

# BIDDING AND CONTRACT REQUIREMENTS AND SPECIFICATIONS

FOR:

REINACH 120,000 GALLON TANK AND WATER  
SYSTEM IMPROVEMENTS

FOR

VILLAGE DISTRICT OF EIDELWEISS  
CONTRACT 2

PREPARED FOR:

VILLAGE DISTRICT OF EIDELWEISS  
ATTN: ADAM LEISER, COMMISSIONER  
1680 CONWAY ROAD, PO BOX 1027  
MADISON, NEW HAMPSHIRE

FEBRUARY 2020  
REV. MARCH 2020



Prepared By:

Jones & Beach Engineers, Inc.  
85 Portsmouth Avenue  
PO Box 219  
Stratham, NH 03885

Phone: (603) 772-4746  
Fax: (603) 772-0227  
JBE Project No. 19078

120,000 GALLON TANK AND WATER SYSTEM IMPROVEMENTS  
CONTRACT 2  
VILLAGE DISTRICT OF EIDELWEISS, MADISON, NH

TABLE OF CONTENTS

<u>SECTION</u>	<u>TITLE</u>
<u>DIVISION 0 – BIDDING AND CONTRACT REQUIREMENTS</u>	
A	Bidding Requirements
B	Contract
C	General Conditions
<u>DIVISION 1 - GENERAL REQUIREMENTS</u>	
01010	Summary of Work
01045	Cutting, Coring and Patching
01050	Coordination
01070	Abbreviations & Symbols
01150	Measurement and Payment
01200	Project Meetings
01310	Construction Schedules
01320	Safety and Health Plan
01340	Submittals
01370	Schedule of Values
01380	Construction Photographs
01400	Quality Control
01500	Temporary Facilities and Controls
01546	Use of Explosives
01562	Dust Control
01570	Traffic Regulation
01630	Substitution and Product Options
01710	Project Cleaning
01720	Project Record Documents
01800	Equipment Startup, Certification and Operator Training

## TABLE OF CONTENTS (CONT.)

### SECTION

### TITLE

#### DIVISION 2 - SITE WORK

02050	Demolition
02110	Clearing and Grubbing
02115	Stripping and Stockpiling Topsoil
02200	Earthwork
02260	Filter Fabric
02270	Temporary Erosion Control
02401	Dewatering
02435	Culverts and Storm Drains
02441	Mulch
02513	Bituminous Concrete Paving
02601	Manholes, Covers and Frames
02622	Polyvinyl Chloride (PVC) Non Pressure Pipe
02628	High Density Polyethylene Pipe & Fittings
02650	Buried Utility Markings
02660	Water Mains, Fittings and Appurtances

#### DIVISION 3 - CONCRETE

03300	Cast-in-Place Concrete
03305	Concrete Testing
03346	Concrete Finishing, Curing and Repairs
03420	Precast Concrete Structures
03604	Non-Shrink Grout

#### DIVISION 6 - WOOD AND PLASTICS

06100	Rough Carpentry
06190	Prefabricated Wood Trusses

#### DIVISION 7 - THERMAL & MOISTURE PROTECTION

07150	Damproofing
07 190	Vapor and Air Intiltration Barriers
07210	Building Insulation
07270	Firestopping
07620	Sheet Metal Flashing and Trim
07900	Joint Sealers

#### DIVISION 8 -DOORS AND WINDOWS

08110	Steel Doors and Frames
08710	Finish Hardware

## TABLE OF CONTENTS (CONT.)

### SECTION

### TITLE

#### DIVISION 9 – FINISHES

09250	Gypsum Wallboard
09900	Painting
09905	Surface Preparation and Shop Coatings

#### DIVISION 11 - EQUIPMENT

11320	Pressure Tank
11350	Motor Control System and Pumps
11360	Telemetry System

#### DIVISION 15 - MECHANICAL

15094	Pipe Hangers and Supports
15100	Valves and Maters-General
15101	Gate Valves
15104	Plug Valves
15106	Ball Valves
15110	Check Valves
15112	Backflow Prevention Valves
15114	Pressure Relief Valves
15400	Plumbing - General
15401	Plumbing, Piping and Specialties
15540	Portable Fire Extinguishers
15550	Dehumidifier and Heater

#### DIVISION 16 - ELECTRICAL

16402	Electrical - General
-------	----------------------

APPENDIX	SW Cole Geotech Report
----------	------------------------

**Construction Contract Documents  
for  
NH Drinking Water and Groundwater Trust Fund**

**These documents apply to construction contracts funded by:**

*NH Drinking Water and Groundwater Trust Fund (DWGTF)*

**June 2019**

## TABLE OF CONTENTS

<b>A. BIDDING REQUIREMENTS</b>	<b>Page No.</b>	<b>through</b>	<b>Page No.</b>
Advertisement for Bids†	A-1.1		A-1.2
Information for Bidders	A-2.1		A-2.5
Bid*	A-3.1		A-3._
Bid Bond*	A-4.1		A-4.2
<b>B. CONTRACT</b>			
Notice of Award	B-1.1		B-1.2
Agreement	B-2.1		B-2.3
Payment Bond	B-3.1		B-3.3
Performance Bond	B-4.1		B-4.2
Notice to Proceed	B-5.1		B-5.1
Change Order	B-6.1		B-6.1
Certificate of Substantial Completion	B-7.1		B-7.2
Certificate of Final Completion	B-8.1		B-8.1
Contractor's Affidavit	B-9.1		B-9.1
Contractor's Release	B-10.1		B-10.1
<b>C. GENERAL CONDITIONS</b>			
General Conditions (State of NH)	C-1.1		C-1.35
Supplemental General Conditions	C-2._		C-2._

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

## **A. BIDDING REQUIREMENTS**

**Revised March 2020**

**ADVERTISEMENT FOR BIDS**

Village District of Eidelweiss

Owner

1680 Conway Rd, PO Box 1027, Madison

Address

Separate sealed BIDS for the construction of {Briefly describe nature, scope, and major elements of the work} Separate sealed BIDS for the construction of the Site Work for Construction of the Reinach 120,000-gallon Prestressed Concrete Tank, booster pump Station, Reinach pressure zones and Additive alternates

will be received by Jones and Beach Eng. Inc.  
at the office of 85 Portsmouth Ave, Stratham, NH 03885 PO Box 219  
until 5:00pm, Local Time April 8, 20 and  
then at said office publicly opened and read aloud.

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

370 calendar days for substantial completion.

400 calendar days for final completion.

Liquidated damages will be in the amount of \$ 500.00 for each calendar day of delay from the date established for substantial completion, and \$ 500.00 for each calendar day of delay from the date established for final completion.

2. Each General Bid shall be accompanied by a Bid Security in the amount of 5% of the Total Bid Price.
3. The successful Bidder must furnish 100% Performance and Payment Bonds, and will be required to execute the Contract Agreement within 10 days following notification of the acceptance of his Bid.



A-1.2 (DWGTF)

4. Any contract or contracts awarded under this Advertisement for Bids are expected to be funded in whole or in part by: \$295,000

- A grant from the New Hampshire Drinking Water and Groundwater Trust Fund (DWGTF)

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

6. Projected Completion Schedule

- Contract Bid Opening, April 8, 2020
- Contract Award and Notice to Proceed April 9, 2020
- Preconstruction meeting with DN Tanks April 20, 2020
- Clear, grub and prepare tank subgrade April 27 to June 1, 2020
- Tank construction Contract 1 DN Tank - June 1, 2020 – August 15, 2020 (105 days)
- Start construction Booster Pump Station – June 1 – October 30 (150 days)
- Start construction Reinach Zone and Additive Alternates – June 1 to Oct. 30, 2020 (180 days)
- Final Tank completion August 15, 2020 to October 30, 2020 (additional 75 days).
- Winter shut down
- Complete Reinach Zone, clean up May 2021 – October 30, 2021

7. A non-mandatory site walk took place on Monday February 10 at 10:30 am.

The Contract Documents may be examined at the following locations:

Jones & Beach Eng. Inc. 85 Portsmouth Ave., Stratham, NH

---

---

---

Copies of the Contract Documents may be obtained from Jones & Beach Engineers, Inc. upon payment of a fee of \$25 per set, which will not be refunded. Partial sets will not be distributed. All requests for mailed documents must be accompanied by an additional fee of \$25 to cover the cost of postage and handling.

**INFORMATION FOR BIDDERS**

BIDS will be received by Jones and Beach Eng. Inc.  
(herein called the "ENGINEER at 85 Portsmouth Ave, Stratham, NH  
until April 8, 2020 and then at said office publicly opened and read aloud.

Each BID must be submitted in a sealed envelope, labeled:

Village District of Eidelweiss at 1680 Conway Road, PO Box 1027, Madison, NH

Each sealed envelope containing a BID must be plainly marked on the outside as BID  
for Reinach 120,000-gallon Tank and Water System Improvements - Contract 2 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 ENGINEER at  
Jones & Beach Eng. Inc., 85 Portsmouth Ave, PO Box 219, Stratham, NH 03885

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.

## A-2.2 (DWGTF)

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

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

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

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

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

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

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

A conditional or qualified BID will 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.

## A-2.3 (DWGTF)

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

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

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

### MANUFACTURERS' EXPERIENCE

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

### DWGTF PROJECT SIGN

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

### SAFETY AND HEALTH REGULATIONS

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

### NON-DISCRIMINATION IN EMPLOYMENT

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

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

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

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

## A-2.4 (DWGTF)

### STATE INSPECTION

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

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

### COPIES OF THE CONTRACT

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

- a) One (1) copy each to the Owner, Engineer, and Contractor.
- b) One electronic copy in PDF format to the NH Department of Environmental Services
- c) Additional copies as required for other federal or state agencies contributing to or participating in project costs.

### NON-RESIDENT CONTRACTORS

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

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

### BIDDER'S QUALIFICATIONS

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

#### A-2.5 (DWGTF)

- 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.

#### 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.

A-3.1 (DWGTF)

**BID**

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

To the Village District of Eidelweiss

In compliance with your Advertisement for Bids, BIDDER hereby proposes to perform all WORK For the construction of Reinach 120,000-gallon Tank & Water System Improvements-Contract 2 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:

370 consecutive calendar days for substantial completion.

400 consecutive calendar days for final completion.

Liquidated damages will be in the amount of \$ 500.00 for each calendar day of delay from the date established for substantial completion and \$ 500.00 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 (DWGTF)

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



A-3.3 (DWGTF)

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 (DWGTF)

**BID SCHEDULE – BASE  
CONTRACT NO. 2**

ITEM NO.	GENERAL CONSTRUCTION	UNIT	QUANTITY	COST	TOTAL
A1	Site work for the 120,000-Gallon Prestressed Concrete Tank, per Lump Sum. The Sum of  _____ Dollars  and _____ Cents (Words)	LS	1		
A2	Reinach Booster Pump Station, per Lump Sum. The Sum of  _____ Dollars  and _____ Cents (Words)	LS	1		
A3	Reinach Pressure Zone 4” HDPE DR 11 pipe, per Linear foot The Sum of  _____ Dollars  and _____ Cents (Words)	LF	4,400		
A4	Reinach Pressure Zone – Blowoff Hydrants, per Each. The Sum of  _____ Dollars  and _____ Cents (Words)	EA	4		
A5	Reinach Pressure Zone – Service Connections, per Each. The Sum of  _____ Dollars  and _____ Cents (Words)	EA	19		

A-3.5 (DWGTF)

A6	Reinach Pressure Zone- Test Pits, per Each. The Sum of _____ Dollars and _____ Cents (Words)	EA	25		
A7	Reinach Pressure Zone- Trench Ledge Excavation, per Cubic Yard. The Sum of _____ Dollars and _____ Cents (Words)	CY	200		
A8	Reinach Pressure Zone – 2” Gate Valves, per Each. The Sum of _____ Dollars and _____ Cents (Words)	EA	2		
A9	Reinach Pressure Zone – 4” Gate Valves, per Each. The Sum of _____ Dollars and _____ Cents (Words)	EA	7		
A10	Pressure Reducing Pits (PRV), per Each. The Sum of _____ Dollars and _____ Cents (Words)	EA	3		
A11	PLC Allowance. The Sum of <u>Twenty Five Thousand Dollars</u> and <u>Zero Cents</u>		1	\$25,000	\$25,000

A-3.6 (DWGTF)

Total Bid Schedule – Base (Items A1-A11):

\_\_\_\_\_ Dollars  
 (words)  
 and \_\_\_\_\_ Cents.  
 (\$ \_\_\_\_\_ )  
 (numbers)

**ADDITIVE ALTERNATES**

ITEM NO.	GENERAL CONSTRUCTION	UNIT	QUANTITY	COST	TOTAL
ADD-ALT 1	Lakeview Drive				
AA1	New 4" HDPE, per Linear Foot. The Sum of _____ Dollars and _____ Cents (Words)	LF	2,500		

A-3.7 (DWGTF)

AA2	Blowoff Hydrants, per Each. The Sum of _____ Dollars and _____ Cents (Words)	EA	1		
AA3	Trench Ledge Excavation, per Cubic Yard. The Sum of _____ Dollars and _____ Cents (Words)	CY	200		
AA4	Service connections, per Each. The Sum of _____ Dollars and _____ Cents (Words)	EA	11		
AA5	2" Gate Valves, per Each. The Sum of _____ Dollars and _____ Cents (Words)	EA	2		
AA6	3" Gate Valves, per Each. The Sum of _____ Dollars and _____ Cents (Words)	EA	2		
AA7	4" Gate Valves, per Each. The Sum of _____ Dollars and _____ Cents (Words)	EA	3		
ADD- ALT 1	TOTAL				

A-3.8 (DWGTF)

ADD-ALT2	Middle Shore Drive				
AB1	New 6" HDPE, per Linear Foot. The Sum of _____ Dollars and _____ Cents (Words)	LF	2,600		
AB2	Unsuitable Material, per Cubic Yard. The Sum of _____ Dollars and _____ Cents (Words)	CY	100		
AB3	Service Connections, per Each. The Sum of _____ Dollars and _____ Cents (Words)	EA	19		
AB4	2" Gate Valves, per Each. The Sum of _____ Dollars and _____ Cents (Words)	EA	1		
AB5	6" Gate Valves, per Each. The Sum of _____ Dollars and _____ Cents (Words)	EA	6		
AB6	8" Gate Valves, per Each. The Sum of _____ Dollars and _____ Cents (Words)	EA	2		
ADD-ALT2					TOTAL

A-3.9 (DWGTF)

ADD-ALT3	Big Loop Road				
AC1	New 6" HDPE, per Linear Foot. The Sum of _____ Dollars and _____ Cents (Words)	LF	2,900		
AC2	Unsuitable Material, per Cubic Yard. The Sum of _____ Dollars and _____ Cents (Words)	CY	100		
AC3	Service Connections, per Each. The Sum of _____ Dollars and _____ Cents (Words)	EA	26		
AC4	2" Gate Valves, per Each. The Sum of _____ Dollars and _____ Cents (Words)	EA	3		
AC5	6" Gate Valves, per Each. The Sum of _____ Dollars and _____ Cents (Words)	EA	9		
ADD-ALT3					TOTAL

TOTAL OF BASE BID \_\_\_\_\_

ADDITIVE ALTERNATES \_\_\_\_\_

A-3.10 (DWGTF)

TOTAL: BASE BID + ALTERNATES (\$ \_\_\_\_\_ )  
(numbers)

\_\_\_\_\_ Dollars  
(words)

and \_\_\_\_\_ Cents.

- a. The Owner reserves the right to eliminate or add any configuration of the additive alternates. Owner retains right to an explanation of allocation of costs/schedule of values for significant lump sum items, after receipt of notice of award, but prior to contract signing.



**BID BOND**

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

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

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

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

the \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

NOW, THEREFORE,

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

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

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

\_\_\_\_\_  
Principal

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

\_\_\_\_\_  
Surety

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

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

**B. CONTRACT**

**February 2020**

**NOTICE OF AWARD**

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

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

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

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

PROJECT: \_\_\_\_\_

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

CONTRACT FOR: \_\_\_\_\_

\_\_\_\_\_  
(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).

---



---



---



---



---



---



---



---



---



---

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.

\_\_\_\_\_  
(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 \_\_\_\_\_, 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

---

(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 \_\_\_\_\_ calendar days after the date of the **NOTICE TO PROCEED** unless the period  
for completion is extended otherwise by the **CONTRACT DOCUMENTS**. Completion time for  
the project will be calculated as calendar days from the date specified in the **NOTICE TO**  
**PROCEED** as follows:

\_\_\_\_\_ calendar days for substantial completion.  
\_\_\_\_\_ calendar days for final completion.

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

4. The **CONTRACTOR** agrees to perform all of the **WORK** described in the **CONTRACT**  
**DOCUMENTS** and comply with the terms therein for the sum of \$ \_\_\_\_\_ or as shown in the  
**BID** schedule.

5. The term "**CONTRACT DOCUMENTS**" means and includes the following:

- (A) ADVERTISEMENT FOR BIDS
- (B) INFORMATION FOR BIDDERS
- (C) BID
- (D) BID BOND
- (E) NOTICE OF AWARD
- (F) AGREEMENT
- (G) PAYMENT BOND
- (H) PERFORMANCE BOND
- (I) CERTIFICATE OF INSURANCE
- (J) NOTICE TO PROCEED
- (K) CHANGE ORDER(S)
- (L) CERTIFICATON OF SUBSTANTIAL COMPLETION
- (M) CERTIFICATION OF FINAL COMPLETION
- (N) CONTRACTOR'S AFFIDAVIT
- (O) CONTRACTOR'S RELEASE
- (P) GENERAL CONDITIONS
- (Q) SUPPLEMENTAL GENERAL CONDITIONS
- (R) SPECIAL CONDITIONS
- (S) FEDERAL PROVISIONS, RULES, REGULATIONS AND FORMS
- (T) DRAWINGS prepared by:

Jones and Beach Eng. Inc.

numbered 1 through 18 , and dated Rev.2/28/20 , 20 20

(U) SPECIFICATIONS prepared or issued by:

Jones and Beach Eng. Inc.

\_\_\_\_\_ , and dated Rev. March , 20 20

(V) ADDENDA:

No. 1 , dated February 16 , 20 20

No. 2 , dated March 18 , 20 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 \_\_\_\_\_ 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)

BY

\_\_\_\_\_  
Principal

\_\_\_\_\_

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

\_\_\_\_\_

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

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

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

ATTEST:

BY

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

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

\_\_\_\_\_  
(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

\_\_\_\_\_ (Name of Owner)

\_\_\_\_\_ (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**

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

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

\_\_\_\_\_

\_\_\_\_\_  
(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

**NOTICE TO PROCEED**

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

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

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

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

PROJECT: \_\_\_\_\_

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

CONTRACT FOR: \_\_\_\_\_

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

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

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

Copy to ENGINEER  
(Use certified Mail, return Receipt Requested)

\_\_\_\_\_  
(owner)  
By \_\_\_\_\_  
(Authorized Representative)  
\_\_\_\_\_  
(Title)

**ACCEPTANCE OF NOTICE**

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

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

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

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

Employer Identification  
Number: \_\_\_\_\_

B-6.1 (DWGTF)

**CHANGE ORDER**

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

PROJECT: _____	DATE OF ISSUANCE: _____
OWNER: _____	
(Address)	
CONTRACTOR: _____	OWNER's Project No. _____
CONTRACT FOR: _____	ENGINEER _____
	ENGINEER's Project No. _____

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:
By: _____	By: _____	By: _____
Engineer	Owner	Contractor
_____	_____	_____
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**

Owner's Project No. \_\_\_\_\_ Engineer's Project No. \_\_\_\_\_  
Project \_\_\_\_\_  
Owner: \_\_\_\_\_  
Contractor: \_\_\_\_\_  
Engineer: \_\_\_\_\_

Agreement Date: \_\_\_\_\_  
Notice to Proceed Date: \_\_\_\_\_  
Contractual Substantial Completion Date as modified by Change Orders: \_\_\_\_\_  
Actual Substantial Completion Date: \_\_\_\_\_  
Contractual Final Completion Date as modified by Change Orders: \_\_\_\_\_

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, Engineer and NHDES, the punch list has been completed and the Work of the Contract is hereby declared to be Finally Complete in accordance with the Contract Documents on: \_\_\_\_\_  
Date of Final Completion

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

Executed by Engineer on: \_\_\_\_\_, 20\_\_\_\_\_

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

Contractor Accepts this Certificate of Final Completion on: \_\_\_\_\_, 20\_\_\_\_\_

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

Owner Accepts this Certificate of Final Completion on: \_\_\_\_\_, 20\_\_\_\_\_

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

NHDES Accepts this Certificate of Final Completion on: \_\_\_\_\_, 20\_\_\_\_\_

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

**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, \_\_\_\_\_  
(Individual, Partner or duly

\_\_\_\_\_ who being duly sworn according to law  
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: \_\_\_\_\_

Name \_\_\_\_\_

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

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

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

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

Owner \_\_\_\_\_

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 \_\_\_\_\_

**C. GENERAL CONDITIONS**

**April 2018**

## GENERAL CONDITIONS

### Index

1. Contract and Contract Documents
2. Definitions
3. Additional Instructions and Detail Drawings
4. Shop or Setting Drawings
5. Materials, Services, Facilities and Workmanship
6. Contractor's Title to Materials
7. Inspection and Testing of Materials
8. "Or Equal" Clause, Substitutions, and Contractor Options
9. Patents
10. Surveys
11. Contractor's Obligations
12. Weather Conditions
13. Protection of Work and Property
14. Inspection
15. Reports, Records and Data
16. Superintendence by Contractor
17. Extra Work and Change Orders
18. Time for Completion and Liquidated Damages
19. Defective Work
20. Differing Site Conditions
21. Claims for Extra Cost
22. Right of Owner to Terminate Contract
23. Construction Schedule and Periodic Estimates
24. Payments to Contractor
25. Acceptance and Final Payment
26. Payments by Contractor
27. Insurance
28. Contract Security
29. Additional or Substitute Bond
30. Assignments
31. Mutual Responsibility of Contractors
32. Subcontracting
33. Authority of the Engineer and His Representatives
34. Stated Allowances
35. Use of Premises, Removal of Debris, Sanitary Conditions
36. Quantities of Estimate
37. Lands and Rights-of-Way
38. General Guaranty
39. Errors and Inconsistencies in Contract Documents
40. Notice and Service Thereof
41. Required Provisions Deemed Inserted

**GENERAL CONDITIONS**

42. Protection of Lives and Health
43. OSHA Construction Safety Program
44. Equal Employment Opportunity
45. Interest of Federal, State or Local Officials
46. Other Prohibited Interests
47. Use and Occupancy Prior to Acceptance
48. Suspension of Work
49. [Reserved]
50. [Reserved]
51. [Reserved]
52. Project Sign
53. [Reserved]
54. Public Convenience and Traffic Control
55. Pre-Construction Conference
56. Maintenance During construction
57. Cooperation with Utilities
58. Work Performed at Night, and on Sundays and Holidays
59. Laws to be Observed
60. Permits
61. Control of Pollution
62. Use of Explosives
63. Arbitration by Mutual Agreement
64. Taxes
65. Separate Contracts

Exhibit 1 – Project Sign Detail

## 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.



#### C-1.4

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.

## C-1.7

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:

## C-1.8

- 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.

## C-1.10

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



## C-1.12

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.

C-1.13

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 otherwise mutually agreed in writing.

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

65. Separate Contracts.

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

C-1.35

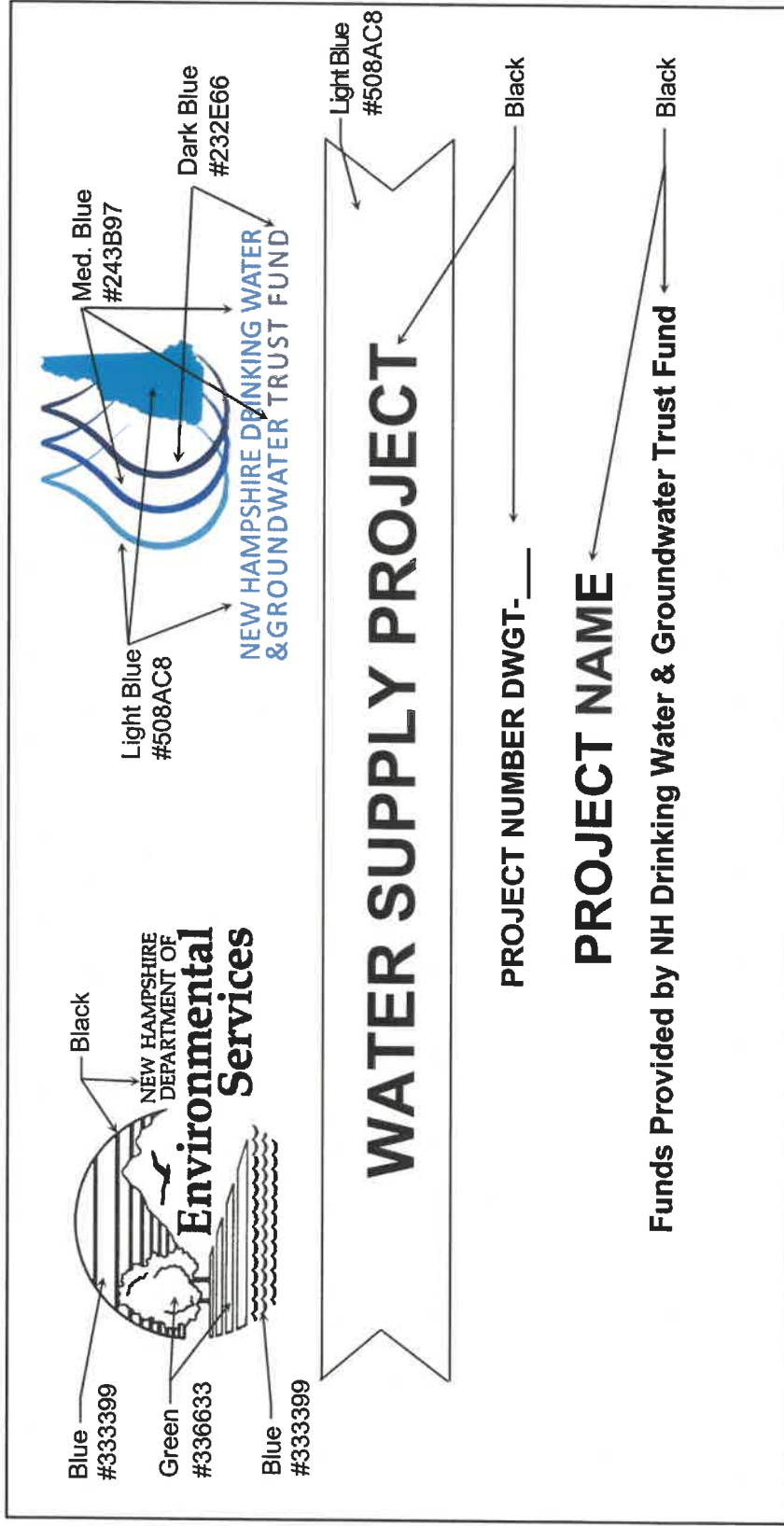
EXHIBIT 1

Project Sign Detail

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



DWGTGTF Temporary Construction Project Sign – Trust Fund only



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

**SUPPLEMENTAL GENERAL CONDITIONS****Special Conditions**

The following special conditions modify, change, delete, or add to the "General Conditions." Where any part of the General Conditions is modified or voided by these Sections, the unaltered provisions of that part shall remain in effect.

<u>Section No.</u>	<u>Section Title</u>	<u>Page No.</u>
SC-27	Insurance; Supplement to GC-27	C-2.2
SC-60	Permits; Supplement to GC-60	C-2.2

**SUPPLEMENTAL GENERAL CONDITIONS**

**SC-27 INSURANCE REQUIREMENTS**

**Add** the following after Paragraph 27.8 of the General Conditions:

27.9 The Contractor shall name Village District of Eidelweiss and the Engineer as an additional insured for their general liability and automobile liability policies.

**SC-60 PERMITS**

**Add** the following after Paragraph 60.1 of the General Conditions:

60.2 The Site Contractor shall be responsible for obtaining and paying for all Building Permits for the construction of the new booster pump station, which may be required by the Town of Madison.

INDEX  
FOR  
DIVISION 2 – SITE WORK

<u>Section Number</u>	<u>Title</u>	<u>Page Number</u>
02050	Demolition	02050-1
02110	Clearing and Grubbing	02110-1
02115	Stripping and Stockpiling Topsoil	02115-1
02200	Earthwork	02200-1
02260	Filter Fabric	02260-1
02270	Temporary Erosion Control	02270-1
02401	Dewatering	02401-1
02441	Mulch	02441-1
02485	Loaming & Seeding	02485-1
02513	Bituminous Concrete Paving	02513-1
02601	Manholes, Covers and Frames	02601-1
02628	High Density Polyethylene Pipe	02628-1
02650	Buried Utility Markings	02650-1
02660	Water Mains, Fittings and Appurtances	02660-1

INDEX

FOR

DIVISION 1 – GENERAL REQUIREMENTS

<u>Section Number</u>	<u>Title</u>	<u>Page Number</u>
01010	Summary of Work	01010-1
01045	Cutting, Coring and Patching	01045-1
01050	Coordination	01050-1
01070	Abbreviations & Symbols	01070-1
01150	Measurement and Payment	01150-1
01200	Project Meetings	01200-1
01310	Construction Schedules	01310-1
01320	Safety and Health Plan	01320-1
01340	Submittals	01340-1
01370	Schedule of Values	01370-1
01380	Construction Photographs	01380-1
01400	Quality Control	01400-1
01500	Temporary Facilities and Controls	01500-1
01546	Use of Explosives	01546-1
01562	Dust Control	01562-1
01570	Traffic Regulation	01570-1
01630	Substitution and Product Options	01630-1
01710	Project Cleaning	01710-1
01720	Project Record Documents	01720-1
01800	Equip. Startup, Cert. & Operator Training	01800-1

SECTION 01010  
SUMMARY OF WORK

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Work Included: The major proposed work under this Contract includes the Following
1. Construction of:
    - a. The site work for the Installation of the Reinach 120,000-gallon concrete tank.
    - b. Construction of a new Reinach Booster Pump Station.
    - c. Installation of approximately 4,400 LF of 4” HDPE and appurtances for the Reinach Pressure Zone.
    - d. Installation of three PRV pits.
    - e. Additive Alternates if funds are available.
- B. Related Work Specified Elsewhere:
1. Coordination: Section 01050
  2. Construction Schedules: Section 01310.

PART 2 – PRODUCTS

Not Applicable.

PART 3 – EXECUTION

3.1 CONSTRUCTION SEQUENCE

- A. A pre-construction meeting is to be held with the Site Contractor, Owner's Representative, water system operator, DN Tank, State Officials and the Engineer prior to the start of construction.
- B. The Contractor shall submit to the Owner and Engineer for review and acceptance a complete schedule of his proposed sequence of construction operations prior to commencing any work.
- C. Clear, grub and prepare the Reinach Tank Site for the construction of the new tank.
- D. Ledge to be hammered as required.
- E. Coordinate with and verify the placement of the final gravel layers with DN Tank.
- F. Install 6” DI drain and intake per plan, one foot outside the tank.
- G. Install gravels and fabric for the crane and winding track.
- H. Construction Booster Pump Station.
- I. After tank completion construct final grades.

END OF SECTION

## SECTION 01045

### CUTTING, CORING AND PATCHING

#### PART I – GENERAL

##### 1.1 DESCRIPTION

- A. Work Included - This section establishes general requirements pertaining to cutting, excavating, coring, fitting, and patching of the Work required to:
1. Make alterations to existing structures.
  2. Make the parts fit properly.
  3. Remove and replace work not conforming to requirements of the Contract Documents.
  4. All cutting, coring, and rough patching shall be performed by the Contractor. Do not cut or alter work performed under separate contract without the Engineer's written permission. Finish patching shall be the responsibility of the Contractor and shall be performed by the trade associated with the application of the particular finish.
- B. Related Work Specified Elsewhere:
1. None.
- C. Quality Assurance:
1. Perform all cutting, coring and patching in strict accordance with pertinent requirements of these Specifications, and in the event no such requirements are determined, in conformance with the Engineer's written direction.
- D. Submittals:
1. Request for the Engineer's consent:
    - a. Prior to cutting which affects structural safety, submit written request to the Engineer for permission to proceed with cutting.
    - b. Should conditions of the work, or schedule, indicate a required change of materials or methods for cutting and patching, so notify the Engineer and secure his written permission prior to proceeding.
  2. Notices to the Engineer
    - a. Prior to cutting and patching pursuant to the Engineer's instructions, submit cost estimate to the Engineer. Secure the Engineer's approval of cost estimates and type of cost reimbursement before proceeding with cutting and patching.
    - b. Submit written notice to the Engineer designating the time the work will be uncovered to provide for the Engineer's observation

#### PART 2 - PRODUCTS

##### 2.1 MATERIALS

- A. Materials for replacement of work shall be equal to those of adjacent construction and shall comply with the pertinent sections of these Specifications.
- B. Concrete and grout for rough patching shall be as specified in Divisions 3.

PART 3 – EXECUTION3.1 CONDITIONS

## A. Inspection:

1. Inspect existing conditions, including elements subject to movement or damage during cutting, excavating, coring, backfilling, and patching.
2. After uncovering the work, inspect conditions affecting installation of new work.

## B. Discrepancies:

1. If uncovered conditions are not as anticipated, immediately notify the Engineer and secure needed directions.
2. Do not proceed in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 PREPARATION PRIOR TO CUTTING AND CORING

- A. Provide all required protection including, but not necessarily limited to, shoring, bracing and support to maintain structural integrity of the work.
- B. All cutting and coring shall be performed in such a manner as to limit the extent of patching.
- C. All holes cut through concrete and masonry walls or slabs shall be core drilled unless otherwise approved. No structural members shall be cut without approval of the Engineer and all such cutting shall be done in a manner directed by him. No holes may be drilled in beams or other structural members without obtaining prior approval. All work shall be performed by mechanics skilled in this type of work.
- D. If holes are cored through floor slabs they shall be drilled from below.

3.3 CORING

- A. Coring shall be performed with an approved non-impact rotary tool with diamond core drills. Size of holes shall be suitable for pipe, conduit, sleeves, equipment or mechanical seals to be installed.
- B. All equipment shall conform to OSHA standards and specifications pertaining to plugs, noise and fume pollution, wiring and maintenance.
- C. Provide protection for existing equipment, utilities and critical areas against water or other damage caused by drilling operation.
- D. Slurry or tailings resulting from coring operations shall be vacuumed or otherwise removed from the area following drilling.

3.4 CUTTING

- A. Cutting shall be performed with a concrete wall saw and diamond saw blades of proper size.
- B. Provide for control of slurry generated by sawing operation on both sides of wall.
- C. When cutting a reinforced concrete wall, the cutting shall be done so as not to damage bond between the concrete and reinforcing steel left in structure. Cut shall be made so that steel neither protrudes nor is recessed from face of the cut.
- D. Adequate bracing of area to be cut shall be installed prior to start of cutting. Check area during sawing operations for partial cracking and provide additional bracing as



## CUTTING, CORING AND PATCHING

- required to prevent a partial release of cut area during sawing operations.
- E. Provide equipment of adequate size to remove cut panel.

3.5 PERFORMANCE

- A. Perform all required excavating- and backfilling- as required under pertinent sections of these specifications. Perform cutting, coring and demolition by methods which will prevent damage to other portions of the work and will provide proper surfaces to receive installation of repair and/or new work. Perform fitting and adjustment of products to provide finished installation complying with the specified tolerances and finishes.
- B. Rough patching shall be such as to bring the cut or cored area flush with existing construction unless otherwise shown. Finish patching shall match existing surfaces as approved.

END OF SECTION

SECTION 01050

COORDINATION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. **The Site Contractor, will be responsible for coordinating with the Tank Manufacturer, DN Tanks.**
- B. The contractor shall follow the haul road as shown on OV1 or as directed by the Engineer to access the Tank site.
- C. The District will hold the general contractor and subcontractors harmless for any normal damage that might occur while hauling material and equipment to the Tank Site. The road agent will be responsible for repairing the roads.

1.2 COORDINATION WITH OTHERS

1. **Contractor shall coordinate access, egress, to the site by the Tank Contractor and the water system operator.**
2. **Contractor shall bear all costs for all testing by third parties.**
3. **The Contractor will be responsible for the coordination and payment of the new utility pole at the Reinach tank site.**

END OF SECTION

## SECTION 01070

### ABBREVIATIONS & SYMBOLS

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

A. Where any of the following abbreviations are used in these Specifications, they shall have the meaning set forth opposite each.

AASHTO	American Association of State Highway and Transportation Officials
AC	Alternating Current
ACI	American Concrete Institute
ACP	Asbestos Cement Pipe
AGA	American Gas Association
AIC	Ampere Interrupting Capacity
AGMA	American Gear Manufacturers Association
AIEE(IEEE)	American Institute of Electrical Engineers (Institute of Electrical and Electronics Engineers, Inc.)
AISC	American Institute of Steel Construction
Amp	Ampere
125-16	
Amer. Std.	American Standard for Cast Iron Pipe Flanges and Flanged Fittings, Class 125 (ASA B16 11960)
ANSI	American National Standards Institute
API	American Petroleum Institute
ASA	American Standards Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWG	American or Brown and Sharpe Wire Gage
AWWA	American Water Works Association
BOD	Biochemical Oxygen Demand
c.f.	Cubic Foot
c.f.m.	Cubic Foot Per Minute
c.f.s.	Cubic Foot Per Second
CI	Cast Iron
CPRA	Cast Iron Pipe Research Association
CSI	Construction Specifications Institute
c.y.	Cubic Yards
DC	Direct Current
DEP	Department of Environmental Protection
DI	Ductile Iron
DOT	Department of Transportation
EDR	Equivalent Directional Radiation

## ABBREVIATIONS &amp; SYMBOLS

EPA	U.S. Environmental Protection Agency
fps	Feet Per Second
ft.	Feet
gal.	Gallons
gpd	Gallons Per Day
gpm	Gallons Per Minute
HP	Horsepower
IBR	Institute of Boiler and Radiator Manufacturers
in.	Inches
inter.	Interlock
ISA	Instrument Society of America
kva	Kilovolt-ampere
kw	Kilowatt
lb.	Pound
max.	Maximum
MCB	Master Car Builders
MGD	Million Gallons Per Day
Min.	Minimum
NBS	National Bureau of Standards
NEC	National Electrical Code, Latest Edition
NEMA	National Electrical Manufacturers Association
NEWWA	New England Water Works Association
NPT	National Pipe Thread
OS&Y	Outside Screw and Yoke
PCA	Portland Cement Association
ppm	Parts Per Million
%	Percent
psi	Pounds Per Square Inch
psig	Pounds Per Square Inch Gage
PVC	Polyvinyl Chloride
rpm	Revolutions Per Minute
RUS	Rural Utility Service
s.f.	Square Foot
STL. W.G.	U.S. Steel Wire, Washburn and Moen, American Steel and Wire Cos., or Roebling Gage
s.y.	Square yard
TDH	Total Dynamic Head
USAS	Standards of the United States of America Standards Institute (formerly American Standards Association)
USS GAGE	United States Standard Gage
VC	Vitrified Clay
WSP	Working Steam Pressure
Fed. Spec.	Federal Specifications issued by the Federal Supply Service of the General Service Administration, Washington, D.C.

END OF SECTION

## SECTION 01150

### MEASUREMENT AND PAYMENT

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

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

##### 1.2 SCOPE OF PAYMENT

- A. Payments to the Contractor will be made for the actual quantities of the Contract items performed and accepted in accordance with the Contract Documents. Upon completion of the construction, if these actual quantities show either an increase or decrease from the quantities given in the Bid Form, the Contract unit prices will still prevail.
- B. The Contractor shall accept compensation, as herein provided, in full payment for furnishing all materials, labor, tools, equipment, and incidentals necessary to the completed work and for performing all work contemplated and embraced by the Contract; also for all loss or damage arising from the nature of the Work, or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the Work and until its final acceptance by the Engineer, and for all risks of every description connected with the prosecution of the work, except as provided herein, also for all expenses incurred in consequence of the suspension of the work as herein authorized.
- C. The payment of any partial estimate or of any retained percentage except by and under the approved final invoice, in no way shall affect the obligation of the Contractor to repair or renew any defective parts of the construction or to be responsible for all damage due to such defects.

## MEASUREMENT AND PAYMENT

- 1.3 PAYMENT FOR INCREASED OR DECREASED QUANTITIES
- A. When alterations in the quantities of work not requiring supplemental agreements, as hereinbefore provided for, are ordered and performed, the Contractor shall accept payment in full at the Contract price for the actual quantities of work done. No allowance will be made for anticipated profits. Increased or decreased work involving supplemental agreements will be paid for as stipulated in such agreements.
- 1.4 OMITTED ITEMS
- A. Should any items contained in the bid form be found unnecessary for the proper completion of the work contracted, the Engineer may eliminate such items from the Contract, and such action shall in no way invalidate the Contract, and no allowance will be made for items so eliminated in making final payment to the Contractor.
- 1.5 PARTIAL PAYMENTS
- A. Partial payments shall be made monthly as the work progresses. Partial payment shall be made subject to the provisions of the Supplemental and General Conditions. The Contractor's Partial Payment Requests shall be submitted in two parts; one part for grant eligible quantities and one part for non-eligible quantities. The breakdown of quantities will be determined by the Engineer.
- 1.6 PAYMENT FOR MATERIAL DELIVERED
- A. When requested by the Contractor and at the discretion of the Owner, payment may be made for all or part of the value of acceptable, non-perishable materials and equipment which are to be incorporated into bid items, have not been used, and have been delivered to the construction site or placed in storage places acceptable to the Owner. Payment shall be subject to the provisions of the General and Supplementary Conditions.
- B. No payment shall be made upon fuels, supplies, lumber, false work, or other materials, or on temporary structures or other work of any kind which are not a permanent part of the Contract.
- 1.7 FINAL PAYMENT
- A. The Engineer will make, as soon as practicable after the entire completion of the project, final quantity invoice of the amount of the Work performed and the value of such Work. Owner shall make final payments of the sum found due less retainages subject to the provisions of the General and Supplementary Conditions.
- B. The Owner shall retain 2% of the final contract cost for a one-year warranty period commencing on the date of substantial completion.
- 1.8 INCIDENTAL WORK
- A. Incidental work items for which separate payment is not made include (but are not limited to) the following items:
1. Dewatering
  2. Erosion control
  3. Loam, seeding, grading, liming, fertilization, mulching and watering
  4. Pipe bedding and backfill
  5. Compaction testing of backfill
  6. Restoration of property, and replacement of fences, curbs, structures, signposts, guard rails, rock wall, mail boxes, traffic loop detectors and other minor items disturbed by the construction activities

## MEASUREMENT AND PAYMENT

7. Coordination with the Owner, Utilities and others, including related inspection cost (refer to Section 01050)
8. Utility crossings and relocations, unless payment is otherwise made
9. **Project Sign – NH Drinking Water and Groundwater Trust Fund Sign**
10. Trench boxes, steel and/or wood sheeting as required, including that left in place
11. Project record documents
12. Materials testing
13. Construction schedules, bonds, insurance, shop drawings, warranties, guarantees, certifications, and other submittals required by the Contract Documents
14. Repair and replacement of culverts and underdrains in streets or private properties and other utilities damaged by construction activities and corresponding proper disposal of removed materials unless payment is otherwise made
15. Utility crossings and relocations, unless payment is otherwise made
16. Cleaning, testing and disinfection of all water lines and appurtenances
17. Final cleaning of sewers, force mains and storm drains
18. Final testing of manholes and sewers
19. Maintenance of all existing sewers flows and repair of existing sewer pipes
20. Removal and disposal of existing sewer structures and pipe as and where indicated in the Drawings
21. Temporary utilities for construction and to maintain existing service during construction
22. Temporary utility services to buildings as required to maintain service during construction
23. Quality assurance testing, except as specified herein
24. Temporary construction and other facilities not to be permanently incorporated into the Work necessary for construction sequencing and maintenance of operations
25. Weather protection
26. Permits not otherwise provided or paid for by Owner.
28. Visits to the Project site or elsewhere by personnel or agents of the Contractor, including manufacturer's representatives, as may be required
29. On-site and other facilities acceptable to Engineer for the storage of materials, supplies and equipment to be incorporated into the Work
30. Facilities start-up services required by the Contract Documents
31. Mobilization/demobilization
32. ~~Test pits to determine existing utility locations and elevations, soils conditions, groundwater conditions, dewatering requirements and as required to complete the project~~
33. Pipe markings
37. Pavement markings
38. Removal of existing pavement
39. Earthwork (except ledge per additive alternates)
40. Preconstruction photos and videos
41. Construction administration and insurance
42. **Provide and maintain a Porta-Poty**
43. **Removal of Concrete by DN Tanks**

1.9 DESCRIPTION OF PAY ITEMS

- A. The following sections describe the measurement of and payment for the work to be done under the respective items listed in the Bid Form.
- C. Each unit or lump sum price stated in the Bid Form shall constitute full compensation, as herein specified, for each item of the work completed.

Item A1. Site Work for the Construct of a 120,000-gallon Concrete Tank

Lump Sum payment for the related site work for the construction of the 120,000-gallon concrete tank. Work as shown on sheet C1 and or as directed by the Engineer. Shall include: clearing and grubbing approximately 23,000 square feet; regrading the site to elevation 932.00'; ledge removal by hammer of approximately 50 cubic yards of ledge. Note the 50 cubic yards is an allowance. If the ledge quantity goes over item A9 ledge excavation will apply; Placement of approximately 75 cubic yards of ASTM C 33 stone size No. 67 under the proposed tank; Provide a staging area for DN Tanks, the tank manufacturer, at elevation 932.00'; construct the gravel pad for the winding track and crane pad per the plan and or as directed by the Engineer; Provide erosion control, water and sanitary provisions for the Tank manufacturer; Import approximately 350 cubic yards of clean sand material for fill and grading around the tank after tank construction; construct the 15' gravel access road and 10' wide gravel perimeter road around the tank; construct the vegetated swale; Installation of the 6" DI pipe with valves and tees from the existing 6" DI pipe into and out of the proposed booster pump station and two lines into the tank per the plan and or as directed by the Engineer; loam and seed all disturbed areas.

Item A2. Construct the Reinach Booster Pump Station

Payment for the lump sum price for the Booster Pump Station shall constitute full compensation for furnishing all labor and materials necessary per the Contract Drawings and Specifications. The work shall include the excavation and construction of the concrete footings, walls, and floors. Installation of the wooden building with wooden trusses. Contractor to provide Engineered drawings for the trusses to be approved by the Engineer. The installation of an electrical system including lights, receptacles, new electrical disconnect, main panel, MCC panel with VFD's, to be an allowance under Item A12 and all associated conduit and wiring. Installation of Ductile Iron piping with flow arrows. Installation of check valves, pressure gauges and 119-gallon pressure tank, and Badger meters. Electric heater, dehumidifier, and fire extinguisher. The proposed layout plan is approximate. The Contractor to coordinate final equipment layout and piping with the Owner, Operator, and Engineer.

Item A3. 4" HDPE DR 11 IPS Water Line

Payment for the installation of the linear foot price shall constitute full compensation for furnishing all labor and materials necessary per the Contract Drawings and Specifications. The work shall include installation of 4" HDPE as shown on Sheets C2-C6 and/or as directed by the engineer which price shall be full compensation for all pipe, welded tees, and tie-ins to existing lines. Price shall also include excavation, trenching, dewatering, bedding, cleaning, backfill, pressure testing, fittings, anchor and thrust block, pipe disinfection. Full payment shall not be made until all testing and subsequent repairs are complete to the satisfaction of the Engineer. For payment purposes, 10% of the unit prices as stated in the Bid Schedule for this item(s) shall be withheld for testing. Six-foot-wide pavement trench patch, placement of 6" of gravel over the entire waterline trench and site restoration shall be considered incidental to the linear foot price. All bend and tees shall be fused. The contractor shall notify the



Engineer and residents at least 48 hours before any water outages. The system must be hooked back up by the end of the day unless an alternative water supply is provided to individual residents.

Item A4. - Blowoff Hydrants

Payment for the installation of each hydrant shall constitute full compensation for furnishing all labor and materials necessary per the detail on sheet D2 and Specifications. Work shall include installation of a welded tee off the main, 2" gate valve with concrete encasement, trust blocks and 2" HDPE pipe from the main to the proposed hydrant location and installation of the new hydrant. Final locations to be determined in the field between the Water System Operator, contractor and the Engineer. Pavement patch repair, placement of 6" of gravel, site restoration and loaming and seeding of any disturbed areas shall be considered incidental.

Item A5. Reinach Pressure Zone - Service Connections

Payment for Each service connection will include the ¾" HDPE pipe, corporation, new curb box and tie-in to the existing house service lines, excavation and backfill, sand bedding. As shown on the plans and details or as directed by the Engineer. The contractor shall relay existing pipe from the house to the new corporation as necessary to maintain proper depth at the water shut off.

Item A6. Reinach Pressure Zone – Test Pits

Test Pits are required to locate the existing water main, determine ledge and other conflicts. Payment for Each Test Pit will include excavation, backfill, gravel replacement if necessary and site restoration of the pit location. Location to be determined in the field by the engineer, contractor and water operator. All labor, equipment, and materials shall be considered incidental. A test pit shall be defined as a trench 10' long x 2.5' wide with an estimated depth of seven feet.

Item A7. Reinach Pressure Zone Trench - Ledge Excavation

Trench ledge excavation shall consist of solid rock or boulders when found to measure two (2) cubic yards or more. The Engineer will measure Trench ledge excavation by the cubic yard to the nearest 0.1 of a cubic yards. Trench widths for rock excavation for pipes shall be width "W" as defined on the standard details as shown on the contract drawings.

Payment for trench rock shall be by the cubic yard and shall constitute full compensation for hammering and or blasting the ledge, removal, disposal, refill, and for all labor, equipment, materials, and incidental work necessary. No borings have been conducted, a unit item has been given for bidding purposes. Pre-blast surveys are incidental to the cubic yard cost if blasting is to take place.

Items A8 & A9. Reinach Pressure Zone - 2" & 4" Gate valves

Payment will be made for 2" and 4" gate valves at the contract unit price per Each, which price shall be full compensation for the valve, riser box with concrete encasement, connections to pipe, and fittings. Unit price shall also include excavation, trenching, dewatering, bedding, cleaning, backfill, testing, fittings, anchor and thrust block, pipe disinfection.

Item A10: Pressure Reducing Pits (PRV)

Payment for the Lump Sum installation of the PRV structures as shown on sheet D1 shall include the concrete structure, ladder and cover, piping, PRV, valves, meter, and drain to daylight. Work shall include excavation and backfill, re-routing piping with tees and valves around current structures, bedding, abandonment of the existing structures, As shown on the plans and details and or as directed by the Engineer. Final locations to be determined by the Engineer and Water Operator.

Item A11. PLC Allowance

A \$25,000 allowance has been provided for the new MCC/ PLC panel and variable speed drives (VFD's) to be designed and supplied by Electrical Installations. The typical SCADA system in VDOE to be provided by EII. The contractor to provide shop drawings for review and approval from EII. The allowance includes the purchase, installation and start up services.

Additive Alternates

AA1, AB1, AC1 - 4", 6" HDPE DR 11 IPS Water Line

Payment for the installation of the linear foot price shall constitute full compensation for furnishing all labor and materials necessary per the Contract Drawings and Specifications. The work shall include installation of 4" and 6" HDPE as shown on Drawings and/or as directed by the engineer which price shall be full compensation for all pipe, welded tees, and tie-ins to existing lines. Price shall also include excavation, trenching, dewatering, bedding, cleaning, backfill, pressure testing, fittings, anchor and thrust block, pipe disinfection. Full payment shall not be made until all testing and subsequent repairs are complete to the satisfaction of the Engineer. For payment purposes, 10% of the unit prices as stated in the Bid Schedule for this item(s) shall be withheld for testing. Six-foot-wide pavement trench patch, placement of 6" of gravel over the entire waterline trench and site restoration shall be considered incidental to the linear foot price. All bend and tees shall be fused. The contractor shall notify the Engineer and residents at least 48 hours before any water outages. The system must be hooked back up by the end of the day unless an alternative water supply is provided to individual residents.

AA2, Blowoff Hydrants

Payment for the installation of each hydrant shall constitute full compensation for furnishing all labor and materials necessary per the detail on sheet D2 and Specifications. Work shall include installation of a welded tee off the main, 2" gate valve with concrete encasement, trust blocks and 2" HDPE pipe from the main to the proposed hydrant location and installation of the new hydrant. Final locations to be determined in the field between the Water System Operator, contractor and the Engineer. Pavement patch repair, placement of 6" of gravel, site restoration and loaming and seeding of any disturbed areas shall be considered incidental.

AA3 - Ledge Excavation

Trench ledge excavation shall consist of solid rock or boulders when found to measure two (2) cubic yards or more. The Engineer will measure Trench ledge excavation by the cubic yard to the nearest 0.1 of a cubic yards. Trench widths for rock excavation for pipes shall be width "W" as defined on the standard details as shown on the contract drawings.

Payment for trench rock shall be by the cubic yard and shall constitute full compensation for hammering and or blasting the ledge, removal, disposal, refill, and for all labor, equipment, materials, and incidental work necessary. No borings have been conducted, a unit item has been given for bidding purposes. Pre-blast surveys are incidental to the cubic yard cost if blasting is to take place.

AA4, AB3 and AC3 - Service Connections

Payment for Each service connection will include the ¾" HDPE pipe, corporation, new curb box and tie-in to the existing house service lines, excavation and backfill, sand bedding. As shown on the plans and details or as directed by the Engineer. The contractor shall relay existing pipe from the house to the new corporation as necessary to maintain proper depth at the water shut off.

AA5, AB4, AC4 - 2"; AA6, - 3"; AA7, AB5 -4"; AB5, AC5 -6"; & AB6 - 8" Gate valves

Payment will be made for 2", 3", 4", 6" and 8" gate valves at the contract unit price per Each, which price shall be full compensation for the valve, riser box with concrete encasement, connections to pipe, and fittings. Unit price shall also include excavation, trenching, dewatering, bedding, cleaning, backfill, testing, fittings, anchor and thrust block, pipe disinfection.

AB2 & AC2 - Unsuitables

Unsuitable material excavation shall consist of material unsuitable for the pipeline or gravel road (in the opinion of the Engineer) found at or below the grade to which excavation would normally be carried in accordance with the Drawings and/or Specifications. Payment for unsuitables shall be by the cubic yard and shall constitute full compensation for removal of such material to the required width and depth and replace it with thoroughly compacted select fill, screened stone, crushed stone, or concrete as directed by the Engineer. All labor, equipment, materials, and necessary work shall be considered incidental. No borings were conducted, a unit item has been given for bidding purposes.

END OF SECTION

## SECTION 01200

### PROJECT MEETINGS

#### PART I - GENERAL

##### 1.1 DESCRIPTION

- A. **Work Included:** To enable orderly review during progress of the work, and to provide for systematic discussion of problems, the Engineer will conduct project meetings throughout the construction period.
- B. **Related work described elsewhere:** The Contractor's relations with his subcontractors and materials suppliers and discussions relative thereto, are the Contractor's responsibility and are not part of project meetings content.

##### 1.2 QUALITY ASSURANCE

- A. Persons designated by the Contractor to attend and participate in the project meetings shall have all required authority to commit the Contractor to solutions agreed upon in the project meetings.

##### 1.3 SUBMITTALS

- A. **Agenda items:** To the maximum extent practicable, advise the Engineer at least 24 hours in advance of project meetings regarding all items to be added to the agenda.
- B. **Minutes:** The Engineer will compile minutes of each project meeting and will furnish a copy to the Contractor. The Contractor may make and distribute such other copies as he wishes.

#### PART 2 — PRODUCTS

(No products are required in this Section.)

#### PART 3 — EXECUTION

##### 3.1 MEETING SCHEDULE

- A. Except as noted below for Preconstruction Meeting, project meetings will be held monthly. Coordinate as necessary to establish mutually acceptable schedule for meetings.

##### 3.2 MEETING LOCATION

- A. To the maximum extent practicable, meetings will be held at the tank site.

##### 3.3 PRECONSTRUCTION MEETING

- A. Preconstruction meeting will be scheduled within twenty days after the Effective Date of the Agreement, but before the Site Contractor starts work at the site. Provide attendance by authorized representatives of the Contractor and all major subcontractors. The Engineer will advise other interested parties and request their attendance.
- B. **Minimum agenda:** Distribute data on, and discuss:
  - 1. Identification of key project personnel for Owner, Engineer, Tank Manufacturer Contractor, funding/regulatory Agencies.

2. Responsibilities of Owner, Engineer, Resident Project Representative, Contractor.
3. Channels and procedures for communications.
4. Construction schedule, including sequence of critical work.
5. Easements, permits.
6. Contract Documents, including distribution of required copies of original documents and revisions.
7. Processing of Shop Drawings and other data submitted to the Engineer for review.
8. Processing of field decisions and Change Orders.
9. Rules and regulations governing performance of the Work, including funding/regulatory Agency requirements.
10. Procedures for safety and first aid, security, quality control, housekeeping, and other related matters.

#### 3.4 PROJECT MEETINGS

- A. Attendance: To the maximum extent practicable, assign the same person or persons to represent the Contractor at project meetings throughout progress of the Work. The Superintendent shall attend. Subcontractors, materials suppliers, and others may be invited to attend those project meetings in which their aspects of the Work are involved.
- B. Minimum agenda :
  1. Review, revise as necessary, and approved minutes of previous meeting.
  2. Review progress of the Work since last meeting, including status of submittals for approval.
  3. Review schedule of work to be accomplished prior to next meeting.
  4. Discuss monthly partial payment request.
  5. Review status of change order requests and Work Directive Changes.
  6. Identify problems which impede planned progress.
  7. Develop corrective measures and procedures to regain planned schedule.
  8. Complete other current business.

END OF SECTION

SECTION 01310

CONSTRUCTION SCHEDULES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. **The Contractor will complete the site preparation work (tank floor base, track and work road/areas complete) no later than June 1, 2020. It is anticipated that construction of the 0.12 MG tank will be accomplished in approximately 10 weeks based on a 5-day work week.** Work Included: Within ten (10) days after the effective date of the Agreement between Owner and Contractor submit to the Engineer an estimated progress schedule as specified herein.
- B. Form of Schedules:
1. Narrative: Completely describe the construction methods to be employed.
  2. Network Analysis System:
    - a. Provide a separate horizontal schedule line for each trade or operation and show concurrent and preceding activities.
    - b. Present in chronological order the beginning of each trade or operation showing duration and float time.
    - c. Scale: Identify key dates and allow space for updating and revision.
  3. Mathematical Analysis:
    - a. A mathematical analysis shall accompany the network diagram. A computer printout will be acceptable.
    - b. Information shall be included on activity numbers, duration, early start, late start, etc. and float times.
- C. Content of Schedules:
1. Provide complete sequence of construction by activity:
    - a. Shop Drawings, Project Data and Samples:
      - 1) Submittal dates.
      - 2) Dates reviewed copies will be required.
    - b. Decision dates for:
      - 1) Products specified by allowances.
      - 2) Selection of finishes.
    - c. Estimated product procurement and delivery dates.
    - d. Dates for beginning and completion of each element of construction.
  2. Identify work of separate phases and logically grouped activities.
  3. Show the projected percentage of completion for each item of work as of the first day of each month.
  4. Provide separate sub-schedules, if requested by the Engineer, showing submittals, review times, procurement schedules, and delivery dates.
- D. Updating:
1. Show all changes occurring since previous submission.
  2. Indicate progress of each activity, show completion dates.
  3. Include:
    - a. Major changes in scope.
    - b. Activities modified since previous updating.
    - c. Revised projections due to changes.
    - d. Other identifiable changes.
  4. Provide narrative report, including:

- a. Discussion of problem areas, including current and anticipated delay factors.
- b. Corrective action taken, or proposed.
- c. Description of revisions that may affect schedules.

1.2 SUBMITTALS

- A. Submit updated schedules with each progress payment request.
- B. Submit 4 copies of initial and updated schedules to the Engineer.

END OF SECTION

## SECTION 01320

### SAFETY AND HEALTH PLAN

#### PART 1- GENERAL

##### 1.1 DESCRIPTION

###### A. Work Included:

1. The Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work, as outlined herein and in the General and Special Conditions of the Contract Documents. Within (10) days after the effective date of the Agreement between Owner and Contractor, submit to the Engineer a Safety and Health Plan as specified herein.
2. Contractor shall comply with all applicable Laws and Regulations related to the safety of persons or property, or for the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.
3. Contractor shall designate a qualified and experienced safety representative (OSHA defined "Competent Person") at the site whose duties and responsibilities shall be the prevention of accidents and maintaining and supervising of safety precautions and programs, including a "Job Hazards Analysis".

###### B. Content of Safety and Health Plan:

1. Prepare complete safety and health plan in accordance with the requirements of CFR Title 29 Part 1926 - Safety and Health Regulations for Construction.
  - a. Provide documentation that Contractor's hazardous communication program is up to date.
  - b. Provide documentation that Contractor's safety training is up to date.
  - c. Prepare a project specific Safety and Health Plan addressing construction safety issues, including but not limited to excavations, fall protection and egress, as well as provisions for construction in hazardous environmental conditions at the wastewater treatment facility. The hazardous environmental conditions at the wastewater treatment facility include, but are not limited to, confined space entry, electrically-classified spaces, and chemical storage and handling areas, to name a few.
2. Safety provisions for confined space entry shall follow General Industry Standard CFR Title 29 Part 1910.146 and will be incorporated into the Safety and Health Plan. The Contractor is required to perform a site evaluation to identify all hazards and potential hazards in work areas prior to control of site. Contractor shall implement appropriate safety precautions and/or construction practices to comply with all requirements. Contractor shall ensure that all employees and subcontractors working in these areas have received appropriate training and are properly equipped in accordance with Contractor's Safety and Health Plan.
  - a. The Contractor shall be responsible for all aspects of construction site safety including development of appropriate confined space entry procedures. The plan shall include, but not necessarily be limited to, the following:
    - Definitions
    - Confined Space Evaluations
    - Equipment Selection
    - Confined Space Entry Training Documentation
    - Permit Required Confined Space Entry Requirements
    - Testing (Monitoring) and Ventilation



- Confined Space Entry Permit Form
  - Rescue and Emergency Procedures
  - Emergency Contact Information
- b. The Contractor shall inform the Owner and Engineer's representative whenever work will be performed in a confined space and the permit space program that the Contractor will follow.
  - c. The Contractor shall inform the Owner and Engineer's representative of any hazards confronted or created during entry operations, either through a briefing or during the entry operation.
  - d. The Contractor will coordinate entry operations with the Owner when both Owner personnel and Contractor personnel will be working in or near permit spaces.
  - e. The Owner, Engineer, their representatives, independent testing laboratories and government agencies, when inspecting the site, shall be supplied by the Contractor proper safety equipment when entry into a confined space is required.
- C. Updating:
1. Contractor shall be responsible for updating the Safety and Health Plan as appropriate throughout the course of the construction period.

## 1.2 SUBMITTALS

- A. **Contractor shall be responsible for all aspects of construction site safety.**  
Provide 3 copies of the contractor's site-specific Safety and Health Plan to the Engineer. The Safety and Health Plan is provided for information only to inform the Owner, Engineer (and Resident Project Representative) of the project specific safety program requirements. The Contractor will overview the plan with the Owner (and staff), Engineer (and Resident Project Representative) at the beginning of the project, and subsequently when the safety plan is updated.
- B. Provide updated Safety and Health Plans as necessary during the course of the project.
- C. Contractor's most current Safety and Health Plan shall be available at the construction site throughout the construction project.

## 1.3 ON-SITE COORDINATION MEETINGS

- A. Contractor shall review key aspects of Safety and Health Plan at the Pre-Construction Meeting, and subsequent on-site safety informational meeting.
- B. Contractor shall report to Engineer and Owner at each progress meeting concerning compliance with the Safety and Health Plan for the most recent construction period and new considerations and requirements for the upcoming period.
- C. Contractor shall hold weekly on-site coordination meetings with Resident Project Representative and Owner to ensure that Owner's staff is aware of key Safety and Health Plan requirements of the current phase of construction.

END OF SECTION

## SECTION 01340

### SUBMITTALS

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

###### A. Work Included:

1. Submit to the Engineer, Shop Drawings, Operation and Maintenance Manuals, Manufacturers' Certificates, Project Data, and Samples required by the Specification Sections.

###### B. Related Work Specified Elsewhere:

1. Construction Schedules: Section 01310
2. Project Record Documents : Section 01720
3. General Conditions

##### 1.2 SHOP DRAWINGS

- A. Shop Drawings are required for each and every element of the work. Each shop drawing shall be assigned a sequential number for purposes of easy identification, and shall retain its assigned number, with appropriate subscript, on required resubmissions.
- B. Shop Drawings are generally defined as all fabrication and erection drawings, diagrams, brochures, schedules, bills of material, manufacturers data, spare parts lists, and other data prepared by the Contractor, his subcontractors, suppliers, or manufacturers which illustrate the manufacturer, fabrication, construction, and installation of the work, or a portion thereof.
- C. The Contractor shall submit to the Engineer a minimum of six (6) copies of Shop Drawings and approved data. The Engineer will retain three (3) copies (for Owner's, Engineer's and Field Representative's files) and return, three (3) copies to the Contractor for distribution to subcontractors, suppliers and manufacturers. If the Contractor requires more than three (3) then the number of copies submitted shall be adjusted accordingly. The only exception to the above is that all shop drawings which incorporate blue line type drawings shall be submitted with only one good quality reproducible. The Engineer will return the one marked up reproducible to the Contractor.
- D. The Contractor shall provide a copy of the completed Submittal Certification Form (copy provided for Contractor's use at the end of this Specification Section), which shall be attached to every copy of each shop drawing. Shop Drawings shall show the principal dimensions, weight, structural and operating features, space required, clearances, type and/or brand of finish or shop coat, grease fittings, etc., depending on the subject of the drawing. When it is customary to do so, when the dimensions are of particular importance, or when so specified, the drawings shall be certified by the manufacturer or fabricator as correct for the work.
- E. Shop Drawings shall be submitted as a complete package by specification section, unless otherwise reviewed and approved by the Engineer. It is the intent that all information, materials and samples associated with each specification section be included as a single submittal for the Engineer's review. Any deviation from this requirement, such as submitting miscellaneous metals grouped by structure, shall be requested in writing prior to any associated submittal.
- F. The Contractor shall be responsible for the prompt and timely submittal of all shop and working drawings so that there shall be no delay to the work due to the absence of such drawings.
- G. No material or equipment shall be purchased or fabricated especially for the Contract until the required shop and working drawings have been submitted as hereinabove provided and

reviewed for conformance to the Contract requirements. All such materials and equipment and the work involved in their installation or incorporation into the Work shall then be as shown in and represented by said drawings.

- H. Until the necessary review has been made, the Contractor shall not proceed with any portion of the work (such as the construction of foundations), the design or details of which are dependent upon the design or details of work, materials, equipment or other features for which review is required.
- I. All shop and working drawings shall be submitted to the Engineer by and/or through the Contractor, who shall be responsible for obtaining shop and working drawings from his subcontractors and returning reviewed drawings to them, Shop drawings shall be of standardized sizes to enable the Owner to maintain a permanent record of the submissions. Approved standard sizes shall be: (a) 24 inches by 36 inches; (b) 11 inches by 17 inches, and (c) 11 inches by 8-112 inches. Provision shall be made in preparing the shop drawings to provide a binding margin on the left-hand side of the sheet. Shop drawings submitted other than as specified herein may be returned for resubmittal without being reviewed.
- J. Only drawings which have been checked and corrected by the fabricator should be submitted to the Contractor by his subcontractors and vendors. Prior to submitting drawings to the Engineer, the Contractor shall check thoroughly all such drawings to satisfy himself that the subject matter thereof conforms to the Drawings and Specifications in all respects. All drawings which are correct shall be marked with the date, checker's name, and indication of the Contractor's approval, and then shall be submitted to the Engineer.
- K. If a shop drawing shows any deviation from the Contract requirements, the Contractor shall make specific mention of the deviations in his letter of transmittal.
- L. Should the Contractor submit equipment that requires modifications to the structures, piping, electrical conduit, wires and appurtenances, layout, etc., detailed on the Drawings, he shall also submit details of the proposed modifications. If such equipment and modifications are accepted, the Contractor, at no additional cost to the Owner, shall do all work necessary to make such modifications.
- M. A maximum of two submissions of each Shop Drawing will be reviewed, checked, and commented upon without charge to the Contractor. Any additional submissions which are ordered by the Engineer to fulfill the stipulations of the Drawings and Specifications, and which are required by virtue of the Contractor's neglect or failure to comply with the requirements of the Drawings and Specifications, or to make those modifications and/or corrections ordered by the Engineer in the review of the first two submissions of each Shop Drawing, will be reviewed and checked as deemed necessary by the Engineer, and the cost of such review and checking, as determined by the Owner, and based upon Engineer's documentation of time and rates established for additional services in the Owner-Engineer Agreement for this Project, may be deducted from the Contractor to make all modifications and/or corrections as may be required by the Engineer in an accurate, complete, and timely fashion.

### 1.3 SAMPLES

- A. The Contractor shall submit samples when requested by the Engineer to establish conformance with the specifications, and as necessary to define color selections available.

1.4 OPERATION AND MAINTENANCE MANUALS

(No operation and maintenance manuals are required in this Section.)

1.5 MANUFACTURER'S CERTIFICATES

- A. Prior to accepting the installation, the Contractor shall submit manufacturer's certificates for each item specified.
- B. Such manufacturer's certificates shall state that the equipment has been installed under either the continuous or periodic supervision of the manufacturer's authorized representative, that it has been adjusted and initially operated in the presence of the manufacturer's authorized representative, and that it is operating in accordance with the specified requirements, to the manufacturer's satisfaction. All costs for meeting this requirement shall be included in the Contractor's bid price.

1.6 SUBMISSION REQUIREMENTS

- A. Accompany submittals with transmittal letter, containing:
  - 1. Date.
  - 2. Project title and number.
  - 3. Contractor's name and address.
  - 4. The number of each Shop Drawing, Project Data and Sample submitted.
  - 5. Notification of deviations from Contract Documents.
  - 6. Other pertinent data.
- B. A completed Submittal Certification Form shall be attached to each copy of each shop drawing and must include:
  - 1. Identification of deviations from Contract Documents.
  - 2. Contractor's stamp, initialed or signed, certifying review of the submittal, verification of field measurements and compliance with Contract Documents.
  - 3. Where specified or when requested by the Engineer, manufacturer's certification that equipment, accessories and shop painting meet or exceed the Specification requirements.
  - 3. Where specified, manufacturer's guarantee.

1.7 RESUBMISSION REQUIREMENTS

- A. Revise initial drawings as required and resubmit as specified for initial submittal.
- B. Indicate on drawings any changes which have been made other than those required by Engineer.

1.8 ENGINEER'S REVIEW

- A. The review of shop and working drawings hereunder will be general only, and nothing contained in this specification shall relieve, diminish or alter in any respect the responsibilities of the Contractor under the Contract Documents and in particular, the specific responsibility of the Contractor for details of design and dimensions necessary for proper fitting and construction of the work as required by the Contract and for achieving the result and performance specified thereunder.

SUBMITTAL CERTIFICATION FORM

PROJECT: \_\_\_\_\_ CONTRACTOR'S PROJ. NO: \_\_\_\_\_

CONTRACTOR: \_\_\_\_\_ ENGINEER'S PROJ. NO: \_\_\_\_\_

ENGINEER: \_\_\_\_\_

TRANSMITTAL NUMBER: \_\_\_\_\_ SHOP DRAWING NUMBER: \_\_\_\_\_

SPECIFICATION SECTION OR DRAWING NO: \_\_\_\_\_

DESCRIPTION: \_\_\_\_\_

MANUFACTURER: \_\_\_\_\_

The above referenced submittal has been reviewed by the undersigned and I/we certify that the material and/or equipment meets or exceeds the project specification requirements with

NO DEVIATIONS

or

A COMPLETE LIST OF DEVIATIONS AS FOLLOWS<sup>a</sup>:

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

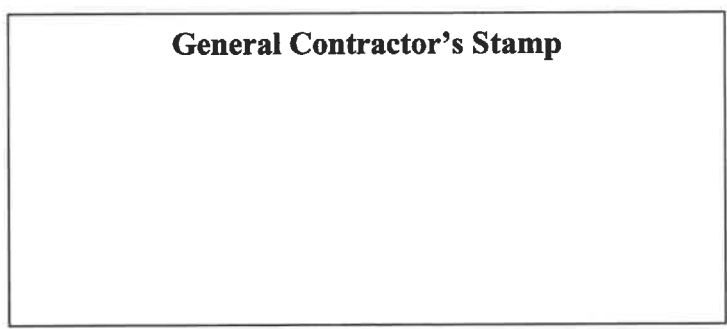
By: \_\_\_\_\_ By: \_\_\_\_\_  
Contractor<sup>b</sup> Manufacturer<sup>c</sup>

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

<sup>a</sup> Any deviations not brought to the attention of the Engineer for review and concurrence shall be the responsibility of the Contractor to correct, if so directed.

<sup>b</sup> Required on all submittals

<sup>c</sup> When required by specifications



END OF SECTION

SECTION 01370

SCHEDULE OF VALUES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Extent of Work:

1. Provide a detailed breakdown of the agreed Contract Sum showing values allocated to each of the various parts of the Work, as specified herein and in other provisions of the Contract Documents.

B. Related Work Specified Elsewhere:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, and Sections of these Specifications.
2. Schedule of values is required under the General Conditions.
3. Schedule of values is required to be compatible with applications for progress payment.

1.2 QUALITY ASSURANCE

A. Use required means to assure arithmetical accuracy of the sums described.

B. When so required by the Engineer, provide copies of the subcontracts or other data acceptable to the Engineer substantiating the sums described.

1.3 SUBMITTALS

A. Prior to first application for payment, submit a proposed schedule of values to the Engineer.

1. Secure the Engineer's approval of the schedule of values prior to submitting first application for payment.

END OF SECTION

SECTION 01380

CONSTRUCTION PHOTOGRAPHS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Pre-Construction Record: Contractor shall utilize digital photographs and video to obtain a visual record of the project area; copies of same shall be given to the Engineer and Owner.
2. Notify Engineer at least three (3) working days prior to photographing or videoing the project area so Engineer may, at his option, observe.

1.2 QUALITY

- A. Pre-Construction Record: Quality shall be such that the condition of existing pavement, curbing, equipment, structures, driveway entrances, sidewalks, etc. can be readily determined.

1.3 SUBMITTAL OF PRINTS

- A. Pre-Construction Record: Submit hard copy prints and electronic files on CD ROM, and video electronic files on DVD to the Engineer and Owner prior to any construction work.
- B. The quality of the photos and video are subject to approval by the Engineer prior to the start of construction work in the areas shown by the photos.

END OF SECTION

## SECTION 01400

### QUALITY CONTROL

#### PART 1 – GENERAL

##### 1.1 REQUIREMENTS INCLUDED

- A. General Quality Control.
- B. Workmanship.
- C. Manufacturer's Instructions.
- D. Manufacturer's Certificates.
- E. Manufacturer's Field Services
- F. Testing Laboratory Services.

##### 1.2 RELATED REQUIREMENTS

- A. Section C.7 - General Conditions: Inspection and testing of materials.
- B. Section 01340 - Submittals: Submittal of Manufacturer's Instructions.
- C. Section 02200 - Earthwork.
- D. Section 03300 - Cast-in-Place Concrete.
- E. Section 03305 - Concrete Testing.

##### 1.3 QUALITY CONTROL

- A. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

##### 1.4 WORKMANSHIP

- A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
- B. Perform work by persons qualified to produce workmanship of specified quality.
- C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

##### 1.5 MANUFACTURERS' INSTRUCTIONS

- A. Comply with instructions in fill detail, including each step-in sequence. Should instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

##### 1.6 MANUFACTURERS' CERTIFICATES

- A. When required by individual Specifications Section, submit manufacturer's certificate that products meet or exceed specified requirements.

##### 1.7 MANUFACTURERS' FIELD SERVICES

- A. When specified in respective Specification Sections, require supplier and/or manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to make appropriate recommendations.
- B. Representative shall submit written report to Engineer listing observations and recommendations.



1.8 TESTING LABORATORY SERVICES

- A. Contractor will employ and pay for services of an Independent Testing Laboratory to perform inspections, tests, and other services wherever an Independent Testing Laboratory is required by individual specification sections listed in paragraph 1.2 above, unless otherwise indicated.
- B. Services will be performed in accordance with requirements of governing authorities and with specified standards.
- C. Reports will present observations and test results and indicate compliance or noncompliance with specified standards and with Contract Documents. Independent Testing Laboratory will submit one copy of each report directly to each of the following: Engineer, Resident Project Representative, Contractor. Reports will be mailed within 5 days of obtaining test results. If test results indicate deficiencies, Independent Testing Laboratory shall telephone or FAX results to Engineer, Resident Project Representative and Contractor within 24 hours.
- D. Contractor shall cooperate with Independent Testing Laboratory personnel; furnish tools, samples of materials, design mix, equipment, storage and assistance as requested.
- E. Contractor shall coordinate all testing work and shall notify Engineer and Independent Testing Laboratory at least 24 hours prior to performing work requiring testing services. If scheduled tests or sampling cannot be performed because the work is not ready as scheduled, testing costs associated with the delay will be determined by Engineer and invoiced by Owner to Contractor. If unpaid after 60 days, the invoice amount will be deducted from the Contract Price. If adequate notice is not provided, Contractor shall suspend work on that portion of the Project until testing can be performed. Such suspension will not be grounds for a claim against the Owner for delay, nor will it be an acceptable basis for an extension of time.
- F. Payment for Independent Testing Laboratory services shall be as follows:
  - 1. General: Testing is the responsibility of the Contractor and will be considered an incidental item unless otherwise indicated in Section 01150, Measurement and Payment.
  - 2. Initial Testing: Contractor will pay for initial tests.
  - 3. Retesting: Costs of retesting due to non-compliance will be paid by Contractor. The cost of retesting will be determined by Engineer and Owner will invoice Contractor for this cost. If unpaid after 60 days, the invoice amount will be deducted from the Contract Price.
  - 4. Contractor's Convenience Testing: Inspections and tests performed for Contractor's convenience will be paid for by Contractor.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

## SECTION 01500

### TEMPORARY FACILITIES AND CONTROLS

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

###### A. Work Included:

1. **The tank contractor shall have the use of any or all of the Contractor's facilities at no cost (i.e., water, sanitary facilities, etc.) if available. The tank contractor can operate using portable generators.**
2. Provide and pay for all temporary applicable utilities required to properly perform the Work at no additional cost to the Owner including the placement and removal of the utilities.
3. Completely remove all temporary equipment and materials upon completion of the Work and repair all damage caused by the installation of temporary utilities.
4. Make all necessary applications and arrangements for electric power, light, water and other utilities with the local utility companies. Notify the local electric power company if unusually heavy loads, such as welders, will be connected.
5. Provide temporary protection of existing concrete tanks and other unheated concrete structures taken out of service for the General Contractor to complete the Work as indicated on the Contract Documents in that area.

##### 1.2 QUALITY ASSURANCE

###### A. Requirements of Regulatory Agencies:

1. Obtain permits as required by local governmental authorities.
2. Obtain easements, when required, across private property other than that of the Owner for temporary power service.
3. Comply with the latest National Electrical Code.
4. Comply with all local, State and Federal codes, laws, and regulations.

###### B. All temporary utilities are subject to the approval of the Engineer.

#### PART 2 – PRODUCTS

##### 2.1 MATERIALS

###### A. Electrical: **NOT REQUIRED BY THE TANK CONTRACTOR. PORTABLE GENERATORS BY THE GENERAL CONTRACTOR ARE ACCEPTABLE.**

1. The General Contractor shall make necessary arrangements with the local power company for connection to the existing power supply and shall provide and pay for all temporary light and power requirements except as otherwise specified hereunder. In general, the temporary electrical service shall include all necessary switches, poles, wiring, cables, conduit, raceways, panelboards, fixtures, lamps and receptacles to supply construction power of adequate capacity for the project. Temporary transformers and meters shall be furnished and installed by the appropriate power authority, but paid for by the General Contractor, who shall be responsible for making all arrangements for their installation prior to using any existing power for temporary purposes.
2. Use new or used materials adequate in capacity for the purposes intended.
3. Materials must not create unsafe conditions or violate the requirements of applicable codes.
4. Conductors:

- a. Wire, cable or busses of appropriate type, sized in accordance with the latest National Electrical Code for the applied loads.
  - b. Use only UL approved wire.
  5. Conduit:
    - a. Rigid steel, galvanized: ANSI C80.1.
    - b. Electrical metallic tubing: ANSI C80.3.
    - c. Other material approved by NEC.
  6. Equipment: Provide appropriate enclosures for the environment in which used in compliance with NEMA Standards.
  7. Temporary power shall be based upon the following minimum requirements:
    - (a) Lighting - 300 watt per 1,000 square feet of floor area.
    - (b) Receptacles - One 15 ampere duplex for 1,000 square feet of floor space.
    - (c) Special Construction Equipment - Provide one 30-amp, 2-pole fused switch for equipment connection. The cost for cables and connection from switch to the special equipment will be borne by the Sub-contractor requiring same.
  8. The General Contractor will pay for the cost of energy consumed by all trades, including cost of lamp replacement. The General Contractor and Subcontractors of all trades shall furnish their own extension cords and such additional lamps as may be required for their work, shall pay for the cost of temporary wiring of a special nature for light and power required, other than that above mentioned.
  9. All temporary work shall be furnished and installed in conformity with the National Electrical Code and in accordance with local ordinances and requirements of the municipal power authority. All temporary wiring and accessories shall be removed after it has served its purpose.
- B. Heating: NOT REQUIRED**
1. The General Contractor shall furnish, install, and maintain a complete temporary heating system, including fuel therefore, which will provide heat as required by the trades and for the protection of stored and installed materials from injury as can be caused by dampness and cold. The General Contractor shall employ, within the terms of the General Contract, a competent watchman who will maintain and operate the system, as required. The General Contractor shall bear all costs incurred from the temporary heating from the time the system is first required until the date of Substantial Completion of the General Contract, as defined in the General Conditions and Special Conditions.
  2. Under no circumstance shall the permanent heating system be used for temporary heating purposes, until the building/buildings have been considered as satisfactorily enclosed by the Engineer, specified hereunder.
  3. Temporary heating equipment must be smokeless and fumeless type, Underwriters Laboratories, Factory Mutual, Fire Marshal and Engineer approved, and will fulfill the heating requirements specified hereunder.
  4. As soon as practicable, after the building/buildings have been considered satisfactorily enclosed by the Engineer, the General Contractor shall have the permanent heating system and apparatus put in operation. Electrical service, wiring, controls, and other essential parts of the permanent system must be installed prior to utilizing the heating system. The General Contractor shall pay for all power and fuel consumed in the

temporary operation of the permanent system until the time the building/buildings are partially or permanently occupied by the Owner, whichever comes first in accordance with the provisions specified herein for use and occupancy prior to acceptance by the Owner.

5. After enclosure of the building/buildings and before installation of wet work such as interior masonry and tile, maintain temperatures of 50 degrees minimum, except for a period commencing 10 days prior to the installation of interior woodwork, interior flooring, or interior painting, whichever occurs first, after which time the temperature shall be maintained at a minimum of 65 degrees F., until the project is either partially or permanently occupied by the Owner.

**C. Water and Sanitary: PROVIDE TEMPORAY SANITARY SERVICES FOR ALL PARTIES.**

1. The General Contractor shall make necessary arrangements for connection to the municipal water supply and shall provide, at his own expense, any extensions as required for the operation of this project. The General Contractor shall bear all costs incurred for the temporary water services, including the costs of the water itself.
2. All lines, temporary or permanent, shall be protected and maintained by the General Contractor. Temporary lines shall be removed by the General Contractor when the temporary service is no longer required.
3. The General Contractor shall provide an adequate drinking water supply, satisfactorily cooled, for his employees.
4. See Site Plan for nearest water hook-up.
5. The General Contractor shall furnish, install, maintain and pay for adequate temporary chemical type toilet accommodations, for all persons employed on the work and located where approved by the Engineer. The accommodations shall be in proper enclosures and in accordance with Municipal Ordinances and shall be maintained in proper, safe and sanitary conditions and suitably heated when requested.
6. Relocate temporary toilet facilities as required to facilitate the construction.
7. Remove all temporary facilities at completion of work when directed by the Engineer.

**D. Protection of Existing Concrete Tanks and other Unheated Concrete Structures taken out of Service:**

1. The General Contractor shall provide protection as required to maintain the surface temperatures of the existing concrete above 40 degrees F during the months of November through March and other periods during which the ambient air temperature is below 32 degrees F. The General Contractor shall be responsible for all means and methods to maintain the specified temperature at no additional cost to the Owner.
2. The General Contractor shall furnish and monitor surface thermometers on the concrete surfaces.
3. The above listed requirement is a minimum required to prevent the structure from freezing. If the nature of the work within the structure requires a greater air temperature to perform the work (such as application of coatings), the requirements of Part 2.1.B shall apply.
4. If, in the opinion of the Engineer, the work required in the unheated structure is of a short duration or the anticipated ambient air temperatures will not drop below 40 degrees F, additional protection as required in Part D.1 may not be required. The

General Contractor shall still be responsible for monitoring the temperature of the concrete surfaces and providing protection if they drop below 40 degrees F.

## PART 3 – EXECUTION

### 3.1 PERFORMANCE

#### A. Electrical:

1. Provide electrical energy to:
  - a. All necessary points on the construction site so that power can be obtained at any desired point with extension cords no longer than 100 feet.
  - b. Construction site offices.
  - c. Lighting as required for safe working conditions at any location on the construction site.
  - d. Night security light.
  - e. When applicable, Owner's present facilities during the changeover of electrical equipment.
2. Maintain electrical energy throughout the entire construction period.
3. Capacity:
  - a. Provide and maintain adequate electrical service for construction use by all trades during the construction period at the locations necessary, as specified herein.
4. Installation:
  - a. Install all work with a neat and orderly appearance.
  - b. Have all installations performed by a qualified electrician.
  - c. Modify service as job progress requires.
  - d. Locate all installations to avoid interference with cranes and materials handling equipment, storage areas, traffic areas and other work.

#### B. Heating:

1. Maintain a heated environment for the work at the temperature and for the length of time specified or as directed by the Engineer.
2. Precaution:
  - a. Operate temporary heating apparatus in such a manner that finished work will not be damaged.
  - b. Repair all damage, caused by temporary heating operations, to the complete satisfaction of the Engineer.

#### C. Water:

1. Provide and maintain water for drinking and construction purposes as required for the proper execution of the Work.

#### D. Sanitary Accommodations:

1. **Provide and maintain sanitary accommodations for the use of the employees of the General Contractor, Tank Manufacturer, and Engineer.**
2. Sanitary accommodations shall meet the requirements of all local, State and Federal health codes, laws and regulations.

#### E. Protection of Existing Tanks and other Unheated Structures taken out of Service:

1. The General Contractor shall provide protection and/or heat as required to maintain the specified temperature of the existing structure.
2. The General Contractor shall document the condition of the structures immediately after they are taken out of service with either still photos or video.

3. Precaution:
  - a. If additional heat is required, operate temporary heating apparatus in such a manner that the existing structure will not be damaged.
  - b. Repair all damage, caused by temporary heating operations, to the complete satisfaction of the Engineer.
4. The General Contractor shall repair any concrete damaged as a result of the surface temperatures of the concrete dropping below 40 degrees F.

END OF SECTION

## SECTION 01546

### USE OF EXPLOSIVES- ARE PERMITTED FOR TRENCH LEDGE ONLY

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

###### A. Work Included:

1. Provide all materials and perform all work necessary to ensure safe use and storage of explosives.
2. Contractor shall be responsible for any and all damage resulting from use of explosives.
3. Perform a pre-blast survey of all structures in the proximity of the blasting area to determine pre-blast conditions.
4. Perform monitoring, documentation and record keeping during blasting.

##### 1.2 QUALITY ASSURANCE

- A. Requirements of regulatory agencies: Conduct all blasting in accordance with all applicable local and state laws, ordinances and code requirements.
- C. Qualifications: The Subcontractor utilized for the blasting operations shall be licensed specialty drilling and blasting contractor with 5-years experience. The Contractor shall submit qualifications and references of the proposed Subcontractor for review and no exceptions shall be taken by the Engineer. All blasting operations completed on this project shall be performed by a single firm.

#### PART 2 – PRODUCTS

##### 2.1 MATERIALS

- A. Explosive charges and detonation devices shall be of a type suitable for the intended use.
- B. Store all explosives in a secure manner, in compliance with all State and local laws and ordinances, and legibly mark all such storage places. Storage shall be limited to such quantity as may be needed for the work underway.

#### PART 3 - EXECUTION

##### 3.1 PERFORMANCE – GENERAL

- A. Designate as a BLASTING AREA all sites where electric blasting caps are located and where explosive charges are being placed.
- B. Mark all blasting areas with signs as required by law.
- C. Place signs, as required by law, at 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.
- C. Perform a pre-blast survey of structures in the proximity of the blasting area to determine pre-blast conditions. The Contractor shall employ the services of an independent firm to conduct the a pre-blast survey of the condition of adjacent structures. The pre-blast survey shall include a video and photographic record of the interior and exterior of all structures

- D. within a 500-foot radius of the work area. The Contractor shall provide the Owner and Engineer with 72-hours written notice prior to the initiation of the pre-blast survey and shall allow for the Owner and/or Engineer to be present during the survey. The pre-blast survey records shall be made available to the Owner and Engineer upon request. The cost of the pre-blast survey shall be incidental to the unit price bid item.
- E. Notify each property owner and public utility company having structures within a 500-foot radius of the site of the work sufficiently in advance to enable the owners and companies to take such steps as they may deem necessary to protect their property. Notice shall be published in a local paper no more than 30 days nor less than 10 days prior to the initiation of the blasting. Notice shall be given to property owners within the 500-foot radius at least 10 days prior to blasting that pre-blast surveys are available. Such notice shall not relieve the Contractor of any of his responsibility for damage resulting from his blasting operation.
- F. 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.
- G. Provide watchmen during the loading period and until charges have been exploded.
- G. Provide adequate protective covering over all charges prior to explosion.
- H. Prepare and submit a blasting plan prior to the commencement of the blasting operations. The blasting plan shall include proposed sketches of the location of each blast, drill patterns, delay periods, and decking. The plan should also indicate the type and amount of explosives to be used, including weight of explosives per delay, stemming, critical dimensions and the location and general description of structures to be protected.
- J. Control blasting by limiting the charge weight per delay to that which produces limited levels of ground vibrations as herein specified. The Contractor shall hire a qualified testing agency to measure particle velocities and frequencies using seismograph. Peak particle velocity and frequency shall be the measures of the level of vibration. Vibration monitoring shall be performed at all structures within 100-feet of the blast.
- K. Maximum depth of lift to be removed at any one time shall be determined by the Explosion Contractor.
- L. Drilling and blasting operations are limited to the hours from 7am to 5pm and shall be limited to Monday through Friday.

### 3.2 PERFORMANCE - CONTROLLED BLASTING AREAS

- A. Blasting in "Controlled Blasting" areas shall meet all of the criteria identified above in addition to the additional criteria identified below. Controlled blasting shall be performed in areas where residences or businesses are within 100-feet of the blast area or as shown on the Drawings or specified herein.
- B. Controlled blasting shall consist of more closely spaced holes with lesser amount of explosives to reduce rock overbreak and vibration.

### 3.3 DOCUMENTATION AND RECORD KEEPING

- A. Prepare and maintain copies of all blasting logs which shall include, but not be limited to, the following information:
  - 1. Date, time and location of blast.



2. Diagram of blast pattern showing the number of holes with delay number and charge by weight per hole.
  3. Blast evaluations.
  4. Weather and cloud conditions.
- B. Prepare and maintain vibration measurement records which shall include, but not be limited to, the following information:
1. Identification of instrument.
  2. Name of instrument operator.
  3. Structure at which the geophone is located.
  4. Distance and direction of geophone from blast site.
  5. Date and time of reading.
  6. Type of ground at recording station.
  7. Peak particle velocity and frequency for all components as well as resultant.
  8. Copies of seismograph readings.
- C. Blast logs and vibration measurement records shall be made available to Owner and/or Engineer upon request.

END OF SECTION

## SECTION 01562

### DUST CONTROL

#### PART 1 - GENERAL

##### 1.1 DESCRIPTIONS

###### A. Work Included:

1. Furnish and apply water or calcium chloride on the road surfaces within the construction site, when required to control dust and when directed by the Engineer.
2. When dust control is not included as a separate item in the Contract, the work shall be considered incidental to the appropriate items of the Contract.

#### PART 2 – PRODUCTS

##### 2.1 MATERIALS

A. Water for Sprinkling: Clean, free of salt, oil, and other injurious matter.

B. Calcium Chloride: Meet the requirements of AASHTO M144.

#### PART 3 - EXECUTION

##### 3.1 APPLICATION

###### A. Water:

1. Apply water by methods approved by the Engineer.
2. Use approved equipment including a tank with gauge equipped pump and spray bar.
3. Avoid excessive application of water that would result in mobilizing sediment and subsequent deposition in natural water bodies.

###### B. Calcium Chloride:

1. Apply at a rate sufficient to maintain a damp surface but low enough to assure non-contamination of water courses.
2. Apply water prior to calcium chloride addition.
3. Calcium chloride cannot be applied in watersheds with chloride-impaired water bodies.

END OF SECTION

SECTION 01570

TRAFFIC REGULATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Provide all materials and perform all work necessary to completely regulate traffic in the area of Work.
2. **Contractor shall provide suitable all-weather access for heavy equipment to the job site and adequate working and storage areas for their materials and equipment. Such roads shall be suitable for the tank contractor to drive its material trucks, 53' trailers, fully loaded concrete trucks, pump trucks, and large mobile crane up and down and positioned to allow access to the tank site. Contractor shall close access to the tank site as necessary. Adequate parking spaces shall be provided on site for the tank contractor's construction personnel.**

1.2 SCHEDULING WORK

A. Not Applicable.

PART 2 - PRODUCTS

2.1 WARNING SIGNS AND BARRICADES

- A. Provide adequate warning signs, barricades, signal lights, watchmen and take other necessary precautions for the safety of the public.
- B. Provide and illuminate suitable warning signs to show where construction, barricades or detours exist.
- C. Provide barricades of substantial construction and painted with a finish that increases visibility at night.
- D. Keep signal lights illuminated at all barricades and obstructions from sunset to sunrise.
- E. Maintain all necessary signs, barricades, lights, watchmen and other safety precautions during authorized suspension of the Work, weekends, holidays or other times when the Work is not in progress.
- F. Traffic control signs for construction work shall be located and of the size and type as outlined in Manual on Uniform Traffic Control Devices for Streets and Highways as published by U. S. Department of Transportation.

2.3 FLAG PERSON

A. Not Applicable.

PART 3 - EXECUTION

3.1 DETOURS

- A. Provide, identify and maintain suitable detours when the project, or any part thereof, is closed to public travel.
- B. When the closed part of the project is reopened, restore the detour area and any other disturbed areas to the original condition.

3.2 INCONVENIENCE TO RESIDENTS OF VICINITY

- A. Whenever a traveled way is closed, perform the Work in such a manner that local travel and residents in the vicinity of the Work will be inconvenienced as little as possible.
- B. Allow access to residents and abutting land owners along the project to driveways and other normal outlets from their property.

END OF SECTION

## SECTION 01630

### SUBSTITUTIONS & PRODUCT OPTIONS

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

A. The below listed requirements are in addition to the requirements contained in the "Equivalent Materials and Equipment" part of the Standard General Conditions of the Construction Contract".

##### 1.2 SUBMITTALS

A. Submit a written application for approval completely describing the proposed substitution.

B. Submit, when requested by the Engineer:

1. Manufacturer's catalog data.
2. Illustrations.
3. Specifications.
4. Samples.
5. Other material that may be required to determine equality.

##### 1.3 CRITERIA

A. The following criteria will be used by the Engineer in determining the equality of proposed substitutions:

1. Adaptability to the design.
2. Functional performance.
3. Quality of materials.
4. Strength of materials.
5. Complexity, frequency and cost of maintenance.

##### 1.4 RESULTING CHANGES

A. If proposed substitutions are judged as being acceptable, make all changes to structures, buildings, piping, electrical, and other items necessary to accommodate the substitutions, at no additional cost to the Owner.

B. Whenever 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.

END OF SECTION

## SECTION 01710

### PROJECT CLEANING

#### PART I – GENERAL

##### 1.1 DESCRIPTION

###### A. Work Included:

1. Maintain premises and public properties free from accumulations of waste, debris, and rubbish, caused by operations.
2. At completion of work, remove waste materials, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces. Leave project clean and ready for use.

##### 1.2 QUALITY ASSURANCE

- ###### A. Requirements of Regulatory Agencies: Conduct cleaning and disposal operations in accordance with all applicable local and state laws, ordinances, and code requirements.

#### PART 2 – PRODUCTS

##### 2.1 MATERIALS

- ###### A. Use only cleaning materials recommended by manufacturer of surfaces to be cleaned.
- ###### B. Use cleaning materials only on surfaces recommended by cleaning material manufacturers.

#### PART 3 – EXECUTION

##### 3.1 PERFORMANCE

###### A. Cleaning During Construction:

1. Execute cleaning operations to ensure that buildings, grounds, and public properties are maintained free from accumulations of waste materials and rubbish.
2. Entirely remove and dispose of material or debris during the progress of the work that has washed into or has been placed in watercourses, ditches, gutters, drains, catch basins, or elsewhere as a result of the Contractor's operations.
3. Wet down dry materials and rubbish to lay dust and prevent blowing dust.
4. At reasonable intervals during the progress of work, clean the site and dispose of waste materials, debris, and rubbish.
5. Clean interiors of buildings, when applicable, prior to finish painting, and continue to clean on an as-needed basis until buildings are ready for occupancy.
6. Handle materials in a controlled manner with as few handlings as possible. Do not drop or throw material from heights.
7. When applicable, schedule cleaning operations so that dust and other contaminants resulting from the cleaning process will not fall on wet, newly painted surfaces.

###### B. Control of Hazards:

1. Store volatile wastes in covered metal containers, and remove from premises daily.
2. Prevent accumulation of wastes which may create hazardous conditions.
3. Provide adequate ventilation during use of volatile or noxious substances.

###### C. Disposal:

1. Do not burn or bury rubbish and waste materials on project site.

2. Do not dispose of volatile wastes, such as mineral spirits, oil, or paint thinner, in storm or sanitary drains.
  3. Do not dispose of wastes into streams or waterways.
- D. Final Cleaning:
1. Employ experienced workmen, or professional cleaners, for final cleaning.
  2. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from all sight-exposed interior and exterior finished surfaces.
  3. Repair, patch and touch up marred surfaces to specified finishes.
  4. Broom clean paved surfaces.
  5. Rake clean non-paved surfaces of the project site.
  6. Restore to their original condition those portions of the site not designated for alterations by the Contract Documents.
  7. **Shotcrete and Concrete Debris from the Tank Manufacturer: The Contractor shall be responsible for removing approximately 20 cubic yards of concrete rubble from the on-site panel casting beds and shotcrete rebound. The tank contractor shall be responsible for cleanup and trash removal, to a location on site, resulting from our work.**

END OF SECTION

## SECTION 01720

### PROJECT RECORD DOCUMENTS

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

###### A. Work Included:

1. Keep accurate record documents for all additions, substitutions of material, variations in work, and any other additions or revisions to the Contract.

###### B. Related Work Specified Elsewhere:

1. Shop Drawings, Project Data, and Samples are specified in "General Conditions" and Section 01340, Submittals.

##### 1.2 MAINTENANCE OF DOCUMENTS

###### A. Maintain at job site, one copy of:

1. Contract Drawings
2. Specifications
3. Addenda
4. Reviewed Shop Drawings
5. Change Orders
6. Any other modifications to the Contract
7. Field Test Reports

###### B. Store documents in files and racks specifically identified for this use, that are apart from documents used for construction.

###### C. File documents in a logical manner indexed for easy reference.

###### D. Maintain documents in clean, dry, legible condition.

###### E. Do not use record documents for construction purposes.

###### F. Make documents available at all times for inspection by the Engineer and Owner, and by the end of the project, transmit these documents to the Engineer.

##### 1.3 RECORDING

###### A. Label each document "PROJECT RECORD in large high printed letters.

###### B. Keep record documents current and do not permanently conceal any work until required information has been recorded.

###### C. General Field Recording Issues:

1. All ties should be taken from existing, permanent features such as utility poles, corners of houses and hydrants. Porches, sheds or other house additions should be avoided for they could be tom down. A minimum of two ties should be taken.
2. Stations should be recorded to the nearest foot.
3. Inverts should be recorded to the nearest hundredth of a foot.
4. Elevations should be recorded to the nearest hundredth of a foot.

###### D. Project Record Drawings - Legibly mark Contract Drawings to record existing utilities and actual construction of all work, including but not limited to the following (where applicable):

1. Existing Utilities



Water mains and services, water main gate valves, sewer mains and services, storm drains, culverts, steam lines, gas lines, tanks and other existing utilities encountered during construction must be accurately located and shown on the Drawings. In congested areas supplemental drawings or enlargements may be required.

- a. Show any existing utilities encountered in plan and profile and properly labeled showing size, material and type of utility. Ties should be shown on plan. Utility should be drawn to scale in section (horizontally and vertically) and an elevation should be called out to the nearest hundredth of a foot.
- b. When existing utility lines are broken and repaired, ties should be taken to these locations.
- c. If existing water lines are replaced or relocated, document the area involved and pipe materials, size, etc. in a note, and with ties.

#### 2. Sewer Manholes.

- a. Renumber structure stationing to reflect changes.
- b. Show ties to center of structure covers or hatches.
- c. In general, show inverts at center of structures. However, for manholes with drop structures, or steep channels (greater than 0.2' change on slope), show inverts at face of manhole.

#### 3. Gravity Sewer Line

- a. Change sewer line slopes indicated on Drawings if inverts are changed.
- b. Draw any new gravity lines that are added on plan and profile.
- c. Show any field or office redesigns.
- d. Redraw the sewer line profile if manhole inverts are redrawn.
- e. Redraw the sewer line on plan corresponding to relocated manholes.

#### 4. Water Mains

- a. Show ties to the location of all valves, bends (horizontal and vertical), tees and other fittings. The use of thrust blocks should be recorded.
- b. Revise elevations indicated on the Drawings to reflect actual construction.

#### 5. Ledge

- a. Ledge profiles should be shown. Note whether the plotted ledge profile reflects undisturbed or expanded conditions.

### 1.4 SUBMITTALS

- A. At the completion of the project, deliver record documents to the Engineer.
- B. Failure to supply all information on the Project Record Drawings as specified in Part 1.3 may result in additional retainage from monthly partial payment requests, and in non-approval of final payments of the Contract and/or if contract time (as specified in accordance with the Standard General Conditions of the Construction Contract) has elapsed, this shall be grounds for the enactment of the liquidated damages as specified.

END OF SECTION

SECTION 01800

EQUIPMENT STARTUP, CERTIFICATION AND OPERATOR TRAINING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. General: The work included in this Section includes startup of equipment, certified equipment testing and manufacturer provided operator training of the facility personnel in the proper operations and maintenance of the furnished equipment. This shall include all equipment provided for the project, regardless of specification Division, unless specifically noted otherwise. Clean, test and adjust each piece of equipment and/or system to the complete satisfaction of the Engineer.
2. One Year Service Call: In addition to the manufacturer's installation and startup/testing services, the Contractor shall arrange for the manufacturer to provide one additional service call of one 8 hour working day on site upon demand of the Owner for each type of equipment within the first year of operation (commencing upon date of Substantial Completion) at no additional cost to the Owner.
  - a. Equipment Systems requiring one year of service call are as follows:

<u>Equipment System</u>	<u>Supplier</u>
Telemetry System	Electrical Installations Inc.

B. General Definitions:

1. Equipment Startup shall be generally defined as the initial placing into operation of the equipment by representatives of the Contractor, any Subcontractors directly responsible for the equipment provided, and the equipment manufacturer.
2. Certified Equipment Testing shall generally be defined as the formal and scheduled demonstration of operations in accordance with the requirements of the Contract Documents. This formal demonstration shall be performed in the presence of the Engineer by representatives of the General Contractor, any Subcontractors directly responsible for the equipment provided, and the equipment manufacturer.
3. Operator Training shall generally be defined as the formal and scheduled instruction of plant personnel and other Owner designated representatives in the proper operations of provided equipment, and in the techniques, methods, schedules, etc. associated with maintenance. This formal training shall be performed in the presence of the Engineer, by representatives of the Contractor, any Subcontractors directly responsible for the equipment provided, and the equipment manufacturer. Operator Training shall also include assistance to plant personnel by manufacturer representatives during the initial operations of the equipment.

C. Related Work Specified Elsewhere:

1. Electrical systems are specified in Division 16.

**D. Submittals:**

1. A minimum of ten (10) days prior to the Pre-Startup Meeting, Contractor shall provide a preliminary equipment start-up schedule and plan for the Certified Equipment Testing and the Operator Training for each piece of equipment to the Engineer for review. This preliminary plan will include a written outline description of the means and methods to be employed during the Certified Equipment Test of each piece of equipment. The schedule and means and methods of testing will be discussed with the Engineer at the Pre-Startup Meeting for acceptance.

**E. Schedules:**

1. The Pre-Startup Meeting shall be held at least ten (10) working days prior to the startup of the first piece of equipment supplied under the Contract. The meeting shall be held at the project site. At that time, the Contractor shall present his plan as detailed in the previous Part D "Submittals" and review Engineer's comments and concerns associated with the general features of each piece of equipment which must be demonstrated.
2. Contractor shall provide Engineer with at least 72 hours' notice of his desire to perform testing and training to allow necessary coordination with Owner representatives. Contractor shall be responsible for any and all coordination necessary with the daily operations of the facility to accommodate his testing schedule. Actual date and time for testing and/or training will be the first mutually acceptable date and time available to all parties subsequent to receipt of the request.
3. Operator Training may be conducted concurrently with the Certified Equipment Testing with prior approval of the Engineer. However, under no circumstances will conditions of the testing interfere with the ability of Owner's representatives to observe necessary features, to hear and understand instructions, or to ask questions. Under such conditions, Operator Training will be conducted separately from, and subsequent to, the Certified Equipment Testing.

**PART 2 - PRODUCTS**

Not Used

**PART 3 - EXECUTION****3.1 EQUIPMENT STARTUP**

- A. Equipment startup shall be performed by a duly authorized representative of the manufacturer, who is fully trained in the installation, startup and operation of the equipment, including, but not limited to, drive system alignment, equipment calibration, and other mechanical or electrical components of the equipment.
- B. The equipment startup shall be performed prior to Equipment Certification Testing and Operator Training.
- C. No form of energy shall be applied to any part of the system prior to receipt by the Engineer of a certified statement of approval of the installation from the Contractor. This certification shall contain a statement by an authorized representative of the equipment

- manufacturer that the equipment is ready for testing.
- D. As part of the equipment startup, the Contractor shall:
1. Verify that the equipment is installed properly and in accordance with manufacturer's requirements and instructions, and as such, it is appropriate to apply power to the units in question.
  2. Verify that all manual, automatic and safety control features of the equipment functions properly, including all alarm, activation and deactivation sequences.
  3. Verify that the equipment can operate without excessive noise, vibration, overheating, overloading, jamming, etc. during normal operating conditions.
  4. Check amperage draws on all power feeds with equipment running under normal operating conditions.
- E. Each piece of equipment shall be tested sufficiently to ensure that all features required to be demonstrated and/or verified during the Equipment Certification Testing are within acceptable limits. The startup shall not be considered complete until the unit is fully capable of passing the Equipment Certification Testing.
- F. Where multiple units are provided, each unit shall undergo startup procedures.
- G. The Contractor shall provide all power, chemical, tools, equipment, labor, water fuel, coordinate with Owner to ensure availability of sludge, etc. as required for startup.
1. The Contractor shall be responsible for all contacts and arrangements as necessary with the proper municipal departments and/or public utility companies to arrange for temporary and/or separate billing so that bills associated with testing and startup procedures can be easily identified.
  2. Contacts and arrangements with the local power company shall include, but not be limited to, all arrangements as necessary so that peak power demands incurred during testing and startup procedures will not become a part of the permanent record for determining future power demand charges for the Owner.
  3. All waste materials shall be disposed of by the Contractor in an environmentally acceptable manner at no additional cost to the Owner.
- H. The manufacturer representative shall fill out the Equipment Certification form included at the end of this Section. Startup will not be considered complete until this form has been provided to the Engineer.

### 3.2 CERTIFIED EQUIPMENT TESTING

- A. Certified Equipment Testing shall be performed after the Equipment Startup is completed and it has been verified that equipment functions in accordance with the requirements of the Contract Documents in all aspects. It is required that a duly authorized representative of the manufacturer, who is fully trained in the installation, startup and operation of the equipment, be in attendance for the Certified Equipment Testing.
- B. Certified Equipment Testing shall not be scheduled concurrently with the Equipment Startup without the prior approval of the Engineer. In all cases, if the Engineer has arrived on-site for the scheduled Certified Equipment Testing and the equipment is not capable of demonstrating complete compliance with the Contract Documents, or if the manufacturer's representative is not present, the Contractor shall be responsible for all costs to the Engineer associated with failed testing, including travel expenses. The importance of prior

- and proper equipment startup demonstrations to verify the requirements of the Certified Equipment Testing is stressed.
- C. At a minimum during the Certified Equipment Testing, the Contractor shall demonstrate to the complete satisfaction of the Engineer the following:
1. That the equipment is installed properly and in accordance with manufacturer's requirements and instructions, and as such, it is appropriate to apply power to the units in question.
  2. That all manual, automatic and safety control features of the equipment functions properly, including all alarm, activation and deactivation sequences.
  3. That the equipment can operate without excessive noise, vibration, overheating, overloading, jamming, etc., during normal operating conditions.
  4. Amperage draws on all power feeds with equipment running under normal operating conditions.
  5. The noise level of equipment, drives and motors, unless otherwise noted, shall not exceed 90 dBA, as measured 3 feet from the unit under free field conditions.
    - i) Each unit shall be monitored for compliance independently with other area equipment deactivated.
    - ii) For monitoring, the equipment will be run under normal operation conditions.
    - iii) Contractor shall provide certified proof of calibration for instrument utilized to measure noise level.
  6. Other specific requirements as outlined within the individual specification's sections.
- D. Each piece of equipment shall be tested sufficiently to ensure that all features required to be demonstrated and/or verified are within acceptable limits.
- E. Where multiple units are provided, each unit shall undergo Equipment Certification Testing procedures individually and then with multiple units on-line to verify the total systems output capacity and performance.
- F. The Contractor shall provide all power, chemical, tools, equipment, piping, labor, water fuel, etc. as required for startup and testing. Contractor is responsible for taking all required samples and testing samples at an independent lab, unless otherwise indicated elsewhere. All waste materials shall be disposed of by the Contractor in an environmentally acceptable manner at no additional cost to the Owner.
- G. All equipment provided on the project shall be demonstrated to function properly. Demonstration as a component of an overall system shall not relieve the Contractor of his responsibilities to demonstrate proper operation or verify specific requirements for each individual component.
- H. Minimum Certified Equipment Testing Requirements for Pumps
1. If sufficient sewage or water is not available for tests, Contractor will provide water at his expense for testing, if so directed.
  2. During tests, observe and record head, output, rpm and motor input. Sufficient test points shall be obtained to develop accurate pump system curve. If multiple operational points are specified, compliance with all points must be sufficiently demonstrated.
  3. Fully demonstrate ability to operate at specified conditions without motor overload.
  4. For mechanical seals, after a run-in period of 30 minutes, the seal area shall be wiped dry. The pump shall be operated for a 10-minute period. No measurable leakage shall be detected from the mechanical seal.
  5. Refer to Section 11000 and 15400, as applicable, for additional details.
- I. Minimum Certified Equipment Testing Requirements for Blowers/Fans.

1. During tests, observe and record pressure, unit rpm's and motor input. If multiple operational points are specified, compliance with all points must be sufficiently demonstrated.
  2. Fully demonstrate ability to operate at specified conditions without motor overload.
  3. Refer to Section 11000, Section 15600 and 15907, as applicable, for additional details.
- J. Minimum Certified Equipment Testing Requirements for Instrumentation/Control Systems.
1. All instruments shall be calibrated in the presence of the Engineer.
  2. All transmitters or direct-operated receivers shall be calibrated to imposed input values representing zero percent, ten percent, and eighty percent of full scale.
  3. The inputs and outputs of devices, as appropriate, shall be connected to manometers for differential pressure devices, or compared to measured levels, rates or quantities, during calibration. The receiving devices shall be adjusted to read the calibrated output of the initial calibration.
  4. After placing each measuring system in service, an actual comparison of the measured variable versus readout shall be made. For each differential pressure-based measuring system, a manometer shall be connected to the connections provided in the piping, tank or other appropriate device. Each system shall meet the manufacturer's standard accuracy.
  5. Secondary functions, such as sequencing, timing features, alarm actuation and pacing shall be adjusted during initial calibration and demonstrated after the system is placed in service.
  6. Linkage or range adjustments shall be sealed by colored lacquer in the presence of the Engineer immediately following calibration.
  7. Process calibration, such as volumetric drawdown tests on flows and level measurements, shall be conducted on all measuring systems as requested by the Engineer. Once established as being within acceptable accuracy limits, future tests which require use of the measuring device to demonstrate system operations can utilize generation of mA signals to simulate level, flow or similar variable variations.
  8. Refer to Section 13440 and Section 15604, as applicable, for additional details.
- K. Minimum Certified Equipment Testing Requirements for Electrical Systems.
1. Refer to Section 16950.

### 3.3 OPERATOR TRAINING

- A. Operator Training shall be performed by a duly authorized representative of the manufacturer, who is fully trained in the installation, startup and operation of the equipment.
- B. Unless otherwise noted within the specific specification sections, provide minimum of one day (\$-hour days, not including travel time) of combined training and operational assistance for plant operators for each piece of equipment in the proper operations of provided equipment, and in the techniques, methods, schedules, etc. associated with maintenance.
- C. The level of the training and operational assistance provided shall be as required to ensure proper understanding of the equipment's operations, maintenance and warranty conditions. Should manufacturer require time in addition to the minimums indicated herein, or within the individual specification sections, to sufficiently detail the proper operations and

maintenance of the equipment, it will be provided at no additional cost to Owner. Under absolutely no circumstances shall warranties become void due to Owner's failure to follow operational and maintenance procedures which were not fully detailed and described to Owner's representatives during these sessions.

- E. Refer to individual equipment specification sections for further requirements.
- F. The manufacturer representative shall fill out the Equipment Training Certification form included within this Section. Training will not be considered complete until this form has been provided to the Engineer.

END OF SECTION

INDEX  
FOR  
DIVISION 2 – SITE WORK

<u>Section Number</u>	<u>Title</u>	<u>Page Number</u>
02050	Demolition	02050-1
02110	Clearing and Grubbing	02110-1
02115	Stripping and Stockpiling Topsoil	02115-1
02200	Earthwork	02200-1
02260	Filter Fabric	02260-1
02270	Temporary Erosion Control	02270-1
02401	Dewatering	02401-1
02441	Mulch	02441-1
02485	Loaming & Seeding	02485-1
02513	Bituminous Concrete Paving	02513-1
02601	Manholes, Covers and Frames	02601-1
02628	High Density Polyethylene Pipe	02628-1
02650	Buried Utility Markings	02650-1
02660	Water Mains, Fittings and Appurtances	02660-1



SECTION 02050DEMOLITIONPART 1 – GENERAL1.1 DESCRIPTION

## A. Work Included:

1. The Contractor shall furnish all labor, materials, tools, equipment and apparatus necessary and shall do all work required to complete the demolition, removal, and alterations of existing facilities as indicated on the Drawings, as herein specified, and/or as directed by the Engineer.
2. Demolition and alteration work within occupied areas shall be accomplished with minimum interference to the occupants and to the plant which shall be in continuous operation during construction.
3. All equipment, piping, and other materials that are not to be relocated or to be returned to the Owner shall become the property of the Contractor and shall be disposed of by him, away from the site of the work and at his own expense.
4. All demolition or removal of existing structures, utilities, equipment, and appurtenances shall be accomplished without damaging the integrity of existing structures, equipment, and appurtenances to remain, to be salvaged for relocation or stored for future use.
5. Such items that are damaged shall be either repaired or replaced at the Contractor's expense to a condition at least equal to that which existed prior to the start of his work.

## B. Related Work Specified Elsewhere: (When Applicable)

1. Earthwork is specified in Section 02200.
2. See Summary of Work, Section 01010.

1.2 JOB CONDITIONS

## A. Condition of Structures:

1. The Owner assumes no responsibility for the actual condition of structures to be demolished.
2. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner as far as practicable. However, variations within the structures may occur due to Owner's removal and salvage operations prior to the start of demolition work (where applicable).

1.3 UTILITIES

## A. Utility Locations:

1. Utility locations shown on the plans are approximate only, based on information supplied by the utility companies.

## B. Coordination with Utilities:

1. The Contractor shall make all necessary arrangements and perform any necessary work to the satisfaction of affected utility companies and

governmental divisions involved with the discontinuance or interruption of affected public utilities and services.

1.4 SUBMITTALS

A. Schedule - Demolition:

1. Submit two (2) copies of proposed methods and operations of demolition to the Engineer for review prior to the start of work. Include in the schedule the coordination for shut-off, capping and continuation of utility services as required.
2. Provide a detailed sequence of demolition and removal work to ensure the uninterrupted progress of the Owner's operations.

1.5 PROTECTIONS

- A. Ensure the safe passage of persons around the area of demolition. Conduct operations to prevent injury to adjacent buildings, structures, other facilities and persons. Erect temporary, covered passageways as required by authorities having jurisdiction.
- B. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.

1.6 DAMAGES

- A. The Contractor shall promptly repair damages caused by demolition operations to adjacent facilities at no cost to the Owner.

PART 2 – PRODUCTS

Not Applicable.

PART 3 – EXECUTION

3.1 PERFORMANCE

- A. Remove and dispose of non-salvageable material in accordance with all applicable local and state laws, ordinances and code requirements.
- B. Dispose of material daily as it accumulates.
- C. Carefully remove, store and protect from damage all materials to be salvaged.
- D. Buildings and Adjacent Property:
  1. Protect all buildings and property adjacent to equipment to be removed from damage by erecting suitable barriers or by other suitable means.
  2. Leave such buildings in a permanently safe and satisfactory condition.
- E. Maintaining Traffic:
  1. Ensure minimum interference with roads, streets, driveways, sidewalks and adjacent facilities.
  2. Do not close or obstruct streets, sidewalks, alleys or passageways without permission from authorities having jurisdiction.

- F. Architectural, structural, mechanical, process and electrical demolition, removal and alteration are indicated below.**
- 1. The existing building is to be removed. Area filled with suitable sand with positive drainage away from the site.**
- G. Mechanical/Process Demolition:**
- Mechanical/Process demolition in general shall consist of the dismantling and removal of existing piping, tanks, pumps, motors, equipment and other appurtenances as specified, and indicated on the Drawings.
  - It shall also include, where necessary, the cutting of existing piping for the purpose of making connections thereto.
  - Piping not indicated to be removed but which may interfere with construction shall be removed to the nearest solid support, capped and left in place. Where piping that is to be removed passes through the wall of existing structures, it shall be cut off and properly capped on each side of the wall.
  - When piping is to be altered or removed underground, the remaining piping shall be properly capped or plugged.
  - Abandoned underground piping shall be left in place unless it interferes with new structures or unless otherwise noted on the Drawings.
- H. Salvage:**
- Salvaged items shall be stored on site for the Owner in an acceptable location and manner.
- I. Tank Abandonment:**
- 1. The existing tank(s) are to be filled with sand or flowable fill.**
- J. Maintain Treatment:**
- During demolition, maintain treatment as outlined in Section 01010, Summary of Work.
- K. Demolition Sequence:**
- The demolition sequence is to conform the reviewed and approved project schedule, and restrictions outlined in Section 013 10, Construction Schedules.
- L. Pest Control:**
- Provide pest control when needed or when directed by the Engineer.
  - Exterminate and prevent migration of rodents to adjoining buildings in accordance with the requirements of the state or local health department.

END OF SECTION

SECTION 02110CLEARING AND GRUBBINGPART 1 – GENERAL1.1 DESCRIPTION

## A. Work Included:

1. Clearing includes, but is not limited to, removal of trees, brush, stumps, wooded growth, grass, shrubs, poles, posts, signs, fences, culverts and other vegetation and minor structures; the protection of designated wooded growth; the storage and protection of minor structures and materials which are to be replaced; and the disposal of nonsalvageable structures and materials, and necessary preliminary grading.

## B. Limits of Work:

1. Perform clearing and grubbing work within the areas required for construction, or as shown on the Drawings, to a depth of 12 inches below the existing grade.
2. Perform additional clearing and grubbing work within areas and to depths which, in the opinion of the Engineer, interfere with excavation and/or construction, or are otherwise objectionable.

## C. Work Not Included:

1. Clearing and grubbing work performed for the convenience of the Contractor will not be considered for payment.

1.2 QUALITY ASSURANCE

- A. Remove and dispose of nonsalvageable structures and material in accordance with all applicable local and state laws, ordinances and code requirements.

PART 2 – PRODUCTS2.1 MATERIALS

- A. Provide all materials required to complete the work.
- B. All timber and wood shall become the property of the Contractor unless other agreements are made between the Owner and the Contractor.
- C. Repair any damage to structures to the complete satisfaction of the Owner and Engineer.

PART 3 – EXECUTION3.1 PREPARATION

- A. Carefully preserve and protect from injury all trees and/or shrubs not to be removed.
- B. Right-of-way:
  1. Where excavation is required on public or private rights-of-way containing trees, shrubs, other growth, or any structure or construction, obtain the

Engineer's direction concerning the extent to which such obstacles can be cleared or stripped prior to performing the Work.

2. In all rights-of-way, remove only those particular growths or structures which are, in the opinion of the Engineer, essential for construction operations.
3. All other removals or damage shall be replaced or restored at the Contractor's expense.

### 3.2 PERFORMANCE

#### A. Clearing:

1. Remove and dispose of all trees, brush, slash, stumps, bushes, shrubs, plants, debris and obstructions within the area to be cleared, except any areas that may be designated as "Selective Clearing", and except as otherwise shown on the Drawings or as directed by the Engineer.
2. Remove all stumps unless otherwise directed by the Engineer.
3. Dispose of material to be removed daily as it accumulates.
4. Take special care to completely dispose of all elm trees and branches immediately after cutting in an offsite location.

#### B. Protection of Wooded Growth:

1. Fell trees toward the center of the area being cleared to protect trees and shrubs to be left standing.
2. Cut up, remove and dispose of trees unavoidably falling outside the area to be cleared.
3. Employ skilled workmen or tree surgeons to trim and repair all trees that are damaged but are to be left standing.

#### C. Selective Clearing:

1. When shown on the Drawings and when directed by the Engineer, perform selective clearing work to preserve natural tree cover.
2. Perform selective clearing work only under the direction and supervision of the Engineer.
3. Remove all dead and uprooted trees, brush, roots and other material which, in the opinion of the Engineer, are objectionable.
4. Cut flush with the ground and remove only those trees indicated by the Engineer.
5. Employ skilled workmen or tree surgeons to carefully trim all branches requiring cutting on trees to be left standing. Wood exposed as the result of removal of branches is to be left exposed to air and sunlight.
6. Bituminous paint shall not be used on wood exposed as a result of branch removal, excavation around roots, or damage to tree bark.

#### D. Grubbing:

1. Perform grubbing work beneath new roads, driveways, walks, seeded areas and other areas and as directed by the Engineer.
2. Grub out all sod, vegetation and other objectionable material to a minimum depth of 12 inches below the existing grade.
3. Completely remove all stumps, including major root systems.

E. Disposal:

1. Remove from the site and dispose of material not being burned.
2. Provide an approved disposal area unless otherwise specified.
- 3.

3.3 REPLACEMENT OF MATERIALS

A. Paving, Curbing and Miscellaneous Material:

1. Remove all paving, subpaving, curbing, gutters, brick, paving block, granite curbing, flagging and minor structures that are over the area to be filled or excavated.
2. Remove and replace bituminous asphaltic and portland cement concrete in accordance with the appropriate sections of these Specifications.
3. Properly store and preserve all material to be replaced in a location approved by the Engineer.

B. Shrubs and Bushes:

1. Remove, store, and replace ornamental shrubs and bushes to be preserved in accordance with accepted horticultural practices.

C. Topsoil:

1. When applicable, carefully remove, store, and protect topsoil in accordance with the appropriate section of this division.

D. Responsibility:

1. Replace, at no additional cost to the Owner, materials lost or damaged because of careless removal or neglectful or wasteful storage, disposal or use of these materials.

END OF SECTION

SECTION 02115STRIPPING AND STOCKPILING TOPSOILPART 1 – GENERAL1.1 DESCRIPTION

## A. Work Included:

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

## B. Related Work Specified Elsewhere (When Applicable):

1. Demolition, clearing, grading, embankment, excavation and landscaping are specified in the appropriate sections in this division.

PART 2 – PRODUCTS2.1 MATERIALS

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

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

PART 3 – EXECUTION3.1 PERFORMANCE

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

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

3.2 STORAGE

## A. General:

1. Locate stockpiles a minimum of 50 feet away from concentrated flows of stormwater, drainage courses, and inlets.
2. Protect all stockpiles from stormwater run-on using temporary perimeter measures such as diversions, berms, sandbags, or other approved practice.
3. Stockpiles should be surrounded by sediment barriers as described in the manual, to prevent migration of material beyond the immediate confines of the stockpiles.

4. Implement wind erosion control practices as appropriate on all stockpiled material.
  5. Placed bagged materials on pallets and under cover.
  6. Neatly trim and grade stockpiles to provide drainage from surfaces and to prevent depressions where water may become impounded.
  7. All loam stripped and stockpiled shall be immediately seeded with 70% Domestic/30% Perennial Rye Grass.
- B. Protection of Inactive Stockpiles:
1. Inactive soil stockpiles should be covered with anchored tarps or protected with soil stabilization measures (temporary seed and mulch or other temporary stabilization practice) and temporary perimeter sediment barriers at all times.
  2. Inactive stockpiles of concrete rubble, asphalt concrete rubble, aggregate materials, and other similar materials, should be protected with temporary sediment perimeter barriers at all times. If the materials are a source of dust, they should also be covered.
- C. Protection of Active Stockpiles:
1. All stockpiles should be surrounded with temporary linear sediment barriers prior to the onset of precipitation. Perimeter barriers should be maintained at all times, and adjusted as needed to accommodate the delivery and removal of materials from the stockpile. the integrity of the barrier should be inspected at the end of each working day.
  2. When a storm event is predicted, stockpiles should be protected with an anchored protective covering.

END OF SECTION



SECTION 02200EARTHWORKPART 1 – GENERAL1.1 DESCRIPTION

- A. The Work described by this Section consists of all earthwork encountered and necessary for construction of the project as indicated in the Contract Documents, and includes but is not limited to the following:
1. Excavation
  2. Backfilling and Filling
  3. Compaction
  4. Embankment Construction
  5. Grading
  6. Providing soil material as necessary
  7. Disposal of excess suitable material and unsuitable materials
- B. Related Work Specified Elsewhere:
1. The use of explosives is specified in the Supplementary Conditions section of this Contract, and in Division 1. **Blasting for trench ledge only on this project**
  2. Traffic Regulation is specified in Division 1.
  3. Clearing and Grubbing, Dewatering, Temporary Erosion Control, Stripping and Stockpiling of Topsoil, Sheeting, Loam & Seeding, and Paving are specified in the appropriate sections of this Division.
  4. Section 01400 - Quality Control.
  5. Pipe, fittings and valves are specified in Divisions 2 and 15.

1.2 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
1. All work shall be performed and completed in accordance with all local, state and federal regulations.
  2. The General Contractor shall secure all other necessary permits unless otherwise indicated from, and furnish proof of acceptance by, the municipal and state departments having jurisdiction and shall pay for all such permits, except as specifically stated elsewhere in the Contract Documents.
- B. Line and Grade:
1. The Contractor shall establish the lines and grades in conformity with the Drawings and maintain same to properly perform the work.
- C. Testing Methods:
1. Gradation Analysis: Where a gradation is specified the testing shall be in accordance with ASTM C117 and ASTM C136 (latest revision).
  2. Compaction Control:
    - a) Unless otherwise indicated, wherever a percentage of compaction for backfill is indicated or specified, it shall be the in-place density divided by the maximum density and multiplied by 100. The maximum density

shall be the density at optimum moisture as determined by ASTM Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort, Designation D1557 (Modified Proctor), latest revision, unless otherwise indicated.

- b) The in-place density shall be determined in accordance with ASTM Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method, Designation D1556, latest revision, or Nuclear Method Designation D6938.
- c) Wherever specifically indicated, maximum density at optimum moisture may be determined by ASTM Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort, ASTM D698 (Standard Proctor), latest revision.
- d) An Independent Testing Laboratory will be retained by the Owner to conduct all laboratory and field soil sampling and testing, and to observe earth work and foundation construction activities. Laboratory testing will consist of sieve analyses, natural water content determinations, and compaction tests. Field testing will consist of in-place field density tests and determination of water contents.

### 1.3 SUBMITTALS

- A. Collection of samples and testing of all materials for submittals shall be performed by the Independent Testing Laboratory and paid for by the Contractor until the materials are approved by the Owner or Engineer.
- B. Submit test results in accordance with the procedure specified in the General and Supplementary Conditions.
- C. Submit test results (including gradation analysis) and source location for all borrow material to be used at least 10 working days prior to its use on the site. Contractor shall identify and provide access to borrow sites.
- D. Submit moisture density curve for each type of soil (on site or borrow material) to be used for embankment construction or fill beneath structures or pavement.

### 1.4 TESTS

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

- A. Submit test results in accordance with the procedure specified in the General and Supplementary Conditions.
- B. All testing shall be performed by a qualified Independent Testing Laboratory acceptable to the Engineer and Contractor at the Owner's expense unless otherwise indicated (see Section 01400 - Quality Control).
- C. Field density tests on embankment materials shall be as follows: Tests shall be taken on every 200 cubic yards of embankment material.
- D. Paved Areas and Building Slab Subgrade: Make at least one field density test of subgrade for every 2,000 sq. ft. of paved area or building slab, but in no case less than 3 tests. In each compacted fill layer, make one field density test for every

2,000 sq. ft. of overlaying building slab or paved area, but in no case less than 3 tests.

- E. Trenches: Field density test in trenches shall be taken at 75 linear foot intervals on every third lift.
- F. Foundation Wall Backfill: Take at least one (1) field density tests per lift per wall at locations and elevations as designated by the Engineer.
- G. In addition to the above tests the Independent Testing Laboratory will perform additional density tests at locations and times requested by the Engineer.
- H. Additional density testing will be required by the Engineer if the Engineer is not satisfied with the apparent results of the Contractor's compaction operation.
  - 1. If the test results fail to meet the requirements of these specifications, the Contractor shall undertake whatever action is necessary, at no additional cost to the Owner, to obtain the required compaction. The cost of retesting will be paid by Owner. The cost of retesting will be determined by Engineer and Owner will invoice Contractor for this cost. If unpaid after 60 days, the invoice amount for retesting will be deducted from the Contract Price. No allowance will be considered for delays in the performance of the work.
  - 2. If the test results pass and meet the requirements of these Specifications, the cost of the testing service will be borne by the Owner, but no allowance will be considered for delays in the performance of the work.

## 1.5 JOB CONDITIONS

### A. Site Information:

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

### B. Existing Utilities and Structures:

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

## PART 2 – PRODUCTS

### 2.1 SOIL MATERIAL

- A. Aggregate Base: Shall be crushed gravel (NHDOT Item #304.5, Crushed Stone (Coarse)) of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. At least 50% of the material retained on the 1-inch sieve shall have a fractured face.

The gradation of the material shall meet the following grading requirements:

<u>Sieve Designation</u>	<u>Percent by Weight Passing Square Mesh Sieves</u>
3-1/2 inch	100
3 inch	85-100
1-1/2 inch	60-90
3/4 inch	40-70
No. 4	15-40
No. 200	0-5 (in Total Sample)

- B. Aggregate Subbase: Shall be bank run gravel (NHDOT Item #304.2, Gravel) consisting of hard durable particles which are free from vegetable matter, lumps or balls of clay and other deleterious substances. 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. The gradation of the material shall meet the grading requirements of the following table:

<u>Sieve Designation</u>	<u>Percentage by Weight Passing Square Mesh Sieves</u>
6 inch	100
No. 4	25-70
No. 200	0-12 (fraction passing No. 4 sieve)

- D. Common Borrow: Shall consist of approved material required for the construction of the work where designated. Common borrow shall be free from frozen material, perishable rubbish, peat, organic, and other unsuitable material. Where used as pipe bedding and initial pipe backfill, maximum rock size shall be 1 inch.

<u>Sieve Designation</u>	<u>Percentage by Weight Passing Square Mesh Sieves</u>
6 inch	100
No. 200	0-5
No. 200*	0-20

\* Only allowable where used as trench fill along HDPE pipe.

- G. Select Fill: Shall consist of well graded granular material free of organic material, loam, wood, trash, snow, ice, frozen soil and other objectionable material and having no rocks with a maximum dimension of over 4 inches and meeting the

following gradation requirements, except where it is used for pipe bedding in which case the maximum size shall be 2 inches.

<u>Sieve Designation</u>	<u>Percent by Weight Passing Square Mesh Sieve</u>
4 inch	100
3 inch	90-100
½ inch	25-90
No. 40	0-30
No. 200	0-5

- H. Sand (base material): Shall be well graded durable material free of organic matter and conform to the following gradation requirements (NHDOT Item No. 304.1, Sand):

<u>Sieve Designation</u>	<u>Percent by Weight Passing Square Mesh Sieve</u>
6 inch	100
No. 4	95-100
No.200	0-5

- I. Sand (concrete aggregate): Sand for use as concrete aggregate shall conform to the requirement for fine aggregate in ASTM Standard Specifications for Concrete Aggregate, Designation C33, and will meet the following requirements:

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

**J. Crushed Stone Leveling Base Material:** Furnish, install, compact and fine grade (0 to – ½”) all necessary imported leveling base material. This item includes providing a minimum 6-inch layer of leveling base material under the tank floor, footing, and pipe its beneath the floor (refer drawing C1). A non-woven geotextile fabric Mirafi 1100N or equal shall be placed between the subgrade and the leveling base material. The leveling base material shall consist of a well-graded crushed stone and shall meet the specification indicated below. If crushed stone is used for the leveling base material, compaction performance criteria shall be used to gauge the degree of compaction. Crushed stone shall be placed in layers not exceeding 9 inches and compacted with at least two passes in each direction with vibratory compaction equipment. Compaction shall be inspected and verification of compaction effort shall be documented by an approved testing laboratory. All work shall be in accordance with the Geotechnical

Engineer's requirements. The surface elevation of the leveling base shall be fine graded to a tolerance of plus 0 inches to minus 1/2 inch over the entire foundation area. Fine grading tolerances for floor pipe encasements shall be plus 0 inches to minus 6 inches. The Geotechnical Engineer shall evaluate the tank subgrade prior to the placement of the leveling base material. The General / Site Contractor shall coordinate the excavation of the pipe pits with the tank contractor.

The crushed stone material shall consist of clean, hard, durable, crushed particles or fragments of stone or ledge rock of uniform quality reasonably free of thin or elongated pieces. The materials shall be free from ice, snow, rubbish, sods, roots and other deleterious or organic materials and shall conform to the following gradation requirements meeting ASTM C 33 stone size No. 67.

Sieve Size	Percent Passing By Weight
1 inch	100%
3/4 inch	90% - 100%
3/8 inch	20% - 55%
No. 4	0% - 10%
No. 8	0% - 5%

responsible for subgrade inspection or handling of unsuitable if encountered. Additional excavation and/or structural fill is required beyond the tank foundation for a 12-foot wide all-weather level wire winding track around the perimeter of the tank, with a finish grade of approximately 932.50 (6-inches below the finish floor elevation of 933.00). The all weather, level track shall be stable and sloped away from the tank for drainage. Additional work will be required to complete the track after the tank floor is poured and the forms are stripped. Perform the excavation and preparation of the precast areas, crane positions, and work road/area as shown on drawing C2. Provide all weather gravel access roads and access ramps to the tank for concrete trucks, crane and other heavy construction equipment.

All work shall comply with all OSHA Safety Requirements and all OSHA Excavation Requirements per 29 CFR 1926. The Contractor shall be responsible for maintaining, protecting and repairing the integrity of the slopes for the duration of the project. All work shall be in accordance and comply with all Local, State, and Federal Regulations.

**K .Preparation of Winding Track, Access Ramp, Work Areas and Crane Areas:** Furnish, install, compact, grade and maintain (through the duration of tank construction) suitable granular all-weather access for heavy equipment to the job site and adequate working and storage areas for our materials and equipment. It is essential that the roadways, track and work road/areas shall be stable and passable at all times under all weather conditions. The track, crane positions, ramp, and work road areas shall consist

of a minimum 6-inch layer of granular all-weather road base material over geotextile filter fabric Mirafi 500X or equal as shown on the drawing C1. Additional grading will be required to complete the winding track after the tank floor is poured and the forms are stripped. All work shall be in accordance and comply with all local, state, and Federal regulations. The precasting areas shall only have the native soil rolled to a hard level surface.

**L. Preparation of the Tank Underslab Piping Pits:** The Contractor shall provide all required excavation beneath the tank for the underslab piping pits (6-inch inlet and 6-inch outlet) and coordinate this excavation with the tank contractor. The piping pits shall be excavated with 1H:1V slopes on three sides with a +/- 6-inches tolerance. The pipe pits beneath the floor shall be in accordance with the Tank Contractors' approved shop drawings. Over excavation resulting in increased quantity of concrete shall be the Contractor's responsibility.

2.2 CONCRETE

- A. If concrete is required for excess excavation, provide 3,000 psi concrete.
- B. Flowable fill used to fill abandoned pipes shall comply with the requirements of Section 02225.

2.3 FILTER FABRIC

- A. Shall be geotextile filter fabric Mirafi 500X or equivalent, refer to Section 02260.

PART 3 – EXECUTION

3.1 INSPECTION

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

3.2 EXCAVATION

- A. General:
  - 1. Excavation consists of removal and disposal of all material encountered when establishing line and grade elevations required for execution of the work.
  - 2. The Contractor shall make excavations in such manner and to such widths as will give suitable room for building the structures or lying and jointing the piping; shall furnish and place all sheeting, bracing, and supports; shall do all cofferdamming, pumping, and draining; and shall render the bottom of the excavations firm, dry and acceptable in all respects.
  - 3. All excavation shall be classified as either earth or ledge.
    - a) Earth Excavation shall consist of the removal, hauling and disposal of all earth materials encountered during excavation including but not limited to native soil or fill, pavement (bituminous or concrete), existing sewers and manholes, ashes, loam, clay, swamp muck, debris, soft or disintegrated rock

or hard pan which can be removed with a backhoe, or a combination of such materials, and boulders measuring less than one cubic yard.

- b) Ledge Excavation: Shall consist of the removal, hauling, and disposal of all ledge or rock encountered during excavation. "Ledge" and "rock" shall be defined as any natural compound, natural mixture that in the opinion of the Engineer can be removed from its existing position and state only by drilling and blasting, wedging, sledging, boring or breaking up with power operated tools. No boulder, ledge, slab, or other single piece of excavated material less than two cubic yards in total volume shall be considered to be rock unless, in the opinion of the Engineer it must be removed from its existing position by one of the methods mentioned above.
4. The Contractor shall not have any right of property in any materials taken from any excavation. Do not remove any such materials from the construction site without the approval of the Engineer. This provision shall in no way relieve the Contractor of his obligations to remove and dispose of any material determined by the Engineer to be unsuitable for backfilling. The Contractor shall dispose of unsuitable and excess material in accordance with the applicable sections of the Contract Documents.
- B. Additional Excavation: When excavation has reached required subgrade elevations, notify the Engineer and Resident Project Representative who will observe the conditions.
1. If material unsuitable for the structure, gravel road or pipeline (in the opinion of the Engineer) is found at or below the grade to which excavation would normally be carried in accordance with the Drawings and/or Specifications, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted select fill, screened stone, crushed stone, or concrete as directed by the Engineer.
  2. All excavated materials designated by the Engineer as unsuitable shall become the property of the Contractor and disposed of at locations in accordance with all State and local laws and the provisions of the Contract Documents.
- C. Unauthorized Excavation: Shall consist of removal of materials beyond indicated subgrade elevations or dimensions without specific authorization of Engineer. Unauthorized excavation, as well as remedial work required by the Engineer shall be at the Contractor's expense. Remedial work required is as follows:
1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation with select fill or screened stone compacted to 95%. Provide 12" minimum select fill or screened stone directly under footings. Concrete fill may be used to bring elevations to proper position, when acceptable to Engineer.
  2. If the bottom of a trench is excavated beyond the limits indicated, backfill the resulting void with thoroughly compacted screened stone, unless otherwise indicated.
  3. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Engineer.
- D. Structural Excavation:



1. Shall consist of the removal, hauling, disposal, of all material encountered in the excavation to permit proper installation of structures.
  2. Excavations for structures shall be carried to the lines and subgrades shown on the Drawings.
  3. Excavate areas large enough to provide suitable room for building the structures.
  4. The extent of open excavation shall be controlled by prevailing conditions subject to any limits designated by the Engineer.
  5. Provide, install, and maintain sheeting and bracing as necessary to support the sides of the excavation and to prevent any movement of earth which could diminish the width of the excavation or otherwise injure the work, adjacent structures, or persons and property in accordance with all state and OSHA safety standards.
  6. Erect suitable fences around structure excavation and other dangerous locations created by the work, at no additional cost to the Owner.
  7. Exposed subgrade surfaces shall remain undisturbed, protected, and maintained as uniform, plane areas and shape to receive the foundation components of the structure.
    - a. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10', and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.
    - b. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade and trim bottoms to required lines and grades to leave solid base to receive the structure.
    - c. If a structure is to be constructed within the embankment, the fill shall first be brought to a minimum of 3 feet above the base of the footing. A suitable excavation shall then be made as though the fill were undisturbed earth.
- E. Trench Excavation: Shall consist of removal, hauling and disposal of all material encountered in the excavation to the widths and depths shown on the Drawings to permit proper installation of underground utilities.
1. Excavate trenches to the uniform width shown on the Drawings sufficiently wide to provide sufficient space for installation, backfilling, and compaction. Every effort should be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed and consolidated.
  2. Trenches shall be excavated with approximately vertical sides between the elevation of the center of the pipe and an elevation one foot above the top of the pipe.
  3. Grade bottoms of trenches as indicated for pipe and bedding to establish the indicated slopes and invert elevations, notching under pipe joints to provide solid bearing for the entire body of the pipe, where applicable.
  4. If pipe is to be laid in embankments or other recently filled material, the material shall first be placed to the top of the fill or to a height of at least two feet above the top of the pipe, whichever is the lesser. Particular care shall be taken to

ensure maximum consolidation of material under the pipe location. The pipe trench shall be excavated as though in undisturbed material.

5. Unless otherwise specifically directed or permitted by the Engineer, begin excavation at the low end of sewer and storm lines and proceed upgrade.
  6. Perform excavation for force mains and water mains in a logical sequence.
  7. The extent of open excavation shall be controlled by prevailing conditions subject to any limits prescribed by the Engineer.
  8. As the excavation progresses, install such shoring and bracing necessary to prevent caving and sliding and to meet the requirements of the state and OSHA safety standards, as outlined in the appropriate section of this Specification.
- F. Protection of Persons, Property and Utilities:
1. Barricade open excavations occurring as part of this work and post with warning lights in compliance with local and State regulations.
  2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations. Exercise extreme caution and utilize sheeting, bracing, and whatever other precautionary measures that may be required.
  3. Rules and regulations governing the respective utilities shall be observed in execution of all work. Active utilities and structures shall be adequately protected from damage, and removed or relocated only as indicated or specified. Inactive and abandoned utilities encountered in excavation and grading operations shall be removed, plugged or capped only with written authorization of the utility owner. Report in writing to the Engineer, the locations of such abandoned utilities. Extreme care shall be taken when performing work in the vicinity of existing utility lines, utilizing hand excavation in such areas, as far as practicable.
  4. Repair, or have repaired, all damage to existing utilities, structures, lawns, other public and private property which results from construction operations, at no additional expense to the Owner, to the complete satisfaction of the Engineer, the utility, the property owner, and the Owner.
- G. Use of Explosives:
1. Do not bring explosives onto site or use in work without prior written permission from authorities having jurisdiction. Contractor is solely responsible for handling, storage, and use of explosive materials when their use is permitted.
  2. All blasting shall be performed in accordance with all pertinent provisions of the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc.
- H. Stability of Excavations:
1. Slope sides of excavations to comply with all codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
  2. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.
- I. Shoring and Bracing:

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

J. Material Storage:

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

K. Dewatering:

1. To ensure proper conditions at all times during construction, the Contractor shall provide and maintain ample means and devices (including spare units kept ready for immediate use in case of breakdowns) with which to intercept and/or remove promptly and dispose properly of all water entering trenches and other excavations (including surface and subsurface waters).
2. Excavations shall be kept dry until the structures, pipes, and appurtenances to be built therein have been completed to such extent that they will not be floated or otherwise damaged. Refer to Specification Section 02401.

L. Cold Weather Protection:

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

M. Separation of Surface Material:

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

N. Dust Control:

1. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and sprinkling of streets as necessary, so as to minimize the creation and dispersion of dust. Refer to Specification Section 01562.

2. If the Engineer decides that it is necessary to use calcium chloride for more effective dust control, the contractor shall furnish and spread the material, as directed.

### 3.3 BACKFILL AND FILL

#### A. General:

1. Backfilling shall consist of replacing material removed to permit installation of structures or utilities, as indicated in the Contract Documents.
2. Filling shall consist of placing material in areas to bring them up to grades indicated on the Drawings.
3. The Contractor shall provide and place all necessary backfill and fill material, in layers to the required grade elevations.
4. Backfill excavations as promptly as work permits, but not until completion of the following:
  - a. Acceptance by Engineer of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
  - b. Inspection, approval, and recording locations of underground utilities.
  - c. Removal of concrete formwork.
  - d. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Temporary sheet piling driven below bottom of structures shall be removed in manner to prevent settlement of the structure or utilities, or cut off and left in place if required.
  - e. Removal of trash and debris.
  - f. Permanent or temporary horizontal bracing is in place on horizontally supported walls.
  - g. Density testing having results meeting requirements specified herein.
5. In general, and unless otherwise indicated, material used for backfill of trenches and excavations around structures shall be suitable excavated material which was removed in the course of making the construction excavation. Unless otherwise specified or allowed by the Engineer the backfill and fill shall be placed in layers not to exceed 8 inches in thickness.
6. All fill and backfill under structures and pavement, and adjacent to structures, shall be compacted crushed stone or select fill as specified or as indicated on the Drawings. The fill and backfill materials shall be placed in layers not exceeding 8 inches in thickness.
7. All structures (including manholes) shall be placed on a 6-inch mat of screened stone unless otherwise indicated.
8. Suitable excavated material shall meet the following requirements:
  - a. Free from large clods, silt lumps or balls of clay.
  - b. Free from stones and rock fragments with larger than 12 inch max. dimension.
  - c. Free from organics, peat, etc.
  - d. Free from frozen material.
9. If sufficient suitable excavated material is not available from the excavations, and where indicated on the Drawings, the backfill material shall be select fill or

common borrow, unless otherwise indicated, as required and as directed by the Engineer.

10. Do not backfill with, or on, frozen materials.
  11. Remove or otherwise treat as necessary, previously placed material that has frozen prior to placing backfill.
  12. Do not mechanically or hand compact material that is, in the opinion of the Engineer, too wet.
  13. Do not continue backfilling until the previously placed and new materials have dried sufficiently to permit proper compaction.
  14. The nature of the backfill materials will govern the methods best suited for their placement and compaction. Compaction methods and required percent compaction is covered in Compaction section.
  15. Before compaction, moisten or aerate each layer as necessary to provide a water content necessary to meet the required percentage of maximum dry density for each area classification specified.
  16. Do not allow large masses of backfill material to be dropped into the excavation in such a manner that may damage pipes and structures.
  17. Place material in a manner that will prevent stones and lumps from becoming nested.
  18. Completely fill all voids between stones with fine material.
  19. Do not place backfill on or against new concrete until it has attained sufficient strength to support loads without distortion, cracking, and other damage.
  20. Deposit backfill and fill material evenly on all sides of structures to avoid unequal soil pressures.
  21. Keep stones or rock fragments with a dimension greater than two inches at least one foot away from the pipe or structure during backfilling.
  22. Leave sheeting in place when damage is likely to result from its withdrawal.
  23. Completely fill voids left by the removal of sheeting with screened stone which is compacted thoroughly.
- B. Pipe Bedding, Initial Backfill and Trench Backfill
1. Place bedding and backfill in layers of uniform thickness specified herein, and as shown on the Drawings.
  2. Thoroughly compact each layer by means of a suitable vibrator or mechanical tamper.
  3. Install pipe bedding and initial backfill in layers of uniform thickness not greater than eight (8) inches.
  4. Deposit the remainder of the backfill in uniform layers not greater than eight inches.
  5. Provide underground sewer marking tape for the full length of sewer trenches as shown on the Drawings. Marking tape shall be SETON (Branford, CT), 3" wide tape, Style No. 85513, or approved equivalent.
  6. Where soft silt and clay soils are encountered the trench shall be excavated six inches below the normal bedding and backfilled with 6-inches of compacted sand.
  7. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and which are carried below the bottom of such

footings, or which pass under wall footings. Place concrete to the level of the bottom of adjacent footings.

8. The following schedule gives the bedding requirements for various types of pipe. Distances refer to vertical thickness below the pipe.

#### BEDDING REQUIREMENTS

DI or Concrete Pipe	6 inches min. screened stone or select fill.
---------------------	--

PVC Pipe	6 inches min. screened stone.
----------	-------------------------------

HDPE Pipe used for Effluent Transmission Line	6 inches min. common borrow.
---	------------------------------

Other HDPE Pipe	6 inches min. screened stone.
-----------------	-------------------------------

9. The following schedule gives the initial backfill requirements for various types of pipes.

#### INITIAL BACKFILL REQUIREMENTS

DI or Concrete, Pipe	Screened stone or select fill 6 inches min. over top of pipe.
----------------------	---

PVC Pipe	6 inches min. screened stone over the top of the pipe.
----------	--

HDPE Pipe used for Effluent Transmission Line	6 inches min. common borrow over top of pipe.
---	---

Other PE Pipe	6 inches min. screened stone over the top of the pipe.
---------------	--

10. Special bedding and backfill requirements shown on the Drawings supersede requirements of this section.
  11. Where pipes or structures pass through or under the impervious core of the basin embankments, bedding and backfill material shall consist of the impervious embankment material. Extra care should be given to properly and thoroughly compact the bedding material around the pipe.
- C. Placing and Compacting Impervious Dam Material:
1. The impervious dam material will be rolled and tamped by mechanical or hand means.
  2. Material shall be placed in lifts not greater than six inches.
- D. Improper Backfill:

1. When excavation and trenches have been improperly backfilled, and when settlement occurs, reopen the excavation to the depth required, as directed by the Engineer.
  2. Refill and compact the excavation or trench with suitable material and restore the surface to the required grade and condition.
  3. Excavation, backfilling, and compacting work performed to correct improper backfilling shall be performed at no additional cost to the Owner.
- E. Ground Surface Preparation:
1. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, scarify or break-up sloped surface steeper than 1 vertical to 4 horizontal.
  2. When existing ground surface has a density less than that specified under "compaction" for the particular area classification, break up the ground surface, pulverize, moisture-condition to the optimum moisture content, and compact to required depth and percentage of maximum density.

### 3.4 COMPACTION:

#### A. General:

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

#### B. Percentage of Maximum Density Requirements:

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

#### C. Moisture Control:

1. Where subgrade or a layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, in quantities controlled to prevent free water appearing on surface during or subsequent to compaction operations.
2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

3. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory level.
- D. Embankment Compaction:
1. After each embankment layer has been spread to the required maximum 8-inch thickness and its moisture content has been adjusted as necessary, it shall be rolled with a sufficient number of passes to obtain the required compaction. One pass is defined as the required number of successive trips which by means of sufficient overlap will insure complete coverage and uniform compaction of an entire lift. Additional passes shall not be made until the previous pass has been completed.
  2. When any section of an embankment sinks or weaves excessively under the roller or under hauling units and other equipment, it will be evident that the required degree of compaction is not being obtained and that a reduction in the moisture content is required. If at any place or time such sinking and weaving produces surface cracks which, in the judgment of the Engineer are of such character, amount, or extent to indicate an unfavorable condition, he will recommend operations on that part of the embankment to be suspended until such time as it shall have become sufficiently stabilized. The ideal condition of the embankment is that attained when the entire embankment below the surface being rolled is so firm and hard as to show only the slightest weaving and deflection as the roller passes.
  3. If the moisture content is insufficient to obtain the required compaction, the rolling shall not proceed except with the written approval of the Engineer, and in that event, additional rolling shall be done to obtain the required compaction. If the moisture content is greater than the limit specified, the material of such water content may be removed and stockpiled for later use or the rolling shall be delayed until such time as the material has dried sufficiently so that the moisture content is within the specified limits. No adjustment in price will be made on account of any operation of the Contractor in removing and stockpiling, or in drying the materials or on account of delays occasioned thereby.
  4. If because of insufficient overlap, too much or too little water, or other cause attributable to defective work, the compaction obtained over any area is less than that required, the condition shall be remedied, and if additional rollings are ordered, they will be done at no cost to the Owner. If the material itself is unsatisfactory or if additional rolling or other means fails to produce satisfactory results, the area in question shall be removed down to material of satisfactory density and the removal, replacement, and re-rolling shall be done by the Contractor, without additional compensation.
  5. Material compaction by hand-operated equipment or power-driven tampers shall be spread in layers not more than 6 inches thick. The degree of compaction obtained by these tamping operations shall be equal in every respect to that secured by the rolling operation.
- E. Compaction Methods: The Contractor may select any method of compaction that is suitable to compact the material to the required density.



1. General: Whatever method of compacting backfill is used, care shall be taken that stones and lumps shall not become nested and that all voids between stones shall be completely filled with fine material. All voids left by the removal of sheeting shall be completely backfilled with suitable materials and thoroughly compacted.
  2. Tamping or Rolling: If the material is to be compacted by tamping or rolling, the material shall be deposited and spread in uniform, parallel layers not exceeding the uncompacted thicknesses specified. Before the next layer is placed, each layer shall be tamped as required so as to obtain a thoroughly compacted mass. Care shall be taken that the material close to the excavation side slopes, as well as in all other portions of the fill area, is thoroughly compacted. When the excavation width and the depth to which backfill has been placed are sufficient to make it feasible, and it can be done effectively and without damage to the pipe or structure, backfill may, on approval, be compacted by the use of suitable rollers, tractors, or similar powered equipment instead of by tamping. For compaction by tamping or rolling, the rate at which backfilling material is deposited shall not exceed that permitted by the facilities for its spreading, leveling, and compacting as furnished by the Contractor.
- F. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

3.5 GRADING:

A. General:

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

B. Grading Outside Building Lines:

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

C. Grading Surface of Fill Under Building Slabs:

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

D. Compaction:

1. After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.
- E. Protection of Graded Areas:
  1. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
  2. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

### 3.6 BASE COURSE AND LEVELING COURSE

- A. General:
  1. Base course consists of placing the specified materials in layers to support a leveling course, as indicated in the Drawings.
- B. Grade Control:
  1. During construction, maintain lines and grades including crown and cross-slope of base course and leveling course.
- C. Placing:
  1. Place base course on prepared subbase conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting base materials.
  2. Place leveling course on prepared base course, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compaction.
- D. Shaping and Compacting:
  1. All layers of aggregate base course and leveling course shall be compacted to the required density immediately after placing. As soon as the compaction of any layer has been completed, the next layer shall be placed.
  2. The Contractor shall bear full responsibility for and make all necessary repairs to the base leveling courses and the subgrade until the full depth of the base leveling courses is placed and compacted. Repairs shall be made at no additional cost to the Owner.
  3. If the top of any layer of the aggregate base or leveling course becomes contaminated by degradation of the aggregate or addition of foreign materials, the contaminated material shall be removed and replaced with the specified material at the Contractor's expense.

END OF SECTION

SECTION 02260

FILTER FABRIC

PART I – GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Furnish all materials and install filter fabric of the types, dimensions and in the location(s) shown on the Drawings and specified herein.

B. Related Work Specified Elsewhere:

1. Specification 02270 Temporary Erosion Control

1.2 QUALITY ASSURANCE

A. A competent laboratory must be maintained by the manufacturer of the fabric at the point of manufacture to insure quality control.

B. During all periods of shipment and storage, the fabric shall be wrapped in a heavy duty protective covering to protect the fabric from direct sunlight, ultraviolet rays, temperatures greater than 140°F, mud, dirt, dust and debris.

1.3 SUBMITTALS

A. Manufacturer shall furnish certified test reports with each shipment of material attesting that the fabric meets the requirements of this Specification.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Filter fabric for use in stabilization, drainage, underdrains, erosion control, landscaping and beneath structures shall be formed in widths of not less than six (6) feet and shall meet the requirements of Table 1. Both woven and non-woven geotextiles are acceptable; however no "slit-tape" woven fabrics will be permitted for drainage, underdrain, and erosion control applications.

Table 1

<u>Geotextile Mechanical Property</u>	<u>Test Method</u>	<u>Minimum Permissible Value</u>
Grab Tensile Strength (both directions)	ASTM D4595-86	120 pounds
Grab Elongation	ASTM D4632-86	50 percent

Mullen Burst Strength	ASTM D3786-87	210 psi
Puncture Strength	ASTM D3787	60 pounds
Trapezoid Tear Strength	ASTM D4533-85	50 pounds
Water Flow Rate	ASTM D4491-85	120 gal/min/sf
Equivalent Opening Size (EOS)	ASTM 114751	80
Coefficient of Permeability	ASTM D4491-85	0.2 cm/sec

The geotextile shall have property values expressed in "typical" values that meet or exceed the values stated above as determined by the most recent test methods specified above.

- B. Filter fabric for use in reinforcement and under riprap shall meet the requirements of Table 2. Woven and non-woven geotextiles are acceptable.

Table 2

<u>Geotextile Mechanical Property</u>	<u>Test Method</u>	<u>Minimum Permissible Value</u>
Grab Tensile Strength (both directions)	ASTM 4595-86	195 pounds
Grab Elongation	ASTM D4632-86	20 percent
Mullen Burst Strength	ASTM D3786-87	340 psi
Puncture Strength	ASTM D3787	85 pounds
Trapezoid Tear Strength	ASTM D4533-85	85 pounds
Equivalent Opening Size (EOS)	ASTM D4751	U.S. Std. Sieve number(s) between #20 and #100

The geotextile shall meet or exceed the "typical" values stated above as determined by the most recent test methods specified above.

**C. Filter Fabric for use in siltation fencing shall be the following:**

1. Environfence 100X (Mirafi)
2. Supac 4NP (Phillip 66)
3. Exxon 180 Siltfence
4. Amoco 1380 Silt Stop
5. Hams Siltfence
6. Or equivalent

**D. Filter Fabric under Winding Track, Access Ramp, Work Areas and Crane Areas:**

1. **Mirafi 500X**
2. Or Equivalent

**PART 3 – EXECUTION**

- 3.1 Install filter fabric as shown on the drawings or as directed in appropriate specifications in this division or in accordance with manufacturer's instructions or as directed by the Engineer.

**END OF SECTION**

SECTION 02270TEMPORARY EROSION CONTROLPART 1 – GENERAL1.1 DESCRIPTION

## A. Work Included:

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

## B. Related Work Specified Elsewhere:

1. Site work, loaming and seeding, and mulching is specified in appropriate sections of this Division.

## C. Design Criteria:

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

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

- A. All materials and methods of erosion control shall meet the guidelines established by the "New Hampshire Stormwater Manual" prepared by the New Hampshire Department of Environmental Services, dated December 2008 or latest revision.

## PART 2 – PRODUCTS

### 2.1 MATERIALS

#### A. Baled Hay:

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

#### B. Sand Bags:

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

#### C. Mulches:

1. Loose hay, straw, peat moss, wood chips, bark mulch, crushed stone, wood excelsior, or wood fiber cellulose.
2. Type and use shall be as specified in the "New Hampshire Stormwater Management Manual, December 2008 (NHSM)" prepared by the NHDES and Comprehensive Environmental Inc.

#### D. Mats and Nettings:

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

#### E. Permanent Seed:

1. Conservation mix appropriate to the predominant soil conditions as specified in the NHSM and subject to approval by the Engineer.

#### F. Temporary Seeding:

1. Use species appropriate for soil conditions and season as specified in the NHSM and subject to approval by the Engineer.

#### H. Water:

1. The Contractor shall provide water and equipment to mitigate fugitive dust, as directed by the Engineer.

#### I. Filter Fabrics:

1. Filter fabric shall be of one of the commercially available brands such as Mirafi, Typar or equivalent. Fabric types for particular applications shall be approved by the Engineer prior to installation.

### 2.2 CONSTRUCTION REQUIREMENTS

#### A. Temporary Erosion Checks:

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

#### B. Temporary Berms:

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

C. Temporary Seeding:

Areas where soil surfaces will not be final graded within 45 days from initial disturbance shall be temporarily seeded in accordance with Table 4-2 and 4-3 of Section 3 in the NHSM (see below).

Temporary Vegetation (Table 4-1):

<u>Dates</u>	<u>Seed</u>	<u>Rate</u>
Prior to May 15	Oats	80 lbs/acre
Aug. 15 - Sep. 15	Annual Rye Grass	40 lbs/acre
Aug. 15 - Sep. 15	Winter Rye Grass	112 lbs/acre
Apr. 1 - Jun. 1 (Aug. 15 - Sep. 15)	Perennial Rye Grass	40 lbs/acre

D. Siltation fences shall consist of porous filter fabric with a wire mesh backing and shall be supported by posts as per manufacturer's recommendations. Fabric shall be approved by the Engineer.

E. Mulch All Areas Receiving Seeding:

Use either wood cellulose fiber mulch; or straw mulch with chemical tack (as per manufacturer's specifications). Wetting for small areas may be permitted. Biodegradable netting is recommended in areas to be exposed to drainage flow.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Temporary Erosion Checks:

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

B. Maintenance:

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

C. Removing and Disposing of Materials:

1. When no longer needed, material and devices for temporary erosion control shall be removed and disposed of as approved by the Engineer.



2. When removed, such devices may be reused in other locations provided they are in good condition and suitable to perform the erosion control for which they are intended.
3. When dispersed over adjacent areas, the material shall be scattered to the extent that it causes no unsightly conditions nor creates future maintenance problems.

END OF SECTION

SECTION 02401DEWATERINGPART 1 – GENERAL1.1 DESCRIPTION

## A. Work Included:

1. Furnish, operate and maintain, as incidental to the project, dewatering equipment for the control, collection and disposal of ground and surface water where necessary to complete the work.

## B. Related Work Specified Elsewhere: (When Applicable)

1. Earthwork and Sheet piling are specified in the appropriate section in this division.

1.2 SUBMITTALS

## A. Provide submittals in accordance with Specification Section 01340.

- B. Submit design calculations, description and complete layout drawings of the proposed dewatering system, stamped and sealed by a Professional Engineer registered in the State of New Hampshire. Such review shall not relieve the Contractor of sole responsibility for the dewatering system as necessary to prevent damage to adjacent structures, utilities, streets adjacent to excavations and for the safety of persons working within the excavated areas.

PART 2 – PRODUCTS

Not Applicable.

PART 3 – EXECUTION3.1 PERFORMANCE

## A. General:

1. Keep work areas dewatered until the structures, pipes, and appurtenances to be built there have been completed to such an extent that they will not be damaged by water.
2. Thoroughly brace or otherwise protect against flotation all pipelines and structures which are not stable.
3. Maintain standby backup equipment and power supply throughout the duration of the dewatering operation.
4. Prevent soil particles from entering the discharge points.
5. Ground water level shall be maintained at least one foot below the bottom of the excavation.

## B. Disposal of Water:

1. Dispose of water pumped or drained from the construction site in a suitable manner to avoid siltation of adjacent drainage structures and piping, wetlands

or water bodies, injury to public health, damage to public and private property, and damage to the work completed or in progress.

2. Provide suitable temporary channels for water that may flow along or across the construction site.
3. Provide treatment as necessary to prevent discharge of contaminated ground water caused by Contractor's operations, or any contaminated ground water that may pass through the excavation support system selected by the Contractor.
4. Contractor must obtain all necessary regulatory approvals for the disposal of dewatering flows. These may include, among others, approval by the USEPA and the New Hampshire Department of Environmental Services under the National Pollutant Discharge Elimination System (NPDES) program for construction activities.

C. Damage:

1. Avoid damage to adjacent buildings, roads, structures, utilities and other facilities.
2. Any damage resulting from the dewatering operations, or the failure of the Contractor to maintain the work in a suitably dry condition shall be repaired by the Contractor at no additional cost to the Owner.

D. Temporary Underdrains:

1. When necessary, temporary underdrains may be placed in excavations.
2. Underdrain pipe shall be perforated corrugated metal, polyethylene or P.V.C. pipe.
3. Entirely surround the underdrain and fill the space between the underdrain and the pipe or structure with free draining material.

E. Excavation Sump Pumping:

1. When necessary and where appropriate to the geotechnical conditions encountered, excavations may be over excavated 6 to 12 inches and filled with screened stone to allow sump pumping of groundwater.
2. The system shall be installed with suitable screens and filters so that pumping of fines does not occur.

F. Well and Wellpoint System:

1. If necessary, dewater the excavations and trenches with an efficient well or wellpoint system to drain the soil and prevent saturated soil from flowing into the excavated wells and area.
2. Wellpoint and well system shall be of the type designed for dewatering work and shall be installed with suitable screens and filters so that pumping of fines does not occur.
3. Pumping units shall be capable of maintaining sufficient suction to handle large volumes of air and water at the same time.

END OF SECTION

SECTION 02441MULCHPART I – GENERAL1.1 DESCRIPTION

## A. Work Included:

1. Furnish all labor, materials, equipment and transportation required to furnish and spread mulch of the types and in the quantities indicated on the plans and as specified under this item.
2. Apply mulch prior to a storm event. This is applicable in extremely sensitive areas such as within 100 feet of lakes, ponds, rivers, streams, and wetlands.
3. Mulching should be completed within the following specified time periods from original soil exposure:
  - A. Within 100 feet of rivers and streams, wetlands, and in lake and pond watersheds, the time period should be no greater than 7 days. This 7-day limit should be reduced further during we weather periods.
  - B. In other areas, the time period can range from 14 to 30 days, the length of time varying with site conditions (soil erodibility, season of year, extent of disturbance, proximity to sensitive resources) and the potential impact of erosion on adjacent areas. Other state or local restrictions may also apply.

PART 2 – PRODUCTS2.1 MATERIALS

## A. Hay or Straw Mulch:

1. Shall consist of long fibered hay or straw, reasonably free of noxious weeds and other desirable material.
2. No material shall be used which is so wet, decayed or compacted as to inhibit even and uniform spreading. No chopped hay, grass clippings or other short fibered material shall be used unless directed by the Engineer.

## B. Cellulose Fiber Mulch:

1. Shall consist of elongated virgin wood fibers capable of producing a strong yellow-brown reaction with Graff C stain for the presence of lignin in accordance with Tappi test T401 OS-74. The ash content shall not exceed 2.0%.
2. The material shall be non-toxic to plants and animals on contact and shall contain a green color sufficient to provide a definite contrast with the ground surface.
3. It shall be supplied ill uniform packages not exceeding 100 pounds each and marked to show the air dried weight for tank mixing purposes.

- C. Wood Chips:
  - 1. Shall be obtained from green wood and shall average 1/8 inch in thickness with 50 percent having an area of not less than 1 square inch nor more than 8 square inches.
  - 2. Not more than a total of 2 percent by volume shall consist of sawdust, shavings and leaves.
  - 3. The mulch shall contain no foreign material injurious to plant growth.
  - 4. Wood chips made from badly weather or decayed material will not be accepted.
  - 5. Wood chips which have been stored long enough to become decayed will not be accepted unless approved by Engineer.
- D. Bark Mulch:
  - 1. Shall consist of soft wood bark fragments of such size and texture as to successfully resist washing or blowing under normal conditions, but capable of being easily and uniformly spread around the plants.
  - 2. No large peel strips and decayed material will be permitted.
- E. Stone Mulch:
  - 1. Shall be clean native stone, except limestone, consisting of stone particles passing a 3/4 inch screen, but retained on a 1/4 inch screen.
  - 2. This material shall be free from dust, dirt or other foreign matter.
- F. Mulch Binder:
  - 1. Shall be emulsified asphalt of a type and trade acceptable to the Engineer.
  - 2. May be diluted with water to ensure even distribution.

### PART 3 – EXECUTION

#### 3.1 INSTALLATION

- A. Hay or Straw Mulch:
  - 4. Shall be spread evenly and uniformly over the designated areas.
  - 5. Unless otherwise directed by the Engineer, hay or straw mulch shall be applied at the rate of one and a half to two tons (1.5 to 2 tons) per acre to cover 75 to 90% of the ground surface.
  - 6. Unless otherwise authorized, the mulch shall be anchored in place by uniformly applying an approved mulch binder.
    - C. Netting: Install jute, wood fiber, or biodegradable plastic netting over hay or straw to anchor I to the soil surface. Install netting material according to manufacturer's recommendation. Netting should be used judiciously, as wildlife can become entangled in the materials.
    - D. Tackifier: Apply polymer or organic tackifier to anchor hay or straw mulch. Application rates vary by manufacturer (typically 40-60 lbs/acre for polymer material, and 80-120 lbs/acre for organic material). Liquid mulch binders are also typically applied heavier at edges, in valleys, and at crests than other areas.
  - 7. When mulch is applied to provide protection over winter (past growing season), it should be applied to a depth of four inches (3 to 4 tons per acre, or

double standard application rate). If vegetation is desired, the mulch will need to be removed in the springtime and the area seeded and re-mulched.

8.

B. Cellulose Fiber Mulch:

1. Shall be applied as water-borne slurry.
2. Shall be applied at a rate of not less than 60 pounds of mulch material per 1000 square foot unit of area.

C. Wood Chip or Bark Mulch:

1. Shall be placed to cover the slope with a three to six inch deep blanket unless otherwise directed.
2. Wood Chips or ground bark should be applied at a rate of 10 to 20 tons per acre or 460 to 920 pounds per 1,000 square feet.

D. Stone Mulch:

1. Shall be placed as shown on the Drawings or directed by the Engineer.

END OF SECTION

SECTION 02485LOAMING & SEEDINGPART 1 – GENERAL1.1 DESCRIPTION

- A. Work Included: Furnish, place, and test topsoil, seed, lime, and fertilizer where shown on the drawings and protect and maintain seeded areas disturbed by construction work, as directed by the Engineer.
- B. Related Work Specified Elsewhere (When Applicable): Earthwork, excavation, backfill, compaction, site grading, landscaping and temporary erosion control is specified in the appropriate Sections of this Division.

1.2 SUBMITTALS AND TESTING

## A. Seed:

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

## B. Topsoil:

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

## C. Lime &amp; Fertilizer:

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

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

1.3 DELIVERY, STORAGE & HANDLING

A. Seed:

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

B. Fertilizer:

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

1.4 JOB CONDITIONS

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

B. Seeding:

1. Planting Seasons: Seeding and initial fertilizing shall be done between May 1 and June 1, between August 15 and September 15, or as permitted. If seeding is done during July or August, additional mulch material may be required by the Engineer. The Contractor may seed at other times as permitted by the Engineer. Regardless of the time of seeding, the Contractor shall be responsible for each seeded area until it is accepted.
2. Weather Conditions:
  - a. Do not perform seeding work when weather conditions are such that beneficial results are not likely to be obtained, such as drought, excessive moisture, or high winds.
  - b. Stop the seeding work when, in the opinion of the Engineer, weather conditions are not favorable.
  - c. Resume the work only when, in the opinion of the Engineer, conditions become favorable, or when approved alternate or corrective measures and procedures are placed into effect.



PART 2 – PRODUCTS

2.1 MATERIALS

A. Seed:

1. Select a seed mixture that is current and consistent with the following Tables 4-1 through 4-3 of Section 3 in the New Hampshire Stormwater Management Manual as referenced from Minnick, E.L. and H.T. Marshall, Stormwater Management and Erosion Control for Urban and Developing Areas in New Hampshire, Rockingham County Conservation District, August 1992. Note: Reed Canary Grass is a problematic species near wetland applications according to the New Hampshire wetlands bureau and therefore should be used with caution.

Temporary Vegetation (Table 4-1):

<u>Dates</u>	<u>Seed</u>	<u>Rate</u>
Prior to May 15	Oats	80 lbs/acre
Aug. 15 - Sep. 15	Annual Rye Grass	40 lbs/acre
Aug. 15 - Sep. 15	Winter Rye Grass	112 lbs/acre
Apr. 1 - Jun. 1 (Aug. 15 - Sep. 15)	Perennial Rye Grass	40 lbs/acre

Permanent Vegetation (Table 4-2):

<u>Use</u>	<u>Mixture Tables</u>	<u>Soil Drainage</u>			
		I.	II.	III.	IV.
Steep cuts and fills, borrow and disposal areas	A	Fair	Good	Good	Fair
	B	Poor	Good	Fair	Fair
	C	Poor	Good	Exc.	Good
	D	Fair	Fair	Good	Exc.
	E	Fair	Exc.	Exc.	Poor
Waterways, emergency spillways and other channels with flowing water	A	Good	Good	Good	Fair
	C	Good	Exc.	Exc.	Fair
	D	Good	Exc.	Exc.	Fair
Lightly used parking lots, odd areas, unused lands, and low intensity use recreation sites	A	Good	Good	Good	Fair
	B	Good	Good	Fair	Fair
	C	Good	Exc.	Exc.	Fair
	D	Fair	Good	Good	Exc.

Play areas and athletic fields. (Topsoil is essential for good turf)	F	Fair	Exc.	Exc.
	G	Fair	Exc.	Exc.

Notes:

1. I. Droughty  
    II. Well Drained  
    III. Moderately Well Drained  
    IV. Poorly Drained
2. Exc.= Excellent
3. Refer to Table 4-3 for seed mixture and application rates

Permanent Vegetation (Table 4-3):

<u>Mixture</u>	<u>Species</u>	<u>Application Rate-Pounds per</u>	
		<u>Acre</u>	<u>1,000 sq. ft.</u>
A	Tall Fescue	20	0.45
	Creeping Red Fescue	20	0.45
	Redtop	2	0.05
	<i>Total</i>	<i>42</i>	<i>0.95</i>
B	Tall Fescue	15	0.35
	Creeping Red Fescue	10	0.25
	Crown vetch/OR	15	0.35
	Flatpea	30	0.75
	<i>Total</i>	<i>40 or 55</i>	<i>0.95 or 1.35</i>
C	Tall Fescue	20	0.45
	Creeping Red Fescue	20	0.45
	Birdsfoot Trefoil	8	0.20
	<i>Total</i>	<i>30</i>	<i>0.70</i>
D	Birdsfoot Trefoil	10	0.25
	Redtop	5	0.10
	Reed Canarygrass	15	0.35
	<i>Total</i>	<i>30</i>	<i>0.70</i>
E	Tall Fescue	20	0.45
	Flatpea	30	0.75
	<i>Total</i>	<i>50</i>	<i>1.20</i>
F	Creeping Red Fescue	50	1.15
	Kentucky Bluegrass	50	1.15
	<i>Total</i>	<i>100</i>	<i>2.30</i>
G	Tall Fescue	150	3.60

- B. Topsoil:
1. Fertile, friable, natural topsoil typical of the locality, without admixture of subsoil, refuse or other foreign materials and obtained from a well-drained site. Mixture of sand, silt, and clay particles in equal proportions.
  2. Free of stumps, roots, heavy of stiff clay, stones larger than 1-inch in diameter, lumps, coarse sand, weeds, sticks, brush or other deleterious matter.
  3. Not less than 4 percent nor more than 20 percent organic matter.
  4. Topsoil depth shall be 4-inches, unless otherwise indicated.
- C. Lime:
1. Provide lime which is ground limestone (equivalent to 50 percent calcium plus magnesium oxide) that 90% will pass a No. 20 sieve and 50% will pass a No. 100 sieve.
  2. Coarser materials will be acceptable provided the specified rates of application are increased proportionately on the basis of quantities passing a No. 100 sieve. No additional payment will be made to the Contractor for the increased quantity.
- D. Fertilizer:
1. Provide a commercial fertilizer approved by the Engineer.
  2. Provide fertilizer containing approved ratio low phosphate (N-P205-K20).
  3. Fertilizer should be restricted to a low phosphate, slow release nitrogen fertilizer when applied to areas between 25 feet and 250 feet from a surface water body. No fertilizer except limestone should be applied within 25 feet of the surface water.

## PART 3 – EXECUTION

### 3.1 PREPARATION

- A. Equipment:
1. Provide all equipment necessary for the proper preparation of the ground surface and for the handling and placing of all required materials.
  2. Demonstrate to the Engineer that the equipment will apply materials at the specified rates.
- B. Soil: Perform the following work prior to the application of lime, fertilizer or seed.
1. Scarify the subgrade to a depth of 2 inches to allow the bonding of the topsoil with the subsoil (critical when soil has been compacted by construction operations).
  2. Apply topsoil to a depth of 4 inches or as directed on areas to be seeded.
  3. Trim and rake the topsoil to true grades free from unsightly variations, humps, ridges or depressions.
  4. Remove all objectionable material and form a finely pulverized seed bed.

### 3.2 PERFORMANCE

#### A. Grading:

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

#### B. Placing Topsoil:

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

#### C. Placing Fertilizer:

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

#### D. Placing Lime:

1. Uniformly distribute lime immediately following or simultaneously with the incorporation of fertilizer.
2. Distribute lime at a rate determined from the pH test, to a depth of at least 4 inches by discing, harrowing, or other methods acceptable to the Engineer.

#### E. Seeding:

1. Fine rake and level out any undulations or irregularities in the surface resulting from tillage, fertilizing, liming or other operations before starting seeding operations.
2. Hydroseeding:
  - a. Hydroseeding may be performed where approved and with equipment approved by the Engineer.
  - b. Sow the seed over designated areas at a seed rate increase of 10 percent.
  - c. Seed and fertilizing materials shall be kept thoroughly agitated in order to maintain a uniform suspension within the tank of the hydroseeder.

- d. The spraying equipment must be designed and operated to distribute seed and fertilizing materials evenly and uniformly on the designated areas at the required rates.
3. Drill Seeding:
  - a. Drill seeding may be performed with approved equipment having drills not more than 2 inches apart.
  - b. Sow the seed uniformly over the designated areas to a depth of  $\frac{1}{4}$  to  $\frac{1}{2}$  inch and at a rate outlined in the New Hampshire Stormwater Management Manual Table 4-3.
4. Broadcast Seeding:
  - a. Broadcast seeding may be performed by equipment approved by the Engineer.
  - b. Sow the seed uniformly over the designated areas to a depth of  $\frac{1}{4}$  to  $\frac{1}{2}$  inch and at a rate outlined in the New Hampshire Stormwater Management Manual Table 4-3.
  - c. Sow half the seed with the equipment moving in one direction and the remainder of the seed with the equipment moving at right angles to the first sowing.
  - d. Cover the seed to an average depth of  $\frac{1}{4}$  to  $\frac{1}{2}$  inch by means of a brush harrow, spike-tooth harrow, chain harrow, cultipacker, or other approved devices.
  - e. Do not perform broadcast seeding work during windy weather.
- F. Compacting:
  1. Seeded areas must be raked lightly after sowing unless seeding is to be directly followed by application of approved mulch.
  2. Compact the entire area immediately after the seeding operations have been completed.
  3. Compact by means of a cultipacker, roller, or other equipment approved by the Engineer weighing 100 pounds per linear foot of roller.
  4. If the soil is of such type that a smooth or corrugated roller cannot be operated satisfactorily, use a pneumatic roller (not wobbly wheel) that has tires of sufficient size to obtain complete coverage of the soil.
  5. When using a cultipacker or similar equipment, perform the final rolling at right angles to the prevailing slopes to prevent water erosion, or at right angles to the prevailing wind to prevent dust.

### 3.3 PROTECTION & MAINTENANCE

#### A. Protection:

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

#### B. Maintenance:

1. At the time of the first cutting, set mower blades two inches high. All lawns shall require at least two mowing cycles before acceptance. Coordinate schedule for mowing with Engineer.

2. Maintenance shall also include all temporary protection fences, barriers and signs and all other work incidental to proper maintenance.
3. Maintain grass areas until a full stand of grass is indicated, which will be a minimum of 45 days after all seeding work is completed, and shall not necessarily related to Substantial Completion of the General Contract.
4. Protection and maintenance of grass areas shall consist of watering, weeding, cutting, repair of any erosion and reseeded as necessary to establish a uniform stand for the specified grasses, and shall continue until Acceptance by the Engineer of the work of this section. It shall also include the furnishing and applying of such pesticides as are necessary to keep grass areas free of insects and disease. All pesticides shall be approved by Engineer prior to use.

3.4 ACCEPTANCE

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

END OF SECTION

SECTION 02513BITUMINOUS CONCRETE PAVINGPART 1 – GENERAL1.1 DESCRIPTION

## A. Work Included:

1. Furnish all plant, labor, equipment and materials required to install bituminous concrete pavement courses, including sidewalks, driveways, temporary and permanent trench paving and restoration of pavement markings as shown on the Drawings and as specified herein.
2. Remove bituminous asphaltic and/or Portland cement pavement, and replace bituminous asphaltic pavement, base, binder courses and surface courses, including temporary pavement, within the area(s) shown on the Drawings and as directed by the Engineer.
3. Keep pavement removal to a minimum width suitable for the required construction.
4. Apply pavement markings to the permanent paving as specified.

B. Work Not Included: Removal and replacement of paving for the convenience of the Contractor will not be considered for payment.

## C. Related Work Specified Elsewhere (When Applicable):

1. Excavation, backfill, aggregate base and subbase.

1.2 QUALITY ASSURANCE

A. Materials: Use only materials furnished by a bulk bituminous concrete producer regularly engaged in the production of hot mixed, hot laid bituminous concrete.

B. Equipment: Provide, maintain and operate pavers, dump trucks, tandem, 3-wheel and pneumatic tired rollers well suited to the mixtures being placed. Provide, maintain and operate hand equipment as required. When applicable, provide, maintain and operate trimming equipment and materials.

C. Mix Requirements, Method of Placement and Compaction: Standard Specifications for Road & Bridge Construction, State of New Hampshire, Department of Transportation, latest edition, hereinafter called NH DOT Standards for mixing, placing and compacting bituminous concrete surfaces are applicable to this work.

1.3 SUBMITTALS

A. A certificate of compliance shall be furnished to the Engineer that the materials supplied comply with the specification requirements.

B. Delivery slips shall be furnished with each load of mix delivered to the project.

Information shall include:

1. Vehicle identification.
2. Date.
3. Project.

4. Identification of material.
5. Gross, tare and net weights.
6. Signed by the bituminous concrete producer.
7. Stamped by a licensed public weigh master.

**PART 2 – PRODUCTS**

**2.1 MATERIALS**

**A. Hot Bituminous Paving Mix:**

1. Binder Course - 19.0 mm nominal maximum aggregate size.
2. Surface Course - 12.5 mm nominal maximum aggregate size.
3. Sidewalks and Drives - 9.5 mm nominal maximum aggregate size.
4. Deep Lifts in Full Construction - 25.0 mm nominal maximum aggregate size.

**B. Composition of Mixtures - Control Points**

SIEVE SIZE	GRADING			
	TYPE 25 mm	TYPE 19 mm	TYPE 12.5 mm	Type 9.5 mm
	PERCENT BY WEIGHT PASSING - COMBINED AGGREGATE			
37.5 mm	100			
25 mm	90-100	100		
19 mm	-90	90-100	100	
12.5 mm	-	-90	90-100	100
9.5 mm	-	-	-90	90-100
4.75 mm	-	-	-	-90
2.36 mm	19-45	32-42	42-52	46-56
1.18 mm	-	-	-	-
0.60 mm	-	-	-	-
0.30 mm	-	-	-	-
0.075 mm	1-7	2-8	2-10	2-10

**C. Tack Coat:**

1. Emulsified type, Grade RS-1, CRS-1, HFMS-1, CSS-1, 1h

**D. Pavement markings shall conform to AASHTO Designation M248-74 for ready-mixed white and yellow traffic paints, Type I.**

**PART 3 – EXECUTION**

**3.1 GENERAL**

**A. Grade Control:**

1. The Contractor shall establish and maintain the required lines and grades, including crown and cross-slope, for each course during construction operations.



- B. Trench areas shall receive initial paving as the work progresses where trenches are in paved streets. Not more than 300 linear feet of backfill trench shall be left unpaved.
- C. Reset all existing manholes to finished grade as required at no additional cost to the Owner.

### 3.2 PAVEMENT REMOVAL

#### A. General:

- 1. Exercise extreme care in the removal of pavement so that pavement will not be unnecessarily disturbed or destroyed.
- 2. Mechanically cut pavement to be removed to a straight line, unless otherwise directed by the Engineer.
- 3. All pavement removed shall become the property of the Contractor and disposed of at acceptable locations designated by the Owner and at no additional cost to the Owner.

#### B. New Hampshire DOT Areas:

- 1. When removing pavement under the jurisdiction of the New Hampshire Department of Transportation (NHDOT) strictly adhere to all DOT regulations controlling pavement openings.

### 3.3 SURFACE PREPARATION

#### A. Prime and tack coats shall conform to the NH DOT Standard Specifications.

#### B. Tack Coat:

- 1. Apply to contact surfaces of previously constructed asphalt or Portland cement concrete and surfaces abutting or projecting into asphalt concrete pavement. Distribute at rate of 0.05 to 0.15 gallons per square yard of surface.

### 3.4 PLACING THE MIX

#### A. General:

- 1. Place asphalt concrete mixture on prepared surface. Minimum allowable temperature for placing is 225°F. Maximum shall be 325°F. Place in areas inaccessible to paving machine and small areas by hand. Place each course to required grade, cross-slope and compacted thickness.

#### B. Protection:

- 1. After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened to the extent that the pavement will not be damaged.

### 3.5 PAVEMENT MARKINGS

#### A. Material, approved by the Engineer, is to be furnished and applied after the installation of permanent paving.

- B. Apply pavement markings in accordance with existing markings. Match paint color, marking dimensions, layout and other details with existing markings in the vicinity of the project.

END OF SECTION

SECTION 02601MANHOLES, COVERS AND FRAMESPART 1 – GENERAL1.1 DESCRIPTION

- A. Work Included: Construct Pressure Reducing Manholes, covers, frames, and brick masonry with the dimensions, elevations, and locations shown on the Drawings and as specified herein.
- B. Related Work Specified Elsewhere (when applicable):
  - 1. Watermains, excavation, backfill and dewatering are specified in the appropriate Sections in this Division.
  - 2. Concrete and grout are specified in Division 3.

1.2 QUALITY ASSURANCE

- A. Precast Structure: Supplied by EF Shea Concrete or Equiv.
  - 1. Conform to ASTM C478-97 except as modified herein, and on the Drawings.
  - 2. Average strength of 5,000 psi at 28 days.
  - 3. Testing:
    - a. Determine concrete strength by tests on 6-inch by 12-inch vibrated test cylinders cured in the same manner as the bases, barrels and tops.
    - b. Have tests conducted at the manufacturer's plant or at a testing laboratory approved by the Engineer.
    - c. Have not less than 2 tests made for each 100 vertical feet of precast manhole sections.
- B. Manhole Ladder
  - 1. Conform to ASTM C478-06 for load carrying capacity and pull out resistance.
  - 2. Aluminum Ladder
  - 3. Acceptable Manufacturers:
    - a. USF Fabrication Inc. Hialeah Florida
    - b. Or equivalent.
- C. Frames and Covers:
  - 1. Ductile Iron hatch and frame
  - 2. Acceptable Manufacturers:
    - a. EJ Group, Inc.
    - b. Or equivalent.
- D. Masonry:
  - 1. Brick: Shall comply with the ASTM Standard Specifications for Sewer Brick (made from clay or shale), Designation C32, for Grade SS, hard brick.
  - 2. Cement: ASTM C-150.
  - 3. Hydrated Lime: ASTM C-207
  - 4. Sand: ASTM C33

1.3 SUBMITTALS TO THE ENGINEER

- A. Submit shop drawings and manufacturer's literature in conformance with Section 01340 and the Standard General Conditions of the Construction Contract.
- B. Precast Vault Section: Submit test results and receive approval from the Engineer prior to delivery to the site.

PART 2 – PRODUCTS

2.1 PRECAST MANHOLE SECTIONS

- A. Dimensions, shall be as shown on the Drawings:
  - 1. Base & Riser Sections:
    - a. Joints: Tongue and Groove Joint sealed with Butyl Resin.
    - b. Constructed to support an HS-20 wheel loading.
- B. Openings:
  - 1. Provide 36" x 36" opening.
- C. Connections:
  - 1. Link Seal Connection

2.2 FRAMES AND COVERS

- A. Standard Units:
  - 1. Made of Ductile Iron conforming to ASTM A536

2.3 MASONRY

- A. Brick:
  - 1. Sound, hard, uniformly burned, regular and uniform in shape and size, compact texture, and satisfactory to the Engineer.
  - 2. Immediately remove rejected brick from the work.
- B. Mortar:
  - 1. Composition (by volume):
    - a. 1 part portland cement.
    - b. 1/2 part hydrated lime.
    - c. 4-1/2 parts sand.
  - 2. The proportion of cement to lime may vary from 1:1/4 for hard brick to 1:3/4 for softer brick, but in no case shall the volume of sand exceed 3 times the sum of the volume of cement and lime.
- C. Cement shall be Type II portland cement.
- D. Hydrated lime shall be Type S.
- E. Sand:
  - 1. Shall consist of inert natural sand.
  - 2. Grading:

<u>Sieve</u>	<u>Percent Passing</u>
3/8-inch	100
No. 4	95-100
No. 8	80-100

No. 16	50-85
No. 50	10-30
No. 100	2-10
Fineness Modulus	2.3 - 3.1

PART 3 – EXECUTION

3.1 PERFORMANCE

- A. Adjust to Grade:
  - 1. Adjust tops of manholes to grade with brick masonry.
  - 2. Concrete rings are not acceptable for adjusting to grade.
- B. Waterline Connections through Manholes: Connect pipes through manholes as approved by the Engineer.
- C. Bedding and Backfilling:
  - 1. Bedding of manholes shall be 6 inches of 3/4" screened stone.
  - 2. Backfill a minimum of 18 inches all around manhole with gravel borrow.

END OF SECTION

SECTION 02628HIGH DENSITY POLYETHYLENE PIPE AND FITTINGSPART 1 – GENERAL1.1 DESCRIPTION

- A. Work Included: Furnish, install and test all polyethylene pipe, pipe fittings and appurtenances of the type(s) and size(s) and in the location(s) as shown on the Drawings and as herein specified.
- B. Related-work Specified Elsewhere:
  - 1. "Pipe and Pipe Fittings - General" is specified in Section 15050.
  - 2. "Earthwork" is specified in Section 02200.

1.2 QUALITY ASSURANCE

- A. Pressure rating or pressure class of pipe as shown on the Drawings or specified herein.
- B. Standards:
  - 1. ASTM C901-02: Standard for Polyethylene (PE) Pressure Pipe and Tubing, ½" (13 mm) through 3" (76 mm) for Water Service.
  - 2. AWWA C 906-99: Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4" (100 mm) through 63" (1,575 mm) for Water Distribution and Transmission.
  - 3. ASTM D 2657-97: Standard Practice for Heat Joining Polyolefin Pipe and Fittings.
  - 4. ASTM D 2683-98: Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
  - 5. ASTM D 2837-04: Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products.
  - 6. ASTM D 3261-03: Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
  - 7. ASTM D 3350-02a: Standard Specification for Polyethylene Plastic Pipe and Fittings Materials.
  - 8. ASTM F 1055-98e1: Standard Specification for Electrofusion type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and tubing.
  - 9. NSF/ANSI-61-2003e: Standard for Drinking Water Systems Components - Health Effects, NSF International, Ann Arbor, MI.
  - 10. CSA B 137.1-2002: Polyethylene Pipe, Tubing, and Fittings for Cold-Water Pressure Services.
  - 11. ASTM F2164, Standard Practice for Field Leak Testing of Polyethylene (PE) Piping Systems Using Hydrostatic Pressure.

## HIGH DENSITY POLYETHYLENE PIPE AND FITTINGS

12. Manufacturers of high density polyethylene pipe, fittings, adapters, and couplings must be certified under ISO 9000, Quality Management Systems - Fundamentals and Vocabulary, International Organization for Standardization (ISO), Geneva, Switzerland.
  13. 49 CFR 192 subpart F, 192.281, selected requirements for plastic joints; 192.282, requirements for qualifying joining procedures; 192.285, specifies qualifying persons to make joints; and 192.287, specifies inspection of joints.
  14. Fusion Operators: Operators shall meet the minimum qualification requirements outlined in 49 CFR 192 subpart F, 192.285 and shall have documented experience with successful butt fusion of pipe larger than 24 inch diameter.
  15. Joint Fusion Data: Fusion plate temperature (°F), interfacial fusion pressure (psi), interfacial contact fusion time (sec.), and cooling time (min.) shall be recorded by data logger for computer download or recorded by the operator(s) in a field book for each joint fusion completed.
  16. Pipe deemed damaged or unacceptable to the Engineer shall be replaced at no additional cost to the Owner. Pipe shall be adequately protected during storage to prevent external damage to the pipe side wall or ends. Pipe will gouged side walls will be rejected by the Engineer.
  17. Exterior pipe markings shall include the nominal pipe diameter, SDR, and rated working pressure.
- C. Acceptable Pipe and Fitting Supplier/Manufacturers:
1. PolyPipe, Inc. "PW Pipe"
  2. KWH Pipe, "Sclairpipe"
  3. Performance Pipe
  4. "Isco-Pipe"
  5. "Poly-Cam"
  6. "Friatec"
  7. Vari-Tech "Performance Pipe"
  8. Independent Pipe Products, Inc.
  9. Or approved equal.

### 1.3 SUBMITTALS

- A. Submit shop drawings in accordance with the applicable section of Division 1 and the General Conditions of the Construction Contract.
- B. Submit manufacturer's "Certification of Conformance" that pipe and fittings and other piping appurtenances meet or exceed the requirements of these Specifications.
- C. Submit experience statement for operator(s) to complete the pipe fusion to demonstrate the minimum experience and qualification requirements described in paragraph 1.2.B.14.
- D. Following pipe construction, submit joint fusion data in an electronic spreadsheet format as a record to document joint fusion quality control.
- E. Submit manufacturers installation instructions and specifications for all fittings, couplings, adapters, saddles, etc.

PART 2 – PRODUCTS2.1 MATERIALS

- A. Pipes shall be IPS with DR ratings as indicated in the pipe schedule.
- B. Polyethylene compounds utilized in the manufacture of products furnished under this specification shall be listed in PPI TR-4, have a grade of PE34 with a minimum cell classification of PE 334434[C, D, or E] for PE 3408 materials, as defined in ASTM D3350. Pipe shall be in conformance with AWWA C901, AWWA C906, or CSA B137.1. They shall have a PPI recommended Hydrostatic Design Basis (HDB) of 1600 psi (PE3408) at a temperature of 73.4°F (23°C).
- C. All materials which come in contact with water, including lubricants, shall be evaluated, tested and certified for conformance with NSF/ANSI Standard 61.
- D. Clean re-work material of the same type grade, and cell classification generated from the manufacturer's own pipe and fitting production may be used by the same manufacturer as long as the pipe, tubing and fittings produced meet all the requirements of AWWA C901, AWWA C906, or CSA B137.1.
- E. Pipe and tubing furnished under this specification shall be manufactured using compounds complying with the requirements above. Dimensional and performance characteristics shall conform to the requirements of AWWA C901, AWWA C906, or CSA B137.1.
- F. The polyethylene compound shall be suitably protected against degradation by ultraviolet light by means of carbon black, well dispersed in a concentration of not less than 2%.
- G. The polyethylene resin compound shall have a resistance to environmental stress cracking as determined by procedure detailed in ASTM D 1693 with sample preparation by procedure C of ASTM D 1928 of not less than 40 hours.
- H. Pipe shall be homogeneous throughout and free of visible cracks, holes, foreign material, blisters, or other deleterious faults.
- I. Polyethylene fittings shall have the same pressure rating as the pipe itself for all pressurized pipeline applications.
- J. Polyethylene fittings shall be molded style for diameters up to 12 inches and fabricated style for diameters larger than 12 inches.

2.2 PIPE SCHEDULE

PIPE IDENTIFICATION	DIA. (inches)	SDR	IPS/DIPS	WORKING PRESSURE RATING (PSI)	DE-BEAD REQUIRED INSIDE PIPE
Waterline and Services	¾", 2", 4", 6", 8"	11	IPS	160	No

## 2.3 ADAPTERS AND COUPLINGS (As Applicable)

### A. Polyethylene Mechanical Joint Adapter

1. For joining IPS or DIPS size polyethylene pipe to any ANSIAWWA C153 ductile iron fitting and valve.
2. Molded from NSF listed PE 3408 resin.
3. Adaptor shall meet requirements of AWWA C901, 906.
4. Adaptor kit to include anchor fitting, retainer gland ring, gasket, and long tee-bolts, and rubber gasket. All hardware components shall be Type 316 stainless steel.
5. Provide stiffeners as necessary.

### B. Polyethylene Flanged Adapter

1. For joining IPS or DIPS size polyethylene pipe to ANSI B16.1, ANSI B16.5, or ANSI A21.10 (AWWA C110) flange as required.
2. Molded from NSF listed PE 3408 resin.
3. Adaptor kit to include Type 316 stainless steel backing ring, gasket, and long tee-bolts, and rubber gasket. All hardware components shall be Type 316 stainless steel.
4. Adaptor shall meet requirements of AWWA C901, 906.

### C. Polyethylene Wall Anchor

1. For restraining polyethylene pipe in cast-in-place concrete headwall.
2. Molded from NSF listed PE 3408 resin.
3. Pressure rating and size shall be the same as the required pipe and fitting SDR.
4. IPS or DIPS to match required pipe size.

### D. Polyethylene Electrofusion Coupling

1. For joining plain ends of polyethylene pipe where butt fusion is not practical as approved by the Engineer.
2. Molded from NSF listed PE 3408 resin or fabricated from pipe meeting NSF requirements with an integral heating element and electrical leads to connect the heating element power supply.
3. Pressure rating and size shall be the same as the required pipe and fitting SDR.

### E. Polyethylene Electrofusion Saddle

1. For installation corporation stops in HDPE pipe for water service connection or manual air release valve.
2. Molded from NSF listed PE 3408 resin with an integral heating element and electrical leads to connect the heating element power supply.
3. Pressure rating and size shall be the same as the required pipe and fitting SDR.

### F. Threaded HDPE Transition Adapter, Unions, and Threaded Adapters

1. For joining polyethylene pipe to threaded fittings and valve ends (NPT).
2. HDPE end of transition adapters be SDR rated to match required pipe SDR.
3. HDPE end of transition adapters shall be molded from NSF listed PE 3408 resin.
4. All metallic materials shall be constructed of Hastelloy C-276
5. Coupling transition end shall be Male NPT.
6. IPS or DIPS to match required pipe size.

### G. Blind Flanges

1. Molded from NSF listed PE 3408 resin.
2. Pressure rating and size shall be the same as the required pipe and fitting SDR.



## 2.4 FABRICATION

### A. Thermal Butt-Fusion:

1. Join the pipe to itself, or to the polyethylene fittings or to the flange connections by means of thermal butt-fusion.
2. Have all fusion performed by personnel trained by the pipe supplier or other qualified persons, using tools approved by the pipe supplier.
3. The polyethylene fittings and flanged connections to be joined by thermal butt-fusion shall be from the same type, grade and class of polyethylene compound as the polyethylene pipe unless otherwise approved.
4. Joint strength must be equal to that of the adjacent pipe.

### B. Socket Fusion (When Applicable)

1. Join the pipe to socket type fittings by means of socket fusion
2. Have all fusion performed by personnel trained by the pipe supplier or other qualified persons, using tools approved by the pipe supplier.
3. The polyethylene fittings to be joined by thermal socket-fusion shall be from the same type, grade and class of polyethylene compound as the polyethylene pipe unless otherwise approved.

### C. Electrofusion (When Applicable)

1. Applies to the installation of electrofusion couplings and saddles.
2. Have all fusion performed by personnel trained by the pipe supplier or other qualified persons, using tools approved by the pipe supplier.
3. The coupling or saddle shall be joined using heat created by electric current from a control box.
4. Install clamps to hold the fitting in place during the fusion process.

### D. Flanged Joints

1. Flange joining of sections of pipe is allowed to facilitate the pipe installation process as approved by the Engineer.
2. Joints shall include full face gaskets.
3. Flange bolts shall be tightened to the same torque value and tightening pattern recommended by the manufacturer.
4. Flange bolts and nuts shall be Type 316 stainless steel and have tensile strength equivalent to SEA Grade 3.
5. Use flat Type 316 stainless steel washers between the nut and backup ring.
6. Retighten bolts to the manufacturer recommended torque value after an hour to offset the effects of compressions et.

E. Mechanical Connections: The mechanical connections of the polyethylene pipe to auxiliary equipment shall be in accordance with the pipe suppliers written instructions.

## PART 3 – EXECUTION

### 3.1 INSTALLATION OF PIPES AND FITTINGS

A. Install pipe and fittings in accordance with the Marine Installations Chapter of PPI Handbook of Polyethylene Piping and C906 (4 in. to 63 in. diameter).

- B. Install joint and transition adapters in accordance with the manufacture's recommendations.
- C. Refer to the drawings and Section 02200 for additional bedding and backfill requirements.
- D. Joining surfaces must be clean and dry.
- E. Pipe must not be dumped, dropped, pushed or rolled into the trench. Provide appropriate equipment to lift move and lower the pipe into the trench as necessary.

### 3.2 TESTING

#### A. Joint Quality

1. 12" diameter and smaller - On each day butt fusions are to be made, the first fusion of the day shall be a trial fusion. The trial fusion shall be allowed to cool completely, then fusion test straps shall be cut out. The test strap shall be 12" or 30 times the wall thickness in length (minimum) and 1" or 1.5 times the wall thickness in width (minimum). Bend the test strap until the ends of the strap touch. If the fusion fails at the joint, a new trial fusion shall be made, cooled completely and tested. Butt fusion of pipe to be installed shall not commence until a trial fusion has passed the bent strap test.
2. Pipes larger than 12" diameter - Visual inspection of the joint shall be the primary indicator of joint quality. Specific visual inspection criteria shall be provided by the pipe and fitting manufacturer. The v-groove between the bends shall be uniform around the circumference of the pipe and the both sides of the bead shall have uniform thickness and height indicating proper pipe alignment during the fusion process.
3. All fused joints shall be visually inspected by qualified fusion operators and the Engineer during construction to assure uniform alignment and beading.

#### B. Leak Test

1. Refer to Section 15050 for testing.

END OF SECTION

SECTION 02650BURIED UTILITY MARKINGSPART 1 – GENERAL1.1 DESCRIPTION

## A. Work Included:

1. This work shall consist of providing utility line markings installed above all buried lines installed as part of this contract as indicated on the Drawings and replacing existing markings disturbed as part of this contract.

## B. Related Work Specified Elsewhere:

1. Pipe, excavation, backfill, insulation are specified in the appropriate Sections in this Division.

PART 2 – PRODUCTS2.1 MATERIALS

- A. Materials and color shall be in accordance with latest AASHTO specifications for pipe and utility marking.
- B. For ferrous pipe material use 0.004" minimum polyethylene film; 6" wide clearly marking type of buried utility
- C. For non-ferrous pipe material (e.g. Concrete, PVC, PE, etc.) use detection tape composit of polyethylene and metallic core 6" wide clearly marking type of buried utility.
- D. Seton Identification Products, New Haven, CT, Utility Safeguard LLC or equal.

PART 3 – EXECUTION3.1 INSTALLATION

- A. Marking tape shall be installed over utility lines centerline and buried 24" below grade.
- B. Markings damaged during opening of trench shall be reinstalled with 2' overlap at broken sections.

END OF SECTION

## SECTION 02660

### WATER MAINS, FITTINGS AND APPURTENANCES

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract.

##### 1.2 DESCRIPTION OF WORK

- A. Extent of water mains, appurtenances and associated work is shown on drawings and as herein specified.
- B. Included.
  - 1. Work under this section includes construction of water mains including: excavation; bedding; backfill and refill; furnishing, laying and jointing pipe; connecting new water mains to existing water mains; valves; gates; and appurtenances; inspection and testing; disinfection; and all incidental work as shown on the plans, as herein specified, and as directed by the Engineer.

##### 1.3 SUBMITTALS

- A. Shop drawings, including specifications, catalog cuts, data sheets, drawings and other descriptive material, shall be furnished in accordance with Section 01300 for the pipe, gaskets, joints, fittings, valves, encasements, specials and other items specified under this Section.
- B. Certificates of Compliance as specified in this Section shall be submitted to the Engineer in accordance with the requirements of Section 01300, Submittals.

##### 1.4 DELIVERY, HANDLING & STORAGE

- A. All pipe and appurtenances are subject to inspection by the Engineer at the point of delivery. Material found to be defective due to manufacture or damage in shipment shall be rejected or recorded on the bill of lading and removed from the job site. The Engineer reserves the right to require tests as specified in the applicable AWWA standard to ensure conformance with the standard. In case of failure of the pipe or appurtenance to comply with such specifications, the Contractor shall be responsible for replacement of the defective materials.
- B. All pipe, fittings, valves, and accessories shall be loaded and unloaded by lifting with hoists or skidding in order to avoid shock or damage. Under no circumstances shall such material be dropped. Pipe handled on skidways shall not be rolled or skidded against pipe on the ground.
- C. Slings, hooks, or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior surface or internal lining of the pipe.
- D. Materials, if stored, shall be kept safe from damage. The interior of all pipe, fittings, and other appurtenances shall be kept free from dirt or foreign matter at all times. Valves and hydrants shall be drained and stored in a manner that will protect them from damage from freezing.
- E. Pipe shall not be stacked higher than four (4) tiers. The bottom tier shall be kept off the ground on timbers, rails, or concrete. Pipe in tiers shall be alternated: bell, plain end; bell, plain end. At least two rows of timbers shall be placed between tiers and

- chocks, affixed to each in order to prevent movement. The timbers shall be large enough to prevent contact between the pipe in adjacent tiers.
- F. Gaskets for mechanical and push-on joints to be stored shall be placed in a cool location out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first-in, first-out basis.
  - G. Mechanical-joint bolts shall be handled and stored in such a manner that will ensure proper use with respect to types and sizes.

## PART 2 – PRODUCTS/MATERIALS

### 2.1 DUCTILE IRON PIPE

- A. Applicable Standards and Requirements:
  - 1. All pipe, fittings, valves and appurtenances shall meet all applicable requirements stipulated herein as follows:
    - a. American National Standard for Thickness Design of Ductile Iron Pipe (AWWA/ANSI C150/A 21.50).
    - b. American National Standard for Ductile Iron Pipe Centrifugally Cast in Metal Molds, or Sand-Lined Molds for Water or Other Liquids (AWWA/ANSI C151/A21.51).
    - c. American National Standard for Ductile Iron and Gray Iron Fittings, 3-inch Through 48-inch for Water and Other Liquids (AWWA/ANSI C110/A21.10).
    - d. American National Standard for Ductile Iron Compact Fittings, 3-inch Through 16-inch for Water and Other Liquids (AWWA/ANSI C153/A21.53).
    - e. American National Standard for Cement - Mortar Lining for Ductile Iron Pipe and Fittings for Water (AWWA/ANSI C104/A21.4).
    - f. American National Standard for Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings (AWWA/ANSI C111/A21.11).
    - g. American National Standard for Polyethylene Encasement for Ductile Iron Pipe for Water and Other Liquids (AWWA/ANSI C105/A21.5).
    - h. AWWA Standard for Gate Valves for Water and Sewerage Systems (C500).
    - i. AWWA Standard for Resilient – Seated Gate Valves for Water and Sewerage Systems (C509).
    - j. AWWA Standard for Installation of Ductile Iron Water Mains and their Appurtenances (C600).
    - k. AWWA Standard for Disinfecting Water Mains (C651).
- B. Pipe shall be ductile iron, pressure class 350 for sizes 6-inch through 12-inch diameter. Class 52 pipe will be allowed for sizes 8-inch through 12-inch diameter with the approval of the Owner.
- C. Pipe shall have a double cement lining with seal coating inside and bituminous coating outside that meets or exceeds the requirements of AWWA/ANSI Standard C104/A21.4.
- D. All joints shall be of the Tyton Joint type unless otherwise specified or noted.

- E. Gaskets for ductile iron pipe shall be oil resistant rubber gaskets which meet or exceed the requirements of AWWA/ANSI Standard C111/A21.11. Pipe shall be furnished complete with gaskets and lubricant.
- G. A Certificate of Compliance indicating conformance with the above specified requirements for ductile iron pipe shall be submitted to the Engineer. Certificates of Compliance shall be submitted prior to shipment of the pipe. Certificate of Compliance shall be notarized by a Notary Public or Justice of the Peace.

## 2.2 PVC BLUE BRUTE C-900 PIPE (Not Allowed)

- A. Applicable Standards and Requirements:
  - 1. All pipe, fittings, valves and appurtenances shall meet all applicable requirements stipulated herein as follows:
    - a. Standard specification for rigid poly(vinyl chloride) (PVC) compounds and chlorinated poly(vinyl chloride) (CPVC) compounds (ASTM D1784)
    - b. ASTM D1784 Cell Class 12454
    - c. Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 12 in. (100 mm through 300mm), for water transmission and distribution (AWWA/ANSI C900).
    - d. Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings (AWWA C605)
- B. Pipe shall be PVC Blue Brute C-900.
- C. All joints shall meet or exceed requirements of Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals (ASTM D3139).
- D. All gaskets shall meet or exceed the requirements of Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe (ASTM F477).
- E. PVC Blue Brute C900 Pipe shall be evaluated, tested and certified for conformance with NSF/ANSI Standard 61 and shall meet or exceed requirements of Standard for Pipe and Couplings, Polyvinyl Chloride (PVC), and Oriented Polyvinyl Chloride (PVCO) for Underground Fire Service (UL Standard 1285).
- F. A Certificate of Compliance indicating conformance with the above specified requirements for ductile iron pipe shall be submitted to the Engineer. Certificates of Compliance shall be submitted prior to shipment of the pipe. Certificate of Compliance shall be notarized by a Notary Public or Justice of the Peace.

## 2.3 VALVES

- A. End connections for all valves shall be mechanical joint unless otherwise approved by the Town of Epping Water Department.
- B. All valves shall be turn to the left to open.
- C. Gate Valves.

1. Gate valves shall be resilient seated with non-rising stem conforming to the requirements of AWWA/ANSI Standard C509, latest edition. Gate valves shall be supplied complete with all accessories.

D. Curb Stops.

1. Curb stops shall be ball curb stops with all metal parts cast from red brass (85% copper 5% each of lead, ten and zinc). The valves shall be non-directional and the throughway dimension shall be no smaller than the nominal size of the valve.
2. All ball curb stops shall have a rated working pressure of 300 PSI. All valves shall fully open or close against the check with a 90° rotation of the cap.
3. Ball curb stops shall be as manufactured by A.Y. McDonald Mfg. Co. or approved equal.

2.4 FITTINGS

- A. Fittings shall be ductile iron with mechanical joints and shall meet or exceed the requirements of AWWA/ANSI Standard C153/A21.53. Ductile iron fittings shall be rated for 350 psi working pressure. Fittings shall be of the mechanical joint type and shall meet or exceed the requirements of AWWA/ANSI Standard C111/A21.11.
- B. All fittings shall be provided with double cement lining, inside seal coating and petroleum-asphaltic outside coating. Linings and coatings shall meet or exceed the requirements of AWWA/ANSI Standard C104/A21.4, latest edition.
- C. Restrained joints shall include a Romac "Grip" Ring1' or acceptable approved equal.

2.5 VALVE BOXES

- A. Valve boxes shall be installed on all buried valves. Valve boxes shall be cast or ductile iron, 5% inch inside diameter, two-piece, and shall be the slide type. Screw type valve boxes shall not be acceptable. Base section shall have a bell type base and
- B. shall be a minimum of 36 inches in length. Stacking of base sections shall not be allowed. The top section shall be a minimum of 26 inches in length and shall include a top flange.
- C. Valve box covers shall be marked "water".

2.6 CURB BOXES

- A. Curb boxes shall be cast or ductile iron and shall be the extension type with arch pattern base. Curb boxes shall be furnished complete with 36 inch shut off rod (single piece) and cover.
- B. Curb boxes shall be supplied with number 3 cover, brass pentagon plug and quick-release thread.

2.7 WATER SERVICES

- A. Brass compression fittings and ball valves shall be products of one of the following: Ford, Mueller, McDonald or Hays. Stop and waste type valves shall not be acceptable.

## 2.8 BEDDING

A. Bedding for water mains and services shall be hand compacted in 6 inch lifts to the spring line of the pipe. Bedding shall be either stone or sand, which shall be free from organic matter and having no stone larger than 1" in diameter.

## 2.9 SAND BLANKET

A. Sand blanket shall consist of clean sand that is free from organic matter and so graded that 90-100% passes a 1/2 inch sieve and not more than 15% will pass a #200 sieve.

## 2.10 SUITABLE MATERIAL

A. Suitable Material in roads, road shoulders, walkways and travel ways for trench backfill shall be the natural material excavated during the course of construction, but shall exclude debris, pieces of pavement, organic matter, top soil, all wet or soft muck, peat or clay, all excavated ledge material and all rocks over six (6) inches in largest dimension, or any material which, as determined by the Engineer, will not provide sufficient support or maintain the completed construction in a stable condition.

## PART 3 – EXECUTION

### 3.1 STORAGE OF WATER PIPE AND FITTINGS

- A. Prior to storing water pipe and fittings on the job site, the Engineer and the Owner shall be notified at least 24 hours in advance as to when pipe and fittings will arrive. Upon arrival, the Engineer and the Owner will visually inspect the pipe for class rating and evidence of mishandling.
- B. After approval of the pipe and fittings, the Contractor shall be required to provide a water tight seal at both ends of the pipe with a minimum of 4 mil. Polyethylene plastic wrap. This shall be accomplished using sheet plastic or bags secured with duct tape.
- C. All pipe shall be stacked on 4" x 4" timbers in tiers with chocks nailed at each end to prevent movement of the pipe. A maximum allowance for height is specified under Part 1 of this Section.
- D. Loader forks are allowed for the unloading and stacking of pipe provided it is done with care. If pipe hooks are used in the ends of pipe for unloading purposes, they should be of special shape and padded so as to fit either the plain or bell end without damaging the pipe lining. Lifting chains shall not be allowed in place of pipe hooks due to safety precautions.
- E. Transporting of the pipe from the stacked pile to the trench by a loader using forks or approved hooks is acceptable provided it is done with care. The pipe may not be strung along the ditch line until after review of the locations and approval of the Engineer and the Owner.



### 3.2 PIPE INSTALLATION

- A. All water mains, valves, fittings and appurtenances shall be laid/installed in the dry and shall be installed in accordance with the manufacturer's recommendations. Ductile iron pipe, fittings and appurtenances shall be installed in accordance with the requirements of AWWA Standard C600, latest edition.
- B. Water mains and appurtenances shall be installed in accordance with the horizontal and vertical alignment shown on the Contract Drawings. Should any deviations in the alignment be necessary due to conflicts with other utilities or other reasons, the changes must first be approved by the Engineer. Any deviations in design must be noted in the record drawings by the Contractor.
- C. Water main pipe shall be continuously bedded in bedding material as specified herein. Bedding shall be installed not less than six (6) inches below the bottom of the pipe and up to the spring line (mid point) of the pipe. Bedding shall be tamped or chinked into place after the pipe is set in place.
- D. Pipe sections shall be lowered into the trench and set in place in such a manner so as to prevent damage or injury to the pipe or to any persons or property in the vicinity of the pipe. The Contractor shall use slings, straps, or other approved means to adequately support the pipe as it is being lifted and lowered into the trench. Pipe shall be dropped from trucks onto the ground or into the trench. Any pipe so dropped shall be immediately rejected and removed from the job site by the Contractor.
- E. Each length of pipe to be installed shall be inspected by the Engineer for cracks, defects or damage in the coating or lining, and any other evidence of unsuitability. The Contractor shall keep the length of open/excavated trench to a minimum. Trenches shall be backfilled to within two (2) pipe lengths of the end of the pipe being laid and backfilled for compaction. Trenches shall be backfilled at the end of the day and shall not be left open overnight.
- F. Whenever pipe installation work is not in progress, the end(s) of the pipe being installed shall be satisfactorily plugged to prevent intrusion of soil, stones, water, debris, animals, or other such materials into the pipe. When pipe laying operations resume, the end(s) of the pipe shall be thoroughly cleaned and the temporary plugs removed.
- G. ALL ductile iron pipe, joints and fittings shall be encased (wrapped) in polyethylene encasement as specified under Part 2 of this Section. Polyethylene encasement shall be installed in strict accordance with American National Standard for Polyethylene Encasement for Ductile Iron Pipe Systems, AWWA/ANSI C105/A21.5, latest edition, and the manufacturer's recommendations.
- H. Push-on joints shall be made in strict accordance with the manufacturer's instructions and as specified in AWWA Standard C 600, latest edition. A rubber gasket shall be inserted in the groove of the bell end of the pipe and joint surfaces cleaned and lubricated. The plain end of the pipe to be entered shall then be inserted in alignment with the bell of the pipe to which it is to be jointed and pushed home with a jack or by other means. After jointing the pipe, a metal feeler shall be used to make certain that the rubber gasket is located correctly.
- H. Mechanical joints at valves, fittings and where designated shall be in accordance with the "Notes on Method of Installation" under ANSI Specification A21.11 and

- I. the instructions of the manufacturer. To assemble the joints in the field, the Contractor shall thoroughly clean the joint surfaces and rubber gasket with soapy water before tightening the bolts. Bolts shall be tightened to the specified torques. The use of extension wrenches or pipe over handle of ordinary ratchet wrenches to secure greater leverage shall u& be allowed.
- J. Joint Deflection.
  - 1. When it is necessary to deflect pipe at the joints from a straight line in either the vertical or horizontal plane, the amount of joint deflection shall not exceed the manufacturer's maximum recommended joint deflection.

### 3.3 INSTALLATION OF VALVES & FITTINGS

- A. All main line valves at pipe intersections, including hydrant valves, shall be located within two (2) feet of tees.
- B. Large valves (i.e. greater than 10 inches) shall be supported with blocking so as to prevent the weight of the valve from being supported by the pipe during installation.
- C. Valve boxes shall be installed with a cushion of sand between the valve and the valve box. In wet areas, washed stone shall be placed around the valve box with a layer of hay or a geotextile fabric to prevent fine soil from mixing with stone during initial backfill. Valves and boxes shall be set with the stem vertical and box vertically centered over the operating nut. Valves shall be set on a firm foundation and supported by tamping select excavation material under and at the sides of the
- D. valve. The gate box shall be supported during backfilling and maintained in vertical alignment with the top flush with finish grade.
- E. Retaining glands, tie rods or a combination of poured-in-place concrete thrust blocks and retainers shall be used on fittings, bends and at other locations as directed by the Engineer. Thrust block sizing and bearing areas shall be as detailed in the Contract drawings. Joints shall be protected by felt roofing paper prior to placing concrete. Concrete shall be placed against undisturbed material and shall cover bolts, nuts, or joints, or interfere with the removal of any joint. Wooden side forms shall be used for thrust blocks.
- F. Couplings and fittings shall be installed in accordance with the manufacturer's recommendations.
- G. The Contractor's attention is directed to the fact that valves or curbstops cannot be operated without the express permission of the Owner.

### 3.4 INSTALLATION OF SERVICE LINES

- A. Corporations shall be installed at either the two o'clock or the ten o'clock position on the water main pipe.
- B. When making taps, the tapping machine shall be rigidly and securely fastened to the pipe. The length of travel of the tap shall be established such that when the stop is inserted and tightened with a wrench, not more than one to three threads will be exposed on the outside. When a wet tapping machine is used, the corporation stop shall be inserted with the machine while it is still in place. Stops shall be tightened only sufficiently to give water tightness, and care must be constantly exercised not to over tighten them.

- C. Saddles are required for service taps over 3/4 inch on 6 inch diameter mains and smaller; and double strapped saddles with a CC (AWWA) thread are required for service taps over 1 inch on mains larger than 6 inch diameter.
- D. Care shall be exercised in placing and laying tubing so as to ensure that the pipe does not have kinks or be pressed against sharp stones or ledge which would cause damage to the pipe. Place at least 6 inches of sand as shown on the Drawings, adjacent to, above and below the tubing. No stone shall be placed over tubing until the depth of backfill above the tubing is in excess of twelve (12) inches.
- E. Service lines, corporations, curb stops, taps and saddles shall be installed in accordance with AWWA Standard C800.

### 3.5 TESTING

- A. All water mains shall be hydrostatically pressure tested for leakage prior to acceptance.
- B. All pipelines shall be thoroughly flushed prior to testing to remove any and all soil, debris and other materials that may have entered the lines during construction. Flushing shall be accomplished by partially opening and closing valves and hydrants several times under expected line pressure, with flow velocities adequate to flush deposited material(s) out of the pipes, valves and hydrants. Flushing velocities shall not be less than 3.5 to 4.0 feet per second (FPS).
- B. Water mains shall be tested at a pressure equal to 1.5 times the maximum expected working pressure of the line segment being tested or the rated pressure of the pipe, whichever is greater. Pressure testing shall be conducted in accordance with Section 4 of AWWA Standard C 600, except as otherwise specified herein.
- C. Prior to applying the specified test pressure, all air shall be expelled from the lines. If a suitable means of expelling air at high points does not exist, the Contractor shall install all necessary taps so that air can be purged and the testing completed. Upon completion of the pressure tests, the corporation stops shall either be left in place or removed and plugs inserted as directed by the Engineer and/or the Owner.
- D. The pressure shall be raised to the test pressure required for each section being tested as determined by the Engineer. When the test pressure is reached, the time shall be recorded and the test shall begin. The duration of each pressure test shall be a minimum of two (2) hours. During the test, pressure shall be maintained in the section of pipeline being tested by means of a recirculating by-pass type test pump. Water shall be added in measured amounts from a container of known volume if required to maintain pressure. The addition of excessive amounts of water shall constitute immediate test failure. All gauges and test equipment must be approved by The Engineer.
- E. During the test, the line will be examined by the Engineer for visible leaks and breaks. Any defects in the line shall be repaired, and any defective materials shall be removed and replaced by the Contractor as and where directed by the Engineer.
- F. Leakage Test.

1. The leakage test shall be performed in conjunction with the pressure test. Leakage and allowable leakage shall not exceed 10 gallons per inch of pipe diameter per mile of pipe per 24 hours.
- G. Allowable leakage at 350 psi test pressures is shown in Table 1 which follows:

TABLE I

Allowable Leakage per 1000 ft (305M) of Pipeline\* – gph †

Avg. Test Pressure psi (Bar)	Nominal Pipe Diameter – Inches (mm)					
	6 (150)	8 (200)	10 (250)	12 (300)	14 (350)	16 (400)
350 (24)	0.47	0.63	0.79	0.95	1.10	1.26

\* If the pipeline under test contains sections of various diameters the allowable leakage will be the sum of the computed leakage for each size.

† To obtain leakage in liters/hour, multiply the values in the table by 3.7854

#### I. Results

1. If the section fails to pass the pressure and leakage test, the Contractor shall do everything necessary to locate, uncover, and repair or replace the defective pipe, fitting, or joint, all at his own expense and without extension of time for completion of the work. Additional tests and repairs shall be made until the section passes the specified test.
2. If, in the judgement of the Engineer, it is impractical to follow the foregoing procedures exactly for any reason, modifications in the procedure shall be made as required or approved; but, in any event, the Contractor shall be responsible for the ultimate tightness of the piping within the above requirements. The tests shall be repeated as often as necessary, and at the Contractor's expense, to assure the Engineer that all piping and valves are free of defects and that all joints are tight.
3. Area to be tested. The waterline is to be tested and disinfected from the existing 12" gate valve to the well house. Passing test results shall be submitted to the engineer for review before tie-in.

### 3.6 TESTING VALVES AND HYDRANTS

- A. All valves and hydrants shall be pressure tested during the main pipeline test. Hydrant gate valves shall remain open during the main pressure test. After the pipeline has been pressure tested and accepted, the hydrant gate valve shall be closed and the hydrant valve cracked open to release some pressure on the hydrant side of the gate valve. An acceptable test for each hydrant gate valve shall be no loss of pressure in the main line test pressure as each valve is closed.

- B. All main line butterfly or gate valves and control valves on any intersecting water lines shall also be tested by the same procedure outlined above as far as practical. The Engineer shall decide if it is impractical to test any one particular valve location. No pressure test shall be considered acceptable until all possible control valves have been tested to ensure proper closing and water tightness.
- C. The Contractor shall make any taps and furnish all necessary caps, plugs, tees, etc., as required to facilitate testing. The Contractor shall also furnish a test pump, gauges and any other equipment required in conjunction with conducting the hydrostatic tests. The Contractor shall at all times protect the water mains from damage and existing water mains from contamination.

### 3.7 DISINFECTION

- A. After the pressure and leakage tests have been completed and all new water mains have satisfactorily passed the leakage tests, but before new water mains are placed into service, all new water mains shall be disinfected by the Contractor.
- B. Prior to disinfection, all water mains shall be thoroughly flushed, as specified herein, to remove dirt and other deleterious materials.
- C. Disinfection of water mains shall be carried out in strict accordance with AWWA Standard C651, latest edition. The basic procedure to be followed for disinfecting water mains is as follows:
  - 1. Prevent contaminating materials from entering the water main during storage, construction, or repair.
  - 2. Remove, by flushing or other means, those materials that may have entered the water mains.
  - 3. Chlorinate any residual contamination that may remain, and flush the chlorinated water from the main.
  - 4. Protect the existing distribution system from backflow due to hydrostatic pressure test and disinfection procedures.
  - 5. Determine the bacteriological quality by laboratory test after disinfection.
  - 6. Make final connection of the approved new water main to the active distribution system.
- D. During the disinfection procedure, the heavily chlorinated water shall be allowed to stand in the water main(s) for a period of not less than twenty four (24) hours. During this retention period, all valves and hydrants in the section being disinfected shall be operated to ensure disinfection of all valves, fittings and appurtenances. At the end of the 24 hour retention period, the chlorine residual at the extremities of the pipe section being disinfected and at various points in between shall be measured. The treated water shall have a chlorine residual of not less than 10 mg/L free chlorine at all locations. At the Contractor's option, a continuous-feed method of chlorination may be utilized as specified in AWWA Standard C 651, latest edition.
- E. After the retention period, heavily chlorinated water shall not remain in prolonged contact with pipe. In order to prevent damage to the pipe lining or corrosion damage to the pipe itself, the heavily chlorinated water shall be flushed from the main until chlorine measurements show that the concentration in the water leaving the main is

- F. no higher than that generally prevailing in the distribution system or is acceptable for domestic use and as approved by the Engineer.
- G. Chlorinated water used for disinfecting water mains shall be neutralized using a reducing agent, such as sodium bisulfite, to eliminate residual chlorine prior to disposal of the water. The method of disposal of the water shall be as approved by the New Hampshire Department of Environmental Services.
- H. After final flushing of the main(s) and before the new water main is connected to the distribution system, two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected from the new main. At least one set of samples shall be collected from every 1200 ft. (366 m) of the new water main, plus one set from the end of the line and at least one set from each branch. All samples shall be tested for bacteriological quality in accordance with Standard Methods for the Examination of Water and Wastewater, and shall show the absence of coliform organisms. A standard heterotrophic plate count may be required at the option of the Engineer or the Owner.
- I. Disinfection of water mains shall take place only in the presence of the Engineer and the Owner. The method(s) of disinfection to be utilized by the Contractor shall be subject to approval by the Engineer and the Owner. If satisfactory results are not achieved, as determined by laboratory testing, re-disinfection of the water main(s) shall be required at the Contractor's expense.
- I. A Record of Compliance shall be submitted to the Engineer by the Contractor with a copy provided to the Owner. The record of compliance shall be the bacteriological test results certifying the water sampled from the new water main to be free of coliform bacteria contamination, and to be equal to or better than the bacteriological water quality in the existing distribution system.

END OF SECTION

INDEX  
FOR  
DIVISION 3 – CONCRETE

<u>Section Number</u>	<u>Title</u>	<u>Page Number</u>
03100	Formwork	03100-1
03200	Concrete Reinforcing	03200-1
03250	Concrete Accessories – Waterstops	03250-1
03300	Cast-in-Place Concrete	03300-1
03310	Concrete Curing/Sealing/Hardening	03310-1
03600	Grout	03600-1
03700	Concrete Repairs	03700-1

SECTION 03100FORMWORK1.1 GENERAL

## A. Scope

1. The work of this section consists of furnishing, erecting and maintaining all forms and falsework required for the cast-in-place concrete shown on the Contract Drawings.

## B. Reference Standards

1. Perform work under this section in accordance with all applicable portions of the American Concrete Institute "Recommended Practice for Concrete Formwork" (ACI 347) as amended and supplemented by these specifications.

1.2 PRODUCE

## A. Materials

1. Studs, wales, shores, braces, mudsills and stakes shall be wood of a species, grade and size required by form and design.
2. Board sheathing shall be Spruce-Pine-Fir No. 2 Grade or better with no loose knots. It shall be tongue and grooved and shall have a minimum nominal thickness of 1" and a maximum nominal width of 6".
3. Plywood sheathing shall be exterior grade Douglas Fir plywood, 3/4 inch thick, faces B-B grade or high density overlay; grade-marked "EXT-DFPA/PLYFORM" or "EXT-DFPAMD OVERLAY". For exposed vertical surfaces, use smooth A-C Douglas fir plywood.
4. Metal-framed plywood panels, with smooth surface, as manufactured by Symons Corp., or equal, as approved by the Engineer.
5. Snapties shall be the adjustable type designed to leave no metal less than 1 inch from finished concrete surfaces. For exposed vertical surfaces, ties and their spacing pattern are subject to approval by the Engineer and Owner. Snapties shall not be used in water retaining structures.

1.3 EXECUTION

## A. Construction of Forms

1. Design, construct, and maintain forms true to lines, grades, profiles, and dimensions shown on the Contract Drawings. Patented steel or steel-and-plywood form systems may be used if approved by the Engineer before their delivery to the project site.
2. Keep all form joints tight to prevent loss of water and mortar. Support joints in sheathing for surfaces to be exposed in a manner to insure continuity of formed surfaces across joints.
3. Form oil, if used, shall be applied to the forms before any reinforcing steel is in place. No oil, on steel will be allowed. Check with the Owner and Engineer prior to use.
4. Provide bulkheads for construction joints designed for continuity of reinforcing.
5. Provide clean-out openings at bottoms of all wall form more than 4 feet high.

## B. Removal of Forms



1. Formwork for footings and other parts not supporting the weight of the concrete may be removed as soon as the concrete has hardened sufficiently, but in no case less than 48 hours, to resist damage from removal operations, particularly when form ties will be bent by the removal operations.
2. Formwork for suspended slabs and other parts that support the weight of concrete, shall remain in place until the concrete has reached its specified 28 day strength, unless otherwise specified or permitted.

END OF SECTION

SECTION 03200CONCRETE REINFORCING1.1 GENERAL

## A. Scope

1. The work of this section consists of furnishing and placing all steel reinforcing for cast-in-place concrete as required by the Contract Drawings.

## B. Reference Standards

1. Perform work of this section in accordance with all applicable provisions of the American Concrete Institute "Building Code Requirements for Reinforced Concrete (ACI 318); CRSI 63-Recommended Practice for Placing Reinforcing Bars; CRSI 65-Recommended Practice for Placing Bar Supports.

## C. Submittals

1. Submit reinforcing shop drawings to the Engineer for review before fabrication.

1.2 PRODUCTS

## A. Materials

## 1. Reinforcing Bars

- a. Reinforcing steel bars shall conform to A.S.T.M. A 615 Grade 60 having a minimum yield of 60,000 psi.

## 2. Reinforcing Mesh

- a. Welded wire fabric shall conform with A.S.T.M. Specification A185, size and spacing of wires as noted on drawings. The mesh shall be delivered to the project in flat sheets or mats.

## 3. Reinforcing Accessories

- a. Accessories shall be of approved design, suitable type and adequate size to support reinforcing and prevent displacement during construction.
- b. Chairs and spacers shall be used for exposed formed surfaces, to maintain proper clearance between reinforcing and forms. They shall be stainless steel or tipped with rigid plastic. Galvanized and soft plastic-tipped chairs are not approved.

## B. Fabrication

1. All reinforcement shall be bent cold unless otherwise permitted by the Engineer.
2. Hooks not dimensioned on structural drawings shall comply with ACI 318 Sections 7.1 and 7.2

## C. Delivery, Storage and Handling

1. Handle and store reinforcing in a manner to prevent unscheduled bending.
2. Keep reinforcing bars and mesh free from dirt, mortar, oil and other materials tending to destroy its bond with concrete.

1.3 EXECUTION

## A. Placing of Reinforcing

1. Before placing any reinforcing, remove mill scale, loose rust and any foreign coating tending to reduce or destroy bond with concrete.
2. All reinforcing bars shall be supported and wired together to prevent displacement by construction loads or the placing of concrete.
3. The reinforcing mesh will be lapped 6 inches, and tied together.

4. Reinforcing bars partially embedded in concrete shall not be field bent, except as indicated on the Contract Documents or permitted by the Engineer.
5. Unless permitted by the Engineer, reinforcing bars shall not be cut in the field.
6. The Contractor shall notify the Engineer when the placement of reinforcing is complete and ready for concrete. Reinforcing shall be checked by the Engineer prior to placement of the concrete. Particular attention shall be paid to maintaining all clearance dimensions between reinforcing steel and formed surfaces. (Spacers must be used - see part 2.1.3). Any inconsistency between field placement and the Contract Drawings and Approved Shop Drawings shall be corrected. The contractor is ultimately responsible for proper bar placement.

END OF SECTION

SECTION 03250CONCRETE ACCESSORIES - WATERSTOPS1.1 GENERAL

## A. Scope

1. The work of this section consists of furnishing and placing all waterstops in expansion, contraction and construction joints as shown on the Contract Drawings or as ordered.

## B. Reference Standards

1. Perform work of this section strictly in accordance with manufacturer's recommendations to produce watertight joints.

## C. Submittals

1. Submit shop drawings to the Engineer for review before fabrication providing locations and limits of all waterstops and locations of all field splices.

1.2 PRODUCTS

## A. Materials

## 1. 9" Waterstops

- a. Waterstops shall contain a continuous fastening system for mechanically attaching each edge of the waterstop to reinforcing steel or formwork as necessary to prevent displacement during concrete placement and consolidation operations. The fastening systems shall include a series of 5/8" x 1" continuous galvanized wire loops, 12 per foot both sides and shall have a minimum pull-out strength of 148 PSI per wire loop.
- b. Waterstops for expansion joints shall be heavy-duty, 9" wide, 3/8" thick near the centerbulb and 1/2" thick at both edges. WIRESTOP Waterstop shall be type number CR-9380 as manufactured by PAUL MURPHY PLASTICS CO., Roseville Michigan, (800-544-2220.)
- c. Waterstops for construction and control joints shall be heavy-duty, 9" wide, 3/8" thick near the middle and 1/2" thick at both edges. WIRESTOP Waterstops shall be type number FR-9380 as manufactured by PAUL MURPHY PLASTICS CO., Roseville Michigan, (800-544-2220).
- d. Waterstops shall be of the highest grade polyvinyl chloride compound with a minimum tensile strength of 2000 PSI and a minimum elongation of 325%. The waterstops shall not contain any scrap, broad-specification or reclaimed material. It shall be symmetrical about its cross section and uniform throughout its length.
- e. The waterstop material shall be impervious to water and resistant to alkalis and weak acids. The material must not be subject to degradation by the concrete mix design.03250-2
- f. The waterstop material must become thoroughly plasticated when heated during splicing operations so that it will readily flow across butt spliced ends and achieve a strong and leak proof seam.
- g. Coils of waterstop shall be packaged and delivered to the job-site in pallet boxes to eliminate kinks and twists as well as to prevent contamination of the waterstop adversely effecting its installation.

- h. Factory fabricated and tested junction sections are required at all joint intersections thus eliminating splices other than properly mitered butt splices.
- i. The waterstop must exhibit zero water leakage when tested in accordance with the ACI test method. Test reports must be conducted by a suitable, private testing laboratory.

### 1.3 EXECUTION

#### A. Installation

##### 1. Waterstops

- a. Waterstops shall be installed in all construction and expansion joints in walls and slabs. The waterstop shall extend the entire length of the joint and shall be positioned across the center of the joint.
- b. Waterstops shall be securely fastened to reinforcing steel or formwork every 12" on both sides of the waterstop prior to concrete placing as required to prevent displacement and ensure accurate location of the waterstop during concrete placement operations. A minim of 2" clearance shall be maintained between waterstop and reinforcing steel wherever possible.
- c. Waterstops shall be heated and spliced with a thermal splicing unit designed for that specific purpose. Only properly mitered, straight butt splices shall be made in the field. All field splices shall be tested for a complete seal by use of a corona discharge unit.
- d. Field splices shall be made outside the rebar assembly in an unobstructed area adjacent to the reinforcing steel. The galvanized wire loops in the edge of the WIRESTOP shall be removed from the vinyl to be spliced. When the splice has cooled and passed inspection, thread the waterstop into correct position and secure it to the rebar. (Plastic coated tie wire, white or yellow in color should be used to provide visual assurance that the waterstops have been properly secured).
- e. No holes will be permitted in the waterstop. Nail holes or other penetrations in the waterstop shall be repaired prior to concrete placing operations.
- f. Concrete shall be placed under horizontally installed waterstop, between base slabs, in such a manner to prevent entrapment of air before concrete is placed on the top side of waterstop. A technique that assures a uniform concrete matrix around waterstops at the base of concrete walls is provided by placing a neat cement mixture just prior to the regular mix design when dropping ready-mix over 10 feet through hopper/tremie/elephant truck assembly.
- g. The waterstop manufacturer shall provide on-site training to the contractor at no additional cost prior to the installation of the waterstops when quantities permit. The training shall include proper storage, fastening, splicing and inspection techniques.

END OF SECTION

SECTION 03300CAST-IN-PLACE CONCRETE1.1 GENERAL

## A. Scope

1. The work of this Section consists of furnishing in place new concrete, slabs, curbs, foundations and other elements as shown on Contract Drawings and as directed by the Engineer.

## B. Reference Standards

1. Perform the work of this section in accordance with all applicable provisions of the following standards:
  - a. ACI 318 "Building Code Requirements for Reinforced Concrete".
  - b. ACE 301 "Specifications for Structural Concrete for Buildings".
  - c. ACI 306R "Recommended Practice for Cold Weather Concreting".
  - d. ACI 304 "Recommended Practice for Measuring, Mixing, and Placing Concrete".
  - e. ACI 305R "Recommended Practice for Hot Weather Concreting".
  - f. ACI 308 "Recommended Practice for Curing Concrete".
2. These standards are available from the American Concrete Institute, P.O. Box 19150, Redford Station, Detroit, Michigan 48219. (Not free of charge).

## C. Submittals

1. Submit to the Engineer two (2) copies of all required data as follows:
2. Design Mix results or certificates (see Paragraph 2.2).
3. Manufacturer's information and engineering data on all admixtures proposed for use. Information and proof of compatibility of curing compound with finishes may be required.
4. Concrete cylinder test results.

1.2 PRODUCTS

## A. Material (For Poured-In-Place Concrete)

1. Concrete: Transit mixed conforming to all requirements of A.S.T.M. Specification C94.
2. Portland Cement: A.S.T.M. Specification C150 Type II, Gray. Do not change sources or manufacturers, particularly for exposed (architectural) concrete.
3. Sand: Conforming to A.S.T.M. Specification C33 - no change in source during construction operations.
4. Coarse Aggregate: Conforming to A.S.T.M. Specification C33, % inch to No. 4 Sieve. 50 percent of the stone to have at least one fractured face.
5. Water: Clean, clear and suitable for drinking.
6. Admixtures :
  - a. An air entraining admixture shall be used in the concrete.

- b. Other admixtures may be used upon approval by the Engineer. These admixtures must meet all the requirements of ASTM C494, type as appropriate for admixture being used. Accelerators and admixtures containing more than 1% of chloride ions, lignosulfonic acids or their salts will a be allowed.
- c. Admixtures must be added proportionally to the trial. mixes described in 2.2, and manufacturer's information must be submitted to secure approval for use.

**B. Design of Mixtures**

1. The Contractor shall submit a concrete mix design for review by the Engineer as required in paragraph 1.1.C. The proposed mix design shall indicate the supplier/source and quantities of cement, fine aggregate, coarse aggregate, and any admixtures in one cubic yard of concrete. The mix design shall also indicate the water-cement ratio, slump, and entrained air in the concrete. The plant that will supply the concrete shall also be identified.
2. Documentation of the compressive strength of the proposed mix shall be submitted with the mix design. The required documentation is specified in ACI 318 Section 4.3. If compressive strength is determined on the basis of trial mixtures (ACI 318 Section 4.3.3.2), cylinders shall be tested at 7 and 28 days. Graphs of compressive strength verses water-cement ratio shall be plotted for both 7 day tests and 28 day tests.
3. In lieu of paragraph 1.2.B.2 above, the Engineer will consider documentation consisting of a minimum of 5 separate field strength test reports from a single project on 5 different days of concrete production at the same plant and using the same materials and proportions to be utilized in this project. These field strength tests reports shall be less than three months old and shall indicate the 7 day and 28 day compressive strengths. If such documentation is considered unsatisfactory by the Engineer, documentation as specified in paragraph 1.2.B.2 will be required.

**C. Quality of Concrete**

1. Minim Compressive Strength: Not less than 4000 psi at 28 days for all concrete.
2. Water-Cement Ratio: Maximum of 0.45 pounds of water per pound of cement.
3. Minimum Cement Content: 564 lbs per cubic yard of concrete.
4. Air Entrainment: 5-7% by volume.
5. Proportions: In accordance with ACI 318 requirements.
6. Slump:
  - a. Slump shall be measured in accordance with ASTM C143.
  - b. For concrete containing a high-range water-reducing admixture the slump shall range between 2 and 3 inches before addition of the high-range water-reducer and between 4 and 6 inches after addition of the highrange water-reducer.

- c. For concrete without a high-range water-reducer the slump shall range between 2 and 4 inches.
  - d. Slumps, greater than the maximums listed in the preceding paragraphs are acceptable in occasional batches. In no case shall the slump exceed the maximum listed by more than one inch.
7. A high-range water-reducer conforming to ASTM C 494 Type F shall be added in accordance with the manufacturer specifications to all concrete used for the construction of all structures intended for the retention or transfer of liquids.

#### D. Related Item

1. General - Apply and/or install all materials specified in this section in accordance with manufacturer's instructions.
2. Dowels - shall be minimum 60,000 psi yield new billet steel (reinforcing bars) conforming to A.S.T.M. A615.
3. Grout - shall be Embeco 713 non-shrink grout as manufactured by Master Builders or approved equal, as specified by the Engineer.
4. Linseed Oil Compound - shall be Euco Linseed Oil Compound as manufactured by Euclid Chemical Company or approved equal.
5. Pipe mortar - (for grouting pipe sleeves into concrete walls) - shall be Thorite quick set non-shrink patching material, 5s manufactured by Thoro Systems Products, or approved equal.
6. PVC Waterstops - shall be as specified in Section 03250 of these Specifications.
7. Joint Sealant - Horizontal joint sealant shall be parable, two component, cold applied compound such as Sealtight Gardox as manufactured by W.R. Meadows, Inc., or approved equal. Vertical joint sealant shall be non-sagging.
8. Preformed Joint Filler - shall conform to ASTM D 1752. It shall permit compression to one-half its original width, and re-expand to fill the joint when members contract.
9. Adhesive Anchors - shall be Hilti HVA Adhesive Anchors with HE4 Vinylester Adhesive Capsules, or approved equal. Anchors shall be installed in accordance with manufacturers specifications.
10. Expansion Bolts - shall be Hilti Kwik Bolts or approved equal installed in accordance with manufacturers specifications.
11. Sleeve Anchors - shall be Hilti Sleeve Anchors or approved equal installed in accordance with manufacturers specifications.
12. Anchor Bolts - shall be steel. Conforming to ASTM Specification A36.
13. Bonding Agent for Bonding Fresh Concrete to Existing Concrete: Sikadur 32 or equal.
14. Pressure Relief Valves: Shall be 4" diameter wall and floor types as manufactured by Trumbull Industries (Trumbull Item #367) or approved equal. Pressure relief valves shall be rubber gasketed.

### 1.3 EXECUTION

#### A. Delivery and Storage

1. Deliver cement in manufacturer's original moisture proof container with labels intact and legible.
2. Store cement in dry, weathertight, properly ventilated space with adequate provision to prevent moisture absorption.



3. Store sand in well drained location, take necessary steps to prevent inclusion of foreign matter.
- B. Test of Structural Concrete (Field Quality Control)
1. During the course of the work, compression test cylinders will be made and tested by a testing laboratory selected by the Owner. Test specimens shall be made, stored and tested in accordance with A.S.T.M. C-31. The Contractor shall give the Engineer two (2) working day's notice before placing concrete. Four test specimens shall be made for each day's pour with a minimum of four (4) test specimens for each 50 cubic yards of concrete. One cylinder shall be tested at 7 days and three at 28 days. The Contractor shall cooperate in the taking of test cylinders and provide suitable storage at the site for the test cylinders.
  2. All testing of structural concrete shall be paid for by the Owner. . If tests show that the materials do not meet the standards s p m d , the Contractor shall make whatever corrections are necessary to remedy the incorrect work and all additional testing required due to-the incorrect work shall be paid for by the Contractor.
  3. Time elapsed from batching to deposit in forms, shall be not more than 1-1/2 hours maximum when air temperature is less than 80°F., and not more than 1 hour maximum when air temperature is over 80°F., unless otherwise approved by the Owner or the Engineer.
  4. Testing shall be done to insure that the requirements of Section 2.3 have been met.
- C. Placing of Concrete
1. Apply and/or install all items related to concrete in accordance with manufacturer's instructions.
  2. Place concrete only when all forms, chamferstrips, reinforcing steel, construction joints, related mechanical or other items have been completely installed, inspected, tested (if necessary and approved by the Owner's Representative). Forms shall be clean and wetted, steel shall be clean and free of any coating. (See other sections for formwork and reinforcing requirements).
  3. Place no concrete in standing water or on frozen ground. Earth on which new concrete is to be placed shall be moistened before placing concrete.
  4. Place no concrete when ambient temperature is less than 40°F. or more than 90°F. without specific approval of Owner's Representative; follow procedure outlined in reference standards ACI-306 or ACI-305.
  5. At the bottom of all walls designed to contain liquids, a six inch slurry mixture of water, sand, and cement (10 bags/c.y.) is to be placed just prior to placing the first lift of concrete. This is to prevent segregation or honeycombing in the concrete at the base of the wall. Place concrete within 20 minutes of slurry placement.
  6. Convey concrete from mixer to place of final deposit as rapidly and continuously as practical until pouring is completed; avoid segregation and loss of ingredients. Deposit concrete in f o m as nearly as possible in final position for minimum rehandling.
  7. Immediately following deposit of structural concrete, consolidate by vibrating with mechanical vibrator or other means approved by Owner and/or the Engineer. Do not vibrate or disturb concrete after initial set.

8. No concrete shall be dropped more than four feet inside a form unless through a concrete pump hose or tremie hopper and elephant trunk. If either of these methods is not used, provide temporary form opening through which concrete can be placed at intermediate height.
9. Construction, control, expansion, and isolation joints shall be located as shown in the contract drawings. Contractor may submit drawings showing revised joint locations and details for the Engineer's approval at least four (4) weeks prior to placing any concrete. Placement of concrete shall be scheduled to allow as much time as practical to allow for shrinkage before adjacent placement. A minimum of three (3) days of curing is required before placing adjacent sections.
10. New concrete shall be bonded to existing concrete surface using the bonding agent specified in paragraph 1.2.D.14 in accordance with the specifications of the manufacturer of the bonding agent.
11. Whenever possible maintain at least 1 inch of concrete cover between embedded aluminum materials and reinforcing steel or other embedded steel materials other than stainless steel. In no case shall aluminum material be allowed to come in contact with any steel (other than stainless steel).
12. All dowels installed in existing concrete shall be installed using the adhesive anchoring system specified in paragraph 1.2.D.9.
13. All exposed corners and construction joints shall be chamfered.

D. Concrete Finishes

1. Slabs:

- a. Float finish: While concrete is green, float to true and uniform plane, avoid overworking. Use machine float whenever possible; in areas too small for satisfactory operation of machine float, float surface by hand with wood or cork float.
- b. Steel Trowel Finish (except exterior slabs) : After floating of concrete surface, trowel to smooth finish free from trowel marks and other blemish except in areas where roughened surface is indicated. At least 3 successive trowelings are required, allowing sufficient time between trowelings for concrete to stiffen and the water sheen to disappear.

03300-6

- c. Exterior slabs shall be broom finished in a direction perpendicular to traffic.
  - d. Hold all slabs to a maximum deviation from the true plane to 1/8 inch in 10 feet, except where sections of slabs are indicated to be sloped.
  - e. Protect finished slabs from grease, oil, mortar, and other materials detrimental to the final appearance or installation of finish materials.
2. Walls & Piers:
- a. Float and hand trowel horizontal surfaces (tops, shelves) of walls.
  - b. Exposed Surfaces. Exposed surfaces shall have all form fins, ridges and protrusions removed. All bee holes, air bubbles, honey-combing and similar imperfections shall be carefully chipped to remove unsound material and then sacked full to form a smooth surface that is flush with the surrounding surface. The entire surface shall then be ground or rubbed as necessary to create a dense, flat, plane surface that is within a tolerance of 1/8 inch in 10 feet. All work on areas requiring filling and repairing shall be performed in accordance with ACI 301, Sections 9.2 and 9.3.

- c. Concealed Surfaces. After form removal, remove tie fins and fill holes with an approved grout slurry. Repair any other holes to the satisfaction of the Owner.

#### E. Protection and Curing

1. Maintain temperature of concrete surface at minimum 50°F for 72 hours after placing concrete. Preheat all enclosures and maintain for at least 2 hours a minimum surface temperature of 45°F on all steel and form surfaces to come in contact with the fresh concrete.
2. Slabs shall be cured in accordance with section 03310.
3. All vertical concrete surfaces shall be cured for a minimum of seven (7) days by one of the following methods :
  - a. Leaving form in contact with the concrete for the full curing period.
  - b. Covering, (only when the average daily temperature exceeds 50°F) with burlap maintained in a constantly wet condition (no alternate wetting and drying allowed).
  - c. Application of an approved liquid membrane curing compound, complying with the requirements of ASTM C 309, immediately after form removal.
  - d. Combinations of the above methods. In extreme hot weather, Method a. is to be supplemented by an approved method of wet curing and protection from direct sunlight and wind, and Method c. will be approved only if all exposed surfaces are kept out of direct wind and sunlight and at a temperature of 90°F or less.
4. Except as specifically outlined above, adhere to all applicable recommended practices of ACI 306, 305 and 308 included in the Reference Standards (1.2 of this specification)

#### F. Linseed Oil Compound

1. Apply two coats of linseed oil compound (at least 28 days after concrete placement) to all exposed walkway slabs, in accordance with manufacturer's instructions.

#### G. Acceptance of Work

1. The Owner's representative will verify the acceptability of the concrete, its finish and its curing and compliance with the requirements of the specification. Concrete that does not meet the specification shall be replaced at no expense to the Owner.
2. Patch, or remove, as directed by the Owner's representative, all new concrete having honeycombed surfaces.
3. Cracks of any nature, other than at construction joints, in the wall or slabs of any areas intended to hold back fluid shall be filled by suitable epoxy injection technique, as directed by the Engineer, at no expense to the Owner.

#### H. Deficiencies

1. Remove and replace all new concrete found to be below required strength at no expense to the Owner.

END OF SECTION

SECTION 03310CONCRETE CURING/SEALING/HARDENING1.1 GENERAL

## A. Description

1. Work included: Provide concrete curing/sealing/hardening of slabs.
2. Related Work:
  - a. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications as well as Section 03300.

## B. Quality Assurance

1. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

## C. Submittals

1. Comply with pertinent provisions of Section 01300.
2. Product data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit :
  - a. Materials list of items proposed to be provided under this Section.
  - b. Manufacturer's specifications, test data and other data required to prove compliance with the specified requirements.
  - c. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the work.

## D. Product Handling

1. Protect the materials of this Section before, during and after installation, and protect the work and materials of all other trades.
2. In the event of damage, immediately make replacements and repair to the approval of the Engineer and at no additional cost to the Owner.

1.2 PRODUCTS

## A. Curing Agent/Sealer/Hardener

1. Provide concrete curing agent/sealer/hardener on all slabs. Curing agent/sealer/hardener shall be "Ashford Formula" as manufactured by Curecrete Chemical Company, P.O. 551 Springville, Utah 84663 (801) 489-5663, (Local Representative: Righter Corporation, 100 Unicorn Park Drive, Woburn, MA 01801, (617) 938-8811) or approved equal with the following attributes:
  - a. A non-film forming chemical that penetrates into the concrete where it reacts with the alkali and lime, commonly called concrete salts. During this reaction it chemically combines with the salts melting them within the concrete into a gel which locks the pores of the concrete.
  - b. This process densifies the concrete into a solid mass that does not allow penetration into the concrete surface.
  - c. The performance criteria shall be established by tests conducted by recognized independent testing laboratories.
    - i. Curing: Reduce moisture loss by a minim of 90% during initial 24 hours.

- ii. Abrasion: Taber C-17 wheel, min. 30% increase in abrasion resistance.
- iii. Bonding: ASTM-D3359, min. 17% increase in epoxy adhesion.
- iv. Hardening: ASTM C-42, min. 38% increase in compressive strength at 28 days. ASTM-C-42, min. 13% increase impact resistance, Schmidt Hamer Test Method.
- v. Permeability: AS734 modified, 7 inch head, min. leakage 0.0083 cc/hr.
- vi. Chemical Resistance: The manufacturer shall provide a chemical resistance guide listing test results by independent laboratories.

### 1.3 EXECUTION

#### A. Surface Condition

1. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

#### B. Preparation

1. Prepare the surface in strict accordance with the manufacturer's recommendations as approved by the Engineer.

#### C. Application

1. Apply the approved product to the designated surfaces in strict accordance with the manufacturer's recommended application procedures as approved by the Engineer.
  - a. Application should be made immediately following the final concrete finishing operation as soon as the concrete is firm enough to work on. This will help prevent temperature and hairline cracking.
  - b. Application shall be made with a low pressure spray. All concrete surfaces shall be kept wet for 30-45 minutes.
  - c. After this period, when the treated surfaces become slippery under foot, lightly sprinkle the surfaces with water to aid penetration.
  - d. After the surface begins to dry once again, flush the entire surface with water to remove excess material, alkali or impurities. Squeegee the surfaces completely dry.
2. Achieve waterproofing, hardening, dustproofing and abrasion resistance of the surface without changing the natural appearance of the materials, except for a latent waxy sheen on smooth-troweled surface.

END OF SECTION

SECTION 03600GROUT1.1 GENERAL

- A. Grout shall be used in such places as under all machinery mounts, around any anchor bolts and dowels or where otherwise shown on drawings and shall be pre-mixed non-shrink "Masterflow 928" natural aggregate grout as manufactured by Master Builders Company, "Vibro-Foil" as made by Dewey & Almy Division of W.R. Grace, "Ferrolith G" as made by Sonnebon- Contech, or an approved equal, with non-metallic aggregate, and used in accordance with the manufacturer's directions.
- B. Preparation. The concrete surfaces shall be cleaned of all contamination, debris and any laitance. Any poor concrete in evidence shall be removed. The concrete surfaces to receive grout shall be roughened by chipping or other approved means. Special care shall be taken with the grout in hot or cold weather to insure proper setting and gain of strength. Aggravating conditions of placement are to be alleviated to an extent that the temperature of the grout and surrounding surfaces up until time of set will be in about the range of 60°F to 80°F. Ice or hot water may be used, and shields from the sun and hot winds shall be provided when required. Following cleaning, the concrete shall be water-saturated for a period of six hours, the excess water then removed from the surface and non-absorbent edge forms erected.
- C. Grouting. Grout shall be placed quickly and continuously, shall completely fill the space to be grouted and be thoroughly compacted and free of air pockets. The grout may be poured in place, pressure grouted by gravity, or pumped. The use of pneumatic pressure or dry-packed grouting shall be only with the approval of the Engineer. Whenever practical, grout shall be poured from one side only and made to flow across to the open side to avoid air-entrapment.

END OF SECTION

## SECTION 03700

### CONCRETE REPAIRS

#### 1.1 GENERAL

##### A. Related Documents

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

##### B. Scope

1. The work of this section consists of inspecting and preparing existing deteriorated concrete surfaces for repairs in the existing secondary clarifier tank and as directed by the Engineer. Since a significant portion of the work may involve discovering and repairing hidden deteriorated concrete, the Contractor should try to ascertain as much information as possible about the work area prior to bidding.

##### C. Submittals

1. Submit six ( 6 ) copies of shop drawings, including manufacturer's literature, product data, specifications, application procedures, recommendations, limitations, etc., to the Engineer for all materials furnished under this Section. Include proposed schedule for the completion of the repair work.

##### D. Quality Assurance

1. All products and materials installed/applied under this section shall be installed by an applicator that is thoroughly familiar with the use and application of the products and has successfully completed not less than five (5) similar installations within the past five (5) years and who is familiar to the manufacturer/supplier of the products specified herein. The Contractor shall submit the name of the product applicator he/she intends to use for this project and a listing of the product applicator's completed work/installations to the Engineer for review and approval in accordance with Section 01300, Submittals, of these Specifications.

#### 1.2 PRODUCTS /MATERIALS

##### A. Concrete Patch Mat&

1. Concrete patch material shall be polymermodified, portland cement, 2-component, fast setting, non-sag, patching mortar consisting of sand and other inert fillers in a binder of solvent free, 100% reactive acrylic resin, specifically formulated for application by trowel on vertical and overhead surfaces. Material shall be Silikal R17 Multi-.Purpose Polymer Concrete by Silikal North America, Inc., Statford, CT.
2. The binder for the mortar shall consist only of solvent-free, 100% reactive acrylic resin. Mortar shall cure and be available for normal use within 90 minutes at 68°F. Cured mortar shall have a compressive modulus no greater than  $1.4 \times 10^6$  psi in accordance with ASTM (2469, a minimum

03700-2

tensile strength of 1200 psi (MTM C190) , and a coefficient of thermal expansion no greater than  $1.8 \times 10^{-5}$  in./in./OF (ASTM C53L). The shear bond adhesion strength of the mortar shall exceed the tensile strength of the concrete

substrate. It shall have a maximum water absorption value of no more than 0.1 percent (by weight) in 24 hours in accordance with ASW D570.

B. Concrete Crack Primer/Sealant

1. Concrete crack primer/sealant shall be a two (or three) component, solvent free, 100% reactive methyl methacrylate acrylic resin suitable for injecting into and filling cracks and rebonding delaminated concrete. Crack primer/sealant shall be specifically designed for sealing, repairing and top coating concrete surfaces. Crack primer/sealant: shall be Silikal RU 727 acrylic reactive resin system or equal.

C. Concrete Surface Coating

1. Finish coating for concrete surfaces in the interior of the existing clarifier shall be Silikal RU 727 acrylic reactive resin system or equal.

1.3 EXECUTION

A. Installation, General

1. Contractor shall comply with manufacturer's printed instructions, except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of work.

B. Scaffolds

1. Scaffolds shall be furnished and erected at those locations where necessary to perform inspection, preparation and repair work.

C. Surface Repairs

1. Surface repairs shall be made using polymer concrete as specified in Part 2, Products/Materials, subpart 2.1, and shall include repair of spalls, chips, "potholes", gouges, large voids and similar deficiencies as approved by the Engineer.
2. Visually examine and test the concrete surface by sounding with a hammer to detect hidden deterioration which is indicated by a hollow sound when struck. While work is in progress, the Contractor and Engineer shall jointly inspect and sound the concrete areas to be repaired to determine the limits of work.
3. Remove deteriorated concrete to a sound concrete surface free of laitance, dirt, or other foreign material by power brushing, the use of jackhammers where their use is allowed, sawing, mechanical abrading, hosing with water, air-blast cleaning, or other approved methods. Minimum depth of removal beyond main reinforcing steel shall be at least 1/2 inch.
4. Saw cut the edges of areas to be patched with concrete to a minimum depth of 1 inch, and the edges of areas to be patched with mortar to a minimum depth of 1/2 inch or as directed by the Engineer. On vertical surfaces, if forms are to be used, the shape of the areas to be patched shall be such that the entire area to be patched is easily accessible, as determined by the Engineer.
5. Reinforcing steel or other steel to be in direct contact with the new concrete shall be cleaned of all grease, dirt, concrete mortar and injurious rust. Injurious rust shall be interpreted to mean rust which is not firmly bonded to the steel. Rust which is difficult to remove by vigorous scrubbing with a wire brush shall be considered firmly bonded to the steel.



6. Substrate shall be visibly dry and shall be cleaned of all oils, grease, wax, solvents, dust, laitance, curing membranes and any other deleterious materials, substances and contaminants. Unsound concrete, in the opinion of the Engineer, and laitance shall be removed by acid etching or appropriate mechanical means.
7. Substrate shall be cleaned of all dirt, laitance, loose coatings and other materials by sweeping, vacuuming or air blow-down. All accessible areas shall then be cleaned by brush blasting or shot blasting so as to expose the upper facade of the aggregate and remove all loose materials. Vertical or inaccessible concrete shall be cleaned to the same degree of cleanliness by using "needle guns" or abrasive blasting.
8. Prior to applying polymer concrete to repair damaged concrete, all such surfaces shall be primed using the concrete crack primer/sealant material specified under Part 2 of this Section. Surfaces shall be primed in strict accordance with the manufacturer's recommendations. Primer shall be allowed to cure fully before polymer concrete is applied.
9. Polymer concrete shall be mixed just prior to use and applied immediately following mixing. Where the thickness of polymer concrete to be applied is greater than  $\frac{1}{2}$  inch, a clean, washed, dried, bagged aggregate must be mixed into the polymer concrete. Minimum size of aggregate shall not be less than #10 and maximum aggregate size shall not exceed one quarter ( $\frac{3}{4}$ ) of the depth of the repair. Sand shall not be used. Mixing and application of polymer concrete shall be done in strict accordance with the manufacturer's instructions and recommendations and are subject to approval by the Engineer.

#### D. Crack Repairs

1. The same exact procedure specified under subsection C for surface repairs shall be followed for crack repairs except that mechanical cleaning shall be accomplished using "needle guns" or abrasive blasting as necessary.
2. Cracks shall be filled by applying the product specified in subsection 1.2.B in strict accordance with the manufacturer's instructions and recommendations. Where the width of cracks exceeds approximately  $\frac{1}{4}$  inch and/or where the crack primer/sealant material specified herein cannot adequately fill the crack, polymer concrete shall be applied to fill the remaining void after application of the primer/sealant.
3. Crack primer/sealant shall be allowed to cure fully before concrete surface coating is applied.

#### E. Coating

1. The interior walls and bottom (floor) of the existing clarifier tank shall be coated using the product/material specified in paragraph 1.2.C.1 of this Section. Coating of the inside of the sludge/scum well and the influent and effluent box(es) shall not be required under this contract unless specifically requested by the Owner and the engineer. Coating of these areas, if requested, will be added by Change Order.
2. Surface coating shall be roller applied at the rate of 8 mils (DFT) per coat. Two (2) coats shall be applied.
3. Surface coating shall only be applied by applicators specifically experienced in using this particular product as specified under subsection 1.1.D.1, Quality Assurance, of this Section.

END OF SECTION

INDEX  
FOR  
DIVISION 6 – WOOD AND PLASTICS

<u>Section Number</u>	<u>Title</u>	<u>Page Number</u>
06100	Rough Carpentry	06100-1
06190	Prefabricated Wood Trusses	06190-1

## SECTION 06100

### ROUGH CARPENTRY

#### PART I - GENERAL

##### 1.1 SECTION INCLUDES

- A. Temporary enclosures.
- B. All rough lumber, including wood nailers, posts, plates, blocking, strapping, and lumber bases for mechanical and electrical equipment.
- C. Plywood sheathing.
- D. Composit wood trim.
- E. FRP Faced Plywood.
- F. Rough hardware, such as nails, bolts, screws, clips, as required to install rough carpentry work.
- G. Lumber Preservatives.
- H. Erection and Installation of Wood Trusses.
- I. Seismic and hurricane anchors for trusses.

##### 1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Section 06190 - Prefabricated Wood Trusses: Wood trusses and accessories.
- B. Section 07190 - Vapor and Air Infiltration Barriers.
- C. Section 07210 - Building Insulation. Perimeter and under slab insulation – batt insulation - sill sealer - rafter vents.
- D. Section 08110 - Steel Doors and Frames: Flush metal doors and pressed steel frames.
- E. Section 08305 - Special Doors: Motor operated rolling door; metal access doors and floor hatches.
- F. Section 08710 - Finish Hardware: Finish hardware for doors and frames.
- G. Section 10010 - Miscellaneous Specialties.
- H. Section 15540 - Fire Extinguishers.

##### 1.3 RELATED SECTIONS

- A. Section 01340 - Submittals
- B. Section 03300 - Cast-in-Place Concrete
- C. Section 06190 - Prefabricated Wood Trusses - Wood Trusses and Accessories
- D. Section 07190 - Vapor and Air Barriers
- E. Section 07620 - Sheet Metal Flashing and Trim
- F. Section 09250 - Gypsum Wallboard
- G. Section 09900 - Paintings

##### 1.4 REFERENCE

- A. Standard pressure process shall conform to Federal Specification TT-W-573.
- B. Plywood shall conform to American Plywood Association APA Grade trademark and Product Standard PS-1.
- C. WIC A-4-2002 - Wood Truss Council of America.
- D. BCSJ 1-03 - Building Component of Safety Information. Guide to Good Practice for Handling, Installing and Bracing of Metal Plate Connected Wood Trusses.

## 1.5 QUALITY ASSURANCE

- A. All lumber except as otherwise specified herein shall:
1. Be new, dressed 4 sides (S4S), clean, and free from warping and other defects.
  2. Conform to U. S. Department of Commerce Simplified Practice Recommendations R-16 for sizes and use Classifications.
  3. Have a moisture content not exceeding 15 percent when delivered to the project.
  4. National Forest Products Association - "National Design Specification for Wood Construction - 1986 including Design Values for Wood Construction".
- B. Plywood shall conform to American Plywood Association APA Grade Trademark and Product Standard PS-1.

## 1.6 SUBMITTALS

- A. Submit product data under provision of Section 01340.
- B. The treating plant shall furnish a notarized certificate that all pertinent details of these specifications have been met.
- C. Submit lumber species and grade.
- D. Submit plywood thickness, grade and structural type.
- E. Submit samples for FRP faced plywood and all accessories, manufacturer's technical data and installation instructions.
- F. Submit manufacturer's catalog cut sheets for seismic and hurricane anchors following review of Section 06190 - Prefabricated Wood Trusses, with no exceptions taken by Engineer.

## 1.7 DELIVERY, STORAGE AND HANDLING

- A. Store all materials in an elevated dry location, protected by waterproof coverings. Do not store within the building until masonry, concrete, and other such wet work has been completed and allowed to dry.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Wolmanized Pressure-Treated Lumber
1. Hickson Corp.
  2. Hoover Treated Wood Products
  3. Koppers
- B. FRP Faced Plywood Panels
1. Nudo Products Inc., Springfield, Ill
  2. Crane Composites
  3. Or equivalent
- C. Wood Composite Trim
1. Trex
  2. Certainteed Broadwalk
  3. Or equal
- D. Seismic Hurricane Anchors
1. Simpson Strong-tie
  2. USP Lumber Correctors
  3. Or equivalent

## 2.2 LUMBER TREATMENTS

- A. Pressure Preservative Treatments: All dimension lumber, wood blocking and nailers which will be embedded or in contact with concrete and masonry, and all nailers which will be concealed by roofing and flashing, shall be treated with ACQ (Type D). The minimum retention shall be 0.25 pounds of preservative per cubic foot of wood.
- B. Brush Preservative Treatment: Brush coat all end cuts after cutting with ACQ or equal. Apply in two heavy coats on all surfaces prior to installation of lumber.

## 2.3 MATERIALS

- A. All dimensional lumber to be used in exterior and bearing walls shall be Spruce-Pine-Fir No. 2 or better or as indicated on the Drawings.
- B. Nailers, blocking, equipment bases, and all other lumber of actual 1-1/2 inches or greater thickness - Douglas fir, spruce, pine, number two (2) or better.
- C. Furring and other lumber less than 1-1/2 inches in thickness - No. 2 spruce or Douglas fir.
- D. Plywood Sheathing - Shall be thicknesses, exposure rating and structural type indicated on the Drawings.
- E. Plywood Panels for Electrical Panel Mountings - INT DFPA A-C, 3/4 inch thick.
- F. MDO plywood base for exterior mounted electrical equipment.
- G. FRP Faced Plywood Panels - .030", textured (white) fiberglass sheet factory laminated to 3/4 inch Fir exterior plywood. (Fiberolite panel, product no. F3P500) Accessories shall include vinyl mouldings, fasteners, silicone sealant and other components for a complete system as recommended by the manufacturer.
  - 1. Moldings: Vinyl, division bar product No. V-43, cap mold product No. V-41. Color to match panels.
  - 2. Fasteners: Philips head stainless steel screws with pre-finished head to match panels and moldings.
  - 3. Sealant: Super Silicone Sealant, SS-W, White.
- H. Interior wood composite trim shall be wood polymer lumber suitable for interior application. Trek or equal.
- I. Seismic and Hurricane Anchors:
  - 1. Type 316L Stainless Steel.
  - 2. SS hardware sized as recommended by manufacturer.
  - 3. Anchor type shall be as indicated on the Drawing. Anchor type may be revised as necessary by Engineer to support design loads.

## 2.4 ROUGH HARDWARE

- A. Joist hangers, truss anchors, framing anchors, nail plates and other fasteners as indicated on Drawings.
- B. Expansion anchor and anchor bolts shall be as shown on the Drawings and as specified in Section 05500. For other non-specified conditions the following minimums shall apply:
  - 1. Top plates and sill plates at masonry bond beams – 3/4-inch diameter galvanized anchor bolts
  - 2. For blocking attached to steel beams – 3/4-inch diameter anchor bolts at 2-feet on center, staggered.
  - 3. Other nailers and blocking in excess of 7/8 inch thick – 3/4 inch diameter galvanized steel anchor bolts or expansion bolts, as applicable.
  - 4. Secure other non-specified lumber with galvanized steel fasteners, of a type most suitable for the application.
  - 5. Fasteners for wood composite trim shall be stainless steel.
  - 6. Hardware and fasteners in contact with pressure treated lumber shall be stainless steel.

## PART 3 - EXECUTION

### 3.1 TEMPORARY BRACING

- A. Provide and maintain, until such time as permanently built into the structure, temporary bracing for walls, door frames, sills, and other work requiring bracing and which is not specified as being provided under other SECTIONS of the specifications.

### 3.2 PROTECTION

- A. Do such work as is necessary to cover and protect all finishes and other work from damage during construction.

### 3.3 ERECTION OF WOOD TRUSSES

- A. Erection and complete installation shall be by the General Contractor.
- B. Erector shall provide proper equipment and handling jig to erect 3 to 4 trusses together (no single truss erection) on bearing walls before separating and locating in final position. All web diagonal bracing, longitudinal bottom chords, temporary strut bracing shall be installed and completely nailed on each truss immediately after each truss is set in final position and before the next trusses are set. All temporary strut and bracing necessary to hold trusses in true position before roof sheathing is installed shall be the responsibility of the General Contractor. No abnormal straining of truss members and connections will be allowed during erection due to mishandling.
- C. All trusses shall be erected plumb level and true to line.
- D. Install full depth 2x6 wood blocking between trusses to support plywood edges.
- E. Install top and bottom chord lateral bracing as shown on the Contract Drawings in addition to the bracing required by the Manufacturer.
- F. Concentrated loads shall not be placed on top of trusses until all bracing has been installed and plywood decking fastened.
- G. Attach trusses to top plates with two stainless steel H10 hurricane anchors at each end (Simpson Strong-tie or equivalent) using SS nails (sizes as recommended).

### 3.4 NAILERS AND BLOCKING

- A. Fasten nailers and blocking to concrete and masonry with specified bolts, as shown on Drawings. Space bolts not over 32 inches on centers. Stagger lines of bolts on nailers wider than nominal 3-1/2 inch width. Use not less than two (2) bolts per piece of nailer length. Counterbore nailers so that nut and ends of bolts are recessed below top surface. Install wood shims behind nailers and blocking against masonry, as required, to ensure completely true surface.

### 3.5 FRAMING AND SHEATHING

- A. Install wood studs and other framing as indicated on the Drawings.
- B. Install plywood sheathing, stagger all joints and block all edges with 2x6.
- C. Nailing shall be as per the nailing schedule indicated on the structural drawings.
- D. All plywood shall be installed such that the long direction is perpendicular to the main framing members of the trusses.

### 3.6 FURRING

- A. Install furring to the underside of trusses or ceiling framing. Secure with two No. 8x2-1/2 inch screws at each member. Shim to level.

### 3.7 INSULATION

#### A. Below Grade Insulation

1. Install perimeter insulation at all frost walls, starting at 6 inches below grade to top of the footing.
2. Install perimeter insulation at all foundation walls starting at 6 inches below grade to the frost depth (4 feet minimum).
3. Install under slab insulation at all slabs on grade.
4. Install rigid insulation below grade at all other locations indicated on the Drawings.

#### B. Sills

1. Install fiberglass sill sealer at the base of all exterior stud walls, including gable end walls on masonry.
2. Install fiberglass sill sealer at the top of all exterior masonry walls with wood top plates.
3. Tops of concrete and masonry walls shall be true and level so the sill sealer will close all gaps.

#### C. Ceilings and Attics

1. Attic insulation shall be 12 inches of fiberglass consisting of two layers of 6 inch batt (unfaced), one layer installed parallel with trusses and one layer installed parallel to the first.
2. Install rafter vents at all eaves and prevent the insulation from blocking ventilation from the soffits.

### 3.8 ERECTION OF DOOR FRAMES

- A. Erect all door frames, furnished under Section 08110, in accordance with the final shop drawings and frame schedule.
- B. Provide rigid temporary bracing for door frames, as required to ensure maintenance of positioning, and remove only after frames have been permanently anchored.

### 3.9 HANGING AND FITTING OF DOORS

- A. Receive, store, and be responsible for hardware as furnished under Section 08710, Finish Hardware.
- B. Fit all hinged doors to their respective openings.
- C. Fit all hardware accurately, from templates supplied with hardware, apply securely, and adjust carefully.
- D. Prior to Substantial Completion of the Contract, and before building is occupied, inspect entire building with the Engineer and see that each piece of finish hardware is undamaged and in perfect order and that the proper key for each lock is identified.

### 3.10 FRP FACED PLYWOOD PANELS

- A. Install according to manufacturer's recommendations and instructions.
- B. Pre-fit each panel before fastening and cut panel if required to center on studs or nailers for proper fastening.
- C. Mechanically fasten panels to studs or nailers. Use pre-finished Philips head stainless screws at 8 inches on center at edges and 24 inches on center in panel field.
- D. Install molding at panel joints and panel ends.
- E. Seal panels at moldings for full length, at edges of cut outs for piping and other penetrations, at top and bottom of panels and intersections with other construction.

- F. Coordinate installation with other trades providing studs, nailers and other concealed supports. Locate all fasteners only over centers of concealed supports, including properly located and installed nailers or support plates between studs where required.

3.11 INSTALLATION OF MISCELLANEOUS SPECIALTIES

- A. Receive all such items, and install in accordance with the instructions of the various manufacturers, using installation accessories furnished with the specific item.

END OF SECTION



## SECTION 06190

### PREFABRICATED WOOD TRUSSES

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Prefabricated Wood Trusses of the types, sizes and in the locations shown on the drawings and specified herein.

##### 1.2 RELATED SECTIONS

- A. Section 01340 - Submittals
- B. Section 06100 - Rough Carpentry
- C. Section 07620 - Sheet Metal Flashing and Trim

##### 1.3 REFERENCES

- A. ASTM A167-99 - Specification for Stainless and heat-resisting Chromium-Nickel Steel Plate, Sheet and Strip
- B. ASTM A653/A653M-04 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the hot-dip process.
- C. ASTM A924/A924M-06 - Specification for General Requirements for Sheet Steel, metallic coated by the hot-dip process.
- D. ANSUF&PA NDS-2001 - National Design Specification for Wood Construction including the Design Values for Wood Construction, American Forest & Paper Association and American Wood Council.
- E. ANSUTPI 1-2002 - National Design Standard for Metal-Plate-Connected Wood Truss Construction, Truss Plate Institute.
- F. BCSI 1-03 - Building Component Safety Information. Guide to Good Practice for Handling, Installing and Bracing of Metal Plate Connected Wood Trusses.
- G. WTCA 4-2002 - Wood Truss Council of America, 2004.

##### 1.4 SUBMITTALS

- A. Submit complete shop drawings stamped by a Professional Engineer registered in the State of New Hampshire in accordance with the provisions of the General Conditions and Supplementary Conditions. The shop drawings shall include the following:
  1. Detailed shop drawings indicating: species, grade, size, moisture content of lumber, connection plate material, sizes and location, actual dimensions of each truss, minimum bearing lengths and location and sizes of all additional bracing not indicated on the design drawings. Notify the Engineer of all special conditions or requirements which affect the use of supplied trusses.
  2. Complete erection and installation details.
  3. Truss layout plan showing all truss locations, designations and spacings. Truss designations and spacings shall correspond with those on the structural design calculations.
- B. Submit complete structural design calculations stamped by a Professional Structural Engineer registered in the State of New Hampshire. Calculations shall show all uniform and concentrated loads, truss member sizes and species, allowable and final stresses in the members, deflections of the truss, reactions and connections of multi-ply trusses.

### 1.5 QUALITY ASSURANCE

- A. The truss manufacturer shall specialize in the manufacturer of Prefabricated Wood Trusses with a minimum of five (5) years of experience.
- B. Stamp each truss with the name and address of the licensed manufacturer
- C. The Truss Erector shall have a minimum of five (5) years of experience in the installation of trusses.

### 1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the job site in an undamaged condition.
- B. Handle and store the materials to avoid damage of any kind.
- C. Store off the ground in fully covered, well ventilated areas, protected from extreme changes in temperature and humidity.
- D. Remove damaged materials from the site and replace at no additional cost to the Owner.

### 1.7 FIELD MEASUREMENTS

- A. Field measurements shall be taken at the site prior to fabrication in order to verify indicated dimensions and to insure proper fit.

### 1.8 DESIGN REQUIREMENTS

- A. Design, detail and fabricate wood trusses in accordance with "National Design Specification for Wood Construction" including "Design Values for Wood Construction", American Forest & Paper Association; "National Design Standard for Metal Plate Connected Wood Truss Construction", Truss Plate Institute.
- B. Truss connection plates shall be 20 percent greater in size and area than required by the ANSITPI 1-2005 specifications.
- C. Top and bottom chords shall be 2 x 6 minimum size, interior webs shall be 2 x 4 minimum size. Truss members sizes shall be increased above the minimums as necessary to support design loads.
- D. Outside dimensions of trusses shall be as indicated on the drawings, interior configurations may vary to suit the design.
- E. Loading Combinations: NOTE: Live load on bottom chords shall be applied over the full span.
  - 1. Full live and full dead load.
  - 2. Full live and full dead load on 1/2 of truss span concurrent with 1/2 of full live load with full dead load on adjacent 1/2 of truss span.
  - 3. Full live, full dead and one lifting hook fully loaded. Trusses with multiple lifting hook shall be designed to support only 1 lifting hook at a time unless otherwise noted.
  - 4. Other cases as specified by the NDS and ANSITPI Specifications.
- F. Deflections
  - 1. Camber trusses to compensate for dead load deflections.
  - 2. Limit floor live load deflection to L/360.
  - 3. Limit roof live load deflection to L/360.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Structural Lumber: Wood used in the manufacturer of wood trusses shall be No. 2 Kiln Dry Southern Yellow Pine, No. 2 Kiln Dry Spruce-Pine-Fir or equal at 19% maximum moisture content.

- B. Galvanized Metal Connector Plates: Material shall not be less than 0.036 inches in thickness (20 gauge) and shall meet ASTM A653 Grade 33, and galvanized coating shall meet or exceed ASTM A924, Coating Designation G60.

2.2 MANUFACTURERS

- A. Wood Structures Inc., Biddeford, ME
- B. Mitek Industries, Inc., Chesterfield, MO
- C. Alpine Engineered Products Inc, Earth City, M8
- D. Equivalent.

2.3 FABRICATION

- A. All trusses:
  - 1. Manufactured by experience workmen and under the direct supervision of a qualified foreman.
  - 2. Fabricated under strict rules of inspection and quality control of local codes and ordinances, and open to inspection of the Engineer.
- B. Cut all truss members accurately to length, angle, and true to line to assure tight joints.
- C. Tightly clamp in place all truss members and connector plates until the connector plates have been pressed into the lumber simultaneously in both sides of the joints.
- D. All field assembly of truss sub-components shall be as shown on the Drawings, specified herein.

PART 3 - EXECUTION

3.1 INSTALLATION

- 1. As specified in SECTION 06100 - ROUGH CARPENTRY.

END OF SECTION

INDEX  
FOR  
DIVISION 7 - THERMAL & MOISTURE PROTECTION

<u>Section Number</u>	<u>Title</u>	<u>Page Number</u>
07150	Damproofing	07150-1
07 190	Vapor and Air Intiltration Barriers	07190-1
07210	Building Insulation	07210-1
07270	Firestopping	07270-1
07620	Sheet Metal Flashing and Trim	07620-1
07900	Joint Sealers	07900-1

## SECTION 07150

### DAMPPROOFING

#### PART 1 – GENERAL

##### 1.1 SECTION INCLUDES

A. Penetrating Dampproofing (above grade).

##### 1.2 RELATED SECTIONS

- A. Section 01340 – Submittals
- B. Section 03300 – Cast-in-Place Concrete
- C. Section 07900 – Joint Sealers

##### 1.4 REFERENCES

A. ASTM D449 - Specification for asphalt used in dampproofing and waterproofing.

##### 1.5 SUBMITTALS

- A. Submit product data and application instructions for all materials in accordance with Section 01340.
- B. Submit Manufacturer's specification and installation instructions.
- C. Submit Warranty

##### 1.6 ENVIRONMENTAL CONDITIONS

A. Do not apply dampproofing at temperatures below 40 degrees F or when temperature is expected to fall below 40 degrees F within 12 hours.

#### PART 2 - PRODUCTS

##### 2.1 MANUFACTURERS

- A. Penetrating Dampproofing
  - 1. Sika Corporation
  - 2. Euclid Chemical Company
  - 3. Or equivalent.
- B. Cavity Wall Dampproofing
  - 1. Sonnebom
  - 2. Karnak
  - 3. Or equivalent

##### 2.2 MATERIALS

- A. Penetrating Dampproofing: Siloxane type penetrating water-repellent.
- B. Cavity Wall Dampproofing: Fiber reinforced (non asbestos) emulsified asphalt compound for dampproofing cavity walls before applying insulation. Sonneborn Building Products - Hydrocide 700B Semi-Mastic (spray or brush applied), Karnak 920 (trowel applied), or equal. Material to be supplied in sufficient quantities for application rate detailed in Section 04200.

#### PART 3 – EXECUTION

##### 3.1 PREPARATION

A. Protect elements surrounding the work of this Section from damage or disfiguration.

3.2 PENETRATING DAMPPROOFING APPLICATION

- A. Apply in strict accordance with manufacturer's printed instructions and as specified herein. Clean and prepare surfaces as required.
- B. Apply to above grade, exterior, masonry and concrete walls where indicated in the "Schedule for Applications".
- C. Apply in two (2) coats at a rate not to exceed 100 sq.ft./gal. for each coat.

3.3 CLEANING

- A. Clean any adjacent materials effected by the application of the penetrating dampproofing with a material recommended by the dampproofing manufacturer.

3.4 PROTECTION

- A. Pretest below grade dampproofing from damage during backfilling.

3.5 SCHEDULE FOR APPLICATION

- A. Penetrating Dampproofing:
  - 1. All new above grade exterior masonry walls.
  - 2. All new above grade exterior building foundation and frost walls.
  - 3. At exterior concrete pads located at building entrance.

END OF SECTION

## SECTION 07190

### VAPOR AND AIR INFILTRATION BARRIERS

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Under Slab Vapor Barrier
- B. Vapor Barriers for Ceilings
- C. Air Infiltration Barrier

##### 1.2 RELATED SECTIONS

- A. Section 01340 - Submittals
- B. Section 01700 - Project Cleaning
- C. Section 02200 - Earthwork
- D. Section 03300 - Cast-in-Place Concrete
- E. Section 06100 - Rough Carpentry
- F. Section 09250 - Gypsum Wallboard

##### 1.3 REFERENCES

- A. ASTM D2103 - Specification for Polyethylene Film and Sheeting.
- B. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
- C. ASTM E96 - Test Methods for water Vapor Transmission of Materials.

##### 1.4 QUALITY ASSURANCE

- A. Install in one area where directed and obtain approval of installation. Sample area will establish quality of workmanship for remaining work.

##### 1.5 SUBMITTALS

- A. Submit product data and manufacturer's installation instructions under provision of Section 01340.

#### PART 2 - PRODUCTS

##### 2.1 MANUFACTURERS

- A. Vapor Barriers
  - 1. Monsanto Plastics and Resins Co.
  - 2. A. H. Harris Polyethylene
  - 3. Or equal.
- B. Air Infiltration Barriers
  - 1. Dupont "Tyvek"
  - 2. Raven Industries "Rufco-Wrap"
  - 3. Simplex Products Division "Barricade Building Wrap"

##### 2.2 MATERIALS

- A. Vapor Barriers: Polyethylene Film and Sheeting
  - 1. Under Slab - 10 mil
  - 2. Ceilings - 4 mil
- B. Air Infiltration Barrier: "Tyvek" or equal, six mil thickness.

- C. Accessories: Tapes, sealant, prefabricated accessories and terminations recommended by the manufacturer.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Apply vapor barrier under all interior or exterior concrete slabs on grade insuring that subbase or crushed stone is level and well compacted.
- B. Apply vapor barrier parallel with the direction of the concrete pour. Lap and seal all joints. Install vapor barrier flat against sides of footings and seal.
- C. Apply air infiltration barrier to sheathing, stapled at 30 inches on center each way with eight inch end laps and twelve inch vertical laps.
- D. Apply vapor barrier to interior of all ceiling framing rafters or bottom of trusses with all joints lapped and taped.
- E. Do not damage vapor barriers; repair all penetrations with a patch extending a minimum of six inches in all directions and seal as specified by manufacturer.

END OF SECTION



## SECTION 07210

### BUILDING INSULATION

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Perimeter and Underslab Insulation

##### 1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Batt Insulation: Installed under Section 06100 - Rough Carpentry
- B. Sill Sealer: Installed under Section 06100 - Rough Carpentry
- C. Rafter Vents: Installed under Section 06100 - Rough Carpentry

##### 1.3 RELATED SECTIONS

- A. Section 01340 - Submittals
- B. Section 02200 - Earthwork
- C. Section 03300 - Cast-in-Place Concrete
- D. Section 06100 - Rough Carpentry
- E. Section 07190 - Vapor and Air Infiltration Barriers
- F. Section 09250 - Gypsum Board

##### 1.4 REFERENCES

- A. ASTM C272 - Test Method for Water Absorption of Core Materials for Structural Sandwich Construction.
- B. ASTM C518 - Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter.
- C. ASTM C653 - Guide for Determination of the Thermal Resistance of Low-Density Blanket-Type Mineral-Fiber Insulation.
- D. ASTM D1621 - Test Method for Compressive Properties of Rigid Cellular Plastics.
- E. ASTM E96 - Test Method for Water Vapor Transmission of Materials.
- F. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace @ 750 degrees C.
- G. FS-HH-1-585C

##### 1.5 SUBMITTALS

- A. Submit product data under provision of Section 01340.
- B. Submit manufacturer's installation instructions.

##### 1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to project site in manufacturer's original unopened packaging.
- B. Identify contents, manufacture, brand name, thermal values, and applicable standards.
- C. Store materials in area protected from weather, and moisture.
- D. Remove damaged materials from site.

## PART 2 – PRODUCTS

### 2.1 MANUFACTURERS

- A. Perimeter and Underslab Insulation
  - 1. Dow Chemical Company
  - 2. U.C. Industries, Inc.
  - 3. Or equivalent
- B. Fiberglass Insulation (Batt)
  - 1. Owens-Coming
  - 2. Certainteed
  - 3. Or equivalent
- C. Cavity Insulation
  - 1. Dow Chemical Company
  - 2. U.C. Industries, Inc.
  - 3. Or equivalent
- D. Rafter Vent
  - 1. Durafoam, Foam Plastics of New England
  - 2. Proper Vent Inc., Minneapolis, MN
  - 3. Ampeor
  - 4. Or equivalent

### 2.2 PERMETER AND UNDER SLAB INSULATION/CAVITY INSULATION

- A. Insulation: Closed cell polystyrene foam board
  - 1. Aged "R" Value – "R" = 5.0 per inch, ASTM C518.
  - 2. Water Absorption - 0.1 percent, ASTM C272.
  - 3. Water Vapor Permeance - 1.1 perm (max) ASTM E96
  - 4. Compressive Strength - 25 pounds per square inch, ASTM D1621.
- B. Adhesive: Non asbestos, asphalt emulsion, trowel consistency.
- C. Thicknesses as indicated on the Drawings.

### 2.3 FIBERGLASS BATT INSULATION

- A. Unfaced fiberglass batt insulation (ceiling).
  - 1. Thermal resistance - R=19 (for 6-inch nominal), ASTM C653.
  - 2. Thermal Resistance - R=38 (for 12-inch nominal), ASTM C653.
- B. Kraft paper faced fiberglass batt insulation (walls).
  - 1. Thermal resistance - R=19, ASTM C653.
  - 2. Permeance rating - 1.0, ASTM E96.
- C. Sill sealer: Closed cell foam, 3/8" thick.

### 2.4 RAFTER VENTS

- A. Rafter vents shall be polystyrene semirigid board stapled to rafters. Vents shall be length as required by widths suited to rafter spacing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Perimeter Insulation: Install vertical perimeter insulation dry, against foundation walls in a continuous manner as the backfill is placed, or held in place with adhesive.
- B. Under Slab Insulation: Lay insulation where indicated under slab, directly on sand, tightly butting each sheet of insulation against adjacent sheet.

END OF SECTION

## SECTION 07270

### FIRESTOPPING

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Firestopping for penetrations in Gypsum Wallboard assemblies.
- B. Firestopping for penetrations in concrete and masonry walls and ceilings.
- C. Firestopping for PVC and insulated pipe penetrations.

##### 1.2 RELATED SECTIONS

- A. Section 01050: Coordination
- B. Section 01340: Submittals
- C. Section 03300: Cast-in-Place Concrete
- D. Section 06100: Rough Carpentry
- E. Section 07900: Joint Sealers
- F. Section 09250: Gypsum Wallboard
- G. Division 15: Mechanical
- H. Division 16: Electrical

##### 1.3 REFERENCES

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

##### 1.4 PERFORMANCE REOUIREMENTS

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

##### 1.5 SUBMITTALS

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

##### 1.6 DELIVERY, STORAGE AND HANDLING

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

##### 1.7 SEQUENCING AND SCHEDULING

- A. Coordinate work under provisions of Section 01050.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

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

### 2.2 MATERIALS

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

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

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

### 3.3 INSTALLATION

- A. Products shall be installed as per the manufacturer's submitted instructions to provide a complete firestopping system at all fire rated assemblies.
- B. Fill all annular spaces of penetrations in gypsum wallboard assemblies with insulation packing material and apply sealing compound.
- C. Fill all annular spaces of penetrations in masonry and concrete with insulation packing material and apply mortar on other approved sealing compound.
- D. Install intumescent wrap around all plastic pipe and insulated pipe penetrating fire rating assemblies.
- E. Install sealant as required per manufacturer's instructions.

3.4 CLEANING

A. Clean work under provisions of Section 01710.

END OF SECTION

## SECTION 07620

### SHEET METAL FLASHING AND TRIM

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Field Formed Metal Roofing (Aluminum)
  - 1. Architectural Standing Seam Metal Roofing
  - 2. Metal Eave Fascia
  - 3. Metal Gable Fascia
  - 4. Metal Soffit Vent
  - 5. Miscellaneous Flashings and Trim
- C. Miscellaneous Accessories
  - 1. Roofing Felt
  - 2. Ice and Snow Guard (ice and water shield)
  - 3. Reglect Flashing
  - 4. Snow Fence
- D. Aluminum Gutters, Downspouts and accessories

##### 1.2 RELATED SECTIONS

- A. Section 01340 - Submittals
- B. Section 04200 - Unit Masonry
- C. Section 06100 - Rough Carpentry
- D. Section 07900 - Joint Sealers

##### 1.3 REFERENCES

- A. SMACNA - Architectural Sheet Metal Manual
- B. ASTM B5 - Specification for Electrolytic Tough-Pitch Copper Refinery
- C. ASTM B101 - Specification for Lead Coated Copper
- D. ASTM B152 - Specification for Copper, Sheet, Strip, Plate and Rolled Bar
- E. ASTM B209 - Specification for Aluminum and Aluminum-Alloy Sheet and Plate

##### 1.4 SUBMITTALS

- A. Submit product data under provision of Section 01340.
- B. Submit large scale shop drawings detailing: Roofing, eave and rake trim, soffit vent, gutters and downspouts, and accessories; include all splice plates and method of anchorage.
- C. Submit color chips for color selection by Engineer.
- D. Submit manufacturers catalog cuts, spec data sheets, and installation instructions.
- E. Submit installer's qualifications for review by Engineer.

##### 1.5 QUALITY ASSURANCE

- A. Field measurements shall be taken prior to fabrication to assure symmetry and verify as built conditions.
- B. All sheet metal flashing and trim shall be fabricated and installed in accordance with the recommendations in the SMACNA - Architectural Sheet Metal Manual.
- C. All materials shall be installed with concealed starter cleats and splice plates to accommodate thermal movement. Exposed through nailing or face nailing is not allowed.
- D. The Contractor shall obtain the services of an installer with a minimum of 10 years of experience of working with the materials specified.

## 1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials with a protective vinyl masking.
- B. Store all materials in properly protected and dry storage facilities until ready for use. Do not use materials which have been damaged in any manner.
- C. Protect work from damage during construction period so that it will be without any indication of abuse or damage at time of acceptance.

## 1.7 WARRANTY

- A. Metal Roofing- Contractor shall guarantee installation for a period of two years for weather tightness from date of substantial completion.
- B. Warranty material to be free of defects in material and workmanship for a period of five years.
- C. Warranty finish against color fade, chalking and film integrity for a period of 20 years.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Atas
- B. Englert
- C. Firestone Metal Products
- D. Or Equal

### 2.2 FINISH

- A. Unless indicated otherwise, finish on all materials shall be Fluoropon Kynar 500 resin finish, color selected by Engineer. Texture shall be smooth.

### 2.3 FIELD FORMED METAL ROOFING COMPONENTS

- A. Coil Stock for Roof - 24-inch wide roils of 0.032-inch aluminum.
- B. Formed trim and closures - 0.032-inch aluminum formed as detailed on the Drawings in the same color and finish as the roofing panels. Provide continuous keeper to hold the fascia in place.
- C. Soffit Vent - 0.032-inch aluminum panel 12-inches wide with a "vee" groove at 6-inches on center. Panels shall be solid, half vented or fully vented as indicated on the Drawings.
- D. All field formed sheet metal flashing and trim shall conform to "Sheet Metal and Air Conditioning Contractors National Association, Inc., - Architectural Sheet Metal Manual".

### 2.4 MISCELLANEOUS ACCESSORIES

- A. Roofing Felt - 30 pound non-perforated asphalt saturated roofing felt.
- B. Ice and Snow Guard - 40 mil rubberized asphalt and polyethylene membrane.

### 2.5 FIELD FORMED METAL ROOFING COMPONENTS

- A. Coil Stock for Roof - 24-inch wide roils of 0.032-inch aluminum.
- B. Formed trim and closures - 0.032-inch aluminum formed as detailed on the Drawings in the same color and finish as the roofing panels. Provide continuous keeper to hold the fascia in place.
- C. Soffit Vent - 0.032-inch aluminum panel 12-inches wide with a "vee" groove at 6-inches on center. Panels shall be solid, half vented or fully vented as indicated on the Drawings.
- D. All field formed sheet metal flashing and trim shall contbrm to "Sheet Metal and Air Conditioning Contractors National Association, Inc., - Architectural Sheet Metal Manual".



## 2.6 MISCELLANEOUS ACCESSORIES

- A. Roofing Felt - 30 pound non-perforated asphalt saturated roofing felt.
- B. Ice and Snow Guard - 40 mil rubberized asphalt and polyethylene membrane.
- C. Snow Fence Shall Be:
  - 1. Prefabricated system as manufactured by Alpine Snow Guards or equal.
  - 2. Brackets shall be Model #40002ZK.
  - 3. Tubing shall be extruded aluminum, one-inch diameter with a 1/8" wall thickness, with end caps and collars.
  - 4. Color to match the roof.

## 2.7 GUTTERS, DOWNSPOUTS AND ACCESSORIES

- A. Gutters shall be seamless 0.032 aluminum 5-inch K series as manufactured by Atas, Englert, or equal.
- B. Downspouts shall be 3-inch by 4-inch aluminum.
- C. Heavy duty hidden hangers.
- C. Straps, endcaps, and accessories as required for a complete system.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Inspect all surfaces and notify general contractor of any defects or other characteristics which may be detrimental to the installation and performance of the materials to be installed.
- B. Commencement of work shall constitute acceptance of surface conditions.
- C. Field verify all dimensions of the prefabricated items prior to fabrication to ensure ease of installation with a proper and tight fit.

### 3.2 INSTALLATION - GENERAL

- A. Installation of all materials in this Section shall be in strict accordance with the manufacturer's printed instructions.
- B. Ensure a watertight installation at all points where prefabricated items meet the roofing.
- C. Install cleats, formed fascia and continuous closure as shown on the Drawings. Anchor as recommended by Manufacturer.
- D. Set fascia flange in sealant as recommended by the roofing materials manufacturer.

### 3.3 FIELD FORMED METAL ROOFING INSTALLATION

- A. Inspect roof deck to verify deck is clean and smooth, free of depressions, waves or projections, and properly sloped to drains valleys eaves.
- B. Verify deck is dry and free of snow and ice. Verify joints in wood deck are solidly supported and fastened.
- C. Verify correct placement of wood nailers.
- D. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, reglets are in place, and nailing strips located.
- E. Verify roofing termination and base flashings are in place, sealed, and secure.
- F. Install the felt underlayment over the plywood sheathing using hot dipped galvanized roofing nails with a minimum head diameter of 1/2-inch.
- G. Install ice and snow guard at all rakes, eaves and valleys. Install material over a primed surface with a six-inch head and side lap and as indicated below.
  - 1. At eaves, provide 66-inches (two rows with 6-inch side laps).
  - 2. At rakes, provide 36-inches (one row).

3. At valleys, provide 96-inches centered on the valley (three rows with 6-inch side laps).
  4. At ridges, provide 66-inches centered on the ridge (two rows with 6-inch side laps).
  5. At additional locations, as indicated on Drawings.
- H. Layout roof so that the seams are equal distant from gable ends and align at corners and hips.
  - I. Roof panels shall be field formed by machine in full lengths.
  - J. Space standing seams at 20-inches on center
  - K. Space cleats at 16 -inches on center along each standing seam.
  - L. Double lock cleats into 1 1/2 inch high standing seams using a mechanical seamer.
  - M. At eaves, fold the roofing over the drip edge.
  - N. Fold seams over at eaves.
  - O. The SMACNA Architectural Sheet Metal Manual, NRCA Roofing and Waterproofing Manual and Handbook of Roofing Knowledge shall be used as guides and details whenever applicable.
  - P. No face penetrations or perforation shall be made in metal panels by fasteners without Engineer's specific approval. All panels shall be continuous from ridge to eaves with no horizontal end laps.
  - Q. Exercise proper care during installation to avoid damage or scratching of the panels. Avoid walking over the metal roof after installation is completed.
  - R. Close and seal the ends of the ridge cap, stepped flashing and all other exposed unfinished ends.
  - S. Install snow fence per manufacturer's instructions, using a bracket at each standing seam.

#### 3.4 INSTALLATION OF GUTTERS, DOWNSPOUTS AND ACCESSORIES

- A. Install in strict accordance with manufacturer's instructions and as detailed on the Drawings.

#### 3.5 CLEANING

- A. At the completion of the work, clean, and remove from site, all rubbish and accumulated materials and leave the work in a satisfactory condition.

END OF SECTION

## SECTION 07900

### JOINT SEALERS

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

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

##### 1.2 RELATED SECTIONS

- B. Section 01340 - Submittals
- C. Section 01710 - Project Cleaning
- D. Section 02513 - Bituminous Concrete Paving
- E. Section 03300 - Cast-in-Place Concrete
- F. Section 04200 - Unit Masonry
- G. Section 07150 - Damproofing
- H. Section 07190 - Vapor and Air Infiltration Barriers
- I. Section 07270 - Fire Stopping
- J. Section 07620 - Sheet Metal Flashing and Trim
- K. Section 08110 - Steel Doors and Frames

##### 1.3 REFERENCES

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

##### 1.4 SUBMITTALS

- A. Submit product data under provisions of Section 01340
- B. Submit color charts or samples.
- C. Submit manufacturer's installation instructions.

##### 1.5 QUALITY ASSURANCE

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

##### 1.6 ENVIRONMENTAL REOUIREMENTS

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

1.7 SEQUENCING AND SCHEDULING

A. Coordinate work in this Section with related sections.

1.8 WARRANTY

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

PART 2 - PRODUCTS

2.1 MATERIALS

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

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

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

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

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

Tensile Strength 650 psi  
Shore "A" Hardness Range 75-80

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

Durability (Bond and Cohesion) +/- 25 percent  
Service Temperature - 40 to 170 degrees F  
Shore "A" Hardness 40

E. S-7, TREMPRO 644 High Temperature, one component, melting point, ASTM E8 14, by Tremco, or equal.

Tensile Strength 250 psi  
Service Temperature Range -75 to 600 degrees F  
Shore "A" Hardness 22

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

## 2.2 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: ASTM D1056; round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width; as recommended by sealant manufacturer.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that surfaces and joint openings are ready to receive work and field measurements are as shown on Drawings and recommended by the manufacturer.
- B. Beginning of installation means installer accepts existing conditions.

### 3.2 PREPARATION

- A. Clean and prime joints in accordance with manufacturer's instructions.
- B. Remove loose materials and foreign matter which might impair adhesion of sealant.
- C. Verify that joint backing and release tapes are compatible with sealant.
- D. Perform preparation in accordance ASTM C790 for latex base sealants.
- E. Protect elements surrounding the work of this Section from damage or disfiguration.

### 3.3 INSTALLATION

- A. Install sealant in strict accordance with manufacturer's instructions.
- B. Measure joint dimensions and size materials to achieve required width/depth ratios.
- C. Install joint backing to achieve a neck dimension no greater than 1/3 the joint width.
- D. Install bond breaker where joint backing is not used.
- E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot apply within these temperature ranges.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- G. Tool joints concave.

### 3.4 CLEANING AND REPAIRING

- A. Clean work under provisions of Section 01710.
- B. Clean adjacent soiled surfaces.
- C. Repair or replace defaced or disfigured finishes caused by work of this Section.

### 3.5 PROTECTION OF FINISHED WORK

- A. Protect sealants until cured.

3.6 SCHEDULEType

A. S-1 or S-6

B. S-1 or S-6

C. S-2

D. S-4 or S-6

E. S-1 or S-4

F. S-7

G. S-8

Location

Interior: Door frame perimeters, and other joints designated to receive caulking as shown on the Drawings.

Exterior: Door frames, exterior and interior control joints in exterior walls. Joints in concrete, pipe penetrations, and other exterior joints designated to receive sealant as shown on the Drawings.

Joints between exterior concrete pavements and pads and walls of building.

Interior concrete slab perimeter and control joints.

Exterior expansion joints.

At all joints, penetrations and areas designated to receive either caulking or sealant surfaces subjected to high heat.

At all joints in fire-rated assemblies. Coordinate with Fire Stopping specified in Section 07270.

END OF SECTION

INDEX  
FOR  
DIVISION 8 -DOORS AND WINDOWS

<u>Section Number</u>	<u>Title</u>	<u>Page Number</u>
08110	Steel Doors and Frames	08110-1
08305	Special Doors	08305-1
08710	Finish Hardware	08710-1

## SECTION 08110

### STEEL DOORS AND FRAMES (EXTERIOR DOOR)

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Steel Doors.
- B. Labeled Steel Doors.
- C. Steel Frames.
- D. Labeled Steel Frames

##### 1.2 RELATED SECTIONS

- A. Section 01340 - Submittals
- B. Section 03300 - Cast-in-Place Concrete
- C. Section 06100 - Rough Carpentry
- D. Section 07900 - Joint Sealers
- E. Section 08710 - Finish Hardware
- F. Section 09900 - Painting

##### 1.3 REFERENCES

- A. ASTM A366 - Specification for steel, carbon, cold-rolled sheer, commercial quality.
- B. ASTM E152 - Methods for fire tests of door assemblies.
- C. ASTM A 525 - Specification for general requirements for steel sheet, zinc-coated (galvanized) by the hot-dip process.
- D. ASTM B117 - Method of salt spray (log) testing.
- E. ASTM D1735 - Method for water fog testing of organic coatings.
- F. SDI - Steel Door Institute - 100  
SDI - Steel Door Institute - 105
- G. DHI - Door Hardware Institute
- H. ANSI - American National Standard Institute
- I. NFPA - National Fire Protection Agency - 80 Fire Rated Doors and Windows
- J. NFPA - National Fire Protection Agency - 250 Fire Rated Assemblies

##### 1.4 SUBMITTALS

- A. Submit product data under provisions of Section 01340.
- B. Submit a complete door and frame schedule, large scale details of door and frame construction, indicating all gauges, reinforcing, cutouts, anchors and anchor clips.
- C. Submit labeled door and frame certification.
- D. Do not fabricate hollow metal work without final shop drawing review.
- E. Submit manufacturers certification that door and frame hardware reinforcing gages comply to ANSI/SDI 100.



### 1.5 QUALITY ASSURANCE

- A. Conform to requirements of SDI-100.
- B. Labeled door and frame construction to conform to NFPA 250.
- C. Doors and frames shall be factory fabricated. All field modifications shall be approved by the Engineer.

### 1.6 QUALIFICATIONS

- A. Steel Doors and Frames - Section 08110, and the Finished Hardware - Section 087 10 shall be provided by a single supplier.

### 1.7 PACKAGING

- A. Doors shall be fully wrapped in corrugated cardboard, single faced paper 42-pound with a 26-pound liner medium "B" flute, protecting all surfaces of the door. Flute shall be run the full height of the door.
- B. Wood strips, 3/8 inches, 2 inches commercial grade, finished one side for marking, extending 1/2 inch beyond the top and bottom of the door shall be temporarily applied to the edges of the door.
- C. The corrugated cardboard and wood strip shall be held firmly in place by three (3) 3/8 inch by 18 GA steel bands on each door.
- D. Wood strips shall be marked clearly giving door type, size, hand lock preparation, and mark number. The metal banding shall not interfere with the marking.

### 1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver doors, frames and windows to the job site in manufacturer's unopened packaging.
- B. Store doors and frames upright in a protected area on wood runners or skids and covered with vented plastic.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Curries
- B. Steel Craft
- C. Or equivalent.

### 2.2 DOOR CONSTRUCTION

- A. 16 gauge stretcher level steel, galvanized for all doors.
- B. 1/8 inch bevel in two inches on hinge and lock edge.
- C. Seams shall be continuously welded and ground smooth.
- D. Top and bottom 14 gauge, cold-rolled steel reinforcing channels spot welded within door.
- E. Mortise and reinforce doors for finish hardware in accordance with template. Requirements are furnished under finish hardware.
- F. Hinge reinforcement - 12 gage, channel shape.
- G. Lock face, flush bolts, surface mounted closers - 14 gage
- H. All other surface mounted hardware - 14 gage.
- I. Provide flush top cap sealing against water on all exterior doors.
- J. Prepare exterior door bottoms to receive door bottoms.
- K. Doors shall be reinforced, stiffened, sound deadened with Kraft Honeycomb core completely filling the inside of the doors and laminated to both inside faces of the panels. The strength

developed on tile laminated assembly shall be 4000 pounds per square foot in compression and 1100 pounds per square foot in shear along the glue line.

- L. Insulated doors shall have, rigid polystyrene foam board, bonded to the inside of both faces. The strength developed on the laminated assembly shall be 1500 PSF in compression and a shear strength of not less than 2500 PSF.
- M. Any additional modifications to specified door construction, as required by Underwriters Laboratories and National Board of Fire Underwriters, to meet required fire rating, shall be performed at the factory, and doors must bear the U.L. seal for each rating so required.
- N. Astragal - 14 GA. overlapping ZEE, attached with flathead countersunk machine screws to inactive leaf.

### 2.3 FRAME CONSTRUCTION

- A. All Frames - 14 gauge, Galvanized.
- B. All frame joints shall be continuously welded and ground smooth. Where galvanized coating has been burned or damaged, paint with Z.R.C. liquid zinc or equal. All joints in frame shall be watertight.
- F. Hinge, Lock and Strike Reinforcement - 10 Gauge
- G. Door Closer Reinforcement - 14 Gauge
- H. Floor Clips - 18 GA minimum
- I. Frame Anchors - Provide minimum three anchors per jamb as required for the adjoining wall construction. Provide anchors of not less than 18 gauge steel or 3/16 inch diameter wire adjustable.
- J. Frame Splines - Same as frame
- L. Reinforcement, stiffeners, and base angle clips shall be welded to inside surfaces of frames.
- M. Locate hardware cutouts and reinforcing from templates obtained from the hardware supplier. Weld sheet steel dust covers over all cutouts in frames to prevent contact of mortar with reinforcing and lock strikes.
- O. Turn edges of frames to form retainers for anchors.
- P. Punch three (3) holes in top of strike jamb of door frames for application of silencers. Punch two (2) holes in head frame for pairs of doors.
- Q. Before shipping, provide removable angle spreaders securely fastened to bottom of each jamb; do not remove until frames are secured in place.
- R. Frames for U.L. Label doors shall be constructed in strict accordance with the requirements of Underwriters Laboratories for the designed fire rating and shall bear the U.L. Label for same.

### 2.4 FINISHING

- A. Doors and frames shall be hot dipped galvanized, A60 coating.
- B. Clean all surfaces of doors, frames, anchors and related items specified hereunder, by hot or cold phosphate treatment standard with the manufacturer. Following cleaning, apply one coat of rust-inhibitive prime paint and bake on. Prime all surfaces, including those which will be inaccessible after erection.
- C. The finished work shall be strong and rigid, neat in appearance, and free from warp and buckle. Miters shall be well formed and in true alignment.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install frames in accordance with Steel Door Institute.
- B. Install doors in accordance with Door Hardware Institute.
- C. Coordinate with Masonry Wall Construction for anchor placement.

3.2 TOLERANCES

- A. Maximum diagonal frame distortion: 11/6 inch measured with straight edge, corner to corner.

3.3 ADJUSTMENTS

- A. Adjust hardware for smooth and balanced door movement.

END OF SECTION

## SECTION 08710

### FINISH HARDWARE

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Finish Hardware for All Doors
- B. Thresholds
- C. Weather Stripping
- D. Door Silencers
- E. Keying to Match the Owner's Existing Master Key System

##### 1.2 RELATED WORK

- A. Section 01340 - Submittals
- B. Section 06100 - Rough Carpentry
- C. Section 081 10 - Steel Doors and Frames

##### 1.3 REFERENCES

- A. ANSI A1 15 - Standards for Door and Frame Preparation
- B. ANSI A156 - Standards for Finish Hardware
- C. NFPA 80 - Fire Doors and Windows
- D. Other Applicable Life Safety and Building Codes.

##### 1.4 SUBMITTALS

- A. The finish hardware supplier shall submit for review a complete and detailed finish hardware schedule using a vertical typewritten format. The finish hardware schedule shall contain a listing of the name of each manufacturer and the product listing for the series included in the hardware schedule.
- B. Provide catalog cuts on specified hardware.
- C. It shall be the responsibility of the finish hardware supplier to obtain from the owner or the owner's representative, a detailed keying schedule listing the respective key symbol and location for the locksets having the corresponding key symbol.
- D. The finish hardware supplier shall make available to the general contractor a detailed list of template numbers and templates required for each of the door manufacturers that require templates.
- E. Submit the finished hardware suppliers field report indicating that the finished hardware has been installed and is working properly. The report shall note all deficiencies and conditions required to correct them. Refer to "Field Quality Control" as specified herein.

##### 1.5 QUALITY ASSURANCE

- A. The hardware supplier shall have in his employ an architectural hardware consultant (AHC) or a person with equivalent number of years required for AHC qualifications. This person shall be recognized as having the ability to be fully responsible for the scheduling, detailing and execution of this section of the specifications and related items. This qualified consultant shall be responsible for processing all submissions, correspondence, technical matters related to the finish hardware and it's application specified in this section.

## 1.6 QUALIFICATIONS

- A. The Steel Doors and Frames - Section 081 10, and the Finished Hardware – Section 08710 shall be provided by a single supplier.

## 1.7 DELIVERY, STORAGE AND HANDLING

- A. The finish hardware shall be delivered to the job site and received there by the General Contractor. The General Contractor shall prepare a locked storage room with adequate shelving, for all hardware. The storage room shall be in a dry, secure area, and shall not include storage of other products by other trades.
- B. All finish hardware shall have the necessary screws, bolts and other fastenings required for correct installation of each item. The cylinders, locksets, exit devices, door closers, shall be clearly marked with the respective individual door or heading number.
- C. After the hardware has been installed and prior to the acceptance of the building by the Owner, it shall be the General Contractors responsibility to properly protect the hardware and the hardware finish from all dents, scratches, defacing that may occur during the construction period. Hardware that is considered damaged or scratched during the construction period shall be replaced by the General Contractor at no cost to the owner or hardware supplier. Hardware items with paint on them shall be cleaned and/or replaced by the General Contractor at no charge to the owner.

## 1.8 WARRANTY

- A. The finish hardware specified for this project shall be guaranteed against defects in material and workmanship for a period of one (1) year from date of completion and acceptance of this building. In addition, door closers shall carry a guarantee of five (5) years from date of completion and acceptance of this building.
- B. If an item of hardware is found to be defective by reasons of defects in material and workmanship, it shall be replaced by the hardware supplier at no charge to the owner. The installation of the replacement item shall be the responsibility of the General Contractor if within the building guarantee period specified under general conditions, or by the Owner if beyond the building guarantee period.

## 1.9 MAINTENANCE SERVICE

- A. Provide special wrenches and tools applicable to each different or special hardware component.
- B. Provide maintenance tools and accessories supplied by hardware component manufacturer.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Hinges
  - 1. Stanley Hardware Division
  - 2. Hager
  - 3. McKinney
  - 4. Or equal
- B. Locksets
  - 1. Best Access Systems/Stanley
  - 2. Or equal that matches existing master key system

- C. Exit Devices
  - 1. Stanley
- D. Door Closers
  - 1. Sargent
  - 2. LCN
  - 3. Corbin/Ruswin
  - 4. Or equal
- E. Kick Plates
  - 1. Burns
  - 2. Rockwood
  - 3. Or equal
- F. Flush Bolts
  - 1. National Guard Products
  - 2. Stanley
  - 3. Or equal
- G. Weather Stripping
  - 1. National Guard Products
  - 2. Pemco
  - 3. Or equal
- H. Thresholds
  - 1. National Guard Products
  - 2. Reese
  - 3. Wooster Safety Products (cast aluminum)

## 2.2 HINGES

- A. All hinges for this project shall be stainless steel, ball bearing type.
- B. The following is a guide for hinge size and type required for this specification.

1.	<u>MANUFACTURER</u>	
1-3/4 inch	Stanley	FBB191-4 1/2 inches
Doors up to	Hager	BB1191-4 1/2 inches
3'0" wide	McKinney	TB2314-4 1/2 inches
1-3/4 inch	Stanley	FBB199-4 1/2 inches
Doors over	Hager	BB1199-4 1/2 inches
3'0" wide	McKinney	T4B3386-4 1/2 inches

- 2. The width of hinges shall be sufficient to clear all trim.
- 3. Hinges of foreign manufacture shall not be considered acceptable for this project.
- C. Two hinges shall be provided for each door leaf up to and including five feet (5'0") in height. An additional hinge shall be required for each additional two and one half feet (2'-6") or fraction thereof in height.
- D. All exterior doors, and any interior doors so indicated in hardware sets, shall be furnished with non-removable pins (NRP).
- E. Refer to finish section for hinge finish.

## 2.3 MORTISE LEVER HANDLE LOCKSETS

- A. Locksets for this project shall be mortise type with solid cast stainless steel lever handle sectional trim.

B. The following is a guide to the manufacturers and designs acceptable for this project.

Best 40H Series Lever 15

C. Locksets for labeled fire doors shall have a fusible link or other mechanism to prevent latch bolt retraction in the event of fire.

D. The following is a list of lock functions as indicated under "hardware sets":

<u>FUNCTION</u>	<u>BEST</u>
A (Classroom)	R ANSI F05

## 2.4 EXIT DEVICES

- A. All exit devices for this project shall be of the same series and design, and shall be manufactured by one manufacturer.
- B. All exit devices shall have a 14 gauge, stainless steel continuous horizontal mounting rail with a 16 gauge, stainless steel touch pad with a Lexan touch pad protection plate and shall be of the same design, and of similar configuration, for all doors throughout.
- C. The chassis shall be a solid cast pressure formed almag or non-ferrous alloy and shall be mounted directly to the door with four (4) wood screws, machine screws, or, through bolted where required for positive attachment for wood fire rated doors.
- D. All exit devices for this project shall have the chassis, end cap, and horizontal mounting rail, mount directly to, and flush with, the door surface. No gaps or space shall be permitted between the back of the horizontal mounting rail and the door surface. If required, a continuous solid stainless steel or bronze dull chrome plated spacer bar shall be used to fill the space between the back of the devices and the door surface.
- E. The chassis cover shall be 16 gauge, cold formed stainless steel, fastened to the solid cast pressure formed chassis, by four (4) Phillip head machine screws, at the side of the chassis cover.
- F. The rail assembly shall be 14 gauge, heavy wrought stainless steel. The rail assembly shall consist of a stainless steel case with a 16 gauge, heavy wrought stainless steel touch pad with a Lexan touch pad protection plate.
- G. The end cap shall be a high impact resistant black lexan, fastened to the rail assembly by means of two, stainless steel Phillip head machine screws.
- H. The touch pad shall retract the latch bolt by means of a sliding motion of the touch pad towards the lock stile, activating the lever arm for easy operation and reduced friction.
- I. All exit devices, regardless of function, except for fire rated devices, shall have one point cylinder dogging
- J. Trim for exit devices shall be one of the following as specified: Cast stainless steel lever handle with cast escutcheon.
- K. Devices for fire rated doors shall be listed for three (3) hour A label doors by Underwriters Laboratories. Exit devices with ratings of less than three (3) hours or listed with Laboratories other than Underwriters Laboratories shall not be considered acceptable for this project. Fire exit devices shall be installed only on fire doors bearing the marking, "Fire doors to be equipped with fire exit hardware".
- L. Exit devices, as manufactured by Stanley Apex 2000 Series, meeting all of the specification requirements set forth above, shall be considered acceptable for this project.
- M. The following is a list of the functions referred to under hardware sets (1, 2, 3) and the model numbers of the acceptable manufacturers.

TYPESTANLEY

R-3 (Key Lock)

2108

2.5 KEYING

- A. All locks and cylinders shall be keyed as required by the owners instruction and operated by master key group A.4 and Grand Master key group A.
- B. It is required that the key system have visual key control and that all keys and cylinders be stamped with the alphanumeric key symbol designated for each key change as recommended by the Nomenclature for Master key Systems established by the Door and Hardware Institute.
- C. Provide six (6) construction master keys to be supplied with the locksets to the General Contractor. The construction master key shall operate all locks and cylinders, and shall permit access to all areas by the General Contractor, during the construction period, prior to the owner assuming control of the building.
- D. Upon completion of the building, the Contractor or Owner shall remove the construction master key biting section by means of an extractor key to be supplied by the finish hardware contractor. The removal of the construction master key biting section shall prohibit the operation of the construction master key from that moment on.
- E. Provide a total of six (6) master keys for each group and six (6) grand master keys. Each keyed different change shall have minimum of four (4) change keys.
- F. All change keys, master and grand master keys shall be delivered directly to the owner by the hardware subcontractor who shall obtain a receipt for delivery of same.

2.6 DOOR CLOSERS

- A. All door closers for this project shall be the product of one manufacturer, and shall have cast iron cases with full cover and be full rack and pinion type construction, non-handed and non-sized with adjustable back-check effective at 70 degrees for both standard and parallel arm mounting.
- B. The following products will be acceptable:
 

<u>Door Closers</u>		
Corbin/Russwin	-	DC6200
LCN	-	4111/4011
Sargent	-	280
Norton	-	CLP7500
- C. The hardware contractor shall insert in the hardware schedule, beside each door listing, the required degree of opening for each door. If the door swing is over 140 degrees, parallel arm type closers shall be used. Door closers mounted on comer brackets, or top jamb application, shall not be permitted.
- D. Door closers with cush-n-stop arms shall be provided for all exterior, out-swing doors and other openings as specified under hardware sets. They shall have heavy forged steel parallel arms and soffit plates attached to the frame by six (6) screws. The forged steel arm shall have a positive stop bracket with an adjustable tension hold-open feature controlled with a slotted screw permitting adjustment from no hold-open to full restraint of door movement, Cush-N-Stop hold open function. The hold open feature does not apply to fire doors.
- E. Where door closers are noted to require delayed action feature, provide closers as specified herein, but having a separate delayed action valve, to permit adjustment of delayed action



cycle. When adjusted, the door closer shall close at a controlled rate of speed, through the delayed action cycle range.

- F. The installing contractor shall be responsible for proper installation of door closers in accordance with degree of opening indicated on hardware schedule. Adjustment of all valves, for proper control of closing speed, latching speed, delayed action, backcheck, and spring power adjustments, shall be the responsibility of the installing contractor as set forth in Part III Execution.
- G. Where top rail of door is insufficient in height to mount the closer directly to the rail, drop brackets shall be provided.

## 2.8 DOOR STOPS

- A. It shall be the responsibility of the hardware supplier to provide door stops for all doors in accordance with the following requirements.
- B. Wall type bumpers with a concealed type flange shall be used wherever possible and shall be one of the following:

Ives	-	407 1/2
Door Controls	-	3211T
Rockwood	-	409

- C. Where wall type bumpers cannot be used, such as on unreinforced partitions or in situations where door comes in contact with material such as glass, or any other obstruction, provide dome type floor stops of the proper height.

Ives	-	436,438
Door Controls	-	3310X, 3320X
Rockwood	-	440,442
Hager	-	243

- D. Exterior doors striking masonry and other doors specified to have door stops and holders shall have cast bronze wall or floor type door stops holders with hook or staple to engage door and to selectively hold in open position. The following will be acceptable:

Ives	-	445,446
Door Controls	-	3237X, 3347X
Rockwood	-	473,477

## 2.9 SILENCERS

- A. Provide rubber silencers for all interior steel (hollow metal) frames. Silencers shall be pneumatic type 1/2 inch diameter with 118 inch projection.
- B. Provide 3 silencers for the strike jamb of steel frames for single doors and two for the head for steel frames for pairs of doors.

## 2.10 KICK PLATES

- A. Kick plates shall be .050 gauge solid stainless steel 8-inches high by 1- 1/2 inches less door width for single doors and 1 inch less door width for pairs of doors.
- B. Kick plates shall be applied on the push side of all doors where noted.

## 2.11 FLUSH BOLTS

- A. Extension flush bolts shall have forged bronze face plate with extruded brass lever and with wrought brass guide and strike. Rods for flush bolts shall be 12 inch steel or brass for doors

up to 7'-6" in height. Where doors are over 7'-6" in height the flush bolt rod length shall be increased in increments of six (6) inch for each six (6) inch of additional door height. Plate size shall be 6 3/4 inch x one (1) inch to meet ANSI A115 and SDI specifications. Bolt projection shall be 5/8 inch.

- B. Floor strikes for flush bolts shall be dustproof type cast or extruded bronze with cast bronze floor plate minimum 3-1/2 inch x 1-5/8 inch with masonry anchors for concrete floors. Provide a dustproof strike, for sill application, for all bottom flush bolts for all pairs of doors.
- C. The following products will be acceptable:
 

Ives	-	458
Glynn Johnson	-	FB6
Door Controls	-	780
Rockwood	-	555

## 2.12 THRESHOLD AND WEATHER STRIPPING

- A. All exterior doors shall have, at a minimum, threshold, weather stripping, and door bottoms.
- B. Provide an extruded or cast aluminum threshold as shown on Drawings by full width of door opening. Anchor thresholds with no less than four (4) machine screw anchors for 3'0" lengths. Provide nonferrous solid brass or stainless steel screws.
- C. Extruded aluminum saddle thresholds shall have factory installed vinyl foot seals, Model 425E, as manufactured by National Guard Products or equal.
- D. Cast aluminum thresholds shall be Model 114 as manufactured by Wooster or equal.
- E. For all exterior hollow metal doors and where indicated, provide an extruded aluminum perimeter seal with neoprene gasketing material (weather-stripping) for head and jambs. The neoprene seals shall be an airfoil design to permit full and positive closure between door and jamb. The continuous aluminum brackets shall be applied on the stop with stainless steel sheet metal screws at the corner of the rabbet located so as to provide full closure at the head and jamb perimeters. Where the door comes in contact with the frame, the maximum projection for the continuous aluminum weather stripping brackets shall be no more than 1/4 inch.
- F. Provide a door bottom at all doors indicated to have weather stripping.
- G. Provide weather stripping at all astragals.
- H. Weather stripping (gasketing material) shall be classified by Underwriters Laboratories for application on fire door frames, for openings rated up to 3 hours.
- I. The finish for the exposed continuous aluminum weather stripping brackets, shall be natural anodized aluminum finish.
- J. The door bottom seal shall be concealed in the bottom of the door and shall be a flexible synthetic vinyl that will not take a formal set, nor break or flake in cold weather. The door bottom seal shall extend the full width of the door and shall also extend below the door bottom and compress against the top for the threshold, for complete closure. The door bottom seal shall be fastened to the recessed channel with 3 or 4 screws through the seal or the seal chassis.
- K. Concealed door bottoms must be installed before the door is in place.

### 2.13 FINISH

- A. With the exceptions of door closers, plates, coordinators, thresholds and weather stripping, all hardware items shall be furnished in satin stainless steel finish 32D.
- B. Exceptions are as follows:
  - Door Closers: Sprayed Aluminum
  - Thresholds: Natural Anodized Aluminum
  - Weather stripping: Natural Anodized Aluminum

## PART 3 - EXECUTION

### 3.1 INSPECTION

- A. It shall be the general contractors responsibility to inspect all door openings and doors to determine that each door and door frame has been properly prepared for the required hardware. If errors in dimensions or preparation are encountered, they are to be corrected by the responsible parties prior to the installation of hardware.

### 3.2 PREPARATION

- A. All doors and frames, requiring field preparation for finish hardware shall be carefully mortised, drilled for pilot holes, or tapped for machine screws for all items of finish hardware in accordance with the manufacturers templates and instructions.

### 3.3 INSTALLATION

- A. All materials shall be installed in a workmanlike manner following the manufacturer's recommended instructions.
- B. Exit devices shall be carefully installed so as to permit friction free operation of crossbar, touch bar, thumb latch, lever or knob. Latching mechanism shall also operate freely without friction or binding.
- C. Door closers shall be installed in accordance with the manufacturer's instructions. Each door closer shall be carefully installed, on each door, at the degree of opening indicated on the hardware schedule. Arm position shall be as shown on the instruction sheets and required by the finish hardware schedule.
- D. Installation of all other hardware, including locksets, push-pull latches, overhead holders, door stops, plates and other items, shall be carefully coordinated with the hardware schedule and the manufacturers instruction sheets.
- E. Locations for finish hardware shall be in accordance with dimensions listed in the pamphlet "Recommended locations for Builders' Hardware" published by the Door and Hardware Institute.

### 3.4 FIELD QUALITY CONTROL

- A. Upon completion of the installation of the finish hardware, it shall be the responsibility of the finish hardware supplier to visit the project and to examine the hardware for each door on which he has provided hardware and to verify that all hardware is in proper working order. Should he find items of hardware not operating properly, he should make a report, in writing, to the general contractor, advising him of the problem and the measures required to correct the problem.

### 3.5 ADJUSTING

- A. The adjustments for all door closers shall be the contractor's responsibility and these adjustments shall be made at the time of installation of the door closer. The closing speed and

latching speed valves, shall be adjusted individually to provide a smooth, continuous closing action without slamming. The delayed action feature or back check valve shall also be adjusted so as to permit the corrected delayed action cycle or hydraulic back check cushioning of the door in the opening cycle. All valves must be properly adjusted at the time of installation.

- B. Each door closer has adjustable spring power capable of being adjusted, in the field, from size 2 through 6. It shall be the contractors responsibility to adjust the spring power for each door closer in exact accordance with the spring power adjustment chart illustrated in the door closer installation sheet packed with each door closer.

### 3.6 CLEANING

- A. It shall be the responsibility of the general contractor to clean all items of finish hardware and to remove any remaining pieces of protective materials and labels.

### 3.7 PROTECTION

- A. All exposed portions of finish hardware shall be carefully protected, by use of cloth, adhesive backed paper or other materials, immediately after installation of the hardware item on the door. The finish shall remain protected until completion of the project. Prior to acceptance of the project by the engineer and owner, the general contractor shall remove the protective material exposing the hardware finish.

### 3.8 INSTRUCTIONS AND TOOLS

- A. It shall be the responsibility of the finish hardware supplier to provide installation and repair manuals and adjusting tools, wrenches, etc... for the following operating products:
  - (1) Locksets (all types)
  - (2) Exit devices (all types)
  - (3) Door closers

END OF SECTION

INDEX  
FOR  
DIVISION 9 – FINISHES

<u>Section Number</u>	<u>Title</u>	<u>Page Number</u>
09250	Gypsum Wallboard	09250-1
09900	Painting	09900-1
09905	Surface Preparation and Shop Coatings	09905-1

## SECTION 09250

### GYPSUM WALLBOARD

#### PART 1 – GENERAL

##### 1.1 SECTION INCLUDES

- A. Gypsum drywall construction systems
- B. Metal accessories
- C. Supplementary framing and bracing
- D. Caulking
- E. Tape-joint finishing system

##### 1.2 RELATED SECTIONS

- A. Section 01340 - Submittals
- B. Section 01710 - Project Cleaning
- C. Section 09900 - Painting

##### 1.3 REFERENCES

- A. ASTM C36 - Specification for Gypsum Wallboard
- B. ASTM C474 - Test Methods for Joint Treatment Materials for Gypsum Wallboard Construction
- C. ASTM C475 - Specification for Joint Compound and Joint Type for Gypsum Board
- D. ASTM C630 - Specification for Water Resistant Gypsum Backing Board
- E. ASTM 1002 - Specification for drill screws for the application of Gypsum Board
- F. ASTM C645 - Specification for Non-Load (Axial) Bearing Steel Studs, Runners (Track) and Rigid Furring Channels for Screw Application of Gypsum Board.
- G. ASTM E1 19 - Methods for Fire Tests of Building Construction Materials.

##### 1.4 SUBMITTALS

- A. Submit product data under provision of Section 01340
- B. Submit manufacturer's installation instructions

##### 1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages, bearing brand name and identification.
- B. Store Materials inside under cover, keep dry, protect from weather, other elements and damage from construction operations and other causes.
- C. Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal accessories and trim from being bent or damaged.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. General: Comply with requirements of gypsum board application standards and manufacturer's recommendations, for environmental conditions before, during and after application of gypsum board.
- B. Cold Weather Protection: When outdoor temperature is below 55 degrees F maintain building working temperature of not less than 55 degrees F for a period of 48 hours prior to, during and following application of gypsum board and joint treatment materials or bonding of adhesives.
- C. Ventilation: Ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Georgia Pacific Corporation
- B. U.S. Gypsum Company
- C. Or equal

2.2 FASTENERS

- A. For gypsum board: self drilling Phillips bugle head, minimum 1-1/4 inch long, length and type as recommended by the manufacturer.

2.3 ACCESSORIES

- A. Corner Beads - Standard Wallboard Comer Bead, galvanized steel, with perforated flanges, one by 1-1/4 inches.
- B. Casing Beads -Casing Bead, galvanized steel, 5/8 inch size, with flanges for finishing with tape joint treatment compound.
- C. Hangers - No. 9, W&M Gage Class 1 galvanized wire.
- D. Furring channels - Cold-rolled, 25 gauge, galvanized, hat-shaped sections, size 7/8 inch x 2 9/16 inch.
- E. Resilient Furring Channels - Cold-rolled, 25 gauge ½ inch by 2 ½ inch.
- G. Other shapes as indicated on the Drawings and as required for a complete installation.

2.4 JOINT TREATMENT MATERIALS

- A. Tape - Tape for reinforcing joints.
- B. Compounds - All purpose joint compound.

PART 3 – EXECUTION

3.1 INSTALLATION PROCEDURES

- A. General - Follow manufacturer's recommendations for installation of metal support systems to include ceiling suspension system, direct hung metal support system and wall support system.

3.2 GYPSUM WALLBOARD

- A. Refer to the Drawings for details of various conditions and locations where gypsum drywall construction will be required.
- B. Fasten Gypsum wallboard to framing and furring with Phillip's Buglehead screws, length and type as recommended by the manufacturer for the intended application.
- C. Install corner beads at all external comers of gypsum wallboard, and casings wherever gypsum wallboard abuts a dissimilar material. Use tape joint treatment for internal comers and for all joints.
- D. Caulk around all items which penetrate gypsum wallboard, including electrical receptacle boxes, switch boxes and piping.
- E. Use joint compound for filling all screw head depressions and other depressions in the faces of the gypsum board. Sand all compound surfaces absolutely smooth and level with the board face.
- F. Installation shall be as detailed and as per manufacturer's recommendations to provide fire rated assemblies.

3.3 PROTECTION AND CLEANING

- A. During the operation of gypsum drywall work, protect the work of other trades against undue soilage and damage by the exercise of reasonable care and precautions. Repair and/or replace any work so damaged and soiled.

END OF SECTION



## SECTION 09900

### PAINTING

#### PART 1 – GENERAL

##### 1.1 SECTION INCLUDES

- A. Examine the various SECTIONS of the SPECIFICATIONS and be thoroughly familiar with all provisions regarding painting and finishing work included therein.
- B. Apply specified finish coats of paint to all preprimed surfaces and complete finishing system to unprimed items.
- C. Paint all process, mechanical, structural, architectural and electrical work exposed to view including equipment, piping, electric panels, electrical boxes, stanchions, supports and all other items unless specified in the respective SECTIONS to be prefinished.
- D. Paint all existing items as noted in this Specification and as indicated on the Drawings.
- E. Backprime, with specified interior first coat, all surfaces of wood finish and trim which will be concealed after installation.
- F. Paint all ferrous metals and galvanized metals on the building extensions.
- G. Apply paint on finish surfaces only to the extent specified herein and indicated on the Drawings.
- H. Pipe, pump and valve identification markers.

##### 1.2 RELATED SECTIONS

- A. Section 01340 - Submittals
- B. Section 03300 - Cast-in-Place Concrete
- C. Section 06100 - Rough Carpentry
- D. Section 07900 - Joint Sealers
- E. Section 08110 - Steel Doors and Frames
- F. Section 09250 - Gypsum Wallboard
- G. Section 09905 - Surface Preparation and Shop Coats
- H. Division 11 - Equipment
- I. Division 16 - Electrical

##### 1.3 PREFINISHED ITEMS NOT REQUIRING PAINT OR FINISH

- A. Items and equipment that are specifically specified to receive the manufacturer's standard primer and finish coats in the factory.
- B. Copper, bronze, brass, chromium plate, nickel, stainless steel, aluminum or monel metals (unless otherwise noted).

##### 1.4 REFERENCES

- A. ASTM D2247 - Practice for Testing Water Resistance of Coatings in 100 Percent Relative Humidity.
- B. ASTM D 2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
- C. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
- D. Federal Test Method No. 141 - Method 6141, Stain Removal.
- E. ANSI A13.1 - Scheme for the Identification of Piping Systems.
- F. SSPC - Steel Structures Painting Council.
- G. SSPC-PA1, "Standard for Shop, Field, and Maintenance Painting."
- H. SSPC-PA2, "Measurement of Dry Paint Thickness with Magnetic Gauges."

- I. SSPC-SP1, "Solvent Cleaning."
- J. SSPC-SP2, "Hand Tool Cleaning."
- K. SSPC-SP3, "Power Tool Cleaning."
- L. SSPC-SP6, "Commercial Blast Cleaning."
- M. SSPC-SP7, "Brush Off Blast."
- N. SSPC-SP10, "Near-White Blast Cleaning."
- O. SSPC-PA Guide 3, Standard "A Guide to Safety in Paint Application," latest revision.
- P. OSHA 29 CFR 1926.62 The Interim Final Rule for Lead Exposure in Construction, May 4, 1993.
- Q. SSPC - Guide 61 (COH) Guide for Containing Debris Generated during Paint Removal Operations.
- R. SSPC - Guide 71 (DIS) Guide for Disposal of Lead-Contaminated Surface Preparation Debris.
- S. SSPC Publication 91-18 Industrial Lead Paint Removal Handbook.
- T. USEPA 40 CFR Part 261 Identification and Listing of Hazardous Waste.
- U. USEPA 40 CFR Part 262 Standards Applicable to Generators of Hazardous Waste.
- V. USEPA 40 CFR Part 263 Standards Applicable to Transporters of Hazardous Waste.
- W. USEPA 40 CFR Part 268 Land Disposal Restrictions.
- X. USDOT 49 CFR Parts 173,178 and 179.
- Y. VOC Standards - All coatings shall be in accordance with all applicable State and Federal VOC Standards.
  - 1. OSHA 29 CFR 1925.55 Gases, Vapors, Fumes, Dusts and Mists.
  - 2. Ozone Transportation Commission (OTC) 2005 VOC Regulation.

#### 1.5 SUBMITTALS

- A. Submit product data under provisions of Section 01340.
- B. Submit a minimum of three (3) color charts for color selection by Engineer.
- C. Submit schedule with list of items to be coated, type and manufacturer of shop coating and type of field coating, including primers, details on surface preparation methods, application procedures and dry mil thickness.
- D. Color scheme shall be in accordance with schedules provided by the Engineer, and all tinting and matching shall be to the satisfaction of the Engineer.
- E. Submit coating manufacturer's certification that proposed field coatings are compatible with shop coatings.
- F. Submit coating manufacturer's certification that the proposed coatings meet all state and federal VOC regulations.

#### 1.6 QUALITY ASSURANCE

- A. All materials used on work shall be exactly as specified in brand and quality. No claim by the Contractor as to unsuitability or unavailability of any material specified, or his unwillingness to use same, or his inability to produce first class work with same, will be entertained unless such claims are made in writing and submitted to the Engineer at least seven (7) days prior to the date established for receipt of General Bids.

- B. Before purchasing materials for the work, the Contractor shall submit to the Engineer a list of the products he proposes to use, and the list shall be reviewed by the Engineer and no exceptions taken and reviewed by him before commitment for materials is made.
- C. Materials selected for coating systems for each type of surface shall be the products of a single manufacturer.
- D. Include on label of all containers:
  - 1. Manufacturer's name
  - 2. Type of paint
  - 3. Manufacturer's stock number
  - 4. Color
  - 5. Instructions for reducing, where applicable
  - 6. Label analysis
  - 7. Shelf life dates
- E. Field Quality Control:
  - 1. Contractor shall request review by the Engineer, of first finished room, space or item of each color, texture and method of applications, prior to proceeding with additional painting.
  - 2. Use first acceptable room, space or Item as the project standard for each color scheme.
  - 3. For spray application, when applicable, paint a surface not smaller than 100 square feet as the project standard.
  - 4. Repainting of materials failing to meet the requirements of the Specifications or Drawings, shall be performed by the Contractor, at no additional cost to the Owner.
  - 5. The number of coats and total mil thickness specified in the paint schedule are minimums. If the specified minimum film thickness is not achieved, additional coats shall be applied to achieve the total film thickness specified.
- F. Paints submitted shall meet all Federal and State regulations pertaining to Volatile Organic Compounds (VOC) compliance, and be in accordance with OTC 2005 Standards.

#### 1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver coating materials in sealed containers with labels legible and intact.
- B. Store only acceptable project materials on the project site.
- C. All painting materials shall be stored and mixed in a single location coordinated with the Engineer. The Contractor shall not use any plumbing fixture or pipe for mixing or for disposal of any refuse. The Contractor shall carry all necessary water to the mixing room, and shall dispose of all waste outside of the building in a suitable receptacle.
- D. Restrict storage location to paint materials and related equipment and supplies.
- E. Keep storage location neat and clean.
- F. Remove all soiled and used rags, waste and trash from the storage location and building at the end of each work day.
- G. Repair all damage to the storage location, caused by painting materials and equipment at no additional cost to the Owner.
- H. Comply with all applicable health and fire codes and regulations including safety precautions recommended by the manufacturer. Storage space shall be provided with a suitable fire extinguisher fully charged at all times.
- I. Heat shall be provided in the storage area if paints are to be stored during winter months. The temperature shall be maintained above 40 degrees F at all times.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems shall be applied.
- B. Do not apply coatings in areas where dust is being generated.
- C. Do not apply coatings when the air or material surface temperature is below 50 degrees Fahrenheit and unless the temperature is at least 5 degrees Fahrenheit above the dew point.
- D. Do not apply exterior coatings in frosty, damp or rainy weather or while surfaces are exposed to hot sunlight.

1.9 EXTRA MATERIALS

- A. For all materials with a shelf life of greater than 12 months, provide one-gallon of each type and each color of touch-up paint shall be provided to the Owner by the Contractor in unopened containers.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Tnemec Company, Inc.
- B. Sherwin Williams
- C. ICI (Glidden/Devoe)
- D. Or equal

2.2 MATERIALS

Refer to the paint schedule for specific products and application.

2.3 COMPONENTS

- A. All finish coats shall be compatible with shop prime coats.
- B. Turpentine shall be pure spirits of turpentine.
- C. Shellac shall be four pounds and shall meet the U.S. Government specifications as issued by the Bureau of Commerce.
- D. When interior or exterior wood and metal are primed in the mill or shop as part of painting contract, use the materials specified in every case for such surfaces and use in accordance with manufacturer's directions for first or priming coat.

2.4 MIXING AND TINTING

- A. Deliver paints and enamels ready-mixed to project site.
- B. Accomplish job mixing and job tinting only when required and no exceptions taken by the Engineer.
- C. Mix only in mixing pails placed in suitably sized nonferrous or oxide resistant metal pans.
- D. Use only tinting colors recommended by the manufacturer for the specific type of finish.
- E. Fungicidal agents, when applicable, shall be incorporated into the paints and stains by the manufacturer.
- F. Mix and prepare paints in strict accordance with Manufacturers recommendations.

## PART 3 – EXECUTION

### 3.1 INSPECTION

- A. Examine surfaces scheduled to receive paint and finishes for conditions that will adversely affect execution, permanence or quality of work and which cannot be put into an acceptable condition through preparatory work as included in Part 3.2, Surface Preparation.
- B. Immediately notify the Engineer in writing when a surface to be finished cannot be put into an acceptable condition.
- C. Do not proceed with surface preparation or coating application until conditions are suitable.
- D. The Contractor shall be responsible for and shall rectify, at no additional cost to the Owner any unsatisfactory finish resulting from the application of coatings on surfaces not in acceptable condition.

### 3.2 SURFACE PREPARATION

- A. Wood and Plywood to be Painted
  1. Clean soiled surfaces.
  2. Except when rough surface is specified, sand to smooth and even surface, then dust off.
  3. Apply shellac to all knots, pitch and resinous sapwood after washing with mineral spirits and, before priming coat is applied.
  4. Fill nail holes, cracks, open joints and other defects with paste wood filler before priming coat surface and color to match finish color. When wood filler is applied on open grain wood, allow the grain to secure a smooth, clean surface.
- B. Concrete:
  1. Clean all dust, dirt, oil and efflorescence from surfaces.
  2. Fill cracks and irregularities with Portland cement grout to provide uniform surface texture.
  3. Etch dense and smooth concrete, or concrete that has had a hardener applied, with a five percent solution (by weight) of muriatic acid.
  4. Fill concrete masonry unit surfaces with block filler in sufficient thickness to produce a final result which shall fill all voids and pin holes.
  5. Allow surfaces to thoroughly dry prior to application of first coat.
- C. Ferrous Metal Surfaces
  1. All submerged ferrous metals shall be sandblast cleaned in accordance to SSPC-SP10 immediately prior to priming.
  2. All other ferrous metals shall be sandblast cleaned in accordance to SSPC-SP6 immediately prior to priming.
  3. Remove dirt, oil and grease by washing surfaces with mineral spirits.
  4. Surfaces shall be dry and free of dust, oil, grease and other foreign material before priming.
  5. Feather edges of sound existing paint by grinding, if necessary.
  6. Clean and touch up weathered, worn or damaged shop coats of paint with the specified primer.
  7. Restore shop coats of paint with identical materials if removed for welding and fabrication.

D. Galvanized Metal:

1. Thoroughly clean surface with mineral spirits to remove oily residue.
2. Dry with clean cloth.
3. Treat surface with copper sulphate or with a compound made for this purpose (Lithoform, Solfo Metallic Coating, etc.) in accordance with the manufacturer's directions, before applying the primer.

E. Previously Coated Surfaces (including existing items and new items that are shop primed)

1. The areas of the coated surface that are blistered, eroded, brittle or otherwise failed shall be completely removed before beginning the specified surface preparation.
2. The areas where the existing coating is intact shall be sanded to dull the finish.
3. Before applying the new coating over an existing coating, a test section must be done to ensure compatibility of the new and old coatings.
4. All other existing coatings shall be prepared as recommended by the manufacturer and as specified in this section.
5. Ferrous metals arriving at the job site with shop primers other than the polyamide epoxy or rust inhibitive primers specified shall be provided with an intermediate coat as necessary for compatibility with specified topcoats.
6. Special attention shall be paid to the potential for epoxy shop and intermediate coats to chalk upon exposure to sunlight. The Contractor shall follow the manufacturer's required surface protection/covering and surface preparation recommendations before any intermediate or top coats can be applied over chalked surface. Epoxy primers and intermediate coats shall be top coated no later than 45 days after the application of the epoxy coating. If topcoats are to be applied later than 45 days, the following surface preparation shall be provided:
  - a. The existing finish shall be etched by sanding with 80 grit paper or cloth.
  - b. Surfaces shall be pressure washed with 3000 to 5000 pounds of pressure.
  - c. The Engineer, at his discretion, can require the Contractor to conduct adhesion tests of the topcoats.
7. The following shall be the minimum surface preparatory for existing surfaces that are to be painted, unless indicated otherwise:
  - a. Existing submerged ferrous metals.
    - Clean
    - Sandblast in accordance with SSPC-SP10.
  - b. Non-submerged ferrous metals.
    - Clean
    - Sandblast in accordance with SSPC-SP6.
  - c. Existing Concrete and Masonry Walls
    - Clean
    - Scrape existing paint to a sound surface.
    - Sand with 80 grit paper or cloth.
    - Pressure wash all existing epoxy coated surfaces.
  - d. Existing Concrete Floors
    - Clean
    - Shot blast to remove coatings and to provide an anchor profile.

### 3.3 APPLICATION

#### A. Workmanship:

1. Employ skilled workmen to insure workmanship of the highest quality.
2. Materials shall be applied only by craftsmen experienced in the use of the specific products involved.

#### B. General Requirements:

1. Apply all coatings under adequate illumination.
2. Perform no work in the rain, dew, or fog, when the temperature is below 50 degrees Fahrenheit and at least 5 degrees Fahrenheit above the dew point, or before the other coats have thoroughly dried.
3. Do not apply coatings until the material surfaces are thoroughly dry.
4. Apply paints and varnishes with suitable brushes, rollers or spraying equipment.
  - a. The rate of application shall not exceed that as recommended by the paint manufacturer for the surface involved.
  - b. Keep brushes, rollers and spraying equipment clean, dry and free from contaminates and suitable for the finish required.
  - c. Apply stain by brush. Cover surfaces with a uniform coat and wipe off if required.
  - d. Make each coat a different tint from that of the preceding coat, with final coat tinted to the exact shade selected by the Engineer. Lightly sand surfaces between each coat of gloss and semi-gloss finishes, and wipe clean.
5. Comply with the recommendation of the product manufacturer for drying time between succeeding coats. Contractor shall follow the manufacturer's specific curing requirements for rust inhibitive primer shop coats prior to allowing topcoating.
6. Sand and dust between each coat to remove defects visible from a distance of five feet.
7. Finish coats shall be smooth, free of brush marks, streaks, laps or pile up of paints and skipped or missed areas.
8. Inspection:
  - a. Do not apply additional coats until the completed coat has been inspected by the Engineer.
  - b. Only inspected and reviewed coats will be considered in determining the number of coats applied.
9. Leave all parts of moldings and ornaments clean and true to details with no undue amount of paint in comers and depressions.
10. Make edges of paint adjoining other materials or colors clean and sharp with no overlapping.
11. Refinish entire wall where portion of finish has been damaged or is not acceptable.
12. Runs on face are not permitted.

### 3.4 PROTECTION

- A. Furnish and lay drop cloths in all rooms and areas where painting and finishing is being done to adequately protect flooring and other work from damage during the prosecution of the painting work.
- B. Remove all canopies of lighting fixtures, all electric switch plates, and similar equipment, set them carefully away, and cover adequately, protect the fixtures, etc.; replace the canopies, plate, etc. in as good condition as when found.

- C. Do not paint over any code-required labels, such as Underwriter's Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

### 3.5 CLEANING

- A. At the completion of the work of this Section, remove all paint spots and oil or grease stains, caused by this work from floors, walls, fixtures, hardware and equipment, leaving their finishes in a satisfactory condition. Remove all materials and debris and leave the site of the work in a clean condition so far as this work is concerned.

### 3.6 FINAL INSPECTION

- A. Protect all painted and finished surfaces against damage until the date of final acceptance of the work. The Engineer will conduct a final inspection of all painters' work. As part of the final inspection the Contractor shall demonstrate compliance with the specified film thickness with appropriate paint gauges. The Contractor shall be required to repaint, refinish, or retouch any areas found which do not comply with the requirements of this Section.

### 3.7 PAINT SCHEDULE

#### A. Definitions

1. Submerged surfaces are defined as:
  - a. Those surfaces which are below the maximum water surface level as indicated on the drawings, and/or extend 3-feet above the maximum water surface for uncovered tanks.
  - b. All surfaces contained within covered tanks.
  - c. The full height of all partially submerged items such as sluice, slide and weir gates, piping, etc.
  - d. All surfaces contained within underground vaults, structures and manholes such as valve pits, dry wells, etc.
2. Enclosed surfaces shall be those non-submerged surfaces enclosed and/or protected within a building in such a manner that it can not be exposed to UV light or weather conditions.
3. Weather exposed surfaces shall be all other conditions including buried items which do not fall into the definition of submerged or enclosed surfaces as noted above.

#### B. General:

1. Paint and finish all new piping, equipment and other items installed, modified or relocated in the existing basement.
2. Correct and refinish all interior and exterior surfaces in the existing basement affected by the new work. Materials and their application shall be as required to most closely match the existing finishes and as specified in this Section.
3. Refinish additional existing items on the existing facility as noted on the Drawings and in this Specification.
4. Finish all new items and components installed or constructed.



3.8 PIPING, EQUIPMENT AND VALVE IDENTIFICATION SCHEDULE

- A. All pipes, whether concealed or exposed to view shall be painted a separate color as selected by the engineer or as specified in the pipe identification schedule. For insulated pipes, only the insulation shall be painted.
- B. Markers shall be corrosion resistant laminated plastic bound to the pipes with nylon fasteners or shall be "coil-fit." Pipes with diameters less than 1-1/4 inch shall have marker hung from pipe with nylon fasteners.
- C. Lettering size shall be in accordance with the following:

SIZE OF LEGEND LETTERS

Outside Diameter of Pipe or Covering In	Minimum Length of Marker In	Size of Letters In
Up to 1-1/4	8	1/2
1-1/2 to 2	8	3/4
2-1/2 to 6	12	1-1/4
8 to 10	24	2-1/2
Over 10	32	3-1/2

- D. Adjacent to each marker there shall be an arrow indicating flow direction.
- E. Marker location shall be in accordance with the American National Standard Institute Scheme for Identification of Piping Systems (ANSI A13.1). Markers shall be placed adjacent to all valves and/or flanges; adjacent to all changes in direction on all pipe branches; and where all pipes pass through walls or floors on each side of wall/floor. On straight runs of piping, markers shall be placed at no less than 10 foot intervals. Where pipes are located above or below the normal line of vision, the lettering shall be placed below or above (as appropriate) the horizontal centerline of the pipe.
- F. All new valves, pumps and other equipment shall be assigned an identification number and shall be marked with the identification number with 3-inch diameter tags.
  - 1. The tags shall be rugged plastic.
  - 2. The tags shall be tied with nylon fasteners.
- G. Valve status indicator alignment arrows shall be provided on the indicator and scale sides of all interior hand wheel, chain and lever operated valves. Arrow heads shall appear aligned when the valve is in the full-open position. Arrow heads shall be painted on with stencils, or a color contrasting with the color of the valve. Arrow heads shall be minimum of 3/4-inch in smallest dimension. Valve position indicators shall be aligned to be visible from normal working levels.
- H. Manufacturer- To establish a standard of quality, design and function, MARKERS, BANDS and TAGS have been based on Seton Name Plate Corporation, New Haven, Connecticut or an equal.
- I. Pipe supports consisting of pipe rings, clamps, clevises, U bolts, pipe rollers, saddles, etc., shall be painted with the same color as that of the pipe.
- J. Wall supported pipe hangers consisting of brackets, standoffs, etc., shall be painted with the same color as that of the wall.
- K. Ceiling/roof supported pipe hangers consisting of thread rods, beam clamps, etc., shall be painted with the same color as that of the ceiling.

- L. Floor supported pipes consisting of stanchions shall be painted with same color as that of the pipe.
  
- (2) Stainless steel piping shall not be color coded, but shall receive the markings indicated.

END OF SECTION

## SECTION 09905

### SURFACE PREPARATION AND SHOP COATINGS

#### PART 1 – GENERAL

##### 1.1 SECTION INCLUDES

- A. Surface preparation and application of shop coatings on materials, equipment, and piping indicated in the various specification sections relating thereto, and as specified herein, including primers and topcoats for materials, equipment and piping that are finished at the point of manufacturer or fabrication.
- B. Examine the various Sections of the Specifications and be thoroughly familiar with all provisions regarding shop coatings.

##### 1.2 RELATED SECTIONS

- A. Section 01340 - Submittals
- B. Section 09900 - Painting
- C. Division 11 - Equipment
- D. Division 16 - Electrical

##### 1.3 PREFINISHED ITEMS NOT REQUIRING PAINT OR FINISH

- A. Copper, bronze, brass, chromium plate, nickel, stainless steel, aluminum or monel metals, except surfaces in contact with or embedded within concrete or masonry, unless otherwise specified elsewhere.

##### 1.4 REFERENCES

- A. ASTM D2247 - Practice for Testing Water Resistance of Coatings in 100 Percent Relative Humidity.
- B. ASTM D 2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
- C. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
- D. Federal Test Method No. 141 - Method 6141, Stain Removal.
- E. SSPC - Steel Structures Painting Council.
- F. SSPC-PA1, "Standard for Shop, Field, and Maintenance Painting".
- G. SSPC-PA2, "Measurement of Dry Paint Thickness with Magnetic Gauges".
- H. SSPC-SP1, "Solvent Cleaning".
- I. SSPC-SP6, "Commercial Blast Cleaning".
- J. SSPC-SP10, "Near-White Blast Cleaning".
- K. SSPC-PA Guide 3, Standard "A Guide to Safety in Paint Application", latest revision.

##### 1.5 SUBMITTALS

- A. Submit product data under provisions of Section 01340.
- B. As a minimum, the following shall be included in the submittal package for all items, products, material or equipment, as specified.
  - 1. Submit data on the proposed shop coatings, details on surface preparation methods, application procedures and dry mil thickness.

2. Submit a minimum of three (3) color charts for all factory top coats for color selection by Engineer.
3. Submit coating manufacturer's certification that proposed shop coatings are compatible with field coatings, as specified in Section 09900.

#### 1.6 QUALITY ASSURANCE

- A. All Shop Coatings shall meet the requirements of the materials section, and shall be guaranteed by the manufacturer to be compatible with the field coatings, as specified in Section 09900. The Contractor shall coordinate this requirement during the Shop Drawing Phase.
- B. All Shop Coatings shall meet all Federal and [State] regulations pertaining to Volatile Organic Compounds (VOC) compliance.

### PART 2 – PRODUCTS

#### 2.1 MATERIALS

- A. Refer to Part 3 – EXECUTION for specific products and applications.

### PART 3 – EXECUTION

#### 3.1 SURFACE PREPARATION

- A. Definitions
  1. Submerged surfaces are defined as:
    - a. Those surfaces which are below the maximum water surface level as indicated on the drawings, and/or extend 3'-0" above the maximum water surface for uncovered tanks.
    - b. All surfaces contained within covered tanks.
    - c. The full height of all partially submerged items such as sluice gates, slide gates, weir gates, piping, etc.
    - d. All surfaces contained within underground structures, vaults and manholes such as valve pits, drywells, etc.
  2. Enclosed surfaces are those non-submerged surfaces enclosed and/or protected within a building in such a manner that it can not be exposed to UV light or weather conditions.
  3. Weather exposed surfaces are all other conditions including buried items which do not fall into the definition of submerged or enclosed surfaces, as noted above.
- B. Ferrous Metal
  1. All submerged ferrous metals shall be sandblast cleaned in accordance to SSPC-SPIO, near white, immediately prior to priming.
  2. All other ferrous metals, Enclosed and Weather exposed surfaces, shall be sandblast cleaned in accordance to SSPC-SP6, commercial grade, immediately prior to priming.
  3. Remove dirt, oil and grease by washing surfaces with mineral spirits.
  4. Surfaces shall be dry and free of dust, oil, grease and other foreign material before priming.

C. Non-Ferrous Metals

1. Surfaces in contact with or embedded within concrete or masonry that are to be primed, shall be cleaned in accordance to SSPC-SP1, Solvent Clean, immediately prior to priming.
2. Remove dirt, oil and grease by washing surfaces with mineral spirits.
3. Surfaces shall be dry and free of dust, oil, grease and other foreign material before priming.

D. Galvanized Metals

1. Thoroughly clean surface with mineral spirits to remove oily residue.
2. Dry with clean cloth.
3. Treat surface with copper sulphate, or with a compound made for this purpose. (Lithoform, Solfo Metallic Coating, etc.), in accordance with the manufacturer's directions, before applying the primer.

3.2. APPLICATION

A. Equipment

1. Motors, speed reducers and similar parts shall have a surface preparation in accordance with the manufacturer standard coating requirements and suitable for weather exposed use. The minimum coating system shall be polyamide epoxy at 3 mils. Other coatings must be approved by the Engineer.
2. Items finished at the point of manufacture (shop primed and painted), such as submersible pumps and other similar surfaces, shall receive manufacturer's standard coating of baked, powder epoxy enamel, suitable for the intended service.
3. All equipment casing openings requiring protection shall have a water repellent tape and vapor phase inhibitor treated paper.
4. All other ferrous surfaces shall be factory primed in accordance with Section 3.2.C, except ferrous surfaces obviously not to be painted (such as gears, exposed machined or bearing surfaces, enclosed machined or bearing surfaces, lubricated contact surfaces moving under load, thread connections to be field connected and other similar items) which shall be given a heavy shop coat of grease or other suitable rust resistant coating per manufacturer's recommendations.
5. These coating shall be maintained as necessary to prevent corrosion during all periods of storage and erection, until final acceptance by the Owner.

B. Pipe, Fittings and Valves

1. The following surfaces shall be prepared in accordance with the manufacturer's recommendations and shall receive a shop coat of asphaltum varnish meeting Federal Specifications TT-C-494A or fusion bonded epoxy coating.
  - a) Interior surfaces of all hydrants, ductile iron pipe, fittings and valves except for air piping lines and air valves which shall be completely unlined.
  - b) The exterior surfaces of buried valves and miscellaneous piping appurtenances.
2. The exterior surfaces of all ductile iron pipe and fittings buried shall receive the standard factory applied asphaltic coating (in accordance with AWWA C151).
3. The exterior surfaces of ductile iron pipe, fittings and valves submerged, enclosed or weather exposed shall receive a factory applied shop primer in accordance with Section 3.2.C
4. Machined surfaces shall be cleaned and coated immediately after being machined, with a suitable rust resistant coating per manufacturer's recommendations.

## SURFACE PREPARATION AND SHOP COATINGS

5. All other ferrous surfaces shall be factory primed in accordance with Section 3.2.C, except ferrous surfaces obviously not to be painted shall receive a heavy shop coat of grease or other suitable rust resistant coating per manufacturer's recommendations.
6. These coating shall be maintained as necessary to prevent corrosion during all periods of storage and erection until final acceptance by the owner.

END OF SECTION

INDEX  
FOR  
DIVISION 11 – EQUIPMENT

<u>Section Number</u>	<u>Title</u>	<u>Page Number</u>
11320	Pressure Tank	11320-1
11350	MCC and VFD	11350-1

SECTION 11320

PRESSURE TANK

PART 1 – GENERAL

1.01 Related Work Specified in Other Sections

None

1.02 QUALITY ASSURANCE

- A. Acceptable Manufacturer: Well-Rite, Flexcon Industries Model WR360 or equivalent  
Phone: (781) 986-2424
- B. Governing Standards:
  - 1. U.L. 142, Underwriters Laboratories, Inc., Steel Aboveground Tanks for Flammable and Combustible Liquids.
  - 2. NFPA 30, National Fire Protection Association Flammable and Combustible Liquids Code.
  - 3. NFPA 30A, National Fire Protection Association Automotive and Marine Service Station Code.
  - 4. Uniform Fire Code, International Fire Code Institute.
  - 5. AWWA standards
- C. Tank manufacturer to have over 5 years experience in water tank construction and field installation.
- D. Tank manufacturer to have previously installed tanks in New Hampshire and comply with NHDES standards.
- E. Certifications: NSF Standard 61 listed

1.03 MANUFACTURER'S WARRANTY

- A. The manufacturer shall warrant the tank for leaks for five (5) years. The Tank manufacturer shall be solely responsible for the warranty.

1.04 SUBMITTALS

- A. Shop Drawings: Contractor shall submit copies of shop drawings for each tank, location of fittings and accessories with specific dimensions shall be shown on all drawings.
- B. Drawing Approval: Contractor shall receive drawing approval prior to product fabrication.

PART II – PRODUCTS

2.01 ABOVE GROUND STORAGE TANK

- A. Materials
  - 1. Only new material shall be used in the manufacturing process, and the manufacturer shall ensure that the material used meets all appropriate specifications and quality assurance requirements.
  - 2. Shell: Drawn Steel w/ Epoxy Finish  
Diaphragm: Butyl Rubber w/ crosslinked polypropylene lower water chamber.
- B. Dimensional Requirements
  - 1. Nominal capacity of the tank(s) shall be 119 gallons.



2. Nominal outside diameter tank(s) shall be 26 inches.
3. Overall height of the tank shall be 59.75 inches.
- C. Loading Conditions: Tanks shall meet the following design criteria.
  1. Internal Load: Tank shall withstand an air pressure test of 3-5 psi
- D. Product Storage Requirements
  1. Tank shall be capable of storing liquids with a specific gravity up to 1.0.
  2. Tank is designed for operation at up to 125 psi.
  3. Tank shall be capable of storing water at ambient temperature temperatures not to exceed 140 degrees Fahrenheit.
  4. Tank to be pre-charged at 38 psi.

## 2.02 ACCESSORIES

- A. Certification Plate: Year of Manufacture, size and pressure rating for atmospheric water tank.
- B. Fittings: Stainless Steel FPT
  1. All threaded fittings shall be of a material of construction consistent with the requirements of the Underwriters Laboratories label. All fittings shall be protected using threaded plugs or suitable closure caps.
  2. Fittings Schedule:

<u>Use</u>	<u>Size</u>
Connection (bottom)	1 1/4" NPT
Air Valve (top)	Brass Valve w/ o-ring seal
  3. Location: Refer to drawings.
- C. On-site construction
  1. Tank will be constructed and completed on site to accommodate the gallonage needed and size requested. Manufacturer will design for minimal welding on site.
- D. The tank shall have a protective coating both inside and out that is certified as being manufactured and applied in accordance with the approved listings in Env-Ws 305.

## PART III – EXECUTION

### 3.01 INSTALLATION

- A. Manufacturer's tank shall be installed in strict accordance with the most recent installation instructions provided by the tank manufacturer, local ordinance, recognized engineering procedure, and other applicable codes.

### 3.02 TESTING

- A. Tank shall pass high pressure, seam weld, helium and final pre-charge check tests.

END OF SECTION



INDEX  
FOR  
DIVISION 15 – MECHANICAL

<u>Section Number</u>	<u>Title</u>	<u>Page Number</u>
15094	Pipe Hangers & Supports	15094-1
15100	Pumps Valves and Meters	15100-1
15101	Gate Valves	15101-1
15106	Ball Valves	15106-1
15110	Check Valves	15110-1
15400	Plumbing – General	15400-1
15401	Plumbing, Piping and Specialties	15401-1
15540	Portable Fire Extinguishers	15540-1
15550	Dehumidifier and Heater	15550-1

## SECTION 15094

### PIPE HANGERS & SUPPORTS

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

- A. Work Included: Furnish and install pipe hangers and supports to rigidly support pipes, maintain the necessary pitch, prevent vibration, prevent movement, and to allow expansion and contraction of the type(s) and in the location(s) shown on the Drawings and specified herein. All pipe hanger and support systems shall be designed and constructed to resist seismic forces as specified herein.
- B. Pipe supports and details are generally not shown on the Drawings. The absence of pipe supports and details on the Drawings shall not relieve the Contractor of the responsibility for providing them. Pipe supports indicated on the Drawings are shown only to convey the intent of the design for a particular location and are not intended to represent a complete system.

##### 1.2 RELATED WORK

- A. Concrete is included in Division 3.
- B. Field painting is included in Division 9.
- C. Pipe and fittings are included in respective sections in Division 15.
- D. Valves and appurtenances are included in Section 15100.
- E. Hangers and supports pertaining to Electrical, HVAC and Plumbing systems are included in their respective sections.

##### 1.3 SUBMITTALS

- A. Submit to the Engineer, in accordance with Section 01300, complete sets of shop drawings of all items to be furnished under this Section. Submittals shall include complete layouts, schedules; location plans and complete total bill of materials for all pipe support systems.
- B. Submittals shall include a representative catalog cut for each different type of pipe hanger or support indicating the materials of construction, important dimensions and range of pipe sizes for which that hanger is suitable. Where standard hangers and/or supports are not suitable, submit detailed drawings showing materials and details of construction for each type of special hanger and/or support. Provide detailed information on anti-seize compound.
- C. Submit complete pipe support system design stamped by a Professional Engineer registered in the State of New Hampshire as specified in Section 15050, Part 1.3 Submittals. The support system shall be designed for dead weight and dynamic analysis, including system thermal effects, pressure thrusts and seismic forces. Refer to Section 15050, Part 1.3 for support system design and submittal requirements. Seismic design and submittal requirements are specified in Section 15050, Part 1.4 Seismic Controls.

##### 1.4 REFERENCES

- A. Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS)
  - 1. MSS SP-58 Pipe Hangers and Supports - Materials, Design and Manufacture
  - 2. MSS SP-69 Pipe Hangers and Supports - Selection and Application
  - 3. MSS SP-89 Pipe Hangers and Supports - Fabrication and Installation Practices

## PART 2 – PRODUCTS

### 2.1 GENERAL

- A. All of the products specified herein are intended to support the various types of piping systems shown on the Drawings. It shall be the responsibility of the Contractor to develop final details associated with special conditions (in particular system temperatures and pressures) associated with this project.
- B. The Contractor may propose minor adjustments to the piping arrangements in order to simplify the supports, or in order to resolve minor conflicts in the work. Such an adjustment might involve minor change to a pipe centerline elevation so that a single trapeze support may be used.
- C. Where flexible couplings are required at equipment, tanks, etc., the end opposite to the piece of equipment, tank, etc., shall be rigidly supported, to prevent transfer of force systems to the equipment. No fixed or restraining supports shall be installed between a flexible coupling and the piece of equipment.
- D. All pipe and appurtenances connected to the equipment shall be supported in a manner to prevent any strain from being imposed on the equipment or piping system.
- E. Unless otherwise specified, all rods, clamps, hangers, inserts, anchor bolts, brackets and components for interior pipe supports shall be furnished with galvanized finish, hot dipped or electro-galvanized coated, except where field welding is required, where cold-applied galvanizing may be used. Interior clamps on plastic pipe shall be plastic coated. All rods, clamps, hangers, inserts, anchor bolts, brackets and components for exterior pipe, piping subject to moisture or corrosive atmosphere, submerged pipe and pipe within outdoor structures shall be of Type 316 stainless steel.
- F. All uninsulated no-metallic piping such as PVC, CPVC, etc., shall be protected from local stress concentrations at each support point. Protection shall be provided by galvanized steel protection shields or other method as approved by the Engineer. Where pipes are bottom supported 180 degrees, arc shields shall be furnished. Where 360 degree arc support is required, such as U bolts, protection shields shall be provided for the entire pipe circumference. Protection shields shall have an 18 gauge minimum thickness, not less than 12-inches in length and shall be securely fastened to pipe with stainless steel or galvanized metal straps not less than 1/2-inch wide.
- F. All insulated pipe shall be furnished with a rigid form insulating saddle at each pipe support location as specified under respective pipe insulation. Provide protection shields as specified in each support location.
- G. Where pipe hangers and supports come in contact with copper piping, provide protection from galvanic corrosion by wrapping pipe with 1/16-inch thick neoprene sheet metal and galvanized protection shield; isolators similar to Eleen, Figure No. 228; or copper plated or PVC-coated hangers and supports. All stainless steel piping shall be isolated from all ferrous materials, including galvanized steel by use of neoprene sheet material and protection shields, similar to above methods.
- H. Pipe supports shall be provided as follows:
  - 1. Supports for multiple PVC plastic piping shall be continuous wherever possible. Individually supported PVC pipes shall be supported as recommended by the manufacturer except that support-spacing shall not exceed 3-feet. Multiple, suspended, horizontal plastic PVC pipe runs, where possible, shall be supported by ladder type cable trays such as the Electray Ladder by Husky-Burndy; the Globetray by the Metal Products,

a division of United States Gypsum, or equal. Ladder shall be of galvanized steel construction. Rung spacing shall be 12 inches. Tray width shall be approximately 6 inches for singly runs and 12 inches for double runs. Ladder type cable trays shall be furnished complete with all hanger rods, rod couplings, concrete inserts, hanger clips, etc., required by a complete support system, Individual plastic pipes shall be secured to the rungs of the cable tray by strap clamps or fasteners similar to Globe, Model M-CAC; Husky-Bumdy, Model SCR or equal. Spacing between clamps shall not exceed 9 feet. The cable trays shall provide continuous support along the length of the pipe. Individual clamps, hangers and supports in contact with plastic PVC pipe shall provide firm support but not so firm as to prevent longitudinal movement due to thermal expansion and contraction.

2. All vertical pipes shall be supported at each floor or at intervals of not more than 12 feet by approved pipe collars, clamps, brackets, or wall rests and at all points necessary to insure rigid construction. All vertical pipes passing through pipe sleeves shall be secured using a pipe collar.
  3. No piping shall be supported from other piping or from metal stairs, ladders and walkways, unless specifically directed or authorized by the Engineer.
  4. Pipe supports shall be provided to minimize lateral forces through valves, both sides of split type couplings and sleeve type couplings and to minimize all pipe forces on pump housings. Pump housings shall not be utilized to support connecting pipes.
- J. Unless otherwise specified herein, pipe hangers and supports shall be standard catalogued components, conforming to the requirements of MCC-SP-58 and -69; and shall be as manufactured by Anvil International Inc., Portsmouth, NH; Carpenter & Patterson Inc., Woburn, MA; F&S Central, Brooklyn, NY, or equal. Any reference to a specific figure number of a specific manufacturer is for the purpose of establishing a type and quality of product and shall not be considered as proprietary.
- K. Expansion anchors shall be equal to Kwik-Bolt as manufactured by the McCulloch Industries, Minneapolis, MI or Wej-it by Wej-it Expansion Products, Inc., Bloomfield, CO. The length of expansion bolts shall be sufficient to place the wedge portion of the bolt a minimum of 1-inch behind the steel reinforcement.

## 2.2 MATERIALS

### A. Overhead Hangers:

1. For pipes 8 Inches in diameter and smaller:
  - a. Adjustable clevis.
  - b. Acceptable manufacturers:
    - (1) Anvil International, Inc
    - (2) Carpenter & Patterson Inc.
    - (3) Or approved equal.
2. For pipes larger than 8 inches in diameter:
  - a. Single pipe rolls and sockets.
  - b. Acceptable Manufacturers:
    - (1) Anvil International, Inc.
    - (2) Carpenter & Paterson Inc.
    - (3) Or approved equal.
3. For insulated pipe use insulation protection shield:
  - (1) Anvil International, Inc.

- (2) Carpenter & Paterson Inc.
  - (3) Or approved equal.
- 4. For copper piping:
  - a. Copper plated malleable iron.
  - b. Acceptable manufacturer:
    - (1) Anvil International, Inc.
    - (2) Carpenter & Paterson Inc.
    - (3) Or approved equal.
- 5. Threaded hanger rods:
  - a. Right-hand and left-hand machine threads.
  - b. Suspended from beam clamps or galvanized inserts in concrete.
  - c. Acceptable manufacturers:
    - (1) Anvil International, Inc.
    - (2) Carpenter & Paterson Inc.
    - (3) Or approved equal.
- B. Pipe Saddle Supports:
  - 1. Adjustable type with pipe and floor flanges.
  - 2. When used under base fittings, substitute matching floor flanges for saddle sections.
  - 3. Acceptable manufacturers:
    - a. Anvil International, Inc.
    - b. Carpenter & Paterson Inc.
    - c. Or approved equal.
- C. Wall and column supports:
  - 1. Welded steel brackets with anchor chairs.
  - 2. Install additional wall bearing plates where required for wall brackets.
  - 3. Acceptable manufacturers:
    - a. Anvil International, Inc.
    - b. Carpenter & Paterson Inc.
    - c. Or approved equal.
- D. Brick and Concrete Piers:
  - 1. Locate where shown on the Drawings and/or where required for proper support.
  - 2. Construct piers to accurately conform to the bottom one-third to one-half of the pipe.
- E. Plastic Pipe Hangers:
  - 1. Plastic coated hangers.
  - 2. Acceptable manufacturers:
    - a. Anvil International, Inc.
    - b. Carpenter & Paterson Inc., Fig. 800PVC.
    - c. Or approved equal.
- F. Miscellaneous Hangers: Submit shop drawings for review and acceptance by Engineer prior to use.
- G. All additional supports, braces, brackets, etc. which are not specifically described above, but which are required to provide a system in accordance with the applicable paragraphs of this section, shall be provided and installed. Submit all such devices for shop drawing review and acceptance by the Engineer prior to use.

PART 3 – EXECUTION3.1 INSTALLATION

## A. General:

1. Install at a minimum, hangers, supports, rods, inserts, clamps, brackets, braces, bolts or other supporting devices at all changes in direction and at the end of piping runs. Provide additional devices as required to meet the intent of the specification with respect to support, pitch, vibration, movement, and expansion and contraction.
2. Install all hangers, supports, rods, inserts, clamps, brackets, braces, bolts and other supporting devices of sizes and spacings to prevent loads from exceeding the manufacturer's maximum recommended loading with a safety factor of 5.
3. Provide lock washers or locknuts on hangers, supports, rods, inserts, clamps, brackets, braces, bolts and other supporting devices.
4. Secure hangers to beams or approved concrete inserts where possible.
5. When piping is installed on structural steel supports, provide blocking of pipe rolls to prevent lateral pipe movement.
6. Do not support piping from other pipes or from stairs and walkways.
7. Set all inserts before the concrete is placed.
8. Hangers secured to precast concrete plank construction shall be attached by means of steel plates placed on the upper side of the plank, with the hanger rod extending through the plate and secured by means of a nut and lock washer. The hole in the plank shall be grouted to fill the void through which the hanger rod protrudes in order to distribute the load over the full area of the hanger plate. Plates shall conform to the following schedule.

<u>Size of Pipe Supported</u> (inches)	<u>Plate Thickness</u> (inches)	<u>Minimum Plate Size</u> (inches)
1 & smaller	3/16	4 x 4
1-114 to 2	3/16	5 x 5
2-112 to 4	1/4	6 x 6
5 to 6	1/4	10 x 10
Over 6	1/4	12 x 12

## B. Expansion and Contraction:

1. Rigidly support all piping with adequate provisions for expansion and contraction.
2. Firmly anchor horizontal runs over 50 feet in length at the midpoint of the runs to force expansion equally toward the ends.

## C. Spacing:

1. Install hangers and supports at sufficiently close intervals to maintain alignment and prevent sagging.



2. Maximum spacing of hangers and supports:

<u>Pipe Size (inches)</u>	<u>Spacing. (feet)</u>
1 & smaller	6
1-1/4 to 2	9
2-1/2 to 3	11
4 and larger	14
C.I. Soil Pipe (all sizes)	5
P.V.C. (all sizes)	As recommended by manufacturer
Fiberglass	As recommended by manufacturer

D. Supporting Vertical Piping:

1. Support at each floor level.
2. Support at all points necessary to insure rigid installation with adequate provisions to allow expansion and contraction and prevent vibration.
3. Support by approved pipe collars, clamps, brackets, or wall rests.

E. Supporting PVC and Fiberglass Piping (when applicable):

1. Support in strict accordance with the manufacturer's instructions and recommendations for the conditions of operation temperature and size of pipe.
2. Support in a manner which will prevent subsequent visible sagging of the pipe between supports due to plastic deformation.

F. Drain, waste, and vent piping: Support by adjustable hangers.

G. Valves, Fittings & Specialties: Independently support pipe connected to pumps, equipment and piping systems.

H. Temporary pipe supports:

1. Lay out each section of pipeline and make connections while the pipe is held in temporary supports.
2. After the completion of connections in each section of pipeline, hold the section in place with temporary clamps.
3. Do not remove the temporary clamps until the piping is correctly installed on the permanent supports.

3.2 TESTING

- A. Demonstrate compliance with the requirements of this section with respect to support, pitch, vibration, movement, and expansion and contraction by operating all pumping, aeration and other systems under simulated operating conditions in the presence of the Engineer. Review demonstration procedures with Engineer sufficiently prior to the actual demonstration to allow incorporation of comments and concerns of the Engineer.
- B. Systems which do not meet the requirements of this section with respect to support, pitch, vibration, movement, and expansion and contraction will be supplemented with additional devices as required and re-demonstrated until compliance is achieved.

3.3 COATINGS

- A. In accordance with Section 09900 and 09905. Coatings shall also be applied to the pipe, hangers and supports at the points of contact with the pipe. Provide temporary support or bracing as necessary to allow complete and continuous coats.

END OF SECTION

SECTION 15100  
VALVES AND METERS – GENERAL

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish, install, support, and test valves, gates, and meters, when applicable, in the location(s) and of the size(s) and quantities shown on the Drawings and/or as specified herein.
- B. Related Work Specified Elsewhere (When Applicable):
  - 1. Surface preparation and shop coatings are specified in Section 09905.
  - 2. Field painting is specified in Division 9.
  - 3. Pipe, fittings, pipe hangers and supports, and piping insulation are specified in the appropriate Sections in this Division.
  - 4. Valves for plumbing are specified in the appropriate Sections in this Division.
  - 5. Electrical is specified in Division 16.

1.2 QUALITY ASSURANCE

- A. Provide pumps, valves and meters of proven reliability manufactured by reputable manufacturers.
  - 1. **Provide a 2” and 4” Badger flow meters for the new booster pump station.**
  - 2. **Provide 2” Neptune meters for the PRV pits.**
  - 3. **Provide 2 – Grundfos 3 HP CR 10-3 A-A-A-V HQQV VFD booster pumps operating at 50 psi at 50 gpm.**
- B. Acceptable manufacturers are listed in each section of this Division. Substitute or "or-equal" valves will be allowed only when indicated.

1.3 SUBMITTALS

- A. Provide shop drawings in accordance with the requirements of the General Conditions, Section 01346 and as specified herein. Shop drawings shall contain the following information at a minimum:
  - 1. Completed Submittal Certification Form. Shop drawing submittals will be returned unreviewed without this form.
  - 2. Certified shop drawings.
  - 3. Manufacturer's literature and illustrations for all equipment to be installed to supplement certified shop drawing information.
  - 4. Short-term and long-term storage requirements.
  - 5. Seismic analysis, design and calculations as specified herein.
  - 6. Shop preparation and shop coatings.
- B. Provide Operation and Maintenance Manuals in accordance with the requirements of Section 01340.

1.4 DELIVERY AND HANDLING

- A. Shipping:
  - 1. Prepare valves, meters and accessories for shipment as required for complete protection.
  - 2. Seal valve ends to prevent entry of foreign matter into valve body.
  - 3. Box, crate, completely enclose, and protect valves and accessories from accumulations of foreign matter.
- B. Storage:
  - 1. Store valves and accessories in an area on the construction site protected from

- weather, moisture, or possible damage.
- 2. Do not store valves or accessories directly on the ground.
- C. Handling: Handle valves and accessories to prevent damage of any nature to the interior and the exterior surfaces.

### 1.5 INSPECTION

- A. Carefully inspect all materials for:
  - 1. Defects in workmanship and materials.
  - 2. Removal of debris and foreign material in valve openings and seats,
  - 3. Proper functioning of all operating mechanisms.
  - 4. Tightness of all nuts and bolts.

## PART 2 – PRODUCTS

### 2.1 MATERIALS

- A. Materials are specified in appropriate Sections in this Division.
- B. The specifications direct attention to certain required features of the valves, meters and gates but do not purport to cover all details entering into their design and construction. Nevertheless, the Contractor shall furnish the valves, meters and gates complete in all details and ready for operation for the intended purpose.

### 2.2 SURFACE PREPARATION AND SHOP COATINGS

- A. Provide surface preparation and shop coatings in accordance with the applicable section of Division 9.

## PART 3 – EXECUTION

### 3.1 INSTALLATION

- A. Install valves and accessories in strict accordance with manufacturer's instructions and recommendations, as shown on the Drawings and/or as specified herein.
- B. Carefully erect all valves and support them in their respective positions free from distortion and strain.
- C. Independently support all valves connected to pumps and equipment, and in piping systems that cannot support valves.
- D. Repair any scratches, marks and other types of surface damage etc. with original coating as supplied by the factory.
- E. Install valves such that "open" and "close" position indicators are easily visible.
- F. All valves (and actuators where specified) shall be installed in a manner that will provide for proper clearances and ease of operation. In addition, valve operators must be capable of being rotated in 90" increments to facilitate field installation.
- G. Check and adjust all valves and accessories for smooth operation.

### 3.2 TESTING

- A. The Contractor shall test all valves and gates in the presence of the Engineer to demonstrate that each valve and gate complies with specified requirements and allowable leakage rates.

### 3.3 FIELD COATINGS

- A. In accordance with Section 09900.

END OF SECTION

## SECTION 15101

### GATE VALVES

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

- A. Work Included: Furnish, install and test gate valves of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified.
- B. Related Work Specified Elsewhere: "Valves and Meters – General" is specified in this Division.

##### 1.2 QUALITY ASSURANCE

- A. All gate valves of same type and style shall be manufactured by one manufacturer
- B. Acceptable Manufacturers: as noted herein.

#### PART 2 – PRODUCTS

##### 2.1 VALVE, LOCATION AND USE

- A. As shown on the Drawings.
- B. Water Supply Piping:
  - 1. Buried: AWWA Type, NRS.
  - 2. Exposed: AWWA OS&Y, or NRS as required.
- C. General Service Piping liquids containing solids):
  - 1. Includes plant water, and liquids containing solids.
  - 2. 2-1/2 inches and smaller: 125 bronze.
  - 3. 3 inches and larger: Non-rising stem; resilient wedge.
- D. Accessories: As shown on the Drawings and required for proper operation.

##### 2.2 MATERIALS

- A. Waterworks type NRS valves (AWWA):
  - 1. Valve Body, bonnet and stuffing box - Cast iron (ASTM A126, C1B), coated inside and out with fusion bonded epoxy meeting AWWA C550. Face-to-face dimensions shall comply with ANSI B16.10 and flanges to comply with ANSI B16.1.
  - 2. Resilient Wedge - Ductile iron wedge with bonded Nitrile elastomer covering.
  - 3. Stem - Manganese bronze, ASTM B584
  - 4. Stuffing box O-rings
    - a. Two O-rings, each nitrile rubber.
    - b. Capable of changing under pressure.
  - 5. Wedgenut - Bronze, ASTM B62
  - 6. Bolting - stainless steel Type 18-8, ASTM F593, GP1
  - 7. End Connections
    - a. Buried valves - mechanical joints
    - b. Exposed valves - flanged
  - 8. Operation
    - a. Buried valves - 2 inch square nut, cast iron, ASTM A126, C1B
    - b. Exposed valves - Handwheel, cast iron or cast aluminum with direction arrow.
    - c. Opening Direction – counterclockwise

9. Water working pressure:
    - a. 12 inches and smaller: 200 psi.
    - b. 14 inches and larger: 150 psi.
  10. Manufacturer
    - a. Waterous Company
    - b. Clow Corporation
    - c. Or equal
  11. Standards - valves shall meet or exceed AWWA C509, latest edition.
- B. Waterworks type OS&Y valves (AWWA):**
1. Equal in all respects to non-rising stem valve specified above, except as required for OS&Y operation.
- C. General Service - 2-V2 inch and smaller:**
1. Bronze construction - 125 pound stem.
  2. Union bonnet.
  3. Inside screw, rising stem.
  4. Solid disc, taper wedge.
  5. End connections:
    - a. Threaded.
    - b. Or solder ends for copper pipe systems.
  6. 200 psi non-shock WOG.
  7. Malleable iron, or steel handwheel.
  8. Acceptable Manufacturers:
    - a. Stockham B-105.
    - b. Craine 428-UB.
    - c. Powell 2700s.
    - d. Jenkins 47U.
    - e. Kennedy 525.
    - f. Or approved equal.
- D. General Service NRS - 3 inches and larger:**
1. Wedge shall be constructed of ductile iron, fully encapsulated in synthetic rubber, except for guide and wedge nut areas.
  2. Non-rising stem (NRS).
  3. Bolted bonnet (stainless steel Type 18-8, ASTM F593, GP1 bolts and nuts).
  4. 125 class body.
  5. Meet or exceed AWWA C-509.
  6. All valves shall be fitted with a resilient wedge.
  7. Flanged ends: 125 pound drilling, ANSI B 16.1.
  8. Face to Face dimensions: ANSI B16.1.
  9. Water working pressure:
    - a. 12 inches and smaller: 200 psi.
    - b. 14 inches and larger: 150 psi.
  10. Operator:
    - a. Handwheel standard.
    - b. 2 inch square operating nut when shaft extension, floor box, valve box or floor stand is required or shown on the Drawings.

- c. Chain wheel:
  - (1) Required for all valves shown.
  - (2) When required for proper operation.
  - (3) For all valves with centerline 7 feet above finished floor or equipment stand.
  - (4) With chain guides.
  - (5) Chain shall extend to 3 feet above floor.
  - (6) Provide wall hooks for chain.
- 11. Buried Valves:
  - a. Mechanical joint type with AWWA bituminous coating system
  - b. Gate box required.
  - c. Sufficient quantity of tee-handle valve wrenches for operating valves of various depths.
  - d. 2-inch square operating nut, securely fastened to shaft.
- 12. Acceptable Manufacturers:
  - a. Waterous.
  - b. Clow.
  - c. Or equivalent.
- E. Knife Gates:
  - 1. Wafer body, rising stem, bonnetless construction.
  - 2. Body:
    - a. Cast iron or 304 stainless steel wetted parts.
    - b. Resilient seat, replaceable.
    - c. Flanges shall be ANSI 1251150 pound.
    - d. Rated for 150 psi working pressure.
  - 3. Valve stem shall be 304 stainless steel.
  - 4. Valve body shall include guides and jams to assist seating.
  - 5. Valve body shall have a raised face seat with relief area to prevent jamming.
  - 6. Provide extended hand wheel actuators and guides.
  - 7. Acceptable Manufacturers:
    - a. Dezurik, Series L.
    - b. Red Valve
    - c. Or approved equal.

### PART 3 – EXECUTION

#### 3.1 INSTALLATION

- A. Install and test in accordance with Section 15100, AWWA C500 and AWWA C-509, latest revision.
- B. For horizontal piping, install valves with stem position between horizontal to vertical upward.

END OF SECTION

## SECTION 15106

### BALL VALVES

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

A. Work Included: Furnish, install and test ball valves of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.

##### 1.2 QUALITY ASSURANCE

A. All ball valves of same type, style, and duty shall be of one manufacturer.

B. Acceptable Manufacturers:

1. VKM Div. of ACF Industries
2. Rockwood Ball Valves (E.W. Bliss Co.)
3. Or equivalent.

#### PART 2 – PRODUCTS

##### 2.1 MATERIALS

A. General Services:

1. Ball valves shall be of the nonlubricated free-floating ball type suitable for service in sludge piping.
2. Port areas shall be full-bore (free area through valve not less than inside area of a pipe of the nominal valve size).
3. Bodies shall be of carbon or semisteel suitable for 200 psi. water working pressure.
4. Balls shall be made of steel, precision machined, and chrome plated.
5. Valves shall be capable of seating in both directions. Seats shall be made of teflon or other acceptable material. Valves shall use upstream line pressure for effectively seating the valve.
6. Stem packing shall be manually adjustable under pressure and of suitable material for the intended service.
7. Ball valves larger than 2% inches shall have flanged ends faced and drilled in accordance with 125-Ib. AN Standard.
8. Ball valves 2% inches and smaller shall have screwed ends.

B. Accessories (When Applicable):

1. Extension (for lever actuated valves):
  - a. Shall include extension pipe, bearing plate and couplings of the sizes as required.
2. Floor Stand (for handwheel actuated valves):
  - a. Shall include stand, coupling, handwheel mounted on stand and extension rod.
  - b. Stand shall have a dial valve position indicator.
3. Extended Actuator Mounting: Supplied when actuators are extended above ground.
4. Floor Boxes:
  - a. Iron body, size as required for valve.
  - b. Cast iron or bronze screwed cover plate.
  - c. Suitable for cast concrete floors of thickness as shown.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install valves in accordance with the "Valves and Specialties – General" Section in this Division.

END OF SECTION



SECTION 15110

CHECK VALVES

PART 1 – GENERAL

1.1 DESCRIPTION

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

1.2 QUALITY ASSURANCE

A. All check valves of same type and duty shall be by one manufacturer.

B. Acceptable Manufacturers:

1. Clow
2. Mueller
3. Or acceptable equivalent.

PART 2 – PRODUCTS

2.1 VALVES – 3 INCHES AND LARGER

A. Meet the materials requirement of AWWA C508.

B. Iron body, bronze mounted, single disc. Dimensions to comply with ANSI B16.1.

C. Flanged ends faced and drilled to the 125 lb. Standard.

D. The working water pressure shall be 175 psig up through 12-inch, inclusive and 150 psig for 16-24 inch, inclusive.

E. So constructed that disc and body seat may easily be removed and replaced without removing the valve from the line.

F. Fitted with extended hinge arm with outside lever and weight.

2.2 VALVES – SMALLER THAN 3 INCHES

A. Standard, all brass or bronze, swing check with screwed ends.

B. Suitable for 150 psi working steam pressure.

PART 3 – EXECUTION

3.1 INSTALLATION

A. In accordance with Section 15100.

B. Install check valves in horizontal sections of pipeline unless otherwise indicated on the Drawings.

END OF SECTION

## SECTION 15112

### BACKFLOW PREVENTION VALVES

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

- A. Work Included: Furnish and install backflow prevention valve assemblies of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein. Backflow prevention valves addressed in this section include the double check types.
- B. Related Work Specified Elsewhere: "Valves & Specialties - General" as specified in Section 15100 of this Division.

##### 1.2 QUALITY ASSURANCE

- A. All backflow prevention valves of same type and duty shall be by one manufacturer.
- B. Qualifications of Manufacturer: Products have proven reliable in similar installations over a reasonable number of years.
- C. Acceptable manufacturers:
  - 1. Febco,
  - 2. Beeco,
  - 3. Or equivalent.

#### PART 2 – PRODUCTS

##### 2.1 VALVES - 3 INCHES AND LARGER

- A. Meet the materials requirement of AWWA C508.
- B. Iron body, bronze trim.
- C. Flanged ends faced and drilled to the 125 pound Standard.
- D. The working water pressure shall be 150 psig.
- E. So constructed that discs and body seats may easily be removed and replaced without removing the valve from the line.

##### 2.2 VALVES - SMALLER THAN 3 INCHES

- A. Standard, all bronze with screwed ends
- B. Suitable for 150 psi working pressure.

##### 2.3 ALL VALVES

- A. The check valves shall be designed to operate independently. A pair of isolating gate valves and necessary test valvecocks shall be included with the backflow prevention valve assembly.

#### PART 3 – EXECUTION

##### 3.1 INSTALLATION

- A. Install in a horizontal position in accordance with the "Valves and Specialties-General" Section 15100 in this Division.

END OF SECTION

SECTION 15114

PRESSURE RELIEF VALVES

PART I - GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish and install pressure relief valves of the type (s), and size (s) and in the location(s) shown on the Drawings and as specified herein.
- B. Related Work Specified Elsewhere: "Valves & Specialties - General" is specified in this Division.

1.2 QUALITY ASSURANCE

- A. All valves of same type and duty shall be by one manufacturer.
- B. Qualifications of Manufacturer: Products have proven reliable in similar installations over a reasonable number of years.
- C. Pressure relief valves shall be suitable for fire service and UL listed and FM approved.

1.3 JOB CONDITIONS

- A. Pressure relief valves shall be hydraulically operated.
- B. Valve shall be suitable for operation with up to 30 psi backpressure at 140 psi inlet pressure.

PART 2 PRODUCTS

2.1 DESCRIPTION

- A. Hydraulically operated, diaphragm-activated, pilot controlled angle pattern valve.
- B. The pilot control shall be direct acting adjustable spring-loaded normally closed type diaphragm valve.
- C. Materials.
  - 1. End Details -Flanged, cast iron, 125 ANSI B16.1.
  - 2. Pressure rating - max operating pressure 175 psi.
  - 3. Body - cast iron ASTM A126.
  - 4. Trim - bronze ASTM B-61.
  - 5. Diaphragm - Nylon fabric bonded with Buna N.
  - 6. Disc - Resilient synthetic rubber.
- D. Manufacturer
  - 1. CLA-VAL model 90-01.
  - 2. OCV Control Valve, Model 127.
  - 3. Masoneilan, Division of Dresser

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions and as shown on the Drawings.
- B. Test valve for proper operation during pump startup period.

3.2 ACCESSORIES

- A. Waste cone:
  - 1. Enclosed type with sight glass.
  - 2. Cast iron with flanged ends (125 ANSI B 16.1)
  - 3. Working pressure - 175 psi.

END OF SECTION

## SECTION 15400

### PLUMBING – GENERAL

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

- A. Description: Furnish all labor and materials required to completely install the plumbing systems as shown on the Drawings, specified in the appropriate Sections and as required for complete systems.
- B. Work Included: The plumbing work shall include, but not be limited to the following (when applicable):
  - 1. Building domestic cold water supply system.
  - 2. Fire extinguishers and brackets.
- C. Related Work Specified Elsewhere (When Applicable):
  - 1. Project cleaning is specified in Division 1.
  - 2. Excavation and backfill is specified in Division 2.
  - 3. Concrete is specified in Division 3.
  - 4. Painting is specified in Division 9.
  - 5. Piping, pipe fittings, valves, insulation, and accessories are specified in the appropriate Sections of this Division.
- D. Drawings and Measurements:
  - 1. The Drawings show the general arrangement, direction, and sizes of pipes. They are not intended to show every offset, valve, and fitting, and every structural difficulty that may be encountered.
  - 2. All measurements shall be verified at the job site.

##### 1.2 QUALITY ASSURANCE

- A. Materials and Workmanship: All materials and workmanship shall be suitable for the respective work and the type of service encountered.
- B. Equipment: All equipment shall be constructed to operate safely without water hammer and undue wear.
- C. Local Codes: Perform all work in accordance with applicable state and local plumbing codes, except where requirements of this Contract are more stringent.
- D. Permits: Arrange for all permits, inspections, and tests required by codes at no additional cost to the Owner.
- E. Standards: When standards are referred to, the latest issue shall apply.

##### 1.3 JOB CONDITIONS

- A. Scheduling Work: Install and test all plumbing to be cast into or buried under concrete floor slabs prior to the placement of concrete.

##### 1.4 SUBMITTALS TO THE ENGINEER

- A. Prior to ordering equipment and appurtenances, submit shop drawings for approval in accordance with the General Conditions and Section 01340 of the Construction Contract.
- B. Submit to the Engineer: Copies of manufacturer's installation, maintenance and operating instructions including parts lists for all equipment M s h e d as specified in the General Conditions of the Construction Contract.

C. Submit a list of local supply houses for replacement parts for all equipment furnished.

1.5 DELIVERY, STORAGE & HANDLING

- A. Exercise care during loading, transporting, unloading and handling to prevent damage of any nature to interior and exterior surfaces of equipment, pipe and fittings.
- B. Do not drop equipment.
- C. Store materials on the project site in enclosures or under protective coverings.
- D. Assure that all materials are kept clean and dry.
- E. Do not store materials directly on the ground.

1.6 JOB CONDITIONS

- A. Scheduling Work: Install and test all plumbing to be cast into or buried under concrete floor slabs prior to the placement of concrete.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Provide materials that are new, suitable for intended use, and of type, style, and quality specified and as shown on the Drawings.
- B. Provide pipe, fittings, and devices that meet requirements of local plumbing codes and be in accordance with applicable ASTM, ANSI, and Commercial Standard (CS) standards.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install all plumbing in a neat workmanlike manner.
- B. Lines and Grades:
  - 1. Unless otherwise shown on the Drawings, install all piping parallel to the building walls wherever possible.
  - 2. Install all piping to accurate lines and grades.
- C. Supports: Support piping as specified in the "Pipe Hangers & Supports" Section in this Division.
- D. Expansion: Provide suitable provisions for expansion of pipelines wherever necessary.
- E. Do not provide nor install close nipples.
- F. Do not install piping through, directly over, or in front of electrical switchgears and power panels.
- G. Fittings for Dismantling Piping: Provide a sufficient number of unions to allow the dismantling of all piping.
- H. Pitch:
  - 1. Pitch sanitary and drainage piping 1/4 inch per foot.
  - 2. Pitch all other piping toward low points and install valved drains at the low points.

3.2 TESTING

- A. When the installation is complete, test all pipelines in the presence of the Engineer and the Plumbing or Building Inspector in accordance with the requirements of the local and state plumbing codes, at no additional cost to the Owner. Provide all necessary equipment and utilities.

- B. Test underground piping prior to backfilling.
- C. Test piping prior to application of paint and insulation.
- D. Separately test portions of piping which will be concealed before completion.
- E. Procedure:
  - 1. Piping Which Carries Water or Liquid Under Pressure: Fill pipes with water and subject them to 100 psig. or 1/2 times the normal working pressure, whichever is greater, for two (2) hours with no loss in test pressure.
  - 2. Soil, Vent, Waste and Drain Piping:
    - a. Plug all outlets and fill pipes with water to the top of the highest vent stack above the roof, or with not less than 10 feet of water at all points in section.
    - b. The piping shall hold this water for a period of 30 minutes without showing a drop in water level.
- F. Repairs:
  - 1. Should leaks be found, repair as required even to the extent of disassembling and remaking the joints, or replacing sections of pipe.
  - 2. Calking of threads or the use of chemical compounds to correct leaks will not be permitted.
  - 3. Replace defective pipe and fittings and repeat tests until the testing results are approved by the Engineer.

### 3.3 DISINFECTION

- A. Disinfect all pipes installed to carry potable water. Perform the work in accordance with the procedure outlined in AWWA Designation 0601.
- B. Use a dosage which will produce not less than 50 ppm. available chlorine throughout the entire system and not less than 10.0 ppm chlorine residual after a contact period of not less than 24 hours. Repeat disinfection if chlorine residual is less than 10 ppm after 24 hour contact period.
- C. During the disinfection period, exercise care to prevent the contamination of water in the existing community, town, or city water main.
- D. After the disinfection period, flush the piping with clean potable water until the chlorine residual does not exceed 0.2 ppm.

### 3.4 IDENTIFICATION

- A. All plumbing piping shall be identified by this Contractor through the use of vinyl pressure sensitive markers.
- B. Markers shall indicate system, using abbreviations supplied by Engineer. Each system shall use a different color marker.
- C. Flow arrows shall indicate direction of fluid flow.
- D. Labels and arrows shall be provided at twenty foot intervals and in or above each room.
- E. Equipment Identification: Provide identification labels for all equipment such as pumps, water heaters, and similar items.
- F. Labels shall be equal to Seton Nameplate Co. or W.H. Brady Co.

END OF SECTION

## SECTION 15401

### PLUMBING, PIPING AND SPECIALTIES

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

- A. Work Included: Furnish and install a complete piping system including all required specialties and appurtenances as indicated on the Drawings and as herein specified.
- B. Related Work specified Elsewhere:
  - 1. "Plumbing General" is specified in Section 15400.

##### 1.2 SUBMITTALS TO THE ENGINEER

- A. Submit shop drawings, manufacturer's literature, maintenance data and operating instructions in accordance with the General Conditions and Sections 01340.

#### PART 2 – PRODUCTS

##### 2.1 MATERIALS

###### A. Pipe and Fittings:

- 1. Sanitary Waste and Vent:
  - a. Below Floor Slabs: Service weight cast iron soil pipe and fittings, bell and spigot with "push-on" gaskets.
  - b. Above ground building lines:  
Service weight cast iron no hub soil pipe and fittings.
- 2. Domestic and Process Water:
  - a. Interior Building Lines - Type "L" copper tube, solder fittings.
- 3. Other process piping: As indicated on the Drawings.

###### B. Solder and Flux:

- 1. Solid string or wire solder, 95 percent tin, 5% antimony on all pressure piping and potable water piping.
- 2. Silver solder, 45% brazing silver alloy.
- 3. Flux: Non-corrosive paste type as required for type of solder.
- 4. Solder and flux used on domestic water lines shall be lead free.
- 5. Other process piping: As indicated on the Drawings.

###### C. Valves:

- 1. Acceptable Manufacturers:
  - a. Stockhain.
  - b. Crane.
  - c. Walworth.
  - d. Jenkins.
  - e. Nibco
  - f. Or approved equal.
- 2. Gate Valves:
  - a. Up to and including 2-1/2 inch - screwed or solder end, bronze body, rising stem, solid bronze disc, 125 psi steam pressure 200 psi W.O.G. Equal to Nibco T-111 or S-111.
- 3. Check Valves:
  - a. Up to and including 2-1/2 inch - screwed or solder end, bronze body, Buna-N disc, 200 psi WOG cold pressure, 250°F working temperature. Equal to Nibco T-413-W or S-413-W.

4. Ball Valve: Acceptable in lieu of gate valves for 2 inch and smaller, full port bronze ball, threaded or solder ends, 3 part bronze body, TFE or equal resilient seat, lever handle, 400 lb. WOG, 250°F working temperature. Equal to NIBCO S-595-Y (soldered end connection) or NIBCO T-595-Y (threaded end connection).
- D. Insulation: Insulation shall be provided as specified in "Pipe and Equipment Insulation" Section in this Division.
- E. Drainage and Pipe Specialties:
  1. Acceptable Manufacturers:
    - a. Zurn.
    - b. Josam.
    - c. J.R. Smith.
    - d. Or approved equal.
  - F. Trench Drain: High strength, corrosion resistant polyester fiberglass trench system with built-in slope of 1.04% and channel width of 8-inches. Provide with ductile iron grating and all required end caps, bottom outlet connections and grate frames to make a complete system. Equal to Jay R. Smith 9821 drainage system.
  - G. Hose:
    1. Hose for Hose Bibb:
      - a. Flexible rubber hose reinforced with two layers of tire cord, smooth internal tube surface, working pressure not less than 150 psi. Size as shown on drawings. 50 foot length equal to swan No. CD3450.
    - H. Hose Bibb: Volume control valve, wall mounting bracket, outlet with pipe supports, vacuum breaker, hose connection, chrome plated finish, stainless steel hose rack. Leonard Model SW-75-1571.
    - I. Floor Drain:
      1. Type "A" – Dura-coated cast iron body with bottom outlet, seepage pan and combination membrane flashing clamp and frame and frame for medium duty deep flange slotted grate. 12-inch diameter top drain, 6-inch outlet, equal to Zurn Model 2-504.

### PART 3 – EXECUTION

#### 3.1 INSTALLATION

- A. Provide offsets in all piping to place in proper position and avoid work of other trades.
- B. The supply lines or fittings for every plumbing fixture shall be so installed as to prevent backflow.
- C. Install all valves with stems horizontally to upright. Do not install with stems down.
- D. Where plastic piping joins metal piping, threaded adapters shall be installed only with plastic male into metal female.

END OF SECTION

SECTION 15540



## PORTABLE FIRE EXTINGUISHERS

### PART 1 – GENERAL

#### 1.1 DESCRIPTION

A. Work Included: Furnish and install portable fire extinguishers where shown on the Drawings and specified herein.

#### 1.2 QUALITY ASSURANCE

A. Codes, Regulations and Standards:

1. National Fire Protection Association.
2. Underwriters Laboratories, Inc.

B. Manufacturers:

1. Amerex Corp.
2. Fry-Fyter
3. Kidde
4. Or approved equal

#### 1.3 SUBMITTALS TO THE ENGINEER

A. Submit shop drawings for approval as specified in the General Conditions of the Construction Contract.

### PART 2 – PRODUCTS

#### 2.1 MATERIALS

A. General: The following models are Fry-Fyter to establish type and quality. Approved equals are acceptable.

B. Size and type to be as shown on the Drawings.

C. Dry Chemical Extinguishers:

1. U.L. approved and rated for Class A, B, and C fires. DOT-ICC cylinder.
2. Heavy duty brass valve, one-hand squeeze grip operation, safety pull pin.
3. Pressure gauge.
4. Flexible discharge hose and nozzle.
5. Wall-mounting bracket.
6. Fully charged with multi-purpose "ABC" dry chemical and pressurized.
7. Stamped with hydrostatic test date.
8. Equal to Fry-Fyter M.

### PART 3 – EXECUTION

#### 3.1 INSTALLATION

A. Mounting: **Install (1) 10 lb. Fire Extinguishers** in the well house as directed by the Engineer. Attached mounting hook or bracket to wall with approved expansion shields or toggle bolts. Mount top of extinguishers at or about 36" above finish floor maintaining a minimum 4" clearance between bottom of the extinguisher and the finish floor.

- B. Identification: Provide wall markers in readily visible location above extinguishers. Markers to be painted metal or decals complying with NFPA Standard No. 10 for fire classification of extinguisher.
- C. Charging of Extinguishers:
  - 1. Dry Chemical extinguishers: Deliver to project fully charged. Weigh each extinguisher at time of installation to prove fully charged condition and have witnessed by the Engineer.
  - 2. If discharged for any reason, refill at no additional cost to the Owner during construction period.

END OF SECTION

## SECTION 15550

### DEHUMIDIFIER AND ELECTRIC HEATER

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

- A. Work Included: Furnish and install one light-Duty Industrial dehumidifier which will drain through a hole in the wall were shown on the Drawings and or directed by the Engineer.
- B. Furnish and install one light-Duty Industrial electric heater were shown on the Drawings and or directed by the Engineer.
- C. Relocate the existing units per the drawings and or as directed by the Engineer.

##### 1.2 QUALITY ASSURANCE

- A. Codes, Regulations and Standards:
  - 1. Underwriters Laboratories, Inc.
- B. Manufacturers:
  - 1. Oasis, model No. 3H356

##### 1.3 SUBMITTALS TO THE ENGINEER

- A. Submit shop drawings for approval as specified in the General Conditions of the Construction Contract.

#### PART 2 – PRODUCTS

##### 2.1 MATERIALS: NEW

###### Dehumidify

- A. General: The following models is Oasis. Approved equals are acceptable.
- B. Adjustable humidistat automatically turns unit on and off.
- C. Temperatures as low at 40 degrees F.
- D. Ability to tie container into flood drain.
- E. Provide dedicated outlet.
- F. CFM = 265, 7.7 amp., 115 volt, 60 Hz unit
- G. provide drain to daylight that can be sealed in the winter.

###### Heater

- A. General: The following models is Dayton. Approved equals are acceptable.
- B. Adjustable electric heater automatically turns unit on and off.
- C. Temperatures as low at 40 degrees F.
- D. Provide dedicated outlet.
- E. BTU = 17,000, 5.0 kw, 208 volt, 60 Hz unit

## PART 3 – EXECUTION

### 3.1 INSTALLATION

A. Mounting: Install (1) Humidifier in the well house as directed by the Engineer. Attach shelf and mounting bracket to wall.

1. Identification: Provide marker.

B. Mounting: Install (1) Electric heater in the well house as directed by the Engineer. Attach shelf and mounting bracket to wall.

1. Identification: Provide marker.

END OF SECTION

INDEX  
FOR  
DIVISION 16 – ELECTRICAL

<u>Section Number</u>	<u>Title</u>	<u>Page Number</u>
16402	Electrical Work	16402-1

SECTION 16402  
ELECTRICAL WORK

PART 1 – GENERAL

1.01 GENERAL

Examine all other sections of the specifications and all drawings for project requirements which affect the work of this Section, whether or not such requirements are particularly mentioned herein.

Coordinate the work of this section with the related work of other trades, and cooperate with such trades to assure the steady progress of all work of this Contract.

Where the National Electrical Code appears in this specification, it shall be interrupted to mean the latest edition.

1.02 SCOPE

The work covered by this Section consists of furnishing all labor, materials, equipment, supplies, devices, electrical apparatus, fixtures, the necessary wiring interconnections for the new water storage tank and associated water booster pump system and associated ancillary equipment, and the performance of all operations necessary for the installation of electrical facilities in and about the structure and around the grounds, as indicated on the Contract Documents. It also includes all associated electrical removals of existing installations associated with the existing installations that are being replaced.

This work shall include all costs involved in providing new utility service indicated and distribution at the facilities and any costs involved with any other special utilities on the project. Without limiting the work required under this specification section, the following is included:

1. Provision of new underground electrical power service with new metering.
2. Provision of and wiring of all alarm interconnections and control interface with the new pump control panel/PLC control system..
3. Provision of disconnects, wiring devices and other devices.
4. Installation of new Pump Control Panel provided under another specification section.
5. New lighting, switches, receptacles, etc.
6. Any other work required to leave a fully operable station per Contract Documents.
7. New Automatic transfer switch, conduit, wiring, receptacle and plug for portable generator connection to the facility.
8. New booster pump wiring.

9. Obtain and pay for all required permits, inspections, etc.

1.03 WORK OF OTHER SECTIONS

Refer to other Sections in this specification as appropriate.

1.04 SUBMITTALS

**Shop Drawings.** Within thirty days after award of the Contract, submit shop drawings in accordance with requirements of the General Conditions and in the manner described therein. Shop drawings shall indicate specifications section and paragraph requiring equipment indicated.

Shop drawings are required on all major pieces of equipment in the following list, but not necessarily limited thereto: breakers; motor starters; contactors; relays of all types involved; push button stations; pull, junction, and terminal boxes; disconnect switches; automatic transfer switch, surge protective device, electric unit heater, light fixtures, wiring devices, etc.

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

**Record Drawings.** In accordance with requirements of the Supplementary General Conditions, the Subcontractor shall furnish and keep on the job at all times one complete set of blackline prints of the electrical work, on which shall be clearly, neatly and accurately noted, promptly as the work progresses, all architectural and electrical changes, revisions and additions to the work. Wherever work is installed otherwise than as shown on the Contract Drawings, such changes shall be noted.

The Subcontractor shall indicate on these prints the daily progress by coloring in the various apparatus and associated appurtenances as they are installed.

No approval of requisition for payment for work installed will be given unless supported by record prints as required above.

At the conclusion of work, prepare record drawings in accordance with the requirements of the Supplementary General Conditions.

**Operating Instructions and Maintenance Manual.** The Subcontractor shall instruct, to the Owner's satisfaction, such persons as the Owner designates in the proper operation and maintenance of systems and their parts.

Parties indicated above sign affidavits stating that the above instructions were given by the Electrical Subcontractor.

Furnish in accordance with 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.

For maintenance purposes, provide shop drawings, parts lists, specifications and manufacturer's maintenance bulletins for each piece of equipment. Provide name, address and telephone number of the manufacturer's representative and service company, for each piece of equipment so that service or spare parts can be readily obtained.

**Manufacturers' Data.** Within thirty days of award of Contract, the Subcontractor shall submit for Engineer's approval a complete list of manufacturers' names of all materials and equipment proposed for the project.

After approval of the above list, the Subcontractor shall submit for Engineer's approval complete detailed manufacturers' data consisting of bulletins, shop drawings, and parts lists of the materials and equipment to be furnished, as required.

Shop drawings and manufacturers' data submitted must bear the Electrical Subcontractor's stamp stating that the shop drawings and data have been checked and meet the plans and specifications before being submitted for Engineer's approval, 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.

The Electrical Subcontractor shall assume the entire cost and responsibility for any changes in the work which may be occasioned by approval of materials other than those specified.

Errors, omissions, and coordination of shop drawings shall be the sole responsibility of the Subcontractor whether or not the shop drawings are approved.

In the event that any specified manufacturer's number has been superseded by a new number since the writing of this specification, the new manufacturer's number shall be immediately submitted to the Engineer for approval. It shall be the responsibility of the Subcontractor to notify the Engineer of any superseded manufacturers' numbers mentioned in these specifications.

## 1.05 QUALITY ASSURANCE

Applicable Standards, Permits and Codes:



The installation shall comply with all laws applying to electrical installations in effect in Madison, New Hampshire, and with regulations of any other governmental body or agency having jurisdiction, including OSHA; with regulations of the National Electrical Code where such regulations do not conflict with those laws, with the regulations of the electric utility involved, with the telephone utility, and with ASHRAE Standard 70, as amended.

File all required notices and plans. Obtain and pay for all permits, inspections, licenses, and certificates required for work under this Section.

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 Electrical Subcontractor shall bring it to the Engineer's attention at least seven days before submitting the bid. Otherwise the cost of all work necessary to make the installation comply with said laws or ordinances shall be paid by the Electrical Subcontractor and shall become a part of this Contract.

#### 1.06 EXAMINATION OF SITE AND CONTRACT DOCUMENTS

Before submitting prices or beginning work, thoroughly examine the site and the Contract Documents.

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

The Subcontractor shall refer to the electrical drawings and the 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.

All work shown on the drawings is intended to be approximately correct to the scale of the drawings, but figured dimensions and detailed drawings are diagrammatic and are not intended to show every detail of construction or the exact location of equipment. Where building construction makes it advisable or necessary to change the location of equipment, the Subcontractor shall perform such work without cost to the Owner on written request of the Engineer. Any doubt as to the intended location of equipment shall be resolved by the Engineer before proceeding with the installation.

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.. The Electrical Subcontractor shall furnish and install all such parts as may be necessary to complete the systems in accordance with the best trade practice and to the satisfaction of the Engineer. Upon completion, the electrical systems and all equipment throughout the structures shall operate properly and adequately and function as intended.

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.

Testing by Contractor: Provide equipment and personnel for operating test of electrical system.

Changes by Contractor: The contract drawings indicate the extent and schematic arrangement of the conduit and wiring systems. If changes from the drawings are deemed necessary by the Contractor, submit details of such changes within 30 days of award of Contract. Make no changes without written authorization of Engineer. Where conduit routings are not indicated, coordinate with Engineer, General Contractor, and other Subcontractors to insure no conflicts result from routings selected.

#### 1.08 ELECTRICAL REFERENCE SYMBOLS

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

#### 1.09 TEMPORARY POWER

The Contractor or Electrical Subcontractor shall furnish and install temporary feeders of proper capacity power required for the project while under construction. Sufficient outlets shall be installed at convenient locations so that extension cords of not over 50 feet will reach all areas requiring power.

The General Contractor and all subcontractors shall furnish their own extension cords and such lamps as may be required for their work, and shall pay for the cost of temporary wiring of construction offices or shanties used by them and any temporary wiring of a special nature for light and power required other than that mentioned above.

Coordinate with the new tank contractor to provide temporary power if a portable generator is not provided by that contractor for his own use.

#### 1.10 GUARANTEE

Contractor's guarantee for items furnished covers and includes:

- Faulty or inadequate design
- Improper installation
- Defective workmanship and materials

Warranties of Manufacture

- Not less than one year

As specified  
As normally supplied if greater than one year

1.11 ALTERATIONS

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

Removal of existing electrical equipment and materials is required. Review the existing installations to determine the removals involved. These are NOT indicated or described on the Contract Drawings or in the specifications.

Any existing wiring discontinued under this project shall be completely removed.

1.12 NON-CODE CONFORMING WIRING SYSTEMS NOT BEING UPDATED

This should not be an issue on this project as the intent is that all existing electrical equipment, conduit, and wiring will be replaced under this project.

1.13 SCHEDULING

The Electrical Subcontractor shall schedule his work in accordance with Contract Requirements. Work may be required to be scheduled during other than normal working hours. If this occurs this contractor shall provide a suitable work force to accommodate the schedule requirements at no added cost to the Owner.

The facilities are NOT to be in use by the Owner during construction.

1.14 BID ALLOWANCES AND BID ALTERNATES

Items indicated as bid allowances shall be carried at the allowance values stated in the Contract Documents in the preparation of the bid.

Items indicated as bid alternates shall be indicated in the bid documents submitted.

The payment to the Electrical Subcontractor for work and/or materials and/or Subcontractor invoices will be limited to the actual, documented costs incurred under the allowance. If costs exceed allowance values, the Electrical Subcontractor must obtain formal approval as with any change order before exceeding the stated allowance amounts.

1.15 EQUIPMENT/MATERIAL REMOVED BY THE CONTRACTOR

Any electrical equipment, etc. removed shall remain the Owner's property, except for any items specifically noted herein. The exception to this is any material that the Owner indicates should be disposed of in which case this Contractor shall dispose of in a lawful and legal manner.

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

#### 1.16 HAZARDOUS MATERIALS

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

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

#### 1.17 SINGULAR WORDING

Where the specifications refer to a singular equipment item and that item is part of the installation requirements for both pump station locations involved in the project it shall be understood that the item must be provided for each location involved in the overall project.

#### 1.18 ARC FLASH WARNING STUDY AND LABEL REQUIREMENTS

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

Calculations for arc flash values shall be prepared by a duly licensed Professional Engineer in the State of New Hampshire and retained by the Contractor. A copy of the calculations/report shall be submitted as part of the shop drawings under this specification.

### PART 2 - PRODUCTS

#### 2.01 GENERAL REQUIREMENTS

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

#### 2.02 IDENTIFICATIONS

All materials shall bear UL labels where such have been established for the particular device.

All devices shall show make, type, serial number (where applicable), voltage, amperage, wattage, motor ratings, and all other pertinent data.

All wire shall have make, type of insulation, size, and voltage rating clearly marked upon it.

### 2.03 SLEEVES/JUNCTION BOXES/ANCHORS

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

### 2.04 ACCESS PANELS

Not applicable on this project.

### 2.05 CONDUITS

#### A. Exterior:

Direct buried conduit and conduit in concrete or below concrete floor slabs in earth shall be Schedule 40 PVC or rigid galvanized steel. Where steel is used, it shall be double coated with bitumastic dried at least 24 hours between coats before installation. Where PVC is used, all elbows and/or offsets shall be rigid galvanized steel. Rigid galvanized steel shall be used above grade. Underground conduit for utility service shall conform to the standards of the serving utility.. It is the Contractor's responsibility to review these and insure they are appropriate.

#### B. Interior

Interior conduits shall be rigid aluminum, surface mounted.

Fittings, boxes, and related items for interior work shall be manufactured by Crouse Hinds, Appleton, or approved equal.

Minimum size conduit for light and power wiring shall be 3/4".

#### C. General

The use of nonmetallic conduit or raceway within a building is not permitted.

Rigid galvanized conduit shall be manufactured by Youngstown Sheet and Tube Company, or equivalent (if any).

Liquid-tight flexible metallic conduit shall be used to tie in all motors or similar equipment within areas not classified as hazardous environments. Provide minimum 2 ft. diameter loop at all locations.

PVC conduit shall be Type II by Carlon Products or approved equal.

Rigid aluminum conduit shall be used on this project.

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.

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.

Provide expansion fittings on all conduits rising from below grade at the exterior of the pump station building and/or at any pole or structure, and elsewhere required by codes and ordinances.

Provide fire stopping on all conduits that penetrate fire rated walls, ceilings, or floors.

Where conduits pass between the exterior of structures and the interior of structures, the Contractor shall provide suitable sealing per NEC Article 300, 300.7 (A).

## 2.06 WIRE AND CABLE

All cable and wire shall comply with the latest requirements and specifications of the NFPA and/or the Insulated Power Cable Engineers Association (IPCEA) and shall be as manufactured by General Cable, General Electric, Anaconda, Phelps Dodge, or approval equal, unless otherwise specified or indicated.

All conductors used in the wiring system shall be soft-drawn copper wire having a conductivity of not less than 98% of that of pure copper, unless otherwise indicated or specified. All conductors shall be stranded. Solid conductors are not acceptable. Aluminum conductors are not permitted.

All wire and cable shall be stamped approximately every two feet to indicate voltage, type, temperature rating, UL listing, manufacturers' name, size, etc.

All underground conductors shall be installed in concrete encased conduits. All underground conductors shall enter manholes, building walls, or termination points through a protective galvanized steel conduit sleeve of appropriate size.

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).

Insulation for cable and wire shall be as follows:

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

All internal wiring to fixtures shall be minimum, No. 14 AWG, silicon rubber insulated (150°C) with minimum 300 volt insulation.

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.

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)		230 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	Grey
Bond	Green	Green

Multi-conductor shielded cables shall be approved equal to GE SI-58760, #16 AWG, with individual grouping shielded.

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.

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.

Wires and cables shall be carefully handled during installation.

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.

Conductors shall be continuous from panelboard to outlet and from outlet to outlet. No splices shall be made except within junction or outlet boxes.

Splices and taps in wires No. 8 AWG and larger shall be made with crimp-on type connectors designed for the purpose. All connections between wires at fixtures and boxes shall be made with UL approved 600 volt pressure connectors equal to ideal "Wire-Nut" or "Wing-Nut" (for general lighting and receptacles only).

Type NM, NMC, AC, MC, or similar cables shall not be permitted on this project.

All conductors and connections shall be free of grounds, shorts and opens.

## 2.07 OUTLET BOXES

All boxes shall be held to wood surfaces by wood screws. On metal surface, boxes shall be held by metal-to-metal screws or by machine bolts.

Any outside boxes or boxes mounted exposed in the buildings shall be cast metal type with integral threaded hubs (style similar to Crouse Hinds FS or FD). "Bell" style boxes will not be approved. Boxes on rigid aluminum conduit shall be aluminum.

## 2.08 PULL BOXES AND JUNCTION BOXES

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

## 2.09 PULLING CABLES

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

## 2.10 DISCONNECTS

Where shown on the Drawings, or when NEC required whether or not shown, install disconnect switches appropriate for the application. When serving motors, they shall be motor rated. Those for equipment (if any) outdoors shall be in rain-tight enclosures, or as otherwise indicated on Contract Drawings. Disconnect switches shall be pad lockable in "on" and "off" positions. Where noted on Contract Documents provide circuit breakers. 240 volt circuit breakers shall have a minimum interrupting rating of 22,000 rms symmetrical amperes at 240 volts, and greater where the available fault current exceeds this value..

Switches shall be heavy duty, quick make and break type. They may be non-fused by a solid copper bar, silver plated, heavy duty on motors over 2 HP. For small motors (1/8 HP and less), a toggle switch, motor rated, may be used; otherwise, they shall be similar to Square D Type HU.

## 2.11 OVERCURRENT PROTECTION - MOTORS

Overcurrent protection for motors is to be in the starters or drives. 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 and/or in the pump control panel. Where combination starters are used, the breaker is to be a motor circuit protector



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

## 2.12 WIRE CONNECTORS AND DEVICES

All wire joints shall be made with a pressure squeezed connector such as T & G Stakon and Ideal, or bolted clamp such as made by Dessert. Twist-on type wire nuts are also permitted for general lighting and receptacle circuits only. Make up to terminals shall be mechanical squeeze connector. Wherever only a screw connector is available, install a conductor terminal like T & G Stakon spade or donut and designed for the application and compression set to the conductor.

Cover all joints made with non-insulated clamp devices with Scotch brand plastic electrical tape. Type #88 may be used at any joint and shall be used whenever the temperature of joint or the room is below 50°F. In the summer, or when temperature is above 60°F, new type #33 plus may be used. Triple wrap joints, each wrap having a 50% overlay.

## 2.13 SWITCHES AND PLATES

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.

Mount all switches vertically, wall-flush, and at a height of 4'-0", adjusted to minimize cut of tile or masonry unit, unless otherwise specified.

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.

On surface boxes plates shall match the box style for the device installed.

Switches and plates shall be a product of General Electric, Hubbell or Leviton.

## 2.14 CONVENIENCE AND OTHER OUTLETS AND PLATES

Convenience outlets shall be duplex, specification grade, ivory face, side wired binding screw type, two pole, three wire, rated 20 amperes at 120 volts, Bryant 5362-I or equal. Use Bryant ivory nylon plates or equal. Mount all outlets a minimum of 24" AFF. **It is the intent that ground fault protection be provided by individual Class A, 20 Ampere, 120 volt, GFI receptacles for each device indicated equal to Bryant GFR53FT-I.**

Mount vertical outlets with grounding slot up. Outdoors, in damp locations, and elsewhere as shown, use weatherproof covers U/L listed for conformity with National Electric Code Article 406.8(B) and approved equal to Tay Mac for receptacle "in use" when not attended.

Corrosion resistant receptacles shall be approved equal to Bryant 5361-CR. Covers shall conform to NEC article 406.8(B) and approved equal to Tay Mac for "in use" while not attended.

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

## 2.15 MOTORS

These specifications relating to motors and motor control apply to all motors and controls furnished by this Section or any other section.

Each section supplying motor drive apparatus will be responsible for supplying an electric motor of sufficient size for the duty performed. These shall not be oversized beyond a normal safety factor, except that standard design ratings for next above motor size required will be used. Unless otherwise specified, all motors shall have open frames, Class A insulation and continuous duty classification based on a 40°F. ambient temperature of reference.

Motors 1/2 HP and larger shall be and those smaller may be, 230 volts, three phase 60 Hertz. Motors 1/3 HP and smaller shall be 120 volts, single phase, 60 Hertz.

Motor Control: Each motor, or group of motors, requiring a single control shall be provided with a suitable controller and devices, which shall perform the functions specified for the respective motors in other sections of these specifications. All controllers shall conform to the adopted standards and recommended practices of the Industrial Control Standards for the National Electrical Manufacturers Association and the Standards for Industrial Control Equipment of Underwriters' Laboratories, Inc.

Thermal Overload Protection. Each motor shall be provided with an overload protective device, integral with either the motor or controller. Unless otherwise specified, the protective device shall be of the manually reset type. Manual controllers for motors shall be specifically designed for the purpose, and shall have a HP rating adequate for the motor. Automatic control devices such as thermostats or floats are satisfactory, provided they are designed for that purpose and have an adequate HP rating.

The utility service is 240/120 volt, single phase at this site. The Pump Control Panel will include VFD phase converters and controllers for the new Booster Pumps to accommodate their 3 phase motors

## 2.16 SECONDARY SERVICE

A new underground 240/120 volt, single phase, 3 wire service is required for this project.

## 2.17 ELECTRICAL SERVICE AND DISTRIBUTION SYSTEM

The Utility's power distribution system will provide the electrical service of the characteristics as shown on the drawings. The Subcontractor's work will begin where the

Utility's work ends, and includes the new service conduits noted and the conductors if they are not normally provided by the utility.

The subcontractor shall furnish all labor, materials, etc. necessary for a complete approved electrical service as required by the facility to the Utility's standards, including inspection and approval by the Utility and the state and local inspection departments.

The Subcontractor shall notify the Utility in writing, with a copy to the Engineer, no later than ten days after signing construction contracts, as to when the power service will be required for the upgraded well and booster pump station.

## 2.18 UNDERGROUND ELECTRICAL SERVICES

Underground service shall comply with all the requirements of the National Electrical Code, national Electrical Safety Code, the serving utility standards, and state and local enforcing authority.

Secondary service shall be cable in rigid conduit to riser at the new utility pole and transformer.

It shall be run in conduit approved by the serving utility standards and installed to depth per the utility standards. Where the utility requires concrete encasement, such shall be provided and its requirement will not be reason for any contract cost increase.

## 2.19 PRIMARY POWER SERVICE

Primary power to the site is existing. The utility will provide a new pole and transformer for the project. The Contractor shall carry all utility costs in his bid..

## 2.20 METERING

The Electrical Subcontractor shall furnish and install all equipment and meter trim for metering, in accordance with utility company requirements, except that the utility meter will be provided by the local utility.

Where the local utility does not supply meter sockets, the Electrical Subcontractor shall provide them to the local utility's specifications at no additional cost to the Owner.

Any utility charges for poles, service cable, meters, etc., in connection with the provision of permanent and/or temporary building power shall be paid in full by the Electrical Subcontractor under this section.

Provide any utility required cold transition meter disconnects, meter transformer enclosures, etc. to the utility's specifications.

Design is based on a combined meter/main breaker assembly. If that is not acceptable to the utility, separately enclosed devices may be required and shall be considered part of the design.

## 2.21 PANELBOARDS

Panelboards shall be provided with main lugs or main breakers and branch circuit breakers according to the schedules on the Contract Drawings.

The general requirements for panelboards are shown on the drawings including mounting and gutters. Mount the panels 6'-6" up to the top of roughing cabinets. Gutters shall not be less than 5". Breaker frame size is shown on the drawings. Handle ties will not be permitted anywhere. Multi- pole breakers shall have common trip and one handle.

All breakers shall be trip-free, suitable for switching, and thermal magnetic. All breakers shall be bolted to bus type secured in place by a holding bolt. "Space" means provision for adding breakers. Breakers or busses shall contain terminations or tappings designed for these attachments. All points of contact between bus and sub-bus shall be copper full silver between all contact surfaces. All breakers shall have an interrupting capacity of not less than 22,000 amperes at 240 volts AC for panels on 240 volt systems, and greater if required based on the available utility fault current. Provide documented available fault current with shop drawings or they will not be considered as complete..

Provide a typewritten tabulation indicating fixture outlets, devices, machines, or apparatus served by each breaker and their room location. This shall follow coding on the drawings with breakers numbered from top to bottom. Mount tabulation inside door in a frame for the purpose, with a transparent plastic cover.

Panelboard covers shall be hinged type, "door - in - door" style.

Panelboards provided under this contract shall be a product of Square D, General Electric, Cutler Hammer, Eaton, or approved equal.

## 2.22 BALANCING OF LOADS

The Contractor shall balance all loads between phases in all panels, etc., around the neutral. Neutral conductors shall be the same size as phase conductors unless specifically noted otherwise. Common neutrals shall not be installed.

All circuits shall be distributed about the phases so as to restrict any phase load imbalance to less than 10% at any panelboard.

After completion of the installation, record under full load conditions, the current flow in each phase feeder. Submit 4 copies to the engineer giving name and location of each panel, etc.

Circuit numbers assigned to home runs and devices on the drawings are for purposes of indicating individual circuits and are intended to correspond with the circuit numbers in the panels. The panelboard directory shall designate each circuit and its associated load. If numbers deviate from the drawings, the as-built drawing shall reflect this.

## 2.23 LIGHTING FIXTURES

Wire directly to an outlet box for each fixture in and on the building. General building wiring is to be used to these outlets. From outlet into fixture, use No. 14 AWG silicon rubber, color coded to make up to fixture socket or ballast supply leads. Add a bond wire to ground all fluorescent fixtures.

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 equivalent characteristics, quality and appearance, and subject to approval by the Engineer. **Substitutes must be approved by the Owner and the Engineer prior to bid opening.**

## 2.24 LAMPS, DRIVERS AND ACCESSORIES

There are no fluorescent fixtures specified for this project.

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.

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.

LED modules shall include the following features unless otherwise indicated:

- a. Comply with IES LM-79 and LM-80 requirements.
- b. Minimum CRI 80 and color temperature 3000 degrees Kelvin unless otherwise indicated in the fixture schedule.
- c. Minimum rated life: 50,000 hours per IES L70

## 2.25 ALARM SYSTEM

The facility will utilize a wireless alarm system that will be provided as part of the Pump Control Panel/ PLC. Provide all alarm field wiring and conduit for remote external antenna cable, exterior strobe alarm light, and all input/output wiring requirements.

## 2.26 EMERGENCY LIGHTS

Emergency lighting is provided per Contract Drawings.

## 2.27 WIRING OF MECHANICAL AND OTHER EQUIPMENT

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

Pump control panel, instrumentation, etc.

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

## 2.28 FUSES (if any)

- A. Provide a complete set of fuses for each fusible switch. Time-current characteristic curves of fuses serving motors or connected in series with circuit breakers or other circuit protective devices shall be coordinated for proper operation; submit coordination data for approval. Fuses shall have a voltage rating not less than circuit voltage.
- B. Cartridge Fuses, Current-limiting Type (Class R): UL 198E, Class RK-1 time-delay type. Associated fuse holders shall be Class R only.
- C. Cartridge Fuses, Current-limiting Type (Classes J and L): UL 198C, Class J for 0 to 600 amps and Class L for 601 to 6000 amps.

## 2.29 INSTRUMENTATION

The subcontractor under this section shall provide all conduit for and install all signal cables for instrumentation provided under all Sections of these specifications, including provision of all required 120 volt power wiring and interconnections of signal cables.

Instrumentation includes, but is not limited to: 2 flow meters, 2 pressure transducers, and other devices indicated on the Contract Drawings.

## 2.30 BUILDING LOW TEMPERATURE THERMOSTATS

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

## 2.31 STAND-BY POWER PROVISIONS

Provision of all electrical conduit and wiring and provision and installation of an automatic transfer switch and all connections of power wiring for a portable standby generator. The generator is NOT part of this project.

Automatic Transfer switch shall be UL listed for NEC Article 702 standby power uses and shall be approved equal to ASCO, 200 Ampere, 2 pole, 240 / 120volt, single phase, NEMA 12 enclosed. Detailed specification follows:

### AUTOMATIC TRANSFER SWITCH

General: UL listed (Standard 924) for all classes of load. Transfer switch shall be ASCO Series 300 or equivalent model manufactured by Russelectric, 200 A, 240/120 Volt, Single Phase, 3 Wire, 60 Hertz. Transfer switch shall not utilize molded case switches for power switching.

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.

C. 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 alarm (2)
- b control (3)

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.

#### D. Rating and Performance

1. Continuous duty is a non-ventilated NEMA 12 enclosure.
2. Load: All classes of load including inductive and non-inductive at 600 volts; tungsten lamp load at 250 volts.
3. Close on inrush current of 20 time continuous rating without welding or excessive burning of the contacts.
4. Load switching capability: 15 times continuous rating.
5. Cycles of operation: 600 cycles at rated current at a rate of 6 cycles per minute. One cycle: One complete opening and closing of both sets of contracts on inrush current 10 times continuous rating.



#### E. Withstand Ratings

Switch withstand rating at utilization voltage must be indicated in shop drawing submittal.

#### F. Construction

1. General: No wearing surfaces or moving parts requiring routine lubrication or maintenance.
2. Enclosure: NEMA 12; key operated door locks; swing-out service panel, pre-punched for future addition of control components.
3. Interlocking: Mechanical and electrical interlocking to prevent simultaneous energizing of load by normal and emergency power.
4. Contacts: Double break design for fast arc suppression, solid silver cadmium, completely enclosed in head resistant contact chambers.

### 2.32 GENERATOR CONNECTION ENCLOSURE/ DOCKING STATION

The Contractor shall provide and install Single phase, 3 wire plus ground, NEMA 3R enclosed generator connection enclosures at the new pump building and with voltage and current rating as detailed below. . Unit shall be approved equal to PSI Controls Solutions Generator Tap Box with Main Circuit Breaker , Cam Lock Style Receptacles, and including 100 % Neutral and Ground. Receptacles shall be male configuration, color coded for each phase, neutral, and ground to match wiring color coding noted in these specifications. Units shall include cover mounted LED, white Phase Pilot Lights for each phase, with individual fuse protection within the enclosure. Assembled unit shall be UL508A labeled. Unit shall be provided with one set of matching female configured plugs, color coded, that will be delivered to the Owner for his use in assembling cables for use with his portable generator. Circuit breaker operating handle shall be within the outer door of the enclosure requiring the door to be opened to operate the breaker. Units shall have the following AIC ratings: 120/240 Volt, Single phase, 3 wire, 60 Hz. - 100 kAIC. Unit Shall be rated 200 A, 120/240 Volts.

### 2.33 PUMP STATION CONTROL PANEL

The Contractor shall install the factory assembled pump control panel. The Electrical Contractor under this specification section shall provide and install all conduits and wiring to provide power to the pump station control panel, wire and connect all equipment powered from the pump control panel, wire and connect all alarms, and wire and connect all field instruments to the control panel..

### 2.34 SURGE PROTECTIVE DEVICE

Provide a SPD unit approved equal to Advanced Protection Technologies, a division of ASCO, including manufacturer's recommended service overcurrent protective device and all associate wiring, conduit, etc.

Unit shall be rated 320 KA surge capacity (160K L-N, L-G, N-G) for service on 240/120 volt, 60 hertz, single phase, 3 wire service. Unit shall have UL suppression voltage ratings of 330 (L-N, L-G, N-G) and 700 (L-L). The maximum continuous operating voltage shall be 150. Unit shall include an event counter and one dry contact for future wiring to alarm system.

### 2.35 DELIVERY, STORAGE AND PROTECTION

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.

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

The entire work provided in this specification shall be constructed and finished in every respect in a workmanlike and substantial manner.

The Subcontractor shall obtain detailed information from the manufacturer of apparatus as to the proper method of installing and connecting same. The Subcontractor shall also obtain all information from the Contractor and other Subcontractors that may be necessary to facilitate the work and the completion of the whole project.

Before installing any of the work, the Subcontractor shall see that it does not interfere with the clearances required for finished columns, pilasters, partitions, walls, and ceilings, as shown on the Contract Drawings and details.

Work installed by the Subcontractor which interferes with or modifies the architectural design as shown on the Contract Drawings shall be changed as directed by the Engineer, and all costs incidental to such changes shall be paid by the Subcontractor.

In any and all cases of discrepancy in figures, plans or specifications the matter shall be immediately submitted to the Engineer for decision.

### 3.02 SITE VISITS

The Subcontractor 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 Subcontractor to furnish and install all sleeves required in the performance of this Contract and to furnish to the Contractor the size and location of all openings required on the performance of this contract; and it shall be the duty of the Contractor to provide the required openings during building construction.

If this Subcontractor fails to provide for all sleeves and openings as required in the performance of this Contract, the Subcontractor shall instruct the Contractor, who shall do such cutting, drilling, patching and grouting and so forth necessary for the proper installation of this Subcontractor's work. The Contractor is to charge this Subcontractor for this work and it shall be done at no additional expense to the owner.

Should the Contractor, after having been fully advised by the Subcontractor, fail to arrange for this work, the Subcontractor shall promptly notify the Engineer in writing of such failure. In the event of any disagreement between the Electrical Subcontractor and the Contractor over the foregoing, and in the absence of any written requests or agreements between the two, the decision of the Engineer shall be final.

### 3.04 ALUMINUM CONDUITS

Aluminum conduits shall be installed for interior installations.

### 3.05 INTERIOR CONDUIT SYSTEMS

Electrical Subcontractor shall coordinate with Engineer as to locations, sizes and number of conduit sleeves to be installed through cast concrete.

Exposed runs of conduit shall have supports not more than 6' -0" apart and shall be installed with runs parallel or perpendicular to walls, structural member, or intersections of vertical planes and ceilings with right angle turns consisting of cast metal fittings or symmetrical bends. Conduit bends and offsets shall be avoided where possible, but where necessary, shall be made with an approved hickey or conduit bending machine. Conduit which has been crushed or deformed in any way shall not be installed.

Expansion fittings shall be used to provide for expansion joints. Wooden plugs inserted in masonry or concrete shall not be used to secure conduits or boxes. Conduits shall be supported on approved types of stainless steel wall brackets, ceiling trapeze, straphangers or pipe straps, secured by means of toggle bolts in hollow masonry units, expansion bolts in concrete or brick, machine screws on metal surfaces, and wood screws on wood construction. Provide stainless steel hardware for stainless steel support systems. Conduit shall be installed in such a manner as to insure against trouble from the collection of condensation, and all runs of conduit shall be so arranged as to be devoid of

traps wherever possible. The contractor shall exercise the necessary precautions to prevent the lodgement of dirt, trash, or plaster in conduits, fittings, or boxes during the course of installation. A run of conduit which has become clogged shall be entirely freed of the accumulation or shall be replaced.

Conduits shall be securely fastened to all sheet metal outlets, junction boxes, pull boxes, and panelboards with galvanized locknuts and bushings, care being taken to establish a firm mechanical and electrical contact between the box and the conduit.

Flexible conduit shall be installed only where necessary to overcome vibration at motor connection, and shall be as short as possible between the motor terminal box and the junction box on the branch circuit rigid conduit. All flexible conduit shall be of the liquid-tight type similar to "Sealtite", with proper fittings. Provide minimum 2 ft. diameter loop.

All rigid metallic conduit shall utilize threaded fittings.

Pull boxes, junction boxes and cabinet boxes shall be furnished with screw fastened covers. Where pull boxes are used in finished areas, the Engineer shall be consulted as to the location, type of cover, and finish of box and cover. Locations shall be as inconspicuous as possible.

### 3.06 CONDUCTORS

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

### 3.07 OUTLETS

Outlets shall be installed in locations as indicated on the Contract Drawings. The Subcontractor 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 Subcontractor 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

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

The conduit system and the neutral conductor of the wiring system shall be grounded. The grounded connection between the electric system neutral and the conduit system shall be made at the main electrical service breaker. A bare copper conductor sized per

NEC shall be installed in nonmetallic conduit from the breaker enclosure to the entrance of the water service. Connection to the water pipe shall be made by a suitable ground clamp or a lug connection to a plugged tee. If flanged pipes are encountered, the connection shall be made with the lug bolted to the street side of the flange connection.

If non-metallic water lines are provided on the project, the ground electrode conductor shall be connected by a process approved equal to "Cadweld" process to copperweld ground rods, 3/4" diameter by 10 feet long. Provide certified test of recognized testing agency that ground resistance does not exceed 25 ohms. Provide bonding of any metallic piping systems within the facility, building reinforcing steel, and a minimum of 2 3/4 " diameter by 10 foot long copperweld ground rods set on 15 foot centers. Provide a common grounding connection point for all connections..

Ground wires shall be grouped and bonded to panel boxes, not to system neutrals. The ground terminal or receptacles shall be bonded to outlet boxes with No. 12 AWG bare or green insulated wire, or other suitable means per the National Electrical Code.

Conduit and/or raceway shall not be utilized as the bonding conductor.

### 3.10 EXPLOSION PROOF REQUIREMENTS

If encountered, equipment shall be rated for the environment present..

### 3.11 PULLING CABLES

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

### 3.12 EXAMINATION AND APPROVAL WORK

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 Subcontractor shall pay all costs of uncovering and reinstating work.

### 3.13 CLEAN UP AND REPAIR

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

### 3.14 GUARANTEE

Attention is directed to provisions of the General Conditions regarding guarantees and warranties for work under this Contract.

Manufacturer shall provide standard guarantees for work under this Section. However, such guarantees shall be in addition to and not in lieu of all other liabilities, which the manufacturer and Subcontractor may have by law or by other provisions of the Contract Documents.

All materials, items or equipment and workmanship furnished under this Section shall carry the standard warranty against all defects in material and workmanship for a period of not less than one year from the date of final acceptance of the work. Any fault due to defective or improper material, equipment, workmanship or design which may develop within that period shall be made good, forthwith by and at the expense of the Subcontractor, including all other damage done to areas, materials and other systems resulting from this failure.

This Subcontractor shall guarantee that all elements of the systems are of sufficient capacity to meet the specified performance requirements as are set forth herein or as indicated.

Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the guarantee period, the affected part or parts shall be replaced by the Subcontractor.

This Subcontractor shall furnish, before the final payment is made, a written guarantee covering the above requirements.

End of Section

APPENDIX  
GEOTECHNICAL REPORT

# REPORT

19-0640 S

July 19, 2019

## Explorations and Geotechnical Engineering Services

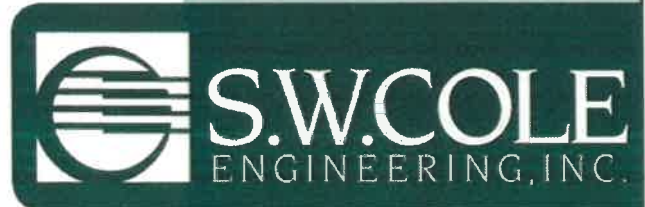
Proposed Concrete Water Storage Tank  
Village District of Eidelweiss  
Madison, New Hampshire

**Prepared For:**

Jones & Beach Engineers, Inc.  
Attention: Mr. Christopher Albert  
85 Portsmouth Avenue, Box 219  
Stratham, NH 03885

**Prepared By:**

S. W. Cole Engineering, Inc.  
10 Centre Road  
Somersworth, NH 03878-2926  
T: 603-692-0088



- *Geotechnical Engineering*
- *Construction Materials Testing and Special Inspections*
- *GeoEnvironmental Services*
- *Test Boring Explorations*

[www.swcole.com](http://www.swcole.com)



## TABLE OF CONTENTS

1.0 INTRODUCTION.....	1
1.1 Scope and Purpose .....	1
1.2 Site and Proposed Construction .....	1
2.0 EXPLORATION.....	2
3.0 SUBSURFACE CONDITIONS .....	2
4.0 EVALUATION AND RECOMMENDATIONS.....	3
4.1 General Findings .....	3
4.2 Site and Subgrade Preparation .....	3
4.3 Excavation and Dewatering .....	3
4.4 Foundations.....	4
4.6 Slab-On-Grade .....	5
4.7 Backfill and Compaction .....	5
4.8 Weather Considerations .....	6
4.9 Design Review and Construction Testing .....	7
5.0 CLOSURE.....	7
Appendix A	Limitations
Appendix B	Figures
Appendix C	Exploration Logs & Key

19-0640 S

July 19, 2019

Jones & Beach Engineers, Inc.  
Attention: Mr. Christopher Albert  
85 Portsmouth Avenue, Box 219  
Stratham, NH 03885

Subject: Explorations and Geotechnical Engineering Services  
Proposed Concrete Water Storage Tank  
Village District of Eidelweiss  
Madison, New Hampshire

Dear Chris:

In accordance with our Agreement, dated June 21, 2019, we have performed subsurface explorations for the proposed Concrete Water Storage Tank in the Village District of Eidelweiss of Madison, New Hampshire. This report summarizes our findings and geotechnical recommendations, and its contents are subject to the limitations set forth in Appendix A.

## **1.0 INTRODUCTION**

### **1.1 Scope and Purpose**

The purpose of our services was to obtain subsurface information at the site in order to develop geotechnical recommendations relative to foundations and earthwork associated with proposed tank construction. Our scope of services included review of refusal/bedrock information from test pits excavated by others, the making of four test boring explorations, a geotechnical analysis of the subsurface findings and preparation of this report.

### **1.2 Site and Proposed Construction**

The site is located in the Village District of Eidelweiss, east of the termination of Reinach Place in Madison, New Hampshire. The area currently contains two 30,000

gallon tanks in the immediate facility. Existing plans indicate that ground surface elevations in the proposed new tank area are at about elevations 934 to 935 feet.

We understand the new tank will be constructed with a finish floor level at elevation 934.0 feet, requiring minor cuts to attain subgrade. The tank will have an inner diameter of 37 feet and a design water height of about 15 feet, therefore holding approximately 0.12 MG. We understand preference is to support the tank walls on a haunched floor slab with thickened perimeter wall foundations.

The proposed tank location is depicted on the "Draft Water Tower Plan" (Drawing CON1) prepared by Jones & Beach Engineers, Inc., revision dated June 21, 2019. This plan has been included in Appendix B.

## **2.0 EXPLORATION**

Four test borings (B-1 through B-4) were made at the site on July 2, 2019 by S. W. Cole Explorations, LLC. The exploration locations were selected and located in the field by others prior to undertaking the test boring work. The approximate exploration locations have been included on Drawing CON1. Logs of the explorations and a key to the notes and symbols used on the logs are attached in Appendix C. The elevations shown on the logs were estimated based on topographic information shown on the plan in Appendix B.

The test borings were drilled using cased wash-boring techniques. In anticipation of shallow bedrock from existing test pit information, we did not sample shallow overburden soils, electing to seat the casing in bedrock and sampling 5 feet of rock core in each of the four borings.

## **3.0 SUBSURFACE CONDITIONS**

Beneath surficial topsoil, overburden soils are silty sands with gravel, cobbles and borings. Bedrock depths are in the range of 3 to 4.5 feet below existing grade. Bedrock is described as granite with variable weathering and Rock Quality Designation values ranging from 0 to 49 percent, indicative of considerable fracturing.

Groundwater was not observed during the test boring program. For more information, please refer to the attached logs.

## **4.0 EVALUATION AND RECOMMENDATIONS**

### **4.1 General Findings**

Based on the subsurface findings, the site is suitable to support the proposed tank on a haunched floor slab with thickened perimeter wall foundations. The four test borings encountered bedrock in the range of elevations 530 to 532 feet, about 2 to 4 feet below tank floor level. We recommend that all overburden soils be removed beneath the tank to expose the bedrock surface. Materials used to refill to bottom of haunched slab level should consist of compacted Crushed Stone.

There is the potential for an undulating bedrock surface beneath the tank area, requiring sporadic bedrock removal.

### **4.2 Site and Subgrade Preparation**

We recommend that site preparation begin with the construction of an erosion control system to protect adjacent drainage ways and areas outside the construction limits. As much vegetation as possible should remain outside the construction areas to lessen the potential for erosion and site disturbance.

All overburden soils should be removed beneath the tank area. The extent of removal should extend 1 foot laterally outward from outside edge of the haunched perimeter foundation wall for every 1-foot of excavation depth (1H:1V bearing splay). Bedrock subgrades should consist of sound, intact bedrock. Loose or weathered rock or fractured rock pieces should be removed prior to placement of Crushed Stone.

The over-excavated area and any fill required to attain subgrade should consist of compacted NHDOT Standard Specification 703-1 Standard Stone Size #467.

### **4.3 Excavation and Dewatering**

Bedrock removal may be required in some areas to achieve subgrade. Bedrock removal could be undertaken by mechanical methods such as drilling and splitting and/or hydraulic hoe ram, or with controlled blasting.

If blasting is used to achieve proposed grades, we anticipate that some over-blasting will occur. We recommend blasting bedrock to a depth of no more than 1-foot below subgrade level. Over-blasted bedrock should be removed and replaced with compacted Crushed Stone. We recommend that an experienced drilling and blasting contractor be engaged to provide rock removal and that the contractor be required to submit qualifications and references prior to commencement of excavation. We recommend a detailed blasting plan be developed prior to blasting work. An owner coordinated pre-blast survey should be conducted on all structures and drinking water wells located within 500 feet of the blast area. The close proximity of existing structures and utilities should be considered during planning. Blasting activities should be undertaken in a manner to reduce vibrations as much as possible to reduce potential for damage to other structures. Vibrations due to blasting should be monitored by qualified personnel.

While groundwater levels appear to be below excavation levels, it is possible that ponded water may occur following periods of precipitation. Sumping and pumping dewatering techniques should be adequate to control groundwater and runoff water in excavations.

Excavations must be properly shored or sloped in accordance with OSHA Regulations to prevent sloughing and caving of the sidewalls during construction. Care must be taken to preclude undermining adjacent structures and utilities. The design and planning of excavations and dewatering is the responsibility of the contractor.

#### **4.4 Foundations**

We understand that the proposed water storage tank perimeter will be supported by a haunched slab. We recommend the haunched slab be cast over at least 6 inches of Crushed Stone bearing on intact bedrock subgrades. Given bedrock subgrades and Crushed Stone fill, frost protection is not a consideration. For foundations bearing on properly prepared subgrades, we recommend the following geotechnical parameters for design consideration:

<b>Geotechnical Foundation Parameters</b>	
Net Allowable Bearing Pressure	6.0 ksf
Base Friction Factor	0.50
Total Unit Weight of Backfill	125 pcf
At-Rest Lateral Earth Pressure Coefficient	0.5
Internal Friction Angle of Backfill	30°
Seismic Soil Site Class	B (IBC 2009)
USGS Spectral Response Acceleration Parameter S1	0.089
USGS Spectral Response Acceleration Parameter SS	0.288
Estimated Total Settlement	½-inch
Differential Settlement	½-inch across width of tank

#### **4.6 Slab-On-Grade**

The on-grade tank slab floor may be designed using a subgrade reaction modulus of 180 pci (pounds per cubic inch) provided the slab is underlain by at least 6 inches of compacted Crushed Stone placed over properly prepared subgrade. The structural engineer or concrete consultant must design steel reinforcing appropriate to slab thickness and function.

The on-grade slab should be appropriately cured using moisture retention methods after casting. Typical slab curing methods should be used for at least 7 days. Project specifications should incorporate curing methods consistent with current applicable American Concrete Institute (ACI) procedures.

#### **4.7 Backfill and Compaction**

We recommend the following fill and backfill materials.

Structural Fill: Backfill for foundations should be clean, non-frost susceptible sand and gravel meeting the gradation requirements for Structural Fill as given below:

<b>Structural Fill</b>	
<b>Sieve Size</b>	<b>Percent Finer by Weight</b>
4 inch	100
3 inch	90 to 100
¼ inch	25 to 90
#40	0 to 30
#200	0 to 6

In our opinion, NHDOT 209.2.1.2 Gravel Backfill meets the intention of the Structural Fill specification and is an adequate substitute.

Crushed Stone: The crushed stone used beneath the tank floor and perimeter / thickened portion of the haunched slab should be washed, hard, durable rock meeting the requirements of 2016 NHDOT Standard Specification 703-1 Standard Stone Size #467.

Reuse of Site Soils: The non-organic on-site soils are unsuitable for reuse in water storage tank areas, but may be suitable for reuse as Common Borrow in landscape areas, provided they are at a compactable moisture content at the time of reuse.

Recycled Products: Borrow products including recycled crushed materials such as asphalt, concrete, and brick can be submitted to S.W. COLE for review and consideration as Structural Fill. Recycled products must also be tested in accordance with state environmental regulations and approved by a qualified environmental consultant.

Placement and Compaction: Fill should be placed in horizontal lifts and compacted such that the desired density is achieved throughout the lift thickness with 3 to 5 passes of the compaction equipment. Loose lift thicknesses for grading, fill and backfill activities should not exceed 12 inches. We recommend that fill and backfill in water storage tank and mounded soils areas be compacted to at least 95 percent of its maximum dry density as determined by ASTM D-1557. Crushed Stone should be compacted in maximum 12-inch thick lifts with 3 to 5 passes of a vibratory plate compactor having a static weight of at least 500 pounds.

#### **4.8 Weather Considerations**

Construction activity should be limited during wet and freezing weather and the site soils may require drying or thawing before construction activities may continue. The contractor should anticipate the need for water to temper fills in order to facilitate compaction during dry weather. If construction takes place during cold weather, subgrades, foundations and floor slabs must be protected during freezing conditions. Concrete and fill must not be placed on frozen soil; and once placed, the concrete and soil beneath the structure must be protected from freezing.

#### **4.9 Design Review and Construction Testing**

S.W.COLE should be retained to review the construction documents prior to bidding to determine that our earthwork and foundation recommendations have been properly interpreted and implemented.

A soils and concrete testing program should be implemented during construction to observe compliance with the design concepts, plans, and specifications. S.W.COLE is available to observe earthwork activities, the preparation of foundation bearing surfaces and pavement subgrades, as well as to provide testing and IBC Special Inspection services for soils and concrete construction materials.

#### **5.0 CLOSURE**

It has been a pleasure to be of assistance to you with this phase of your project. We look forward to working with you during the construction phase of the project.

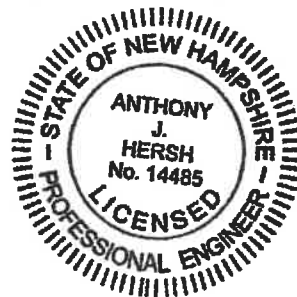
Sincerely,

**S. W. Cole Engineering, Inc.**

A handwritten signature in black ink, appearing to read 'Anthony Hersh', written in a cursive style.

Anthony J. Hersh, P.E.  
Senior Geotechnical Engineer

AJH:cbm





## **APPENDIX A**

### **Limitations**

This report has been prepared for the exclusive use of Jones & Beach Engineers, Inc. for specific application to the proposed Concrete Water Storage tank east of Reinach Place in the Village District of Eidelweiss of Madison, New Hampshire. S. W. Cole Engineering, Inc. (S.W.COLE) has endeavored to conduct our services in accordance with generally accepted soil and foundation engineering practices. No warranty, expressed or implied, is made.

The soil profiles described in the report are intended to convey general trends in subsurface conditions. The boundaries between strata are approximate and are based upon interpretation of exploration data and samples.

The analyses performed during this investigation and recommendations presented in this report are based in part upon the data obtained from subsurface explorations made at the site. Variations in subsurface conditions may occur between explorations and may not become evident until construction. If variations in subsurface conditions become evident after submission of this report, it will be necessary to evaluate their nature and to review the recommendations of this report.

Observations have been made during exploration work to assess site groundwater levels. Fluctuations in water levels will occur due to variations in rainfall, temperature, and other factors.

S.W.COLE's scope of services has not included the investigation, detection, or prevention of any Biological Pollutants at the project site or in any existing or proposed structure at the site. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and the byproducts of any such biological organisms.

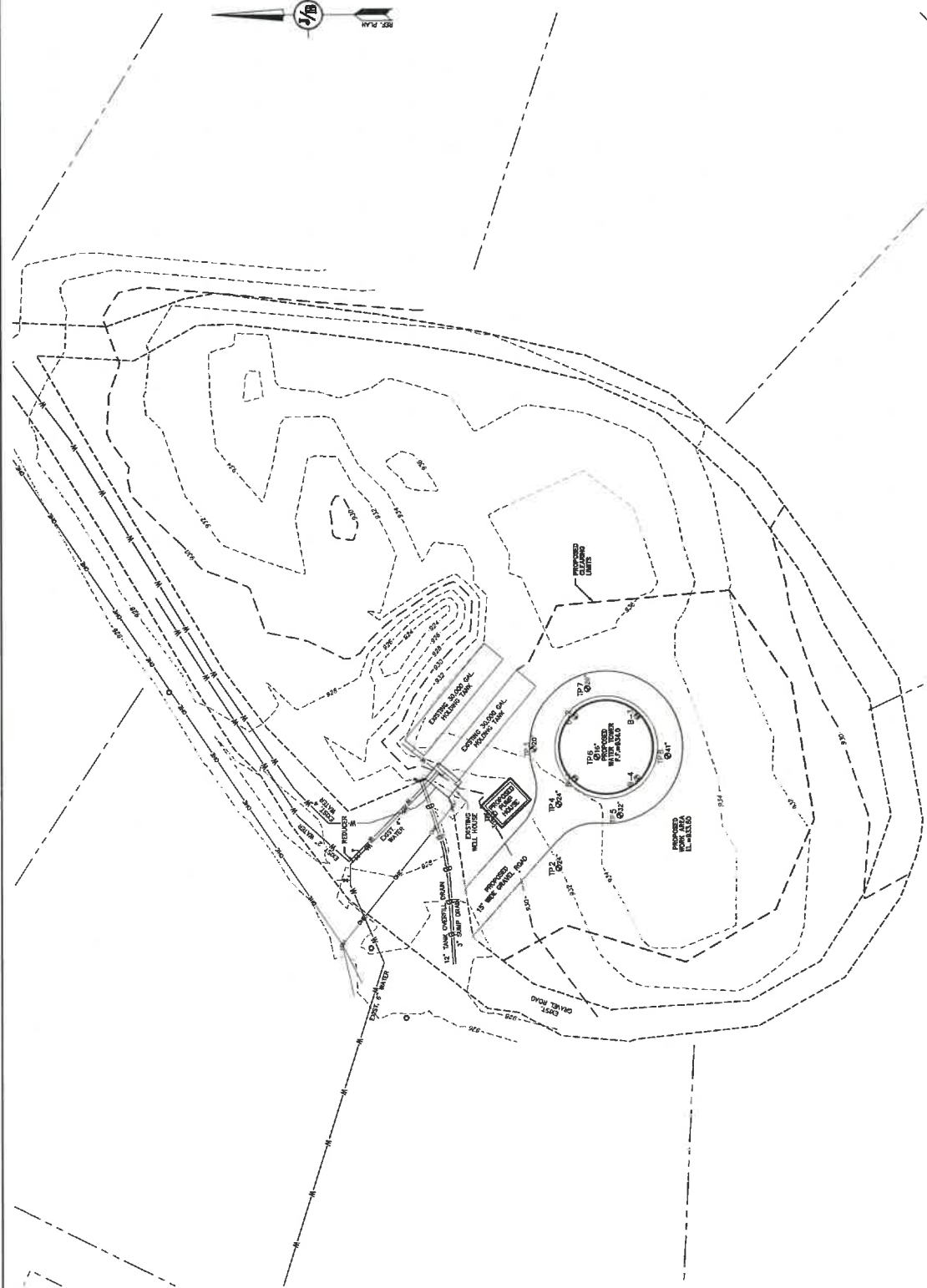
Recommendations contained in this report are based substantially upon information provided by others regarding the proposed project. In the event that any changes are made in the design, nature, or location of the proposed project, S.W.COLE should review such changes as they relate to analyses associated with this report. Recommendations contained in this report shall not be considered valid unless the changes are reviewed by S.W.COLE.

## **APPENDIX B**

### **Figures**



LOCUS SCALE: 1"=2000'



DRAWING No. **CON1**  
 SHEET OF 1  
 PROJECT NO. 18078

Plan Name: **DRAFT WATER TOWER PLAN**  
 Project: **VILLAGE DISTRICT OF EIDELWEISS**  
 1880 CONWAY ROAD, MADISON, NH  
 Owner of Record: **ADAM LESLER, COMMISSIONER**  
 1880 CONWAY ROAD, PO BOX 1027, MADISON, NH 03848

Designed and Produced in NH

**J/B Jones & Beach Engineers, Inc.**  
 Civil Engineering Services  
 88 Portsmouth Ave.  
 Seabrook, NH 03885  
 TEL: 603.775.4746  
 FAX: 603.775.4200  
 E-MAIL: JBE@JONESANDBEACH.COM

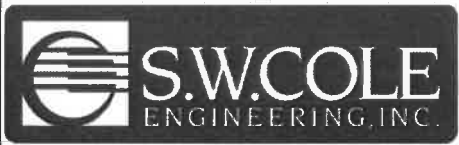
REV.	DATE	BY	REVISION
1	06/21/18	AMJ	REVISED BORING LOCATIONS
0	06/20/19	AMJ	ISSUED FOR REVIEW

Checked by: **AMJ** Date: **06/20/2019**  
 Drawn by: **AMJ** Scale: **1" = 20'** Project No.: **18078**  
 Description: **18078 CONCEPT PLAN**

THIS PLAN SHALL NOT BE AMENDED WITHOUT WRITTEN  
 AUTHORIZATION OF THE ENGINEER. ANY ALTERATIONS  
 AUTHORIZED OR OTHERWISE SHALL BE  
 AT THE USER'S SOLE RISK AND WITHOUT LIABILITY TO JBE.

**APPENDIX C**

**Exploration Logs and Key**



# BORING LOG

CLIENT: Jones & Beach Engineers, Inc.  
 PROJECT: Proposed Concrete Water Storage Tank  
 LOCATION: Village District of Eidelweiss, Madison, NH

BORING NO.: **B-1**  
 SHEET: 1 of 1  
 PROJECT NO.: 19-0640  
 DATE START: 7/2/2019  
 DATE FINISH: 7/2/2019

## Drilling Information

LOCATION: See Exploration Location Plan ELEVATION (FT): 934' +/- TOTAL DEPTH (FT): 8.5 LOGGED BY: Antonio Santiago  
 DRILLING CO.: S. W. Cole Explorations, LLC DRILLER: Jeff Lee DRILLING METHOD: Cased Boring  
 RIG TYPE: Track Mounted CME 850 AUGER ID/OD: N/A / N/A SAMPLER: Standard Split-Spoon  
 HAMMER TYPE: Automatic / Automatic HAMMER WEIGHT (lbs): 140 / 140 CASING ID/OD: 4 in / 4 1/2 in CORE BARREL: NQ2 / 2  
 HAMMER EFFICIENCY FACTOR: HAMMER DROP (inch): 30 / 30  
 WATER LEVEL DEPTHS (ft): No free water observed

## GENERAL NOTES:

**KEY TO NOTES AND SYMBOLS:**  
 Water Level  
 At time of Drilling  
 At Completion of Drilling  
 After Drilling  
 D = Split Spoon Sample  
 U = Thin Walled Tube Sample  
 R = Rock Core Sample  
 V = Field Vane Shear  
 Pen. = Penetration Length  
 Rec. = Recovery Length  
 bpf = Blows per Foot  
 mpf = Minute per Foot  
 WOR = Weight of Rods  
 WOH = Weight of Hammer  
 RQD = Rock Quality Designation  
 PID = Photoionization Detector  
 S<sub>v</sub> = Field Vane Shear Strength, kips/sq.ft.  
 q<sub>u</sub> = Unconfined Compressive Strength, kips/sq.ft.  
 Ø = Friction Angle (Estimated)  
 N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION					Graphic Log	Sample Description & Classification	H <sub>2</sub> O Depth	Remarks
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD				
930	5		1R		3.5-8.5	60/40	0		0.3		3 inches Topsoil and Forest Duff Brown, silty SAND some gravel with cobbles and boulders
									3.5		Hard, moderately weathered, extremely to moderately fractured, tan, coarse-grained, TWO-MICA GRANITE, with partings very close to close, horizontal to shallow.

Bottom of Exploration at 8.5 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING NO.: **B-1**





# BORING LOG

**BORING NO.:** B-3  
**SHEET:** 1 of 1  
**PROJECT NO.:** 19-0640  
**DATE START:** 7/2/2019  
**DATE FINISH:** 7/2/2019

**CLIENT:** Jones & Beach Engineers, Inc.  
**PROJECT:** Proposed Concrete Water Storage Tank  
**LOCATION:** Village District of Eidelweiss, Madison, NH

### Drilling Information

**LOCATION:** See Exploration Location Plan      **ELEVATION (FT):** 935' +/-      **TOTAL DEPTH (FT):** 9.5      **LOGGED BY:** Antonio Santiago  
**DRILLING CO.:** S. W. Cole Explorations, LLC      **DRILLER:** Jeff Lee      **DRILLING METHOD:** Cased Boring  
**RIG TYPE:** Track Mounted CME 850      **AUGER ID/OD:** N/A / N/A      **SAMPLER:** Standard Split-Spoon  
**HAMMER TYPE:** Automatic / Automatic      **HAMMER WEIGHT (lbs):** 140 / 140      **CASING ID/OD:** 4 in / 4 1/2 in      **CORE BARREL:** NQ2 / 2  
**HAMMER EFFICIENCY FACTOR:**      **HAMMER DROP (inch):** 30 / 30  
**WATER LEVEL DEPTHS (ft):** No free water observed

### GENERAL NOTES:

**KEY TO NOTES AND SYMBOLS:**  
 Water Level  
 At time of Drilling  
 At Completion of Drilling  
 After Drilling  
D = Split Spoon Sample  
U = Thin Walled Tube Sample  
R = Rock Core Sample  
V = Field Vane Shear  
Pen. = Penetration Length  
Rec. = Recovery Length  
bpf = Blows per Foot  
mpf = Minute per Foot  
WOR = Weight of Rods  
WOH = Weight of Hammer  
RQD = Rock Quality Designation  
PID = Photoionization Detector  
S<sub>v</sub> = Field Vane Shear Strength, kips/sq.ft.  
q<sub>u</sub> = Unconfined Compressive Strength, kips/sq.ft.  
Ø = Friction Angle (Estimated)  
N/A = Not Applicable

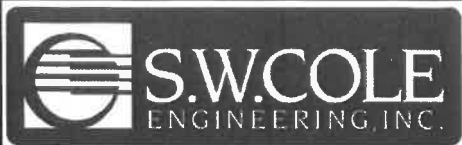
Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION					Field / Lab Test Data	Graphic Log	Sample Description & Classification	H <sub>2</sub> O Depth	Remarks
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD					
930	5		1R		4.5-9.5	60/54	8		3 inches Topsoil and Forest Duff			
									0.3	Brown, silty SAND some gravel with cobbles and boulders		
									3.0	Probable boulder or weathered rock		
									4.5	Hard, moderately weathered, extremely to moderately fractured, tan, coarse-grained, TWO-MICA GRANITE, with partings very close to close, horizontal to moderately dipping.		
								9.0				

Bottom of Exploration at 9.5 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

**BORING NO.:** B-3

BORING / WELL: 19-0640.GPJ\_SWCE TEMPLATE.GDT 7/3/19



# BORING LOG

**BORING NO.:** B-4  
**SHEET:** 1 of 1  
**PROJECT NO.:** 19-0640  
**DATE START:** 7/2/2019  
**DATE FINISH:** 7/2/2019

**CLIENT:** Jones & Beach Engineers, Inc.  
**PROJECT:** Proposed Concrete Water Storage Tank  
**LOCATION:** Village District of Eidelweiss, Madison, NH

### Drilling Information

**LOCATION:** See Exploration Location Plan    **ELEVATION (FT):** 935' +/-    **TOTAL DEPTH (FT):** 8.0    **LOGGED BY:** Antonio Santiago  
**DRILLING CO.:** S. W. Cole Explorations, LLC    **DRILLER:** Jeff Lee    **DRILLING METHOD:** Cased Boring  
**RIG TYPE:** Track Mounted CME 850    **AUGER ID/OD:** N/A / N/A    **SAMPLER:** Standard Split-Spoon  
**HAMMER TYPE:** Automatic / Automatic    **HAMMER WEIGHT (lbs):** 140 / 140    **CASING ID/OD:** 4 in / 4 1/2 in    **CORE BARREL:** NQ2 / 2  
**HAMMER EFFICIENCY FACTOR:**    **HAMMER DROP (inch):** 30 / 30  
**WATER LEVEL DEPTHS (ft):** No free water observed

### GENERAL NOTES:

**KEY TO NOTES AND SYMBOLS:**  
 Water Level  
 ▽ At time of Drilling  
 ▾ At Completion of Drilling  
 ▿ After Drilling  
 D = Split Spoon Sample  
 U = Thin Walled Tube Sample  
 R = Rock Core Sample  
 V = Field Vane Shear  
 Pen. = Penetration Length  
 Rec. = Recovery Length  
 bpf = Blows per Foot  
 mpf = Minute per Foot  
 WOR = Weight of Rods  
 WOH = Weight of Hammer  
 RQD = Rock Quality Designation  
 PID = Photoionization Detector  
 S<sub>v</sub> = Field Vane Shear Strength, kips/sq.ft.  
 q<sub>u</sub> = Unconfined Compressive Strength, kips/sq.ft.  
 Ø = Friction Angle (Estimated)  
 N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION					Graphic Log	Sample Description & Classification	H <sub>2</sub> O Depth	Remarks
			Sample No.	Type	Depth (ft)	Pen./Rec. (in)	Blow Count or RQD				
930	5		1R		3-8	60/51	49	0.3 3 inches Topsoil and Forest Duff Brown, silty SAND some gravel with cobbles and boulders			
											3.0 Hard, slightly weathered, extremely fractured to sound, gray, medium-grained, TWO-MICA GRANITE, with joints very close to moderately close, horizontal to shallow.

Bottom of Exploration at 8.0 feet

BORING / WELL 19-0640.GPJ SWCE TEMPLATE.GDT 7/3/19

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

**BORING NO.:** B-4



## **KEY TO NOTES & SYMBOLS**

### **Test Boring and Test Pit Explorations**

Stratification lines represent the approximate boundary between soil types and the transition may be gradual.

#### **Key to Symbols Used:**

w	-	water content, percent (dry weight basis)
q <sub>u</sub>	-	unconfined compressive strength, kips/sq. ft. - laboratory test
S <sub>v</sub>	-	field vane shear strength, kips/sq. ft.
L <sub>v</sub>	-	lab vane shear strength, kips/sq. ft.
q <sub>p</sub>	-	unconfined compressive strength, kips/sq. ft. – pocket penetrometer test
O	-	organic content, percent (dry weight basis)
W <sub>L</sub>	-	liquid limit - Atterberg test
W <sub>P</sub>	-	plastic limit - Atterberg test
WOH	-	advance by weight of hammer
WOM	-	advance by weight of man
WOR	-	advance by weight of rods
HYD	-	advance by force of hydraulic piston on drill
RQD	-	Rock Quality Designator - an index of the quality of a rock mass.
γ <sub>T</sub>	-	total soil weight
γ <sub>B</sub>	-	buoyant soil weight

#### **Description of Proportions:**

Trace:	0 to 5%
Some:	5 to 12%
"Y"	12 to 35%
And	35+%
With	Undifferentiated

#### **Description of Stratified Soils**

Parting:	0 to 1/16" thickness
Seam:	1/16" to 1/2" thickness
Layer:	1/2" to 12" thickness
Varved:	Alternating seams or layers
Occasional:	one or less per foot of thickness
Frequent:	more than one per foot of thickness

**REFUSAL: Test Boring Explorations** - Refusal depth indicates that depth at which, in the drill foreman's opinion, sufficient resistance to the advance of the casing, auger, probe rod or sampler was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

**REFUSAL: Test Pit Explorations** - Refusal depth indicates that depth at which sufficient resistance to the advance of the backhoe bucket was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

Although refusal may indicate the encountering of the bedrock surface, it may indicate the striking of large cobbles, boulders, very dense or cemented soil, or other buried natural or man-made objects or it may indicate the encountering of a harder zone after penetrating a considerable depth through a weathered or disintegrated zone of the bedrock.