description of proposed compaction equipment.
- C. Copies of the results of the laboratory sieve analyses and moisture density tests, certified by the Testing Laboratory.

##### 1.04 JOB CONDITIONS

- 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. Protect pipes, structures and all other subsurface work from displacement or injury during compaction operations.

#### PART 2 - PRODUCTS

##### 2.01 COMPACTION

Utilize the proper compaction methods and equipment to suit the soils and conditions encountered.

##### 2.02 LABORATORY TEST REPORTS

- A. As a minimum, the laboratory moisture-density 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. Moisture - Density Curve plotted on graph paper to as large a scale as is practical with all points used to derive the curve being clearly visible.
  4. Designation of the test method used.
  5. The optimum density and moisture content.
  6. A description of the sample.
  7. The date the test was performed and the person who performed the test.
  8. The Project name, identification and Contractor's name.
  9. The signature of a responsible officer of the Testing Laboratory certifying to the information contained in the report.
- B. As a minimum, the field compaction density testing reports shall contain the following:
1. Laboratory's name.
  2. Date, time, depth, and specific location at which the test was made and the person's name who performed the test.
  3. Designation of the test method used.
  4. Designation of the material being tested.
  5. Test number.
  6. In place dry density and moisture content.
  7. Optimum density and moisture content.
  8. Percentage of optimum density achieved.
  9. The Project name, identification and Contractor's name.
  10. The signature of a responsible officer of the Testing Laboratory certifying to the information contained in the report.

## 2.03 OTHER MATERIALS

All other materials which are required to achieve adequate compaction shall be as selected by Contractor subject to approval of the Engineer.

## PART 3 - EXECUTION

### 3.01 INSPECTION

- A. Verify that layers of material are no thicker than the maximum thickness specified in other Sections.
- B. Verify that moisture content is nearly optimum.
- C. Do not begin compaction operations until conditions are satisfactory.

### 3.02 PERFORMANCE

- A. Compaction densities shown are percentages of the maximum density obtainable at optimum moisture content as determined by ASTM D1557, Method C (Modified Proctor).
- B. Moisten or dry each layer of material to achieve optimum moisture content. Unless otherwise specified or directed by Owner, compact each layer of material to the following required densities:

<b>Location</b>	<b>Density</b>
Under concrete slabs, foundations, and footings	95%
Backfill around Structures	95%
Embankments	95%
Paved Areas	95%
All Other Areas	95%
Remainder of Trench	95%
Bedding around pipes	95%

### 3.03 FIELD QUALITY CONTROL

- A. Perform a laboratory moisture density test for each type of soil proposed for use or encountered in the Work. Determine optimum moisture content in accordance with ASTM D1557, Method C (Modified Proctor).
- B. Engineer will designate the time, date and exact location of all field compaction density tests. Field density tests may be ordered by the Engineer in accordance with the following average frequencies. However, the Engineer may require, that the testing laboratory perform tests at a greater or less frequency than the stated averages.
  - 1. Under Structures: One test for every 400 square foot area of each layer of compacted granular fill.
  - 2. Outside of Structure: One test for each foot of backfill at intervals of approximately 50' around the structure.
  - 3. Trenches: One test for two feet of backfill at intervals of approximately 200' along the trench.
  - 4. Embankment: Three tests for each foot of compacted fill.
  - 5. Roads: One test for each layer of compacted fill and base material at intervals of approximately 200' along the roadway.
  - 6. Parking Areas and Sidewalks: One test for every 750 square foot area at parking areas and one test at intervals of 100' along sidewalks.
- C. Testing frequency indicated in Paragraph 3.03 B is at the discretion of the Engineer and may be decreased as the Project progresses.
- D. Field density and moisture testing shall conform to the requirements of ASTM D1556 or D2922 and ASTM D3017. Soils shall be described in accordance with ASTM D2488, Visual-Manual Procedure.

### 3.04 COMPACTION REQUIREMENTS

- A. Compaction of base course gravel shall be done with an approved vibratory roller, producing a dynamic force of at least 20,000 pounds in an 8 inch lift.

- B. Compaction of base course crushed stone shall be done with an approved vibratory roller producing a dynamic force of 27,000 pounds in a 12 inch lift.
- C. Rolling and shaping of successive gravel base lifts shall be done parallel to roadway centerline and continue until each layer conforms to the required grade and cross-section.
- D. Material Density requirements shall be field determined in accordance with AASHTO T191 (Sand Cone) or ASTM D2922/AASHTO T238-239 (nuclear method). Maximum density shall be determined by ASTM D1557 Modified Proctor. Compaction of backfill material below foundations, above the bottom of foundations, and below pavement and building slabs shall be 95% of the maximum density.
- E. Material Density tests which indicate deficient material or insufficient compaction following a first failure shall be paid for by the Contractor.  
  
Density tests resulting from a materials change by the Contractor or repeated failures shall be paid for by the Contractor.
- F. Material which does not meet the minimum density requirements shall be reworked in accordance with the NHDOT Spec. or removed and replaced, at the Contractor's expense, with acceptable material.

### 3.05 COORDINATION

- A. Provide all assistance and cooperation during testing and coordinate operations to allow ample time for the required sampling and testing.
- B. See Section 01 40 00 for requirements as they apply to making arrangements with the approved testing laboratory.

### 3.06 ADJUST AND CLEAN

- A. Replace or repair any pipe, structure or other work which has been displaced, damaged, or injured.
- B. Compacted soils not meeting compaction densities shall be re-excavated, re-compacted, and re-tested at the Contractor's expense until all requirements are met.

END OF SECTION 31 23 23.23

**DIVISION 32**

**EXTERIOR IMPROVEMENTS**

<u>Section No.</u>	<u>Title</u>	<u>No. of Pages</u>
32 02 00	Site Restoration and Rehabilitation	4
32 12 00	Flexible Paving	6
32 91 35	Landscape Maintenance	10

## SECTION 32 02 00

### SITE RESTORATION AND REHABILITATION

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION OF WORK

- A. Provide restoration of growth in areas cleared for Work or as shown on the Drawings.
- B. Repair grassed areas disturbed during the Work.

##### 1.02 QUALITY CONTROL AND STANDARDS

- A. Standard products used shall bear the manufacturer's certified analysis. For other materials, provide an analysis by a recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists.
- B. Reference Standard for Work shall be New Hampshire Department of Transportation Standard Specifications for Road and Bridge Construction

##### 1.03 SUBMITTALS

- A. Certification of seed and fertilizer manufacturer's guaranteed analysis of materials shall be submitted in advance of starting the Work of this section.
- B. Seed analysis shall cite botanical and common names of each seed of the mixture required.
- C. Samples of loam to be used from on-site stockpile shall be submitted for testing of the suitability for restoration of growth and whether soil amendments need to be provided.

##### 1.04 DELIVERING, STORAGE AND HANDLING

- A. Grass seed shall be delivered in original containers showing analysis, percentage of pure live seed, percent purity, year of production, net weight, percent germination and location of packaging.
- B. Seeding of restored areas shall be done between April 1 and June 1; August 15 and October 14.

#### PART 2 - PRODUCTS

##### 2.01 TOPSOIL

- A. Use stockpiled topsoil from on-site areas as specified in Section 31 25 00. Stockpile topsoil from stripped material shall be screened on-site to ¾" maximum diameter prior to placement. When stockpiled topsoil or humus is deficient or of insufficient quantity, provide additional topsoil as required.
- B. All topsoil shall be loose, friable material without refuse or chemicals toxic to growth. Loam shall be free of stones, lumps, stumps, roots or objects greater than

(3/4") inches in diameter. Conform to ASTM D5268 having a pH range 5.5 to 7 and four percent (4%) organic material minimum.

- C. Topsoil shall be obtained from approved local sources. Loam obtained from bogs or wet areas shall be unacceptable as topsoil, but may be used as noted on the Drawings. Up to a fifty percent (50%) amendment of biosolids or leaf compost would be advantageous for soil moisture control.

## 2.02 SOIL AMENDMENTS

- A. Lime shall be calcitic or dolomitic ground agricultural limestone containing not less than 95 percent of either calcium or magnesium carbonate, or both.
  - 1. Sieve analysis shall show a minimum of 40 percent passing a No. 100 sieve; 95 percent, passing a No. 8 sieve.
- B. Fertilizer shall be 10-20-20 commercial grade supplied in labeled containers.
- C. Compost, either biosolids or yard waste is allowable in up to a fifty percent (50%) mixture with the topsoil material. The addition of compost enhances the moisture content for droughty soil conditions.

## 2.03 GRASS MATERIALS

- A. Grass seed shall be fresh, clean, new-crop seed and shall meet the provisions of the New Hampshire Agricultural and Vegetable Seeds Law. Seed specified in this section shall meet the following analysis:

	<u>LBS/ACRE</u>
Fine Textured Perennial Rye Grass (50%)	120
Jamestown II Chewings Fescue (15%)	36
Creeping Red Fescue (15%)	36
Baron Kentucky Bluegrass (20%)	48
	<hr/>
	240      lbs/acre

- B. Seeding rates: shall be adjusted to meet the pure live seed percentages of the approved seeding mix.

Pure Live Seed (PLS) = %Germination x %Purity

For example, a 1-pound bag of grass seed might contain the following information: purity = 85%, germination = 75%. The PLS formula for this bag of grass seed would be:  $0.85 \times 0.75 = 0.64$  PLS.

In other words, the 1-pound bag of grass seed actually contains 64% (or 0.64 pounds), of pure, live seed. It also means that 36% or 0.36 pounds is unneeded material.

In order to get one pound of pure live seed, it's best to set up a basic proportion equation which says ".64 pounds pure live seed is to one pound, as one pound is to x pounds pure live seed." The equation would look like this:  $0.64:1 = 1:x$

Solving the equation you would find,  $0.64x = 1$  and then,  $x = 1/.64 = 1.56$  (lbs. bulk) Therefore in our example, you would need to purchase 1.56 pounds of bulk seed in order to get 1.0 pound of pure live seed.

### PART 3 - EXECUTION

#### 3.01 PREPARATION

- A. All areas to be seeded shall be graded uniformly. Foreign matter, plants, roots, stones and debris shall be removed from subgrade.
- B. Topsoil shall be applied to a minimum depth of 4". Lime and fertilizer shall be worked into the soil by raking, harrowing or dragging with a chain mat.
  - 1. Lime shall be applied at a rate not to exceed 2 tons per acre, but generally at the direction of the Engineer.
  - 2. Fertilizer shall be applied at a minimum rate of 12 pounds per 1000 square feet.
  - 3. Seed shall be applied at the recommended application rates shown.
- C. Seed shall be applied only after 24 hours have elapsed from the time of lime application and worked into the top three (3") inches of topsoil.
- D. Loamed areas shall be raked, rolled, and mulched as soon as possible.
- E. Hydro-seeded areas shall be done in accordance with Section 644 of the New Hampshire Standard Specifications.

#### 3.02 LAWN MAINTENANCE

- A. Maintain and establish lawns by watering, fertilizing, weeding, replanting and other operations as necessary. Roll, regrade and replant bare or eroded areas and mulch to provide uniformly smooth lawn. Maintain temporary protection fences as necessary to establish lawns.
- B. Watering: Water lawns as needed. The Contractor shall contact the Owner to review water source(s) availability and coordinate access to those source(s).
- C. The initial mowing and trimming shall be performed by the Contractor as soon as there is enough top growth to cut with a mower set at 3" high.
- D. Post fertilizer: Apply fertilizer to lawn after first mowing and when grass is dry, as necessary.

#### 3.03 INSPECTION AND ACCEPTANCE

- A. Restoration of growth may be accepted in parts agreeable to the Engineer, provided the Work offered is complete, including maintenance. To be acceptable, a stand of grass shall show a reasonably thick, uniform stand, of the species listed, and free from sizeable areas of thin or bare spots.

### 3.04 WARRANTY

- A. The Contractor shall provide a one (1) year warranty for all restoration of growth after the date of Substantial Completion. The warranty shall provide a guarantee for the restoration area against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by the Owner or abutting individual landowners, abnormal weather conditions unusual for warranty period, or incidents that are beyond the Contractor's control.

END OF SECTION 32 02 00



## **DIVISION 33**

### **UTILITIES**

<b><u>Section No.</u></b>	<b><u>Title</u></b>	<b><u>No. of Pages</u></b>
33 01 00.10	Existing Utilities and Underground Structures	2
33 10 10	HDPE Pipe and Fittings	4
33 31 00	Sanitary Utility Sewerage Piping	1
33 39 13	Sanitary Utility Sewerage Manholes	7
33 39 18	Pump Stations	6
33 41 00	Storm Utility Drainage Piping	17
33 44 00	Stone Masonry Headwalls	2

## SECTION 33 01 00.10

### EXISTING UTILITIES AND UNDERGROUND STRUCTURES

#### PART 1 - GENERAL

##### 1.01 JOB CONDITIONS

- A. Locations of existing utility installation and underground structures shown on the Contract Drawings are only approximate. It shall be the Contractor's responsibility to locate all utilities within the construction area prior to proceeding with construction.
- B. Wherever culverts, sewers, drains, manholes, catch basins, catch basin connections, water mains, valve chambers, electric conduits, telephone conduits, or any other underground constructions are encountered by the Contractor during construction they shall be protected and firmly supported 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. The authority having charge of any particular underground structure shall be notified promptly of injury to its structure.

No additional compensation will be allowed for any delays, inconvenience, or damage sustained by the Contractor due to any interference from said utility appurtenances or the operation of moving them by the utility companies.

- C. Whenever the Engineer may require, pipe or other underground structures encountered in excavating or trenching, shall be permanently supported with suitable supports across the excavation or trench.
- D. The restoration of existing property or structures shall be done as promptly as practicable and shall not be left until the end of the construction period.
- E. Cooperation with Utilities: 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. 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.

- F. Temporary provisions shall be made by Contractor to ensure proper functioning of all gutters, sewer inlets, and drainage ditches, which shall not be obstructed except as approved by the Engineer.

END OF SECTION 33 01 00.10

SECTION 33 10 10  
POLYETHYLENE PRESSURE PIPE AND FITTINGS

PART 1.00 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide HDPE sewer force main distribution pipe as shown on the drawings. This section includes:
  - 1. HDPE 4710 SDR-11 (DIPS) Pipe and Fittings. (May be substituted with PVC SDR 21 Pipe and Fittings)

1.02 QUALITY ASSURANCE

- A. Inspect all pipe upon receipt. Remove damaged pipe from the work site.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Deliver Pipe, fittings, and accessories in a clean and undamaged condition. Store pipe, fittings, and accessories off the ground.
- B. Keep interior of pipe, fittings and accessories free from dirt and foreign matter.
- C. Store pipe and fittings, gaskets, and other products, which would be deteriorated by sunlight in a cool location out of direct sunlight.

1.04 SUBMITTALS

- A. Submit manufacturer's product data and installation guide.
- B. Certified copies of test results on pipe units.
- C. Record Drawings In accordance with section 01 70 00.

Record in a permanently bound notebook. Provide access to records for the Project Superintendent, Engineer, and Owner at all times. Submit records at substantial completion.

PART 2.00 - PRODUCTS

2.01 PIPE AND FITTINGS

- A. Work Plan: Prior to beginning work, the Contractor shall submit to the Engineer detailed work plan outlining the procedure and schedule to be used to execute the project.
- B. Equipment: Contractor shall submit specifications on a directional drilling equipment to be used to ensure that the equipment will be adequate to complete the project if this alternate is selected.

C. HDPE Piping:

1. HDPE Pipe: All HDPE Pipe specified on the drawings shall be HDPE 4710 (DIPS). Piping shall be DR-11 (200 psi). Pipe sections shall be welded/fused together forming one continuous length. Applicable standards include AWWA C906 & ASTM F714 NSF/ANSI 61. The PE4710 material shall conform to ASTM D3350 with the cell classification of 445574C/E and listed with the Plastic Pipe Institute's (PPI) TR4. The pipe shall be manufactured and tested in accordance with AWWA C906, and shall be so marked.

D. HDPE Fittings:

1. HDPE Fittings: HDPE fittings shall be injection molded from polyethylene resin PE 4710 (DIPS) and shall meet the applicable requirements of ASTM 3350 "Standard Specifications for Polyethylene Plastics Pipe and Fitting Materials". In addition butt fittings must meet the requirements of ASTM D-3261 while socket fittings shall conform to ASTM D-2683. All fittings shall have the same pressure rating as the system piping.

E. HDPE to Ductile Iron Transition Fittings:

1. Straight HDPE Pipe to Ductile Iron Pipe connections shall be by a (DIPS) Bell MJ Adapter Kit meeting the requirements of HDPE 4710.
2. HDPE Pipe to Ductile Iron Fittings or Valves shall be by a (DIPS) Mechanical Joint Adapter Kit meeting the requirements of HDPE 4710.

2.02 TRACER WIRE AND DETECTABLE WARNING TAPE

A. Corrosion tracer wire with a high bonded steel core with metallurgically bonded copper cladding with HDPE insulation must be installed with all HDPE pipe in directional drilling and open trench construction.

B. The conductor shall meet or exceed all applicable ASTM specifications and requirements of the National Electric Code.

1. ASTM B869: Standard Specification 21% IACS, Hard Drawn, Copper-Clad Steel Wire.
2. ASTM B170: Standard Specification for Oxygen-Free Electrolytic Copper.
3. ASTM D1248: Standard Specification for Polyethylene Plastics Extrusion Materials For Wire and Cable.

C. Tracer wire must be installed in accordance with manufacturers recommendations. Tracer wire shall be an extra high-strength, copper clad steel wire and have a high carbon steel core, metallurgically bonded with a copper cladding, that is uniform and continuous, creating a bi-metal conductor that acts as one and is corrosion resistant. It shall have a high break load that allows only 1

conductor to be used in any tracer wire application while providing the perfect balance between break load, ductility. Tracer wire shall be designed specifically for directional drilling (boring) operations. Tracer wire shall be protected with a 45 mil, high-density, high molecular weight polyethylene (HDPE) insulation with polymer fiber reinforcement. Sizing shall be 10 AWG minimum.

- D. Detectable tape shall be installed in all service trenches. Detectable tape shall have a minimum thickness of 4 mils with a solid conducting core to ensure continuity. Tape shall be a minimum of 2-inches wide and shall conform to the APWA color code specifications for underground tape systems.
- E. Markings - Imprint identifying the type of line buried below.
- F. Install the tape 24 inches below the surface of any trench or as shown on the drawings.

### PART 3.00 - EXECUTION

#### 3.01 LAYING PIPE AND FITTINGS

- A. Storage: Pipe stored on-site shall be stacked on timbers in an area free from dirt and foreign matter. Protection and storage of gaskets, fittings, and accessories shall be in conformance with the applicable requirements.
- B. Install HDPE pipe by horizontal directional drilling, see section 33 90 00.
- C. Field cuts may be made for shorter pipe lengths. All field cuts must be made by the person making the thermal butt fusion joints and with proper tool and machine. Pipe ends shall be cut square and perpendicular to pipe axis. All cut pipe ends must be examined for damage caused by cutting. All cut ends must be finished in accordance with manufacturer recommendation.
- D. Prior to butt fusion, clean pipe ends by removing all dirt and debris and the end of the pipe dry. Make thermal butt fusion joints in accordance with the manufacturer's recommendations and the fusion equipments manufacturers instructions.
- E. Prior to making thermal butt fusion joints, determine optimum range of fusion conditions, such as fusion temperature, interface pressure, and cooling time.
- F. Thermal fusion must only be completed by persons who have received training in the use of fusion equipment in accordance with the recommendations of the pipe and fitting supplier or the fusion equipment supplier.
- G. Install pipe at correct line and grade.
- H. All pipe, fittings, and valves shall be carefully examined for damage or defects immediately before installation. Defective material shall be marked and promptly removed from the site.

3.02 JOINING DUCTILE IRON SLEEVES, FITTINGS, AND VALVES WITH  
MECHANICAL JOINTS TO HDPE PIPE.

- A Use adaptors furnished or approved by HDPE pipe manufacturer to join HDPE pipe to ductile iron mechanical joint sleeves, fittings, and valves.
- B. HDPE to ductile iron mechanical joint adaptors shall be thermal butt fusion welded to HDPE pipe in accordance with manufacturer's recommendations.

END OF SECTION 33 10 10

## SECTION 33 31 00

### SANITARY UTILITY SEWERAGE PIPING

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. Work described in this section includes the furnishing, installation, and testing of sanitary sewer piping, fittings, and accessories.

##### 1.02 QUALITY ASSURANCE

- A. Materials must be provided in accordance with the specification.
- B. The Engineer shall be notified 24 hours in advance, prior to any system testing. Any testing done prior to notification shall be considered as not having taken place. 24 hour notice shall be construed as ample time for the Engineer to prepare for and observe the testing.
- C. All work must comply with New Hampshire Department of Environmental Services Code of Administrative Rules, Env-Wq 700.
- D. Inspect all pipe upon receipt. Remove damaged pipe from the work site.
- E. All work must be completed in accordance with the applicable federal, state, and local standards.

##### 1.03 SUBMITTALS

- A. Submit manufacturer's product data and installation guide.
- B. Certified copies of test results on pipe units.
- C. Record Drawings showing depth and location of:
  - 1. Cleanouts
  - 2. Service bends
  - 3. Wye connections
  - 4. Repairs to existing utilities
  - 5. Record in a permanently bound notebook. Provide access to records for the project superintendent, Engineer, and Owner at all times. Submit records at substantial completion.



## PART 2 - PRODUCTS

### 2.01 PIPE AND FITTINGS

- A. Pipe and Fittings shall be as depicted on the drawings.
- B. Force main Pressure Pipe shall allow for an alternate pipe material by the contractor. Acceptable alternate materials for the open excavation method are as follows.

PVC Pressure Pipe Steel Size: SDR21, Pipe shall conform to ASTM D2241 for SDR 21. PVC Resin compound shall conform to ASTM D1784 and rubber gaskets shall conform to ASTM D1869 and F477. Pipe shall be 20' 0" nominal lengths.

Fittings for the above PVC pressure pipe options shall be as follows: All fittings shall be mechanical joint compact fittings meeting the requirements of ductile iron class 350 and shall be produced in strict accordance with ANSI/AWWA A21.53/C-153 and ANSI/AWWA A21.11/C-111 for joints and ANSI/AWWAA21.4/C104 for cement lining. Mechanical joint nuts and bolts shall be Corten or Ductile Iron, high strength, low alloy steel ANSI/AWWA A21.11/C111. Retainer glands shall be designed for use with PVC pipe (C-900 or IPS whichever is being installed) and comply with manufacturers requirements. Thrust blocks are required at all fittings. Pipe shall have tracer wire installed in accordance with section 33 10 10. All fittings and tracer wire are incidental to the pipe item.

Forcemain piping through forcemain structures shall be in accordance with the drawings.

- C. Low pressure sewer: PVC Pipe (Solid Wall) (4" –27") ASTM D3034 and F679; strength requirement, SDR-35; push-on joints, ASTM 3212, gaskets ASTM F-477, Pipe will be marked with manufactures name, diameter, and thickness class.
- D. Provide fittings of a standard type and class of materials. Provide plugs or vertical cleanout piping.

### 2.02 MISCELLANEOUS

Flexible adaptors: Non-pressure pipe: Neoprene full circle sleeve with stainless steel strap, equal to those manufactured by Fernco. Use only in connecting new service to existing service pipe.

## PART 3 - EXECUTION

### 3.01 INSTALLATION OF GRAVITY PIPE AND FITTINGS AND ALTERNATE PRESSURE FORCEMAIN PIPING.

- A. Methods: Install pipe and fittings in accordance with manufacturer's recommendations. Control line and grade with a laser beam unless otherwise authorized by the Engineer.
1. Bed and secure each length of pipe before placing the next length.
  2. Plug open pipe ends whenever work is suspended.
  3. Bed pipe as shown on the Drawings.
  4. Wheel-load PVC pipe only after 30 inch minimum backfill cushion is in place.
- B. Line and Grade: Lay pipe to the line and grade shown on the Drawings.
1. Lay pipe to uniform grade between manholes.
  2. Line and grade may be adjusted from plan by the Engineer as conditions require.
  3. Forcemain line and grade shall be in accordance with the drawings.
- C. Laying Conditions: Lay pipe in a dry trench. When pipe-laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means as specified. The plug shall be fitted with a means for venting. When practical, the plug shall remain in place until the trench is pumped completely dry. Care must be taken to prevent pipe flotation if the trench fills with water. Prior to removal of the plug for extending the line or for any other reason, air and water pressure in the line shall be released. No trench water shall be allowed to enter pipe.
- D. Bedding material and fill material for excavation below grade shall be ¾" crushed stone to ASTM C33-03 Stone Size No. 67. Bedding must extend 6" below the bottom crown of the pipe in soil and 12" in ledge.
- E. The pipe blanket material shall be free graded sand free from organic materials, graded such that 100% passes the ½" sieve and a maximum of 15% passes a #200 sieve.
- F. In lieu of the sand blanket as specified above, a stone blanket 6" thick completely around the pipe using ¾" stone may be used.
- G. Pipe bedding material shall extend from a horizontal plane through the pipe axis to six inches below the bottom outside surface of the pipe.

- H. Pipe bedding material shall cover the pipe a minimum of 12" above the crown of the outside surface
- I. Compaction shall be in accordance with specification section 31 23 23.23.
- J. From 1-foot above the top of the pipe to grade or to the subgrade of the pavement, material containing stones up to 8 in. in their greatest dimension may be used, unless otherwise specified. Backfilling shall be completed in accordance with specification section 31 23 16.13, "Trenching." All backfill material shall be free from cinders, ashes, refuse, vegetable or organic material, boulders, rocks or stones, large pieces of concrete or masonry, frozen soil, or other unsuitable material that may be detrimental or cause damage to the pipe, fittings, valves. The excavated material shall be used as backfill unless otherwise stated on the approved plans within these documents, provided that this material consists of loam, clay, sand, gravel, or other suitable materials. Backfill material must be capable of meeting the compaction requirements listed within these documents.
- K. Trenches with sewer pipes with slopes over 0.08 feet per foot and trenches for sewer pipes below seasonal high ground water table shall have impervious trench dams constructed every 300 feet to prevent potential disturbance to pipe bedding and blanket materials.
- L. Flush all pipe of dirt and debris using a method approved by the Engineer. Gravity flushing of lines is not acceptable.
- M. Flexible joints at manholes: Provide 4 foot maximum stub from inside face of manhole to flexible joint.
- N. Service fittings: Size of service pipe is noted on Drawings.
1. Depth and location of service is to be determined by Engineer in field.
  2. Provide wye fittings on main line pipe as shown on the Drawings or as directed by the Engineer.
  3. Provide plug or cap at service pipe ends with witness stake. Assist Engineer in measurements of pipe and swing location ties.
- O. Trench dimensions shall be as follows:
1. For sewer pipe less than 15 inches in diameter, the allowable trench width at a plane 12 inches above the pipe shall be no more than 36 inches; and
  2. For pipe 15 inches and larger, the allowable trench width shall be equal to the pipe outside diameter plus 24 inches.
- P. Sewers shall be located at least 10 feet horizontally from any existing or proposed water main.

- Q. A deviation from the separation requirements of (b) or (c) above shall be allowed where necessary to avoid conflict with subsurface structures, utility chambers, and building foundations, provided that the sewer is constructed in accordance with the force main construction requirements specified in Env-Wq704.06.
- R. Whenever sewers must cross water mains, the sewer shall be constructed as follows:
1. Vertical separation of the sewer and water main shall be not less than 18 inches, with water above sewer; and
  2. Sewer pipe joints shall be located at least 6 feet horizontally from the water main.
- S. Sewer main pipes are never to cross-above any existing or proposed water main piping unless approved by the system operator or Engineer. Installation of ductile iron piping in replacement of PVC sewer piping at the crossing may be required.
- T. All crossing separation distances are to be documented on red-lined plans and provided to the Engineer at system completion. If a Contractor crosses over an existing utility line, the existing utility line must be located to determine proper separation is achieved. Vertical separation between all utilities shall be not less than 18 inches.

### 3.02 TESTING OF SANITARY GRAVITY SEWERS

- A. Test all sanitary sewer pipes after backfilling and flushing.
1. Test mainline sewer pipe only after service connection pipe has been installed and backfilled.
  2. Perform tests in presence of the on-site superintendent and Engineer/Owners representative.
- B. Gravity Sewer Leakage test:
- Use low-pressure air in accordance with the following chart:
1. Plug pipe ends in section to be tested.
  2. Supply air slowly to the test section until the air pressure inside the pipe is 4.0 psi greater than the average back pressure of any groundwater over the pipe. Ground water back pressure is equivalent to 1 psi for every 2.3 feet the ground water table is above the top of pipe.
  3. Allow 2 minutes for stabilization of pressure with .5psi loss allowable. Allowable drop in pressure will be no greater than 0.5 psi over the test duration.

4. Time the test according to the chart values.

SPECIFICATION TIME REQUIRED FOR A 0.5 PSIG PRESSURE DROP FOR SIZE AND LENGTH OF PIPE INDICATED											
1 Pipe Diameter (in.)	2 Minimum Time (min:sec)	3 Length for Minimum Time (ft)	4 Time for Longer Length (sec)	Specification Time for Length (L) Shown (min:sec)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	0.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	0.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	11:2	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:1	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:0	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470	19:5	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674	22:4	34:11	45:34	56:58	8:22	79:46	91:10	102:3
27	25:30	88	17.306	28:5	43:16	57:41	72:07	86:32	100:5	115:2	129:4
30	28:20	80	21.366	35:3	53:25	71:13	89:02	106:5	124:3	142:2	160:1
33	31:10	72	25.852	43:0	64:38	86:10	107:4	129:1	150:4	172:2	193:5
36	34:00	66	30.768	51:1	76:55	102:3	128:1	153:5	179:2	205:0	230:4

C. Deflection test (Gravity Mains) 100% of pipe thirty (30) days or more after backfilling.

1. Use a rigid ball or mandrel with diameter equal to 95% of PVC pipe I.D. Do not use mechanical pulling units.
2. Pipe deflection shall not exceed 5% in any section of pipe installed.
3. Pipe sections failing the deflection test shall be removed and re-laid as directed by the Engineer. Any associated cost of relaying the pipe shall be at the Contractor's expense.

3.03 TESTING OF SANITARY FORCEMAIN SEWERS

A. Force mains will be tested hydrostaticly in accordance with the following.

1. Piping and appurtenances to be tested shall be within sections between valves or adequate plugs, not exceeding 2000 feet with prior approval from the system operator. Testing shall not proceed until restraining devices are installed. All piping shall be thoroughly cleaned and flushed prior to testing to clear the lines of all foreign matter. While the piping is being filled with water, care shall be exercised to permit the escape of air

from extremities of the test section, with additional release cocks provided if required.

2. Hydrostatic testing shall be performed at 100 psi for all sizes of force mains. The testing procedure shall continue for an uninterrupted period of not less than two (2) hours. Testing shall be in accordance with the applicable AWWA provisions for PVC-AWWA Publication M-23 and for ductile iron pipe (DIP)-AWWA Standard C600, Section 4. HDPE pipe shall be tested in accordance with HDPE-AWWA Standard C906 HDPE pipe and manufacturers recommendations and allowable leakage shall be calculated the same as DIP. Test pressure must be maintained within +/- 5 psi for the duration of the test. Test must be witnessed by the Owners representative/Engineer, or third party inspector. The allowable rate of leakage shall be less than the number of gallons per hour determined by the following formulas.

PVC

$$L = \frac{NDp^{1/2}}{7400}$$

7400

DIP/HDPE

$$L = \frac{SDp^{1/2}}{148,000}$$

148,000

For 100 psi; test:  $L = 0.00135 ND$  (PVC)

For 100 psi; test;  $L = 0.000075 SD$  (DIP/HDPE)

L = Allowable leakage in gallons per hour

N = Number of joints in section tested

S = Length of pipe tested, in feet

D = Nominal diameter of pipe in inches

P = Average test pressure maintained during the leakage test in pounds per square inch gauge.

END OF SECTION

## SECTION 33 39 13

### SANITARY UTILITY SEWERAGE MANHOLES, FRAMES, AND COVERS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. Provide precast concrete manholes complete and in place as shown on the Drawings including:
  - Sewer Manhole
  - Forcemain Manholes
  - Brick and Masonry Invert
  - Frames and Covers
- B. The Engineer shall be notified 24 hours in advance, prior to any system testing. Any testing done prior to notification shall be considered as not having taken place. 24 hour notice shall be construed as ample time for the Engineer to prepare for and observe the testing.
- C. All work must comply with New Hampshire Department of Environmental Services Code of Administrative Rules, Env-Wq 700.
- D. Inspect structures upon receipt. Remove damaged structures from the work site.
- E. All work must be completed in accordance with the applicable federal, state, and local standards.

##### 1.02 QUALITY ASSURANCE

- A. Provide a complete manhole as shown on the Drawings.
  - 1. Precast units shall be capable of supporting AASHTO H-20 loading.
  - 2. Precast units shall comply with ASTM C913 - Standard Specifications for Precast Concrete Water and Wastewater Structures and ASTM C478.

##### 1.03 SUBMITTALS

- A. Submit Shop Drawings for precast manholes and related precast concrete items. Detail components to be used, thickness dimensions, reinforcing, elevations at tops of precast sections, base and pipe inverts and location of pipe penetrations. Submit copies of manhole schedule indicating all of the above. All steel and iron products shall include Buy American Certification.

- B. Product data shall be submitted showing installation instructions and details for frames, covers, precast items, manhole sleeves, steps and joint sealants.

## PART 2 - PRODUCTS

### 2.01 MANHOLES

- A. Base sections shall be precast monolithic construction. Pipe openings shall not be less than six inches (6") from section joints.
- B. Barrel sections shall be precast sections.
- C. Top sections shall be precast eccentric cone. Flat top slabs shall be used when manhole depth is less than five feet (5'). Flat top slabs shall withstand H-20 loading. Rough opening shall be thirty inch (30") diameter.
- D. Each Section shall have stamped upon it date of manufacture and name or trademark.
- E. Manhole connections at pipe penetrations of four inch (4") diameter or greater shall be KOR-N-SEAL, CP series or LOCK-JOINT flexible rubber manhole sleeve sized to fit the diameter and type of pipe without the use of gaskets.

Pipe penetrations less than four inches (4") shall be schedule 40 galvanized steel pipe sleeve seal equal to "LINK-SEAL" by Thunderline Corp.

Forcemain Manholes shall be LINK-SEAL or equivalent.

- F. Horizontal joints between sections of precast concrete barrels shall be of an overlapping type, sealed for water-tightness using a double row of an elastomeric or mastic type sealent.
- G. Dampproofing coat on the exterior of all precast sections shall be factory applied bituminous coating equal to DEHYDRATE No. 4 Dampproof by W. R. Grace, or BITUMASTIC SUPER SERVICE BLACK by Koppers Co.
- H. Exterior joints shall receive a bituminous coating following installation.
- I. Inside Drop: The invert of the incoming pipe shall be no more than 6 inches above the invert of the outgoing pipe unless a inside drop entry is used. Sewer pipe slopes shall be adjusted to avoid differences in incoming and outgoing pipe inverts greater than 6 inches unless a drop entry is used. A drop entry pipe shall be used for any sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. The pipe drop must be constructed internal of the manhole. All manholes requiring internal drops shall be a minimum 5-foot inside diameter. All manhole inside drops must be constructed in accordance with the attached details and all inside drop hardware shall be stainless steel:



## 2.02 MASONRY MATERIALS FOR MANHOLE INSTALLATION

- A. Brick masonry for shelf, invert and grade adjustment shall comply with ASTM C32-05, clay or shale, for grade SS hard brick.
- B. Mortar shall be composed of portland cement and sand with or without hydrated lime addition. Proportions of mortar of parts by volumes shall be 4.5 parts sand and 1.5 parts cement, or 4.5 parts sand, one part cement and 0.5 part hydrated lime.
- C. Cement shall be type II portland cement conforming to ASTM C150-05.
- D. Hydrated lime shall be type S conforming to ASTM C207-06 "Standard Specifications for Hydrated Lime for Masonry Purposes."
- E. Sand shall consist of inert natural sand conforming to the ASTM C33-03. "Standard Specifications for Concrete, Fine Aggregates."
- D. In the flow channel, a drop of at least 0.1 feet shall be provided between incoming and outgoing sewers on all manholes.

## 2.03 FRAMES AND COVERS

- A. Coatings: Not required.
- B. Cast iron shall be ASTM A48, Class 30.
- C. Manhole frames and shall be with three inch (3") high raised letters cast on the cover, labeled "SEWER".
- E. Manhole cover castings shall be of even-grained cast iron, smooth, and free from scale, lumps, blisters, sand holes, and defects.
- F. Contact surfaces of covers and frames shall be machined at the foundry to prevent rocking of covers in any orientation.
- G. Castings shall be equal to class 30 and certified by their manufacturer as conforming to the ASTM A48/48M standard in effect at the time the castings were manufactured.

## PART 3 - EXECUTION

### 3.01 INSTALLATION OF MANHOLE

- A. Placement: Place bases on compacted leveled bedding material with manhole inverts at proper elevations with vertical section plumb. Plug all lift holes with non-shrink grout.

- B. Joints: Shall be watertight, shiplap type, sealed with rubber 'o'-ring or two 1 inch diameter butyl rubber sealant strips equal to RAM-NEK or KENT SEAL No. 2.
- C. Frames and Covers: Set to final grade as shown on the Drawings, or as indicated below:
  - 1. Set flush with pavement in roadways.
  - 2. Set one inch (1") below finish grade in unpaved roadways.
  - 3. Set all manhole frames and covers to grade after pavement base course has been applied.
- D. Manhole Sub-grade: Manholes will be installed on ¾" crushed stone (ASTM C33-03 No. 67 stone) to a minimum thickness of 6"- 8" or sufficient depth to stabilize the manhole sub-grade. Care must be taken during excavation to not over excavate below structure sub-grade. The excavation must be properly dewatered while placing bedding material and setting the base.
- E. Manholes brick paved shelf and invert shall be constructed to conform to the size of pipe and flow. At changes in direction, the inverts shall be laid out in curves of the longest radius possible tangent to the centerline of the sewer pipes. Shelves shall be constructed to the elevation of the highest pipe crown and sloped to drain toward the flowing through channel. Underlayment of invert and shelf shall consist of brick masonry. Inverts and shelves shall be installed after testing is complete.
- F. Note: Verify that all elastomeric boots are tight and secure to both the manhole and the pipe prior to testing or backfilling.

### 3.02 LEAKAGE TEST - SEWER MANHOLE

- A. Manholes shall be tested for leakage using a vacuum test in accordance with the ASTM C1244 standard in effect when the testing is performed. A manhole may be backfilled prior to performing a vacuum test, but if the manhole fails the vacuum test, backfill shall be removed so repairs to the manhole can be made from the outside of the manhole prior to retesting.
- B. Forcemain Manholes, Install piping through the penetrations prior to testing and reinforce. Interior pipe shall not be completed until after vacuum testing is complete.
- C. Vacuum Test:
  - 1. The initial vacuum gauge test pressure shall be 10 inches Hg; and the minimum acceptable test hold time for a 1-inch Hg pressure drop to 9-inches Hg shall be:

2. Not less than: 2 minutes for manholes less than 10 foot depth;  
2.5 minutes for manholes less than 10-15 feet deep;  
3 minutes for manholes more than 15 feet deep;
- D. The manhole shall be repaired from the exterior and retested if the test hold time fails to achieve the acceptance limits specified in item C above. Sealing of manhole joints with hydraulic cement is not acceptable for structure repair. The Contractor may seal all lifting holes and ladder rungs as necessary with hydraulic cement. If the structure is leaking at the seams, the structure must be disassembled and reset with new elastomeric or mastic joints and retested.
- E. Inverts and shelves shall not be installed until after successful testing is completed.
- F. Immediately following completion of the leakage test, the frame and cover shall be placed on the top of the manhole or some other means used to prevent accidental entry by unauthorized persons, children, or animals, until the contractor is ready to make final adjustment to grade.
- G. Hydrostatic testing is not acceptable as a substitute for vacuum testing of sewer gravity manholes.

END OF SECTION

## SECTION 33 39 18

### PUMP STATION

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

- A. The contractor shall provide all materials, labor, equipment and incidentals necessary to install the new Shaker Landing Pump Station as shown on the drawings and specified herein.
- B. The pump station shall include pre-cast concrete wet wells and valve vaults, all related piping, all electrical work (excluding the backup generator), all instrumentation work, panels to be installed on an above grade pedestal at Shaker Landing), all mechanical components, site work, complete, field tested ready for use and approved by the Town and Owner.
- C. Items having separate unit bid items shall be separate from this section. All items required to complete the pump station that do not have individual unit bid items are considered incidental to this work and pump station bid items at both locations.
- D. Specific Manufacturers and Products identified in this section are for basis of design only. Equipment/Product selection shall be competitive. Equivalent products (Accepted by the Engineer) to the ones specified in these documents are acceptable on this project.

##### 1.2 SUBMITTALS

- A. Excavation Procedure: The contractor shall submit a detailed outline of their intended excavation procedure for the Engineers information. This submittal will not relieve the Contractor of complete responsibility for the successful performance of intended excavation methods. Detailed dewatering plan shall be included in this excavation procedure. Shoring methods shall be included in this plan as well as a plan detailing how the Contractor intends to protect the excavation from public access (fencing, etc.).
- B. Shop Drawings: The Contractor shall supply shop drawings for all materials and equipment as specified in Section 01 60 10 – Submittals.
- C. The manufacturer or supplier shall submit to the Engineer for approval, certified performance test data (Test Type 2) rating curves and details of construction for the pumps he proposes to furnish. The curves shall indicate certified performance at design point, shutoff and five points spaced over the operating range of the pump. Test data shall consist of head and capacity. If pump is direct driven by an

electric motor to be shipped with the pump, kilowatt input to the motor will be taken. A plotted copy of the test data shall be certified and supplied.

### 1.3 GUARANTEE

- A. All products and/or equipment incorporated into the pump station and valve pit shall be guaranteed for a period of one (1) year from startup and acceptance from the Town.

## PART 2 - PRODUCTS

### 2.1 OPERATING CONDITIONS

- A. The pump station equipment shall be capable of continuous and automatic operation.
- B. The electrical and control system for the pump station shall be connected to the emergency power system to allow operation during power outages.
- C. Only one pump should be in operation at a time. At no time should both pumps operate at the same time.

### 2.2 CONCRETE PUMP STATION STRUCTURES.

- A. All concrete shall conform to the provisions of specification Section 03 30 53 Miscellaneous Concrete, as specified herein.
- B. The contractor shall furnish and install the concrete structures as shown on the Drawings and specified herein.
- C. The pumping station shall be the product of a manufacturer regularly engaged in design and fabrication of this type of equipment.
- D. The wet well structures shall have an anti-flotation slab with tie-down brackets designed to prevent flotation without benefit of skin friction when the water service elevation is at finished ground surface. Design calculations shall be submitted to the Engineer for approval before fabrication of the structures. This submittal will not relieve the Contractor of complete responsibility for the successful performance of the structures. Design computations for uplift forces shall contain a minimum factor of safety of 1.15.
- E. Each penetration shall be sealed water tight in accordance with the drawings and the New Hampshire Department of Environmental Services ENV-WQ 700 administrative rules.

- F. Dampproofing shall be applied to the outside surface of the pump station. Surfaces to be dampproofed shall receive one coat of Coal Tar Concrete Priming Oil and two coats of Coal Tar Butumen as manufactured by the Koppers Company or approved equivalent, and conforming to the recommendations of the manufacturer. Surfaces to be treated shall be free from oil dirt and shall be in the proper conditions as indicated by the manufacturer prior to the application of the dampproofing material.
- G. Pumping station structures shall be designed H-20 loading min.
- H. Pump station structures shall pass a leakage test and shall be approved by the Engineer prior to being accepted by the Town.

2.3 PUMP CHARACTERISTICS

- A. Two pumps with the same characteristics shall be provided for the pump station. Pumps shall have the characteristics tabulated below. All pumps shall be capable of handling 3-inch maximum solids.

- B. Pump Characteristics are as follows:

<b>Shaker Landing</b>	
Number of Units	2
Design Flow (gpm)	120
Design TDH (ft)	29
Minimum Shut Off Head	44
RPM	1561
Minimum HP	3
Min Efficiency at DP (%)	45
Voltage/HZ	230/60
Phase	3

- C. Pumps

Provide FM explosion proof submersible non clog sewage pumps suitable for continuous duty operation underwater without loss of watertight integrity to a depth of 65 feet. Pumps shall be connected to a guide rail system such that the pumps will be automatically connected to the discharge piping when lowered into place on the discharge connection. The pumps shall be easily removable for inspection or service, requiring no bolts, nuts, or other fasteners to be disconnected, or the need of personnel to enter the wet well. The motor and pumps shall be designed, manufactured, and assembled by the same manufacturer.

All major parts of the pumping unit(s) including casing, impeller, suction cover, wear rings, motor frame and discharge elbow shall be manufactured from gray

cast iron, ASTM A-48 Class 30. Castings shall have smooth surfaces devoid of blow holes or other casting irregularities. Casing design shall be centerline discharge with large radius on the cut water to prevent clogging. Units shall be furnished with a discharge elbow and 125 lb. flat face ANSI flange. All exposed bolts and nuts shall be 304 stainless steel. All mating surfaces of major components shall be machined and fitted with NBR O-rings where watertight sealing is required. Machining and fitting shall be such that sealing is accomplished by automatic compression of O-rings in two planes and O-ring contact is made on four surfaces without the requirement of specific torque limits. Internal and external surfaces shall be prepared to SPPC-VISI-SP-3-63 then coated with a zinc-chromate primer. The external surfaces shall be coated with a H.B. Teneme-Tar 46H413 Polyamide Epoxy-Coal Tar Paint.

The impeller shall be a mixed flow multi-vane semi-open design. It shall be dynamically balanced and shall be designed for solids handling with a long throulet without acute turns. The impeller design must also include back pump out vanes to reduce the pressure and entry of foreign materials into the mechanical seal area.

Pumps to be Ebara Fluid Handling Model DLFU, Cornell Submersible, or approved equivalent.

## 2.4 GUIDE RAIL SYSTEM

- A. Pumps shall include a guide rail system such that the pumps will be automatically connected to the discharge piping when lowered into place on the discharge connection. The pumps shall be easily removable for inspection or service, requiring no bolts, nuts, or other fasteners to be disconnected, or the need for personnel to enter the wet well.
- B. Guide rails shall include two (2) galvanized steel guide rails sized to mount directly to the quick discharge connector, QDC, at the floor of the wetwell and to a guide bracket at the top of the wetwell below the hatch opening (refer to drawings).
- C. The quick discharge connector shall be manufactured of cast iron, ASTM A48 Class 30. It shall adequately support the guide rails, discharge piping, and piping unit under both static and dynamic loading conditions with support legs that are suitable for anchoring it to the wetwell floor.
- D. The face of the quick discharge connector flange shall be perpendicular to the floor of the wetwell.
- E. The pump design shall include an integral self-aligning sliding bracket.
- F. Sealing of the pumping unit to the quick discharge connector shall be accomplished by a single, linear, downward motion of the pump. The entire

weight of the pump unit shall be guided to and wedged tightly against the inlet flange of the QDC, making metal to metal contact with the pump discharge forming a seal without the use of bolts, gaskets, or O-rings.

- G. A galvanized steel lifting chain of adequate length for removing and installing the pump unit is required. The chain shall have a round 2 ¼" inside diameter every two feet. This link will allow for a sliding pinch bar through the link to pick the chain, more than once if necessary, at multiple intervals during pump removal and installation.
- H. Pump slide rail assemblies shall be manufactured by the same manufacturer as the submersible wastewater pumps. Lift out systems comprised of guide wires shall not be acceptable.
- I. Fastening hardware including anchor bolts, shall be ANSI Type 316 stainless steel.

## 2.5 GAUGES

- A. Pressure gauges shall be provided for discharge sides of all pumps. Gauges shall be 316 Stainless Steel, 4 ½-inches in diameter, 1/4-inch in stainless steel mall connection, white face with filled-black markings of suitable range. Each gauge shall be fitted with a steel diaphragm oil seal to prevent the entrance of sewage. Gauges shall be manufactured by Ashcroft Co., Steward Warner Co., U.S. Gauge or approved equivalent. Gauges shall read to 100 in increments of 10, and gauge measurement shall be in pounds-per-square-inch. Gauges shall be designed for use on wastewater lines and be corrosion resistant.

## 2.6 PUMP STATION CONTROLS

- A. General: The pump control package shall be mounted in a single enclosure of galvanized steel, furnished inside and out with industrial grade enamel. The enclosure shall be furnished with a lockable outside door and an inner door, fabricated from marine alloy aluminum, suitable for mounting all control lights and switches. All hardware shall be stainless steel. A stripheater and a thermostat shall be installed in all enclosures to prevent condensation and freezing.

The control panel shall be pedestal mounted outside the pump station as indicated on the Drawings.

Circuit breakers, motor disconnects, magnetic starters, and overload protection shall be an integral part of the pump control package.

Pump station shall have local audible and visible alarm indication for low water and high water conditions as well as loss of power. The local alarms shall be located outside the pump station on the pedestal.



The existing emergency dialer at the Shaker Landing pump station shall be relocated to the new pedestal.

- C. Controls: To control the operation of the pumps with variation in sewage level in the wet well, a transducer with mercury float backup shall be employed.

The control panel shall provide the following components and functions:

- Hands-Off-Auto selector switch for each pump.
- Pump run pilot light (green) for each pump.
- 24 VAV power "on" indicator light (yellow).
- High level alarm indicator light (red).
- Low level alarm indicator light (red).
- Loss of power alarm indicator light (red).
- Alarm silence push button.
- Alarm reset push button/alarm memory circuit.
- Elapsed time indicators for each pump.
- Phase/under voltage monitor 200-240 volt.
- Lightning arrestor.
- Electromechanical alternator.
- Auto/Manual alternation sequence selector switch.
- Pump seal failure indicator
- Pump motor overheating indicator
- Control chassis to be electrically protected by two control circuit breakers, one for 120 volts and one for 240 volts.
- All necessary relays and contacts.
- Duplex 120VAC receptacle.
- VFD phase converters (One for each pumps 1 phase to 3 phase)

The control panel shall provide an alteration of pump operation on every cycle, only one pump will run at a time and both pumps will never run simultaneously. The logic control sequence of operations shall be as follows.

- 4<sup>th</sup> level: High Level Alarm  
(Automatic pump alteration to pump No. 2 from pump No. 1)
- 3<sup>rd</sup> level: Start Pump
- 2<sup>nd</sup> level: Stop Pump
- 1<sup>st</sup> level: Low Level Alarm

The Contractor shall supply and install a complete and operational pump control system.

## 2.7 PLUMBING PUMP STATION

- A. The contractor shall supply and install all materials as necessary to furnish the pump station.
- B. Sewer Flow Meters: An inline electromagnetic flow metering system shall be installed in accordance with the manufacturer's recommendations at each pump station. The flow metering tube shall be Foxboro 9300A Series Flanged Magnetic Flowtubes or equivalent. The flow meter system shall operate on the principle of electromagnetic induction, with a pulsed DC excitation frequency, and shall produce a signal output that is directly proportional and linear with the volumetric flow rate of the liquid flowing through the metering tube. The metering systems shall have remote mounted intelligent flow transmitter. The metering system shall comply with CE and FCC standards.

The metering tube shall be constructed of 316 stainless steel and rated for a working pressure of 150 PSI minimum. The metering tube shall be available in line sizes ranging from ¼" to 24". The metering tube end connections shall be carbon steel or 316 stainless steel flanged, according to ANSI B16 Class 150 and AWWA Class B standards. The insulated liner material of the metering tube shall be available in PFA. The housing construction shall consist of a welded housing with a NEMA 4X finish for the tubes.

The intelligent flow transmitters shall be program selectable to display the following units of measure: U.S. gallons, imperial gallons, million gallons per day (U.S.), cubic feet, cubic meters, liters, oil barrels, pounds, ounces or acre feet.

A LCD display interface shall be provided. In addition to the LCD display interface, the signal amplifier shall provide the following:

1. Two open collector digital outputs independently programmable for the following: scaled pulse, min-max flow alarm and status or frequency output.
2. Two AC solid state relay outputs that are programmable for either a flow alarm or status.
3. One analog output signal programmable and scalable for the following: 0-10mA, 0-20 mA or 4-20 mA. The output shall be in voltage sourced and isolated. Maximum loop resistance = 750 ohms.
4. One digital auxiliary input selectable for positive zero return, external totalizer reset or preset batch start.
5. All signal amplifier outputs shall be galvanically isolated to 500 volts.
6. The signal amplifier enclosure shall be constructed of cast aluminum with powder coated paint and rated to meet NEMA 4X/6P (IP66/IP67) standards.
7. Each meter shall be hydraulically calibrated in an ISO 9000 certified testing facility, which utilizes a computerized gravimetric testing method with a measuring uncertainty of 0.1%.

8. Each meter shall be provided with a calibration certificate indicating the measured error (percent deviation) at three different flows, respectively equivalent to 25%, 50% and 75% of the nominal flow for each size.
- C. Sump Pumps: The contractor shall supply and install two (2) submersible sump pumps (one for each station) as shown on the drawings. The sump pumps shall be supplied with a ¼”H.P. motor and have a minimum capacity of 25 gpm at 14 ft. T.D.H. The pumps shall be controlled by a mercury float switch capable of operating a 7-inch drawdown. The sump pumps shall be Myers, Zoeller or approved equivalent. The sump pumps shall be supplied with local on/off switch, completely wired with circuit breaker in electrical panel.
- D. Valves and Piping
1. Each pump shall be equipped with a full flow swing type check valve, capable of passing a 3” spherical solid. Check valves shall be of the swing type and shall meet the material requirements of AWWA C508. the valve shall be iron body, (epoxy coated) , bronze mounted, single disc for non-shock working pressure of 175 psi (4-8”) and hydrostatically tested to at least twice the working pressure. The seat ring shall be bronze or stainless steel, renewable. The disc shall be bronze. The flange shall be Class 125. A BUNA-N seal shall be furnished to provide zero leakage. The BUNA-N seal shall be vulcanized to the flapper plate and may not be glued or chemically adhered. The valve shall be so constructed that by simply unbolting and lifting off the cover, the internal working parts may be easily removed and replaced without removing the valve body from the pipeline. The valve shall be of the conventional swing check style provide with a lever and weight to assist in closure. The valve shall permit flow in one direction only, be tight sealed when the outlet pressure exceeds the inlet pressure, and be suitable for mounting in horizontal or vertical lines. The valve shall have a stainless steel shaft (hinge pin) supported by bronze bearings, and sealed by an adjustable packing gland with compression type packing.
  2. Plug Valves shall be provided for isolation of each pump, and will be located downstream of the check valves to provide isolation of each check for service as needed. Plug valves shall also be provided as detailed for forcemain manholes and where depicted on the drawings. Plug valves shall be a heavy duty service valve designed primarily for the water and wastewater applications. Plug valves shall be heavy duty class #150 ANSI B16.5. Valve body, bonnet and plug shall be cast iron complying with ASTM A536 grade 65-45-12. Plugs shall be fully encapsulated with resilient facing per ASTM D2000-BG and ANSI/AWWA C517 requirements. Plug valves shall be mechanical joint or flange assembly as depicted on the drawings with stainless steel bolts, hardware, washers, and fasteners. Valves shall be epoxy coated inside and out by the

manufacturer. Eccentric plug that provides a tight shut off and wear resistance. Pressure class shall be rated 175 PSI min. Plug valves shall be with 2" operating nut, inclusive of handwheels when specified on the drawings.

E. Ductile Iron Piping

1. Ductile iron pipes and fittings shall meet the requirements of the Town of Enfield.
2. Size: As shown on drawings.
3. Minimum thickness class: ANSI A21.51/AWWA C151 Class 52 unless otherwise shown on drawings. All flanged pipe shall be class 53.
4. Lining: Cement lined minimum 1/8-inch thick, ANSI A21.4/AWWA C104.
5. Coating: Seal coating inside and outside, ANSI A21.4/AWWA C104. All piping internal to pump station valve vaults and forcemain manholes shall be painted with epoxy paint color "dark green" following installation. Proper ventilation shall be provided during painting complying with all OSHA regulations. Painting shall be compliant to section 09 91 00.
6. Joint: Push on unless otherwise shown on the drawings, ANSI A21.51/AWWA C151.
7. Gaskets: ANSI21.11/AWWA C111.
8. Maximum length: 20 feet.
9. All steel and iron piping shall include Buy American Certification.

F. Ductile Iron Fittings

1. Size: As shown on the drawings.
2. Minimum pressure rating: 250 psi, ANSI21.10/AWWA C110.
3. Lining: Cement lined minimum 1/8-inch thick, ANSI A21.4/AWWA C104.
4. Coating: Seal coating inside and outside, ANSI A21.4/AWWA C104. All piping internal to pump station valve vaults and forcemain manholes shall be painted with epoxy paint color "dark green" following installation. Proper ventilation shall be provided during painting complying with all OSHA regulations. Painting shall be compliant to section 09 91 00. Bolts, nuts and washers shall not be painted.
5. Joint: Mechanical joint pipe restraint system. Retainer glands shall be heavy duty ductile iron body. Flanged fittings as shown on the drawings with water tight gaskets. Flange fittings shall be in accordance with manufacturer requirements. All internal fittings within pump station valve vaults, wet wells, and forcemain manholes shall have stainless steel bolts, nuts, and washers.

6. The contractor must insure that all pipes connected to the pump station are supported to prevent loads from being transmitted to pumps or station piping.
7. All steel and iron fittings shall include American Iron and Steel Certification.

## 2.8 LIQUID LEVEL CONTROL

- A. Liquid level controls shall be by transducer with mercury float backups for alarms.

### Submersible Transducer Requirements

1. The liquid level of the wet well shall be sensed by a submersible level transducer. The transducer shall be a 2-wire type to operate from the level controller's regulated supply voltage and produce an instrumentation signal in direct proportion to the measured level excursion over a factory-calibrated range of zero to 20 feet of water.
2. The transducer shall be of the solid-state head-pressure sensing type, suitable for continuous submergence and operation and shall be installed in accordance with manufacturer's instructions. The bottom diaphragm face of the sensor shall be installed approximately 6 inches above the wet well floor. The sensor shall be mounted using a stainless steel cable suspension system in a location and as shown on the job plans.
3. The transducer housing shall be fabricated of type 316 stainless steel with a bottom diaphragm 2-5/8" diameter of heavy-duty, limp, foul-free, molded Teflon (TM) bonded to a synthetic rubber back/seal.
4. A hydraulic fill liquid behind the diaphragm shall transmit the sensed pressure to a solid-state variable-capacitance transducer element to convert the sensed pressure to a corresponding electrical value. The sensed media shall exert its pressure against the diaphragm that flexes minutely so as to vary the proximity between an internal ceramic diaphragm and a ceramic substrate to vary the capacitance of an electrical field created between the two surfaces. A stable, hybrid, operational amplifier assembly shall be incorporated in the transducer to excite and demodulate the sensing mechanism. The transducer shall incorporate laser-trimmed, temperature compensated, high quality components and construction to provide a precise, reliable, stable output signal directly proportional to the sensed pressure over a factory-calibrated range.
5. The internal pressure of the lower transducer assembly shall be relieved to atmospheric pressure through a heavy-duty urethane jacketed hose/cable assembly and a slack PVC bellows mounted in the control panel. The

sealed breather system shall compensate for variations in barometric pressure and expansion and contraction of air due to temperature changes and altitude as well as prevent fouling from moisture and other corrosive elements.

6. The transducer assembly shall be installed where directed by the Engineer and connected with other system elements and placed in successful operation.
7. The sensor shall be suspension-mounted using a Stainless Steel Cable Suspension Mounting Kit. The mounting kit shall consist of a 2' long one-inch NPT type 316 stainless steel pipe with coupling, bolt, cable clamps and hardware. The required length of 1/8 inch diameter 7 x 19 stainless steel cable shall also be provided.
8. The control panel shall include a UL Listed intrinsic safety barrier that has been UL tested with the specific submersible transducer furnished for this application to render the transducer suitable for use in Class 1, Division 1 or 2, Groups A, B, C and D; Class II, Division 1 or 2, Groups E, F and G; and Class III, hazardous locations (which includes a sewage wet well).

B. Float Switch – Backup Control Requirements

1. The contractor shall furnish, install, and wire the float switches for back up control as shown on the drawings.
2. Each float shall have molded polyethylene body, internal redundant polyurethane foam flotation, potted mechanical switch and cable connections and fine-stranded AWG #18 cable with heavy-duty synthetic rubber jacket in lengths as required to run unspliced to the control panel. The floats shall include internal weight allowing suspended operation without the use of special pipe or suspension mounting systems.

C. Operating Condition Alarms

1. Condition normal: The general alarm pilot light will quick flash until silenced, then slow flash until reset, then glow steady until condition returns to normal, then off. The operator interface will display when acknowledged. The external alarms will be active until silenced, then off.
2. Condition abnormal then returns to normal: The general alarm pilot light will quick flash until silenced, then slow flash until reset, then off. The operator interface will display the alarm when acknowledged. The external alarms will be active until silenced, then off.
3. Subsequent alarms will re-alarm when silenced or reset.

- A. Wetwell Exhaust Fan: Wet well exhaust fans shall be spun aluminum downblast exhaust fans and shall be belt driven type. Exhaust fan shall be motor mounted, ¼ H.P. with EXP enclosure. Motor shall be 1,725 RPM. The fan housing shall consist of the motor cover, shroud, curb cap and lower windband, and shall be constructed of heavy-gauge aluminum. Housing shall have a rigid internal support structure and leakproof design. The fan shroud shall be one piece with a rolled bead for extra strength which directs exhaust air downward. The lower windband shall be one piece with formed edges for added strength and the curb cap shall include pre-punched mounting holes to ensure correct attachment. The unit shall include a positive electrical shutoff disconnect switch to be wired from the fan motor to the junction box within the motor compartment. Disconnect switch shall be factory mounted or shipped loose for field mounting. Structure shall include a curb seal, hinge kit, hinge base, roof curb, and tie-down points with stainless steel cables. Roof curb shall be 24" minimum in height off the top of the pump station. Roof opening shall match the requirements of the fan manufacturer. A galvanized mesh bird screen is required for the exhaust fans. Exhaust fans shall be furnish and installed in accordance with the manufacturers requirements. Vent fan shall be Hi-pro polyester finish with a baked color enamel (forest green).
- B. Valve Vault Exhaust Blower: 75 cfm shaded pole blower with round outlet. Exhaust blower shall be designed to be installed in the atmospheric conditions for which it is being proposed.

## 2.10 PUMP STATION STRUCTURE COMPONENTS

- A. Access Hatches:
1. Wet Well: Access hatch shall roof hatch galvanized steel or aluminum cover and frame. Cover shall be brake formed, hollow-metal design with 1" concealed fiberglass insulation, 3" beaded, overlapping flange, fully welded at corners, and internally reinforced for 40psf. Curb shall be 12" in height with integral cap flashing, 1" fiberboard insulation, fully welded at corners, and 3 ½" mounting flange with pre punched holes for securing frame to the concrete roof. The cover and curb shall be weathertight/watertight. Spring latch shall be a two-point latch. All hardware shall be Type 316 stainless steel. Hatch dimensions shall be in accordance with the drawings. Installation shall be per the manufacturers recommendations.
  2. Valve Vault: Access hatch shall be roof hatch galvanized steel or aluminum cover and frame or equivalent. Cover shall be brake formed, hollow-metal design with 1" concealed fiberglass insulation, 3" beaded, overlapping flange, fully welded at corners, and internally reinforced for 40psf. Curb shall be 12" in height with integral cap flashing, 1"

fiberboard insulation, fully welded at corners, and 3 ½" mounting flange with pre punched holes for securing frame to the concrete roof. The cover and curb shall be weathertight/watertight. Spring latch shall be a two-point latch. All hardware shall be Type 316 stainless steel. Hatch dimensions shall be in accordance with the drawings. Installation shall be per the manufacturers recommendations. Access shall include an aluminum slip resistant access ladder with a ladder safety post (Galvanized steel or Aluminum).

- B. Vent Pipes: Vent pipes shall be Flange type Class 53 Ductile iron pipe and fittings meeting the requirements listed herein. Vent pipes above grade shall be painted forest green on site with an enamel paint approved by the pipe manufacturer. Pipe penetrations shall be cast into the structure with FLGx PE wall pipe with anchor collar. A ½" galvanized mesh bird and insect screen shall be installed in each vent.
- C. Adjustable pipe supports shall be locking type stainless steel or galvanized finish adjustable to the required heights. Pipe supports shall be anchored to the structure floor with stainless steel hardware. Pipe supports shall be capable of supporting the designed system within the structures.
- D. Cellular Glass insulation: Cellular glass insulation shall be foil faced 2" thick cellular glass insulation and shall be installed to the concrete surface with a heavy duty construction adhesive compatible with the material and the concrete that it will adhere to. Apply primer if required by adhesive manufacturer.
- E. Strainer Baskets: The contractor shall supply and install galvanized steel strainer basket. The baskets shall be of all welded construction and shall have full screens on three sides and on the bottom. The lower portion of the front shall have a screen and the top shall be open to the influent sewer line. The screen material shall be of galvanized steel sheets 5/32 in. thick with 1 ½" diamond mesh pattern. In lieu of expanded metal an equivalent woven wire mesh made of stainless steel may be utilized provided all elements of the mesh are welded to the frame.

The guide rails shall be galvanized steel pipe and the supporting brackets and assemblies shall be hot-dipped galvanized after assembly and fastened to the structure with stainless-steel bolts and galvanized malleable-iron inserts. The guide rails shall be single continuous lengths of pipe with no joints.

The guides on the basket shall be spaced to provide a nominal clearance of 1/8 to ¼ in. between the basket and the rails.

A heavily galvanized steel lifting chain (safe working load 500 lb.) shall be provided with each basket. The chain shall be fastened to the bail of the basket with a coupling link and shall extend from the basket to the hook just below the



access hatch. The chain shall be furnished with a pear-shaped link at the top for lifting.

## 2.11 OPERATIONS AND MAINTENANCE (O & M) MANUALS

- A. The Manufacturer shall furnish three (3) O & M Manuals
- B. O & M Manuals shall be prepared with clear instructions which will enable the Owner's personnel to operate and maintain the overall pump station and all equipment associated with each individual system installed within the station.
- C. The manuals shall be prepared specifically for this installation. General literature from the equipment manufacturer which is not specifically applicable to the operation and maintenance of the installed items shall not be acceptable.
- D. The manuals shall be bound in a three ring vinyl binder with a heavy gauge clear vinyl overlay on the front cover and spine which is accessible from the top. A title sheet tabulating project information including name and location of project; manufacturer's and consulting engineers' name and address; shall be placed in these pockets. Manuals shall contain an index which list and locates all enclosed literature and drawings.
- E. The manuals shall be comprehensive and as a minimum contain:
  - 1. Descriptions and operating instructions for all system components within the station.
  - 2. Instructions relevant to all modes of equipment operation.
  - 3. Service and trouble-shooting instructions as may be available from select manufacturers of equipment supplied.
  - 4. Procedures for the adjustment of equipment at initial start-up, during routine preventative maintenance, and following replacement or repair.
  - 5. Instructions for testing and calibration of electronic components as may be required to determine proper performance.
  - 6. Record Mechanical drawings and dimensional information showing the actual layout and location of all major equipment components within the structure.
  - 7. Record Electrical schematic drawings of all wiring as supplied with the station. Motor controls, alarm system circuitry, electrical appliances, interconnections, etc. as well as all electrical components within the station to be fully identified and described.
  - 8. Finish Schedule, listing all paints and/or special coatings utilized on the various components.

## 3.0 INSTALLATION

- A. Install all equipment systems in accordance with manufacturer's instructions.

- B. Prior to shipment and installation, all station components shall be factory inspected for quality and tested for proper function and freedom from defects. Upon completion of factory assembly, all system components will undergo an operational test. Any deficiencies or irregularities shall be corrected at the factory.
- C. Excavation and Fill: Excavation and backfill are specified under section 31 23 00 Excavation and Fill, and section 31 23 16.13 Trenching, but are to be done as a part of this work under this section, including any necessary sheeting, bracing, drainage, dewatering, etc. The contractor shall be responsible for handling groundwater to provide a firm, dry subgrade for the structure in accordance with section 31 23 19 Dewatering. Contractor shall also prevent water from rising on the structure within 24 hours after placement, and shall guard against flotation or other damages resulting from ground water or flooding. NHDOT 304.1 Sand shall be used for backfilling within 3 foot perimeter around the exterior of the structures minimum and shall be brought up evenly on all sides, and thoroughly compacted as placed in 1-foot lifts.
- D. Installation of Structures: The structures shall be installed on 12" thick subbase of  $\frac{3}{4}$ " crushed stone. Woven geotextile fabric shall be placed between the stone subbase and subgrade. Woven geotextile shall have a tensile strength of 315lbs. min. with CBR puncture rating of 500 lbs. min. and percent elongation of 15% max. The subgrade shall be rendered firm and dry before placing structures. Depth of crushed stone may need to be increased due to instability of the subgrade as determined by the Engineer in the field. The contractor and the manufacturer shall insure against flotation of the station as specified herein. If additional weight is required to prevent flotation, based on manufacturer's approved calculations, the contractor shall furnish and place such concrete as approved by the Engineer. All such additional concrete shall be considered a part of, and incidental to, the station installation.
- E. After field installation and startup, all surfaces shall be cleaned and any coating damage touched up.

### 3.1 MANUFACTURER'S REPRESENTATIVE

- A. After the installation is complete, the manufacturer shall provide the services of a factory trained representative for a maximum period of one day to perform initial start-up of the pump station and to instruct the Owner's operating and maintenance personnel in the operation and maintenance of the equipment. This service will be included in the pump station price. The required copies of the O & Manuals will be supplied to the Owner prior to initial operation.

### 3.2 MANUFACTURER'S WARRANTY

- A. The pump manufacturer shall warranty all equipment to be of quality construction, free of defects in material and workmanship. A written warranty shall include specific details described below.
1. All equipment, apparatus, and parts furnished shall be warrantied for five (5) years, excepting only those items that are normally consumed in service, such as light bulbs, oils, grease, packing, gaskets, O-rings, etc. The pump manufacturer shall be solely responsible for warranty of the pumps and all components.
  2. Components failing to perform as specified by the Engineer, or as represented by the manufacturer, or as proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer without cost of parts or labor to the owner.
- B. It is not intended that the station manufacturer assume liability for consequential damages or contingent liabilities arising from failure of any vendor supplied product or part which fails to properly operate, however caused. Consequential damages resulting in design, or delays in delivery are also beyond the manufacturer's scope of liability.
- C. The warranty shall become effective upon the acceptance by the purchaser or the purchaser's authorized agent, or sixty (60) days after installation, or ninety (90) days after shipment, whichever comes first.

END OF SECTION

## SECTION 33 41 00

### STORM UTILITY DRAINAGE PIPING

#### PART 3 - GENERAL

##### 1.01 DESCRIPTION

Provide storm drain pipe and fittings as shown on the Drawings.

##### 1.02 QUALITY ASSURANCE

- A. Materials must be provided in accordance with the specification.
- B. Inspect all pipe upon receipt. Remove damaged pipe from the work site.
- C. All work must be completed in accordance with the applicable federal, state, and local standards.

##### 1.03 DELIVERY, STORAGE, AND HANDLING

- A. Schedule delivery to coincide with related work.
- B. Verify compliance with the Specifications at time of delivery.
- C. Store equipment in dry enclosed area, off the ground.
- D. Submit pipe material certificates of compliance with deliveries.

##### 1.04 SUBMITTALS

- A. Submit manufacturer's product data and installation guide.
- B. Certified copies of test results on pipe units.
- C. Record Drawings showing depth and location of:
  - Structures
  - Pipe elevations
  - Pipe sizes
  - Pipe types
  - Repair to existing utilitiesRecord in a permanently bound notebook. Provide access to records for the project superintendent, Engineer, and Owner at all times. Submit records at substantial completion.

#### PART 2 - PRODUCTS

##### 2.01 PIPE AND FITTINGS

- B. Provide fittings of a standard type and class of materials.
- C. PVC Drain Pipe (Perforated and Solid): (4" - 27") ASTM D3034 and F679; strength requirement, SDR-35; push-on joints, ASTM 3212; gaskets ASTM F-477.

- D. HDPE Drain Pipe (Perforated and Solid): (6" - 48") Corrugated smoothbore; ASTM F-2648 and AASHTO M-294; locking joint system.
- E. Corrugated Metal Pipe and Arch Culvert Pipe: (6" - 60") As specified on the Drawings and per NHDOT Standards and Specifications for Road and Bridge Construction, latest edition including all addenda.

## 2.02 MISCELLANEOUS

Flexible adaptors-Non-pressure pipe: Neoprene full circle sleeve with stainless steel strap, equal to those manufactured by Fernco. Use only in connecting new service to existing service pipe.

## PART 3 - EXECUTION

### 3.01 INSTALLATION OF GRAVITY PIPE AND FITTINGS

- B. Methods: Install pipe and fittings in accordance with manufacturer's recommendations and NHDOT guidelines. Control line and grade with a laser beam unless otherwise authorized by the Engineer.  
  
Bed and secure each length of pipe before placing the next length.  
Wheel-load PVC pipe only after 30 inch minimum backfill cushion is in place.
- C. Line and Grade: Lay pipe to the line and grade shown on the Drawings. Lay pipe to uniform grade between manholes.  
  
Line and grade may be adjusted from plan by the Engineer as conditions require.
- D. Laying Conditions: Lay pipe in a dry trench. When pipe-laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means as specified. The plug shall be fitted with a means for venting. When practical, the plug shall remain in place until the trench is pumped completely dry. Care must be taken to prevent pipe flotation if the trench fills with water. Prior to removal of the plug for extending the line or for any other reason, air and water pressure in the line shall be released. No trench water shall be allowed to enter pipe.
- E. Bedding Material shall be in accordance with the manufacturers requirements.
- F. From 1-foot above the top of the pipe to grade or to the subgrade of the pavement, material containing stones up to 8 in. in their greatest dimension may be used, unless otherwise specified. Backfilling shall be completed in accordance with specification section 31 23 16.13, "Trenching." All backfill material shall be free from cinders, ashes, refuse, vegetable or organic material, boulders, rocks or stones, large pieces of concrete or masonry, frozen soil, or other unsuitable material that may be detrimental or cause damage to the pipe, fittings, valves. The excavated material shall be used as backfill unless otherwise stated on the approved plans within these documents, provided that this material consists of loam, clay, sand, gravel, or other suitable materials. Backfill material must be capable of meeting the compaction requirements listed within these documents.

- G. Flush all pipe of dirt and debris using a method approved by the Engineer. Gravity flushing of lines is not acceptable.
- H. Flexible joints at manholes and catch basins: Provide 8 foot maximum stub from inside face of manhole to flexible joint.

### 3.02 TESTING OF GRAVITY DRAINS

- A. Deflection test 100% of pipe thirty (30) days or more after backfilling.
  - 1. Use a rigid ball or mandrel with diameter equal to 95% of PVC pipe I.D. Do not use mechanical pulling units.
  - 2. Pipe deflection shall not exceed 5% in any section of pipe installed.
  - 3. Pipe sections failing the deflection test shall be removed and re-laid as directed by the Engineer. Any associated cost of relaying the pipe shall be at the Contractor's expense.

END OF SECTION 33 41 00

## SECTION 33 44 40

### STONE MASONRY HEADWALLS

#### PART 1.- GENERAL

##### 1.01 DESCRIPTION OF WORK

Provide stone masonry headwalls complete and in place at the locations shown on the Drawings.

##### 1.02 QUALITY ASSURANCE

Reference standards for work in this Section shall be the New Hampshire Department of Transportation "Standard Specifications".

##### 1.03 SUBMITTALS

Submit samples of stone to be used in the work.

#### PART 2 - PRODUCTS

##### 2.01 STONE

A. Stone for stone masonry headwalls shall be sound, durable units of natural cobble, uniformly stratified field stone, or broken ledge.

1. Stone Size: 8" to 12" in greatest dimension.

##### 2.02 PORTLAND CEMENT MORTAR

A. Cement: Type II, ASTM C150.

B. Lime: Type S, hydrated, ASTM C6.

C. Sand: Washed, natural sand with hard, angular grains conforming to New Hampshire Department of Transportation "Standard Specifications", Section 707.2.3.

D. Proportions: 1 part Portland cement, 1/2 part lime, 3 1/2 parts sand.

#### PART 3 - EXECUTION

A. Laying Stone:

1. Place starter courses on a thoroughly compacted even foundation of fine crushed gravel.

2. Vertical joints: staggered, of uniform width.

3. Horizontal joints: level and of uniform width.
4. Exposed stone face shall be vertically plumb with individual stones true to line in each direction.
5. Stone shall be of uniform appearance and color.
6. Mortar joints shall be pointed, stone surfaces left free of clinging mortar and brushed clean.
7. Headwall dimensions shall conform to those shown on the Drawings.
8. Annular spaces between drain pipe and stonework shall be thoroughly closed with mortar and stone spalls.
9. Pipe shall be recessed with stone facing covering the pipe plain-end.

B. Curing and Backfilling

1. Stone masonry shall be cured by covering with wetted burlap to prevent rapid hydration of mortar.
2. Backfill around headwalls only after proper curing has been completed.

C. Cleaning

1. Mortar particles and laitance shall be removed.
2. Stone work shall be brushed-cleaned with a mild solution of water and muriatic acid.

END OF SECTION 33 44 40



APPENDIX I  
TIGHTNESS TESTING OF ENVIRONMENTAL  
ENGINEERING CONCRETE STRUCTURES  
ACI 350.1

This Appendix includes testing requirements for the Pump Station Wet Wells and Valve Vaults.

# Tightness Testing of Environmental Engineering Concrete Structures (ACI 350.1-01) and Commentary (350.1R-01)

REPORTED BY ACI COMMITTEE 350  
ACI Committee 350  
Environmental Engineering Concrete Structures

Charles S. Hanskat  
**Chairman**

Roger H. Wood\*  
**Subcommittee Chairman**

Lawrence M. Tabat  
**Secretary**

James P. Archibald<sup>†‡</sup>  
Jon B. Ardahl<sup>†</sup>  
Walter N. Bennett  
Steven R. Close  
Ashok K. Dhingra\*  
Anthony L. Felder

A. Ray Frankson  
Anand B. Gogate  
William J. Hendrickson  
Jerry A. Holland  
William Irwin

Dov Kaminetzky  
M. Reza Kianoush  
David G. Kittridge\*  
Nicholas A. Legatos  
Larry G. Mrazek  
Jerry Parnes

Andrew R. M. Philip  
David M. Rogowsky  
Satish K. Sachdev  
William C. Schnobrich  
Sudhaker P. Verma

## Voting Subcommittee Members

Osama Abdel-Aai  
John Baker  
Patrick J. Creegan  
David A. Crocker  
Ernst T. Cvikl  
Robert E. Doyle

Clifford T. Early  
Clifford Gordon  
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Keith W. Jacobson  
Dennis C. Kohl  
Bryant Mather

Jack Moll  
Carl H. Moon  
Javeed A. Munshi  
Terry Patzias  
Narayan M. Prachand

John F. Seidensticker  
William C. Sherman  
Lauren A. Sustic\*  
Lawrence J. Valentine  
Miroslav Vejvoda  
Paul Zoltanetzky

\*Members of ACI 350 Tightness Testing Subcommittee who prepared the report.

†Past chairmen of ACI 350 who served during a portion of the time required to create this document.

‡Past secretary of ACI 350 who served during a portion of the time required to create this document.

*This standard gives methods and criteria for tightness testing of environmental engineering concrete structures. It is applicable to liquid and gas containment structures constructed with concrete or a combination of concrete and other materials. It includes hydrostatic, surcharged hydrostatic, and pneumatic tests.*

*The standard is written in explicit, mandatory language, and as such, is intended for reference in project specifications.*

*The values stated in inch-pounds are to be regarded as the standard. The values given in parentheses are for information only. The text of this standard is accompanied by a commentary which provides explanatory material. The commentary shall not be considered as requirements of the standard.*

*This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

**Keywords:** hydrostatic; leakage; pneumatic; reservoirs; tanks (containers); tests; tightness; tightness criteria.

ACI Committee Reports, Guides, Standard Practices, and Commentaries are intended for guidance in planning, designing, executing, and inspecting construction. This Commentary is intended for the use of individuals who are competent to evaluate the significance and limitations of its content and recommendations and who will accept responsibility for the application of the material it contains. The American Concrete Institute disclaims any and all responsibility for the stated principles. The Institute shall not be liable for any loss or damage arising therefrom. Reference to this commentary shall not be made in contract documents. If items found in this Commentary are desired

by the Architect/Engineer to be a part of the contract documents, they shall be restated in mandatory language for incorporation by the Architect/Engineer.

ACI 350.1-01/350.1R-01 became effective on December 11, 2001.

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# CHAPTER 1 — TIGHTNESS TESTING OF TANKS

## STANDARD

## COMMENTARY

### 1.0—Notations

- F = Fahrenheit Temperature  
 (C = Centigrade Temperature)  
 $P_G$  = Design gas pressure, psig (kPa gage)  
 $P_V$  = Vacuum pressure for which the tank has been designed, psig (kPa gage)

### 1.1—Scope

**1.1.1**—This Standard is for the tightness testing of concrete environmental engineering liquid and gaseous containment tanks. The included tests are:

- (a) Hydrostatic Test for Open or Covered Tanks, HST. See [Chapter 2](#);
- (b) Surcharged Hydrostatic Test for Closed Tanks, SHT. See [Chapter 3](#);
- (c) Pneumatic Test for Closed Tanks, PNT. See [Chapter 4](#); and
- (d) Combination Hydrostatic-Pneumatic Test for Closed Tanks, CPT. See [Chapter 5](#).

**1.1.2**—The tightness testing procedures and requirements contained herein are applicable to reservoirs, basins, and tanks constructed of concrete or a combination of concrete and other materials. The owner shall be permitted to waive certain preparatory items but the waiver of such items shall not change the test criteria.

### R1.1—Scope

The American Concrete Institute Committee 350, Environmental Engineering Concrete Structures, recognized the need for standardized procedures of testing of reinforced concrete structures for water tightness. A joint committee of ACI 350 and American Water Works Association Committee 400, Waterproofing, prepared the ACI 350.1R/AWWA 400 Report<sup>1</sup> on recommendations for water tightness of reinforced concrete containment structures. This Standard is an evolution of that report.

The pneumatic tests in this Standard are based on the American Petroleum Institute's publication API 620 for Large, Welded, Low-Pressure Storage Tanks.<sup>2</sup>

Under most circumstances, only one type of test would be used for a tank. The type of test selected should best represent the design loading condition of the tank. If the tank is designed for several different types of loading conditions, tests should be selected to represent each of the types.

The tank should have the maximum amount of the exterior surface visible during the test. New partially buried or buried tanks should not have the backfill placed against the walls and roof prior to testing. If the structure is not designed to be test loaded prior to backfill placement, the test should only be performed with the backfill in place.

**R1.1.2**—Tightness testing of concrete tanks for the containment of liquids and low-pressure gases may be necessary to verify that the structure can fulfill its intended purpose. Tanks for environmental facilities often include structures designed with a combination of concrete and other materials. These include concrete digesters with floating steel covers; tanks with aluminum dome roofs; basins with metal, wood or plastic covers; process basins with steel walls and concrete floors; and similar structures. The combination of materials in the tank construction should not preclude performing the tightness testing of the tank nor the tightness testing of the joint between the different materials.

## STANDARD

**1.1.3**—Each cell of multi-cell tanks shall be considered a single tank and tested individually unless otherwise directed by the engineer.

**1.1.4**—The HST procedures and requirements herein are also applicable for tightness testing of open concrete liquid transmission structures such as cast-in-place concrete channels and conduits.

**1.1.5**—The HST procedures and requirements, where applicable, can be used for tightness testing of concrete paved structures, such as channels and impoundments.

**1.1.6**—These provisions are not intended for precast concrete structures such as culverts and pipes, for hazardous material primary containment structures, for cryogenic storage structures, or for high-pressure gas tanks.

## 1.2—General

**1.2.1**—Definitions. The following definitions shall apply to words and phrases used in this Standard.

**1.2.1.1**—*Tank*—A concrete basin, reservoir, channel, or conduit to be tested regardless of whether it has a closed or open top or is constructed partially or entirely of concrete.

**1.2.1.2**—*Open tank*—A tank where the top surface of the tank's contents is exposed to the atmosphere.

**1.2.1.3**—*Covered tank*—A tank where the contents are protected from exterior contamination by the presence of a cover or roof over the top of the tank.

**1.2.1.4**—*Closed tank*—A tank where the roof or cover is used to prevent the escape of the contents, including gases emanating from the contents, to the outside atmosphere.

**1.2.1.5**—*Soap suds*—Water impregnated with soap or synthetic detergent used to indicate air passage through joints or defects by the formation of soap bubbles.

## COMMENTARY

**R1.1.3**—Multi-cell tanks for water and wastewater facilities are not always designed for water tightness between adjacent cells. During maintenance, it is considered acceptable for these tanks to have some seepage into an empty cell from an adjacent full cell. It is not practical to establish a water loss criterion for testing cells where seepage is acceptable. Therefore, these multi-cell tanks should be tested as a unit. The design of multi-cell tanks should be reviewed to determine that they are multi-cell tanks rather than a single tank with non-structural baffle walls.

**R1.1.4**—Tightness testing of liquid transmission structures will require the use of major, very tight, temporary bulkheads—a feature usually not defined in the structure design.

**R1.1.5**—Concrete paving is placed, finished, and jointed in a different manner than are cast-in-place concrete tanks. The differences in design, details, and construction will affect the tightness of the structure and some test procedures may not be applicable.

**R1.1.6**—Precast concrete structures and structures for the primary containment of hazardous materials, cryogenic fluids, or high-pressure gases require specialized testing methods, procedures, and criteria.

## R1.2—General

**STANDARD**

**1.2.1.6**—*Fittings*—A material or product, other than concrete, embedded in the concrete or passing through the concrete.

**1.2.1.7**—*Low-pressure*—A pressure less than 2.5 psig (17 kPa gage).

**1.2.1.8**—*Vacuum box*—A box with a transparent top, open bottom, and air sealing bottom edges used in conjunction with an air pump capable of creating at least a 3 psi (20 kPa) vacuum within the box.

**1.2.2**—The structural adequacy of the tank shall be verified for the test pressure or pressures to be applied. One type of test shall not be substituted for another type of test without approval of the engineer.

**1.2.3**—Unless specifically allowed by the engineer, the tank shall not be tested before all of the structure is complete and the tank's concrete has attained its specified compressive strength.

**COMMENTARY**

**R1.2.2**—When using the stated procedures and criteria for an existing tank, it should not be assumed that the tank has been designed for the test pressure or for the specific type of test. A tank designed for a triangular hydrostatic pressure may not be able to withstand a uniform pneumatic pressure with the same maximum intensity.

**R1.2.3**—Pressure testing of a partially completed tank may not be a true test of tightness of the tank. Shrinkage cracks may continue to propagate during the construction period after the test. The fastening of walkways, exterior stairways, roof beams, or other structural elements above or outside of the tank's liquid containment shell, after the tightness test, may provide additional shell restraint and result in the formation of concrete cracks.

**Notes**

## CHAPTER 2—HYDROSTATIC TEST, HST, FOR OPEN OR COVERED TANKS

### STANDARD

#### 2.1—Standard Test

**2.1.1**—The standard hydrostatic test shall have the prefix HST followed by the test criterion expressed as the maximum allowable percent loss per day of the test water volume. Standard criteria for the HST test are:

Designation	Tightness Criterion
HST-NML	No measurable loss
HST-025	0.025% per day
HST-050	0.050% per day
HST-075	0.075% per day
HST-100	0.100% per day
HST-VIO	Visual inspection only

**2.1.2**—Standard test HST-VIO shall be the preliminary test for all other HST tests as well as an individual standard test.

**2.1.3**—Tanks shall be tested for tightness when required by contract documents, applicable code, regulation, statute, or governing authority. When a hydrostatic tightness test is required and a specific criterion is not stated, the test shall be HST-NML for fully lined tanks or tanks required to have secondary containment, HST-050 for other types of tanks, and HST-100 for concrete paved reservoirs and channels.

#### 2.2—Tank inspection and HST-VIO, Part 1

**2.2.1**—Clean the exposed concrete surfaces of the tank, including the floor, of all foreign material and debris. Standing water in or outside of the tank that would interfere with the observation of the exposed concrete surfaces of the tank shall be removed. The concrete surfaces and concrete joints shall be thoroughly inspected for potential leakage points. Areas of potential leakage shall be repaired prior to filling the tank with water. Liners, that are mechanically locked to the surface during the placement of the concrete, shall be installed prior to the tank inspection. The inspection and corrective action shall also be performed on in-place interior liners.

### COMMENTARY

#### R2.1—Standard Test

**R2.1.1**—The test designation system adopted allows for future revision, if necessary, to the tightness criteria. The system makes the tightness criterion used for the test self-evident.

Different materials, methods of construction, and design philosophy may result in different tank tightness. A prestressed concrete tank with the concrete always in compression may have a different tightness than a reinforced concrete tank with the concrete partially in tension. A lined tank will have a different tightness than an unlined tank. Based on reasonable tightness of different types of tank construction, six standard criteria have been established. The selected criterion should consider the tank design, tank construction, and the tightness necessary for the stored contents.

**R2.1.2**—The visual test, as a preliminary procedure for all tests in this Standard, should minimize the number of tank retests.

**R2.1.3**—Liners should be considered when HST-NML tightness criterion is required. The tightness criterion should consider that tanks without expansion joints normally have a smaller floor area than tanks with expansion joints. Liquid loss through floor imperfections will be at a higher rate than through wall imperfections due to the higher hydrostatic pressure at the floor level. Expansion joints also can leak due to the detail work required in constructing the joint. Movement at expansion joints during the life of the structure may result in future leakage.

#### R2.2—Tank inspection and HST-VIO, Part 1

**R2.2.1**—The requirement to clean the tank surfaces is to allow cracks and defects to be observed and not obscured by mud, material spills, or stains. Sprayed water may be necessary to wash foreign material from the concrete surfaces. Mud, soil, or other foreign material on the tank floor may not only obscure the floor condition but may temporarily fill defects, voids, or cracks, thus giving test results that may not reflect the true condition of the tank. The same inspection procedure is required for the concrete that is to be covered by a liner as for concrete that will be exposed. Liners are generally used to obtain a very tight structure. Therefore, the basic structure should also be reasonably tight to serve as a barrier to the stored material if pinholes occur in the liner. Concrete surfaces to which liners are mechanically locked during the placement of concrete, cannot be visually inspected. Coatings, such as paint, should not be applied until after testing is complete.



**STANDARD**

**2.2.2**—All openings, fittings, and pipe penetrations in the tank shell shall be inspected at both faces of the concrete, if practical. Defective or cracked concrete shall be repaired.

**2.2.3**—Interior liners shall be inspected for pinholes, tears and partially fused splices. Deficiencies shall be repaired.

**2.3—Test preparation and HST-VIO,  
Part 2**

**2.3.1**—All tank penetrations and outlets shall be securely sealed to prevent the loss of water from the tank during the test. If the tank is to be filled using the tank inlet pipe, positive means shall be provided to check that water is not entering or leaving the tank through this pipe once the tank is filled to test level.

**2.3.2**—Tank penetrations and pipe, channel, and conduit outlets shall be monitored before and during the test to determine the watertightness of these appurtenances. Leakage at these outlets shall be repaired prior to test measurements. No allowance shall be made in test measurements for uncorrected known points of leakage. The flow from the underdrain system shall be monitored during this same period and any increase in flow shall be recorded.

**2.3.3**—The ground water level shall be brought to a level below the top of the base slab and kept at that elevation or at a lower elevation during the test.

**2.3.4**—The initial filling of a new tank should not exceed a rate of 4 ft/h (1.2 m/h). Filling shall be continued until the water surface is at the design maximum liquid level or 4 in. (100 mm) below any fixed overflow level, whichever is lower.

**2.3.5**—The water shall be kept at the test level of unlined concrete tanks for at least three days prior to the actual test.

**COMMENTARY**

**R2.2.2**—Fittings and pipe penetrations have the potential for allowing water to flow along the contact surface between the fitting or pipe and the concrete. Metal fittings and pipe, unlike concrete, do not change in volume during wetting or drying. Metal pipes and fittings may resist the volume change of the concrete and result in the formation of concrete cracks. It is usually impractical to inspect the bottom of pipe penetrations passing through the base slab.

**R2.2.3**—Different liner materials require different liner tests and different methods of repair. It is beyond the scope of this Standard to go into the details of testing liner material and therefore the user is advised to contact the liner manufacturer for recommended repair procedures.

**R2.3—Test preparation and HST-VIO,  
Part 2**

**R2.3.1**—Leaking or partially seated valves and gates are a source of water loss from tanks. A tank inlet pipe, if connected to a water source, may be difficult to check for leakage. One possible method of checking for leakage is to install a sampling cock in the pipe invert between two valves in series.

**R2.3.2**—An increase in flow from the underdrain system may indicate leakage through the tank floor. However, it may also be due to rain or some other external source of water. The conditions at each event should be evaluated to estimate the most probable cause of the increased flow.

**R2.3.3**—The ground water can cause a back pressure on the walls and floor of tanks and reduce the outflow of the test water through tank defects. The presence of ground water may indicate a greater watertightness of the tank than is actually present.

**R2.3.4**—The water should be far enough below the overflow level to prevent the overflow from skimming off water from wind generated waves, or from slight differential settlement, or both.

**R2.3.5**—The three-day waiting period for the usual tightness tests is considered sufficient allowance for moisture absorption by the concrete and temperature stabilization of the test water. A longer waiting period may be desired for the more stringent test criteria. A waiting period is not required for lined tanks as the liner should prevent water from reaching the concrete.

## STANDARD

**2.3.6**—The exterior surfaces of the tank shall be inspected during the period of filling the tank. If any flow of water is observed from the tank exterior surfaces, including joints or cracks, the defect causing the leakage shall be repaired.

### 2.4—Test measurements

**2.4.1**—The test measurements shall not be scheduled for a period when the forecast is for a substantial change in the weather pattern. The test shall also not be scheduled when the weather forecast indicates the water surface would be frozen before the test is completed.

**2.4.2**—The vertical distance to the water surface shall be measured from a fixed point on the tank above the water surface. Measurements shall be recorded at 24 h intervals.

**2.4.3**—The test period shall be at least the theoretical time required to lower the water surface 3/8 in. (10 mm) assuming a loss of water at the maximum allowable rate. The test period need not be longer than five days.

**2.4.4**—The water temperature shall be recorded at a depth of 18 in. (450 mm) below the water surface.

**2.4.5**—In uncovered tanks, evaporation and precipitation shall be measured. Evaporation shall also be measured in well-ventilated covered tanks.

**2.4.6**—The tank shall be inspected daily for damp spots, seepage, and leakage.

**2.4.7**—At the end of the test period, the water surface shall be recorded at the location of the original measurements. The water temperature and the evaporation and precipitation measurements shall be recorded.

## COMMENTARY

**R2.3.6**—Observed leakage should be repaired prior to the start of the actual test. The quantified maximum water loss included in this Standard is for unexplained losses; it is not a criterion for acceptance of leaking tanks.

### R2.4—Test measurements

**R2.4.1**—A substantial change in the weather pattern would be when there would be more than 35 F (20 C) difference between in the temperature readings at the initial measurement and final measurement of the water surface. It is preferable to minimize temperature change of the water during the test. This would minimize computed temperature corrections of measurements. Temperature stratifications can occur in the contained water and affect the test results.

**R2.4.2**—Measurements taken at two locations, 180 degrees apart, will usually minimize effect of differential settlement on the computed values for small and medium size tanks. Measurements at four points, 90 degrees apart, will give more accurate results. Measurements taken at the same time of day will reduce the probability of temperature difference.

**R2.4.4**—If the specified tightness criterion for the tank is very stringent, the water temperature should be recorded at 5 ft (1.5 m) intervals of depth.

**R2.4.5**—A floating, restrained, partially filled, calibrated, open container for evaporation and precipitation measurement should be positioned in open tanks and the water level in the container recorded. Determination of evaporation by a shallow pan type measuring devices is discouraged. The heating of the bottom of a shallow pan can cause accelerated evaporation of water as compared to that taking place from a deep tank.

**R2.4.6**—Observed flow or seepage of water from the exterior surface, including that from cracks and joints, should be considered as a failed test. Flows can be temporarily plugged by dirt or debris being drawn into the defects. Such plugging does not constitute permanent repairs and therefore is not a true measurement of the tank's tightness. The limits of flowing water or damp spots, observed during daily inspections, should be marked for later repair.

**R2.4.7**—Measurements taken at the same location will reduce the probability of measurement differences.

## STANDARD

**2.4.8**—The change in water volume in the tank shall be calculated and corrected, if necessary, for evaporation, precipitation, and temperature. If the loss exceeds the required criterion, the tank shall be considered to have failed the test. The tank shall also be considered to have failed the test if water is observed flowing or seeping from the tank or if moisture can be transferred from the exterior surface to a dry hand. Dampness or wetness on top of a footing, in the absence of flowing water, shall not be considered as a failure to meet the acceptance criterion.

### 2.5—Quantitative criteria

**2.5.1**—There shall be no measurable loss of water for tanks subjected to the HST-NML tightness test. No measurable loss of water means the drop in the water surface shall not exceed 1/8 in. (3 mm) in three days.

**2.5.2**—The allowable loss of water for HST-025, HST-050, HST-075, and HST-100 tightness tests shall not exceed 0.025%, 0.050%, 0.075%, and 0.100%, respectively, of the test water volume in 24 hours. The test shall be continued for a duration sufficient to cause a 3/8 in. (10 mm) drop in the water surface assuming the loss of water is at the maximum rate.

**2.5.3**—There is no numerical value for the allowable loss of water during the HST-VIO tightness test. However, no flow or seepage of water from the tank shall be present on the exterior surfaces for 24 hours after the tank is filled to test level.

**2.5.4**—A restart of the test shall be required when test measurements become unreliable due to unusual precipitation or other external factors.

**2.5.5**—The tank builder shall be permitted to immediately retest a tank failing the test when no visible leakage is exhibited. If the tank fails the second test or if the builder does not exercise the option of immediately retesting after the first test failure, the interior of the tank shall be inspected by a diver or by other means to determine probable areas of leakage. The tank shall only be retested after the most probable areas of leakage are repaired.

**2.5.6**—Tanks shall be retested until they meet the required criterion. Repairs shall be made to the probable leakage areas before each retest.

## COMMENTARY

**R2.4.8**—Temperature corrections to the water volume should be based on the change in water density but may also include the effect of the thermal change to the structure dimensions. Structure dimension changes may be appropriate for circular tanks that have a sliding joint at the base of the perimeter wall.

### R2.5—Quantitative criteria

When numerical limits are given for the allowable loss of water during the tightness test, they are for the undetected loss of water from the tank. Therefore, test values should be corrected for temperature change, evaporation, and precipitation, if present.

**R2.5.2**—The tests should be of sufficient duration to be certain of the results. An example of the method of calculating the duration of a tightness test is as follows. A flat bottom concrete tank, required to pass the HST-050 tightness test, has a 20 ft (6 m) water depth. The acceptance criterion is a maximum of 0.05% loss of water volume in 24 hours. The required duration of test would be

$$\frac{0.375 \text{ in}}{0.0005 \text{ in./in./day} \times 20 \text{ ft} \times 12 \text{ in./ft}} = 3.13 \text{ days}$$

$$\left( \frac{10 \text{ mm}}{0.0005 \text{ mm/mm/day} \times 6000 \text{ mm}} = 3.33 \text{ days} \right)$$

Measurements are taken at 24 hour intervals; therefore, the test duration should be at least four days.

**R2.5.4**—Unusual precipitation would be when the amount of precipitation would exceed the capacity of the precipitation gage, or would plug the precipitation gage with snow, or would cause water to spill over the tank overflow.

**R2.5.5**—The immediate retest is allowed for confirmation of the first test results. This should minimize the cost of inspections and wasted water due to measurement errors, slower than normal water absorption by the concrete, or slow deflection of structural elements.

Vacuum boxes can be used to locate leaking joints, cracks, and porous spots. Soap suds are applied to the suspect area and the area covered with a vacuum box. A vacuum of at least 3 psig (20 kPa gage) is created within the box. Air leakage through or at the suspect area will result in the formation of soap bubbles. All soap solutions should be thoroughly flushed and rinsed from the concrete and metal surfaces after use.

## CHAPTER 3—SURCHARGED HYDROSTATIC TEST, SHT, FOR CLOSED TANKS

### STANDARD

#### 3.1—Standard test

**3.1.1**—The standard surcharged hydrostatic test shall have the prefix SHT followed by the test criterion expressed as the maximum allowable percent loss per day of the test water volume. Standard criteria for the SHT test are:

Designation	Tightness Criterion
SHT-NML	No measurable loss
SHT-050	0.050% per day
SHT-VIO	Visual inspection only

**3.1.2**—Surcharged hydrostatic testing shall be confined to tanks that have been designed and constructed to be filled with liquid to the underside of the roof and surcharged. The surcharge test pressure, at the underside of the roof high point, shall be within the low pressure range.

**3.1.3**—Tanks shall be tested for tightness when required by contract documents, applicable code, regulation, statute, or governing authority. When a surcharged hydrostatic tightness test is required and a specific criterion is not stated, the test shall be SHT-NML for tanks that are enclosed or partially enclosed in a building and SHT-050 for tanks that are surrounded by outside air.

#### 3.2—Tank inspection

**3.2.1**—The tank inspection shall be in accordance with the requirements of test HST-VIO, Part 1 as described in [Section 2.2](#). Concrete joints and cracks shall be tested with a vacuum box.

### COMMENTARY

#### R3.1—Standard test

**R3.1.1**—The test designation system adopted allows for future revision, if necessary, to the tightness criteria. The system makes the tightness criterion used for the test self-evident.

Different materials, methods of construction, and design philosophy may result in different tank tightness. Based on reasonable tightness of different types of tank construction, three standard criteria have been established. The selected criterion should consider the tank design, tank construction, and the tightness necessary for the stored contents.

**R3.1.2**—A surcharged hydrostatic test should be used only on tanks that have been structurally analyzed for the test surcharge loading that will be applied. The test should only be performed on tanks with the intended use of storing water or other fluids under low pressure. Composite tanks of concrete and steel should be periodically tested as the loss of corrosion allowance metal may reduce the strength and tightness of the tank. Concrete tanks, particularly concrete roofs, have a limit on the maximum pressure for which they can be economically designed. The low pressure limitation is an attempt to keep the test loading within this range.

**R3.1.3**—Liners should be considered when SHT-NML tightness criterion is required.

#### R3.2—Tank inspection

**R3.2.1**—[See R2.2](#). The stringent criteria for the SHT test requires joint and crack testing for potential leaks. Vacuum boxes are used to locate leaking joints, cracks, and porous spots. Soap suds are applied to the suspect area and the area covered with a vacuum box. A vacuum of at least 3 psig (20 kPa gage) is created within the box. Air leakage through or at the suspect area will result in the formation of soap bubbles. All soap solutions should be thoroughly flushed and rinsed from the concrete and metal surfaces after use.

**STANDARD****3.3—Test preparation and SHT-VIO**

**3.3.1**—All tank penetrations and outlets shall be securely sealed to prevent the loss of water from the tank during the test. If the tank is to be filled using the tank inlet pipe, positive means shall be provided to check that water is not entering or leaving the tank through this pipe once the tank is filled to test level.

**3.3.2**—Tank penetrations and pipe, channel, and conduit outlets shall be monitored before and during the test to determine the watertightness of these appurtenances. Leakage at these outlets shall be repaired prior to test measurements. No allowance shall be made in test measurements for uncorrected known points of leakage. The flow from the underdrain system shall be monitored during this same period and any increase in flow shall be recorded.

**3.3.3**—The ground water level shall be brought to a level below the top of the base slab and kept at that elevation or at a lower elevation during the test.

**3.3.4**—After the tank inspection has been completed, the pressure-relief valve or valves shall be plugged and the top of the tank vented to the atmosphere. The tank shall be filled with water, at a rate not exceeding 4 ft/h (1.2 m/h), to the underside of the roof while allowing all air to freely escape. The water level shall be kept near or at the top of unlined or uncoated tanks for a period of at least three days prior to the test.

**3.3.5**—The tank vent at the roof high point shall be replaced with an open ended pipe to form a standpipe. The diameter of the standpipe shall not be less than the diameter of the vent it replaces nor more than six times the vent diameter. The top of the standpipe shall be located to limit the hydraulic surcharge to 1.25 times the design surcharge at the high point of the underside of the roof. The standpipe shall be slowly filled to the point of overflow.

**3.4—Test measurements**

**3.4.1**—The duration of the test shall be 1 hour. The water temperature 18 in. below the water surface shall be taken at the start and end of each test.

**COMMENTARY****R3.3—Test preparation and SHT-VIO**

**R3.3.1**—Leaking or partially seated valves and gates are a source of water loss from tanks. A tank inlet pipe, if connected to a water source, may be difficult to check for leakage.

**R3.3.2**—An increase in flow from the underdrain system may indicate leakage through the tank floor. However, it may also be due to rain or some other external source of water. The conditions at each event should be evaluated to estimate the most probable cause of the increased flow.

**R3.3.3**—The ground water can cause a back pressure on the walls and floor of tanks and reduce the outflow of the test water through tank defects. The presence of ground water may indicate a greater watertightness of the tank than is actually present.

**R3.3.4**—The requirement for the free escape of air while filling the tank is to prevent the water from being pressurized by trapped air. The foundation, venting equipment, or other conditions may limit the water filling to a lower rate. The tank contents should not be surcharged until the test water temperature has stabilized. It is preferred that the test water temperature be 60 F (15.5 C) or above. The three-day waiting period for the test is considered sufficient allowance for moisture absorption by the concrete and temperature stabilization of the test water. The waiting period can be extended for unlined or uncoated tanks, if desired, to obtain additional moisture absorption. A waiting period is not required for moisture absorption of lined tanks as the liner should prevent water from reaching the concrete.

**R3.3.5**—The standpipe protects the tank from unanticipated pressure. If there is not a free water surface at the standpipe, rapid pressure changes can occur due to a water temperature change or a vacuum can occur due to water leakage.

**R3.4—Test measurements**

**R3.4.1**—It is not expected that there will be a change in water temperature during the 1 hour test period. The temperature readings are taken primarily to verify that the temperature has not affected the test results.

## STANDARD

**3.4.2**—The water level in the standpipe shall be measured after 1 hour. If the water level has dropped below the top most point of the underside of the roof or to a level, within the standpipe, below the calculated allowable loss of water volume from the tank, the standpipe shall be refilled and the test repeated. However, if the drop of the water surface below the allowable level can be shown to be due to water temperature change, the tank shall be considered to have met the test requirement. If the water level fails to remain within the allowable range in the initial test or up to two retests, the tank shall be reinspected for leaks in the exterior surface and then drained and inspected for defects that are suspected leak locations in the interior surfaces. All leaks or points of suspected leaks shall be repaired and the test repeated.

**3.4.3**—Once the water level has remained within the allowable range in the standpipe for the test period of 1 hour, the water level shall be kept in the standpipe until a close visual inspection of all visible tank joints and around hatches, manways, nozzles, pipe connections, and other openings and penetrations has been performed.

**3.4.4**—The water level shall then be lowered below the inlets to the pressure-relief valves, and the plugs shall be removed from the relief valves. The operation of the relief valves shall then be checked by removing the standpipe, plugging the air vent, and injecting air into the top of the tank until the pressure in the vapor space equals the design pressure  $P_G$ . If the relief valves do not start to release air at the design pressure, they shall be adjusted or repaired.

**3.4.5**—Upon completion of the test, the pressure in the tank shall be released and the tank emptied. A thorough visual inspection shall be made of both the inside and outside of the tank, giving particular attention on combination metal and concrete tanks to any internal metal ties, braces, trusses, and their attachments to the walls of the tank.

### 3.5—Quantitative criteria

**3.5.1**—There shall be no measurable loss of water for tanks subjected to SHT-NML tightness test. No measurable loss of water shall mean a drop in water surface in the standpipe indicating less than 0.01% loss of tank water volume in 24 hours.

**3.5.2**—The allowable loss of water for the SHT-050 tightness test shall not cause the water in the standpipe to fall below the underside of the top of the roof within the 1 h test period or to a level indicating a loss of tank water volume of more than 0.05% in 24 hours, whichever is the smaller loss.

## COMMENTARY

**R3.4.2**—The standpipe will magnify the observation of the loss of water from the tank. An example would be a 0.05% loss of water from a 20 ft (6 m) diameter, 15 ft (4.5 m) high tank with a flat roof and floor would result in a 3 ft (900 mm) drop of the water surface in a 12 in. (300 mm) diameter standpipe. It is recognized that the criterion is very stringent and the test is very temperature sensitive. Three attempts are therefore allowed before requiring the tank to be reinspected.

**R3.4.3**—The potential for leakage is greater at joints, fittings, and accessories.

**R3.4.4**—The operability of the relief valves should be checked to see that the tank will be protected when the tank is placed in operation.

**R3.4.5**—The final inspection is called for to verify that no damage has occurred to the tank from the test loading.

### R3.5—Quantitative criteria

The criterion for this test tends to be liberal due to the effect a slight temperature change can have on the test measurements. Other criteria may be set by the engineer if needed for the stored liquid. The test should be sufficient for most tanks constructed for the storage of liquids under low pressure; but if, in the opinion of the engineer, additional tests are needed to investigate the safety of a tank under certain other conditions of loading, as determined from the design computations, such tests should also be made on the tank in addition to this test.

**STANDARD****COMMENTARY**

**3.5.3**—There is no numerical value for the allowable loss of water during the SHT-VIO tightness test. However, no flow or seepage of water from the tank shall be present on the exterior surfaces for 24 h after the tank is filled to test level.

**3.5.4**—A restart of the test shall be required when test measurements become unreliable due to a sudden change in temperature or other external factors.

**3.5.5**—Retests of tanks are addressed in [Section 3.4](#)

**3.5.6**—Tanks shall be retested until they meet the required criterion. Repairs shall be made to the probable leakage areas before each retest.

## CHAPTER 4—PNEUMATIC TEST, PNT, FOR CLOSED TANKS

### STANDARD

#### 4.1—Standard Test

**4.1.1**—The standard pneumatic test shall have the prefix PNT followed by the test criterion expressed as the maximum allowable percent loss per day of the test air volume. Standard criteria for the PNT test are:

Designation	Tightness Criterion
PNT-NML	No measurable loss
PNT-2000	2.000% per day
PNT-VIO	Visual inspection only

**4.1.2**—Pneumatic testing shall be confined to tanks that have been designed and constructed to be tested with a pneumatic pressure. The pneumatic testing of the tanks shall occur after any lining, interior waterproofing membrane, or interior coating is in place. Pneumatic tests shall be limited to test pressures within the low pressure range.

**4.1.3**—Tanks shall be tested for tightness when required by contract documents, applicable code, regulation, statute, or governing authority. When a pneumatic tightness test is required and a specific criterion is not stated, the test shall be PNT-NML for tanks that are enclosed or partially enclosed in a building and PNT-2000 for tanks that are surrounded by outside air.

#### 4.2—Tank inspection

**4.2.1**—The tank inspection shall be in accordance with the requirements of test HST-VIO Part 1 as described in [Section 2.2](#). Concrete joints and cracks shall be tested with a vacuum box.

**4.2.2**—Interior liners (if not already in place), interior waterproofing membranes, and interior coatings shall be installed after the joints or cracks exhibiting leakage of air, through the joint or crack, are repaired and retested.

### COMMENTARY

#### R4.1—Standard Test

**R4.1.1**—The test designation system adopted allows for future revision, if necessary, to the tightness criteria. The system makes the tightness criterion used for the test self-evident.

Different materials, methods of construction, and design philosophy may result in different tank tightness. Based on reasonable tightness of different types of tank construction, three standard criteria have been established. The selected criterion should consider the tank design, tank construction, and the tightness necessary for the stored contents.

**R4.1.2**—A pneumatic test should only be used to check the tightness of a tank when specified by an engineer who has structurally analyzed the tank considering the pressure test loading that will be applied. The test should be performed on tanks with the intended use of storing water or gas or a combination of water and gas under low pressure. The low pressure limitation on this test is to limit it to the maximum expected design loading range of reinforced concrete tanks. The test is sometimes used as an alternate test for a hydrostatic test when allowed in the specifications.

**R4.1.3**—The 2% air loss criteria was selected due to the calculation of air loss being very sensitive to atmospheric pressure. The 2% is consistent with loss at unidentifiable locations. Liners should be considered when PNT-NML or PNT-2000 tightness criterion is required.

#### R4.2—Tank inspection

**R4.2.1**—See [R2.2](#). The stringent criterion for this test requires additional checking for potential leaks. Vacuum boxes are used to locate leaking joints, cracks, and porous spots. Soap suds are applied to the suspect area and the area covered with a vacuum box. A vacuum of at least 3 psig (20 kPa gage) is created within the box. Air leakage through or at the suspect area will result in the formation of soap bubbles. All soap solutions should be thoroughly flushed and rinsed from the concrete and metal surfaces after use.

**R4.2.2**—Liners that are mechanically locked to the surface during concrete placement should be installed prior to the preliminary test. Liners, membranes, or coatings when included in the design should be installed prior to checking the exterior of the tanks for leaks due to the stringent criteria of the test.



## STANDARD

**4.2.3**—The tank shall then be slowly filled with air to a pressure of 1.25 psig (8.5 kPa gage) or one-half the design pressure  $P_G$ , whichever is smaller. Soap suds shall be applied to the exterior of the tank. If any leaks appear, the defects shall be repaired, and the test repeated. The PNT-VIO test is complete when no leaks are found.

### 4.3—Test preparation

**4.3.1**—After the tank has been inspected, a calibrated pressure gage or manometer shall be connected to the tank and the pressure-relief valve or valves and vents shall be plugged. Air shall be slowly injected into the tank until the internal pressure reaches 1.25  $P_G$  or the maximum allowable test pressure, whichever is smaller.

### 4.4—Test measurements

**4.4.1**—As the pressure is increased, inspect the tank for signs of distress. If distress is observed, the condition shall be repaired before progressing with the test. After the test pressure is achieved, close the inlet and keep the tank pressurized for 2 hours. Record the barometric pressure and pressurized air temperature at the start and end of the test period. Measure the pressure drop and elapsed time between the start and conclusion of the test for the purpose of calculating the volume change over a 24-hour period. If the tank does not meet the test criterion, the tank shall be retested after repair of any known defect. The pressure shall then be released slowly and the plugs shall be removed from the relief valves. The operation of the relief valves shall then be checked by injecting air into the tank until the pressure equals the design pressure  $P_G$ . If the relief valves do not start to release air, they shall be adjusted or repaired.

**4.4.2**—The design pressure shall be held until a close visual inspection of all visible joints in the tank and around manways, nozzles, and other openings and penetrations has been performed. During such inspection, soap suds shall be applied to the surface being inspected.

**4.4.3**—Upon completion of the test, the pressure in the tank shall be released and a thorough visual inspection made of both the inside and outside of the tank. Give particular attention, on combination metal tanks, to all internal metal ties, braces, trusses, and their attachments to the walls of the tank.

## COMMENTARY

**R4.2.3**—The exterior test can indicate defects in liners, membranes, and coatings.

### R4.3—Test preparation

**R4.3.1**—The requirement for using the smaller pressure is to prevent the structure from becoming overstressed.

### R4.4—Test measurements

**R4.4.1**—The criterion is very stringent and therefore the 2 h time period should be sufficient to determine the tightness of the tank. The operability of the relief valves is checked to see that the tank will be protected when placed in operation.

**R4.4.2**—The potential for leakage is greater at joints, fittings and accessories. The use of soap suds at these locations, with the tank pressurized, should indicate if leakage is present.

**R4.4.3**—The final inspection is called for to verify that no damage occurred to the tank from the test loading.

## STANDARD

## 4.5—Quantitative criteria

4.5.1—There shall be no measurable loss of test air volume for tanks subjected to the PNT-NML tightness test. No measurable loss shall mean less than 1.0% loss of test air volume after correction for the change in barometric pressure and air temperature.

4.5.2—The allowable loss of air volume for the PNT-2000 tightness test shall not exceed 2% of the test air volume in a 24-hour period after correction for the change in barometric pressure and air temperature.

## COMMENTARY

## R4.5—Quantitative criteria

The test is believed to be sufficient for most tanks constructed for the storage of liquids or gases under low-pressure. However, if in the opinion of the engineer, additional tests are needed to investigate the safety of a tank under certain other conditions of loading, as determined from the design computations, such tests should also be made on the tank in addition to this test.

R4.5.2—An example of the calculations for determining the percent of air volume loss for a test would be:

Initial readings: Pressure	2.250 psig
Barometric Pressure	14.70 psi
Temp. of test air	72 F
Final readings: Pressure	2.225 psig
Barometric Pressure	14.67 psi
Temp. of test air	71 F
Test duration:	2 hours

Absolute values:

Initial

$$P_1 \text{ (Pressure)} \quad 2.25 + 14.70 = 16.95 \text{ psi}$$

$$T_1 \text{ (Temperature)} \quad 72 + 459.7 = 531.7 \text{ R}$$

Final

$$P_2 \text{ (Pressure)} \quad 2.225 + 14.67 = 16.895 \text{ psi}$$

$$T_2 \text{ (Temperature)} \quad 71 + 459.7 = 530.7 \text{ R}$$

$$V_2 = P_1 V_1 T_2 / P_2 T_1 = 16.95 V_1 530.7 / 16.895 (531.7)$$

$$V_2 = 1.001369 V_1$$

$$\% \text{ loss of air volume} =$$

$$0.001369(100) / 1.001369 = 0.137\% \text{ in 2 h}$$

$$\% \text{ loss of air volume in 1 day} = 0.136(12) = 1.6\%$$

## SI Units

Initial readings: Pressure	15.513 kPa gage
Barometric Press.	101.353 kPa
Temp. of test air	22.22 C
Final readings: Pressure	15.341 kPa gage
Barometric Pressure	101.146 kPa
Temperature of test air	21.667 C
Test duration:	2 hours

Absolute values;

Initial

$$P_1 \text{ (Pressure)} \quad 15.513 + 101.353 = 116.866 \text{ kPa}$$

$$T_1 \text{ (Temperature)} \quad 22.22 + 273.2 = 295.42 \text{ K}$$

Final

$$P_2 \text{ (Pressure)} \quad 15.341 + 101.146 = 116.487 \text{ kPa}$$

$$T_2 \text{ (Temperature)} \quad 21.67 + 273.2 = 294.87 \text{ K}$$

$$V_2 = P_1 V_1 T_2 / P_2 T_1$$

$$V_2 = 116.866 V_1 294.87 / 116.487 (295.42)$$

$$V_2 = 1.001386 V_1$$

$$\% \text{ loss of air volume} =$$

$$0.001386(100) / 1.001386 = 0.139\% \text{ in 2 h}$$

$$\% \text{ loss of air volume in 1 day} = 0.139(12) = 1.7\%$$

**STANDARD**

**4.5.3**—Test designation PNT-VIO shall be used for a tank tested only by visual inspection with a vacuum box. The inspection shall be performed while the tank is pressurized to 1.25 psig (8.5 kPa gage) or one-half the design pressure, whichever is smaller.

**4.5.4**—A restart of the test shall be required when test measurements become unreliable due to a rapid change of barometric pressure or other external factors.

**4.5.5**—The tank constructor shall be permitted to immediately retest a tank failing the test when no visible leakage is exhibited. If the tank fails the second test or if the builder does not exercise the option of immediately retesting after the first test failure, the tank shall be inspected to determine probable areas of leakage. The tank shall only be retested after the most probable areas of leakage are repaired.

**4.5.6**—Tanks shall be retested until they meet the required criterion. Repairs shall be made to the probable leakage areas before each retest.

**COMMENTARY**

**R4.5.3**—Test PNT-VIO may be used for exterior tanks that will contain nonhazardous gases.

**R4.5.5**—The immediate retest is allowed for confirmation of the first test results. This should minimize the cost of inspections due to measurement errors or slow deflection of structural elements.

# CHAPTER 5—COMBINATION HYDROSTATIC-PNEUMATIC TEST, CPT, FOR CLOSED TANKS

## STANDARD

### 5.1—Standard Test

**5.1.1**—The standard combination hydrostatic-pneumatic test shall have the prefix CPT followed by the test criterion expressed as the maximum allowable percent loss per day of the test air volume. Standard criteria for the CPT test are:

Designation	Tightness Criterion
CPT-NML	No measurable loss
CPT-2000	2.000% per day
CPT-VIO	Visual Inspection only

**5.1.2**—Combination hydrostatic-pneumatic testing shall be confined to tanks that have been designed and constructed to resist the applied test loading. The combination hydrostatic-pneumatic testing of the tank shall be conducted after any lining, interior waterproofing membrane, or interior coating is in place. Combination hydrostatic-pneumatic tests shall be limited to pneumatic test pressures within the low pressure range.

**5.1.3**—Tanks shall be tested for tightness when required by contract documents, applicable code, regulation, statute, or governing authority. When a pneumatic tightness test is required and a specific criterion is not stated, the test shall be CPT-NML for tanks that are enclosed or partially enclosed in a building, and CPT-2000 for tanks that are surrounded by outside air.

### 5.2—Tank inspection

**5.2.1**—The tank inspection shall be in accordance with the requirements of test HST-VIO, Part 1 as described in [Section 2.2](#). Concrete joints and cracks shall be tested with a vacuum box.

**5.2.2**—Interior liners (if not already in place), interior waterproofing membranes, and interior coatings shall be installed after the joints and cracks exhibiting leakage of air, through the joint or crack, are repaired and retested.

## COMMENTARY

### R5.1—Standard Test

**R5.1.1**—The test designation system adopted allows for future revision, if necessary, to the tightness criteria. The system makes the tightness criterion used for the test self-evident.

Different materials, methods of construction, and design philosophy may result in different tank tightness. Based on reasonable tightness of different types of tank construction, three standard criteria have been established. The selected criterion should consider the tank design, tank construction, and the tightness necessary for the stored contents.

**R5.1.2**—A combination hydrostatic-pneumatic test should only be used to check the tightness of a tank when specified by an engineer who has structurally analyzed the tank for the combination hydrostatic-pneumatic test loading that will be applied. The test should be performed on tanks with the intended use of storing water or other liquids under air or gas pressure. The low pressure limitation is to limit the test to the maximum expected design loading range of reinforced concrete tanks.

**R5.1.3**—The 2% air loss criteria was selected due to the calculation of air loss being very sensitive to atmospheric pressure. The 2% is consistent with loss at unidentifiable locations. Liners should be considered when CPT-NML or CPT-2000 tightness criterion is required.

### R5.2—Tank inspection

**R5.2.1**—See [R2.2](#). The stringent criteria for this test requires checking joints and cracks for leakage. Vacuum boxes are used to locate leaking joints, cracks, and porous spots. Soap suds are applied to the suspect area and the area covered with a vacuum box. A vacuum of at least 3 psig (20 kPa gage) is created within the box. Air leakage through or at the suspect area will result in the formation of soap bubbles. All soap solutions should be thoroughly flushed and rinsed from the concrete and metal surfaces after use.

**R5.2.2**—Liners, membranes, or coatings, when included in the design, should be installed prior to final testing due to the stringent criteria of the test. Liners, mechanically locked to the surface during concrete placement, should be installed prior to preliminary testing.

**STANDARD****5.3—Test preparation**

**5.3.1**—After all the joints have been inspected and all defective joints disclosed by such inspection have been repaired and reinspected, the tank shall be filled with water to the design water level. The top of the tank shall be vented to the atmosphere during the filling of the tank to prevent pressurization by trapped air. The rate at which water is introduced into a tank shall not exceed 4 ft/h (1.2 m/h). If any leaks appear, the defects shall be repaired.

**5.3.2**—The water in unlined or uncoated tanks shall remain at the design water level for at least three days. Pressure shall not be applied above the surface of the water before the tank and its contents are at about the same temperature.

**5.3.3**—A calibrated pressure gage or manometer shall be connected to the pneumatic portion of the tank and the pressure-relief valve or valves shall be plugged. Vents at the top of the tank shall be closed, and air shall be injected slowly into the top of the tank until the pressure in the vapor space is at the design pressure  $P_G$ . Soap suds shall be applied to the exterior of the pneumatic portion of the tank to check for air leakage. All defects allowing air or water leakage shall be repaired and the tank rechecked for leakage. The CPT-VIO test is complete when no leaks are found. Air shall then be slowly injected into the tank until the internal pressure reaches  $1.25P_G$  or the maximum allowable test pressure, whichever is smaller.

**5.4—Test measurements**

**5.4.1**—As the pressure is being increased, the tank shall be inspected for signs of distress. If distress is observed, the condition shall be repaired before progressing with the test. After the test pressure of 1.25 times the vapor space design pressure  $P_G$ , is achieved, it shall be held for sufficient time for the pressurized air to saturate the liquid. The inlet shall then be closed and the pressure held in the tank for 2 hours. Record the barometric pressure and pressurized air temperature at the start and end of the test period. Measure the pressure drop and elapsed time between the start and the conclusion of the test for the purpose of calculating the volume change over a 24-h period. If the tank does not meet the test criterion, the tank shall be retested after repair of any known defect. The pressure shall then be released slowly and the plugs removed from the relief valves. The operation of the relief valves shall then be checked by injecting air into the top of the tank until the pressure in the vapor

**COMMENTARY****R5.3—Test preparation**

**R5.3.1**—The foundation, venting equipment, or other conditions may limit the water filling to a lower rate.

**R5.3.2**—The three-day waiting period is considered sufficient allowance for moisture absorption by the concrete. The waiting period can be extended for unlined or uncoated tanks, if desired. A change in the air temperature of the pressurized air could affect the results of the test. It is preferred that the test water temperature be 60 F (15.5 C) or higher.

**R5.3.3**—The exterior test can indicate defects in liners, membranes, and coatings. The requirement for using the smaller pressure is to prevent the structure from becoming overstressed.

**R5.4—Test measurements**

**R5.4.1**—It is recognized that the criterion is very stringent and therefore the two-hour time period should be sufficient to determine the tightness of the tank. The operability of the relief valves is checked to see that the tank will be protected when placed in operation.

**STANDARD**

space equals the design pressure  $P_G$ . If the relief valves do not start to release air, they shall be adjusted or repaired.

**5.4.2**—The design pressure shall be held long enough to permit a close visual inspection of joints in the tank and around hatches, manways, nozzles, pipe connections, and other openings and penetrations. During the inspection, soap suds shall be applied to all of the tank's exterior surface which is opposite the pressurized air.

**5.4.3**—Upon completion of the test, the tank shall be emptied and a thorough visual inspection shall be made of both the inside and outside of the tank. Give particular attention, on combination concrete and metal tanks, to all internal metal ties, braces, trusses, and their attachments to the walls of the tank.

**5.5—Quantitative criteria**

**5.5.1**—There shall have no measurable loss of test air volume for tanks subjected to the CPT-NML tightness test. No measurable loss shall mean less than 1.0% loss of test air volume after correction for the change in barometric pressure and air temperature.

**5.5.2**—The allowable loss of air volume for the CPT-2000 tightness test shall not exceed 1% of the test air volume in a 24-hour period after correction for the change in barometric pressure and air temperature.

**5.5.3**—Test designation, CPT-VIO, shall be used for a tank tested only by visual inspection for water leakage and inspection by soap bubbles over the exterior surface of the pneumatic area of the tank while the design pressure is applied.

**5.5.4**—A restart of the test shall be required when test measurements become unreliable due to a rapid change of barometric pressure or other external factors.

**5.5.5**—An immediate retest of tank failing the initial test shall be permitted when no leakage is exhibited. If the tank fails the second test or if the tank constructor does not exercise the option of immediately retesting after the first test failure, the interior of the tank shall be inspected by a diver or by other means to determine probable areas of leakage. The tank shall only be retested after the most probable areas of leakage are repaired.

**5.5.6**—Tanks shall be retested until they meet the required criterion. Repairs shall be made to the probable leakage areas before each retest.

**COMMENTARY**

**R5.4.2**—The potential for leakage is greater at joints, fittings and accessories. The use of soap suds at these locations, with the tank pressurized, should indicate if leakage is present.

**R5.4.3**—The final inspection is called for to verify no damage occurred to the tank from the test loading.

**R5.5—Quantitative criteria**

**R5.5.1**—The test is believed to be sufficient for most tanks constructed for the storage of liquids under low air or gas pressure; but if, in the opinion of the engineer, additional tests are needed to investigate the safety of a tank under certain other conditions of loading, as determined from the design computations, such tests should also be made on the tank in addition to this test.

**R5.5.2**—See [R4.5.2](#) for an example calculation of volume loss.

**R5.5.3**—Test CPT-VIO may be used for exterior tanks that will contain non-hazardous gases in addition to liquids.

**R5.5.5**—The immediate retest is allowed for confirmation of the first test results. This should minimize the cost of inspections due to measurement errors or slow deflection of structural elements.

**Notes**

## CHAPTER 6—REFERENCES

1. ACI Committee 350, “Testing Reinforced Concrete Structures for Watertightness (ACI 350.1R-93/AWWA 400-93),” American Concrete Institute, Farmington Hills, Mich., 1993, 5 pp.
2. “Design and Construction of Large, Welded, Low-Pressure Storage Tanks (ANSI/API—620),” American Petroleum Institute, Washington, D.C., 1992.