PROJECT MANUAL

CITY OF PORTSMOUTH

PORTSMOUTH, NEW HAMPSHIRE

ISLINGTON STREET CORRIDOR IMPROVEMENTS PHASE 2

Bid # 47-22

August 15, 2022



Portsmouth, New Hampshire FILE NO. 2705

CITY OF PORTSMOUTH

PORTSMOUTH, NEW HAMPSHIRE

ISLINGTON STREET CORRIDOR IMPROVEMENTS PHASE 2



August 15, 2022

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Underwood Engineers, Inc. 25 Vaughan Mall Portsmouth, New Hampshire 03801

FILE NO. 2705

TABLE OF CONTENTS

DIVISION A. BIDDING REQUIREMENTS Page No. through Page No. Advertisement for Bids A-1.1 A-1.2 A-2.4 Information for Bidders A-2.1 A-3.22 Bid A-3.1 A-4.2 Bid Bond A-4.1 **B. CONTRACT**

Notice of Intent to Award	B-1.1	B-1.2
Agreement	B-2.1	B-2.4
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

C. GENERAL CONDITIONS

General Conditions	00700
Supplementary Conditions	00800

D. FUNDING REQUIREMENTS

E. TECHNICAL SPECIFICATIONS

- 1. Division 1 General Requirements
- 2. Division 2 Site Work
- 3. Division 3 Concrete
- 4. Division 4 Masonry
- 5. Division 7 Thermal and Moisture Protection
- 6. Division 13 Special Construction Requirements

F. NHDOT STANDARD SPECIFICATIONS, AMENDMENTS & SPECIAL PROVISONS

G. APPENDICES **APPENDIX A – Geotechnical Engineering Report**

SECTION NO.

A. BIDDING REQUIREMENTS

ADVERTISEMENT FOR BIDS

City of Portsmouth, New Hampshire

Owner

Department of Public Works, 680 Peverly Hill Road, Portsmouth, NH 03801

Address

Separate sealed BIDS for the construction of Islington Street Corridor Improvements – Phase 2 will be received at the City of Portsmouth Purchasing Department, City Hall, 1 Junkins Avenue, Portsmouth, NH 03801, until 2:00 p.m. local time on <u>October 4, 2022</u>. BIDS will then be publicly opened and read aloud at said office and time. The Project includes, but is not limited to, water, sewer, drainage, roadway, sidewalk, traffic signal, lighting and landscape improvements to Islington Street from the vicinity of Dover Street to the intersection of Cornwall Street. (Base Bid) The project also includes add/alternatives to extend the limit of work from Cornwall Street to Maplewood Avenue and improvements to Goodwin Park.

There will be a **mandatory** pre-bid meeting on <u>September 15, 2022</u>, at 2:00 PM. The pre-bid meeting will be held in the first-floor conference room located at the City of Portsmouth Department of Public Works, 680 Peverly Hill Road, Portsmouth, New Hampshire, 03801. Bid notes as follows:

- 1. Completion time for the base bid project will be calculated as calendar days (exclusive of winter shut down) as specified in the agreement, from the date specified in the Notice to Proceed.
- 2. Liquidation damages will be in the amount of \$1,000 for each calendar day from the date established for substantial completion, and \$1,000 for each calendar day from the date established for final completion
- 3. Each General Bid shall be accompanied by a Bid Security in the amount of 5% of the Total amount of the Bid (Base Bid plus any Bid Alternates).
- 4. 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.
- 5. No Bidder may withdraw a Bid within 60 days after the actual date of opening thereof.
- 6. The owner reserves the right to reject any and all bids, to accept any bid, to waive any informality on bids received, and to omit any item or items it may deem to be in the best interest of the Owner.
- 7. Any questions regarding bidding should be directed to the Purchasing Coordinator

by email, purchasing@cityofportsmouth.com, or by phone (603) 610-7227. Questions must be received by 1:00 pm on September 22, 2022.

 Technical questions regarding the plans and specifications can be directed to Daniel Rochette, P.E., Underwood Engineers, Inc., by phone (603) 436-6192 or by email, drochette@underwoodengineers.com. Questions must be received by 1:00 pm on September 22, 2022 to be addressed by addendum.

Electronic Contract Documents (Plans, Specifications, and Addenda) may be obtained at the City's website <u>http://cityofportsmouth.com/finance/purchasing.htm</u>. Documents are not available for pickup.

Addenda to this bid document, including response to questions submitted will not be provided directly to bidders, but <u>will be posted on the City's website</u>, under the project heading by 4:00 pm on September 28, 2022. <u>It will be the bidder's responsibility to check the website for any addenda issued prior to submitting their bid.</u> Bidders must acknowledge receipt of addendums with their Bid (page A-3.2).

A-2.1

INFORMATION FOR BIDDERS

BIDS will be received by The City of Portsmouth, New Hampshire

(herein called the "OWNER"), at <u>Purchasing Dept., 1 Junkins Avenue, Portsmouth, NH 03801</u> until <u>2:00 pm, October 4, 2022</u>, and then at said office publicly opened and read aloud.

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

City of Portsmouth Purchasing Department at City Hall, 1 Junkins Avenue, Portsmouth, NH 03801

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

for Bid No. 47-22 Islington Street Corridor Improvements - Phase 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 OWNER at

<u>City of Portsmouth Purchasing Department, City Hall, 1 Junkins Avenue, Portsmouth, NH03801</u> All BIDS must be made on the required BID form and be based on the complete set of CONTRACT DOCUMENTS including all ADDENDA. All blank spaces for BID prices must be filled in, in ink or typewritten, and the BID form must be fully completed and executed when submitted. Only one copy of the BID form is required.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

MANDATORY PRE-BID MEETING

There will be a **mandatory pre-bid meeting** as specified in the Advertisement for Bids. All prospective bidders must attend.

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.

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.

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 Engineer, and Contractor. Two (2) copies will go to the Owner.

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.

BIDDERS QUALIFICATIONS

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

- A. BIDDER 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. BIDDER shall maintain a permanent place of business.
- C. BIDDER shall have adequate personnel and equipment to perform the work expeditiously.
- D. BIDDER shall have suitable financial status to meet obligations incidental to the work.
- E. BIDDER shall have appropriate technical experience satisfactory to the Engineer and the Division in the class of work involved.
- F. BIDDER shall be registered with the Secretary of State to transact business in New Hampshire.
- G. BIDDER shall have performed to the satisfaction of the Engineer and the Division on previous contracts of a similar nature.
- H. BIDDER shall not have failed to complete previous contracts on time, including approved time extensions.
- I. The BIDDER shall be Pre-qualified with NHDOT for Road Construction.

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.

RESERVATION OF RIGHTS

The Owner reserves the right to reject any and all bids, to accept any bid, to waive any informality on any bids received, and to omit any item or items it may deem to be in the best interest of the Owner.

BID

Proposal of	(hereinafter								
called "BIDDER"), organized and existing under the laws of the State of									
doing business as									
(Corporation, Fait	nersnip, nurviduar)								
To the City of Portsmouth, NH	(hereinafter called "OWNER").								

In compliance with your Advertisement for Bids, BIDDER hereby proposes to perform all WORK For the construction of <u>Islington Street Corridor Improvements - Phase 2</u> 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 base bid PROJECT within the number of calendar days (exclusive of winter shut down) from the date specified in the NOTICE TO PROCEED. The Contractor shall notify the Owner if supply chain for obtaining materials should impact the start of the work.

Liquidated damages will be in the amount of $\underline{1,000.00}$ for each calendar day of delay from the date established for substantial completion and $\underline{1,000.00}$ for each calendar day of delay from the date established for final completion, as provided in Paragraph 12.04 of the Supplemental Conditions.

BIDDER acknowledges receipt of the following ADDENDUM:

Bid Instructions:

The work under this contract consists of a base bid and potential bid alternates as follows:

Base Bid

The base bid shall be all work as shown on the Contract Plans and Documents, complete and in place.

In preparing the Bid Form, Bidders shall note the following:

- (1) Insert Unit Price (numeric amount in dollars and cents) under "Unit Price in Figures" for each Item.
- (2) Multiply the "Est. Quantity" by the "Unit Price in Figures" and insert the product for "Item Total in Figures" for each Item.
- (3) Add all products in the "Item Total in Figures" and insert the sum for the "Total Base Bid Price" in numeric value and words.
- (4) In the event of a discrepancy between a "Unit Price in Figures" and "Item Total in Figures", the "Unit Price in Figures" shall control, and the "Item Total in Figures" shall be corrected by the Owner during the review of bids.
- (5) In the event of a discrepancy between the sum total of the "Item Total in Figures" and the "Total Base Bid Price", the sum total of the "Item Total in Figures" shall control, and the "Total Base Bid Price" shall be corrected by the Owner during the review of bids.
- (6) Base Bid includes all work <u>except</u> those included in Bid Alternates.

An unbalanced or unreasonable lump sum or unit price submitted herein may be grounds for rejection of the Bid. Specific items of this Contract may be eliminated or reduced in quantity to keep within limits of available funding, at the OWNER'S option.

Unit prices set for certain items (MIN.) are minimum unit prices established by the Engineer to be used by the Bidder.

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

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

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

16. With what banks do you conduct business?

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

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

Respectfully submitted:

Signature		Address							
Title		Date							
	Being du	uly sworn, deposes and says that he	is						
of		Name of Organization)							
and that the answers to the foregoing	questions and all state	ments contained therein are true and	ł						
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.

			BAS	BASE BID - STA 131+84 TO STA		ADD ALTERNATIVE #1 - STA		ADD ALTERNATIVE #3 - GOODWIN	
			DOT	141+00		141+00 10 STA 134+49	DOT	IARK	
BID ITEM	UNITS	UNIT PRICE	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	
SCHEDUL	E 1 - SE	WER		· ·					
1A	LS	MAINTENANCE OF COMBINED SANITARY AND STORM SEWER FLOWS:	1		0				
		Dollars and \$		\$		\$			
		Cents per							
1B	LS	MAINTENANCE OF COMBINED SANITARY AND STORM SEWER FLOWS:	0		1				
		Dollars and \$		\$		\$			
		Cents per							
1.1.06A	LF	6" PVC SDR 35 SEWER SERVICE CONNECTION (CITY RIGHT OF WAY):	440		540				
		Dollars and \$		\$		\$			
		Cents per							
1.1.06B	LF	6" PVC SDR 35 SEWER SERVICE CONNECTION (PRIVATE PROPERTY):	50		50				
		Dollars and \$		\$		\$			
		Cents per							
1.1.06C	EA(*)	FURNISH AND INSTALL SEWER SERVICE CHIMNEYS:	1		2				
		Dollars and		\$		\$			
		Cents per							
1.1.06D	EA	FURNISH AND INSTALL CAST IRON CLEAN OUT COVERS:	11		12				
		Dollars and \$		\$		\$			
		Cents per							
1.1.08	LF	8" PVC SDR 35 SEWER PIPE:	580		970		-		
		Dollars and \$		\$		\$			
		Cents per							
1.1.10	LF	10" PVC SDR 35 SEWER PIPE:	10		260				
		Dollars and \$		\$		s			
		Cents per							
1.1.12	LF	12" PVC SDR 35 SEWER PIPE:	10		70				
		Dollars and \$		\$		\$			
		Cents per							
1.1.18	LF	18" PVC SDR 35 SEWER PIPE:	30		10				
		Dollars and \$		\$		\$			
		Cents per							
1.5.4	VF	4' DIA SEWER MANHOLE:	50		95				
		Dollars and		\$		\$			
		Cents per							

				BAS	<u>BASE BID</u> - STA 131+84 TO STA 141+00		<u>ADD ALTERNATIVE #1</u> - STA 141+00 TO STA 154+49		ADD ALTERNATIVE #3 - GOODWIN PARK	
BID ITEM	UNITS		UNIT PRICE	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	
1.5A	EA	ADDITIONAL ADJUSTMENT OF SEWER MANHOLES TO FINAL GRADE:		6		10				
		Dollars and	\$		\$		\$			
1.6	VF	FURNISH AND INSTALL INSIDE DROP STRUCTURE FOR SEWER MANHOLES:		4		6		_		
		Dollars and	\$		\$		\$			
		Cents per								
1.8A	LF(*)	FURNISH AND INSTALL GEOTEXTILE WRAP AROUND SEWER BEDDING:		200		300		-		
		Dollars and	\$		\$		\$			
		Cents per								
1.8B	LF(*)	FURNISH AND INSTALL GEOGRID TRENCH STABILIZATION (\$8 MIN):		20		30				
		Dollars and	\$		\$		\$			
		Cents per								
1.9A	EA(*)	FIELD CORE SEWER MANHOLES AND FOUNDATIONS, 4" - 15" :		1		1				
		Dollars and	\$		\$		\$			
		Cents per								
1.9B	EA(*)	FIELD CORE SEWER MANHOLES, 18" - 30" :		1		1				
		Dollars and	\$		\$		\$			
		Cents per								
1.9C	EA(*)	FIELD CORE FOUNDATION PENETRATION THROUGH STONE OR GRANITE:		1		1		-		
		Dollars and	\$		\$		\$			
		Cents per								
1.10	EA	REMOVE EXISTING SEWER MANHOLES:		3		10				
		Dollars and	\$		\$		\$			
		Cents per								
1.11	CY(*)	FURNISH AND INSTALL FLOWABLE FILL WHERE DIRECTED:		5		5				
		Dollars and	\$		\$		\$			
		Cents per								
1.12	LF	WELLPOINT DEWATERING SYSTEM:		125		125				
		Dollars and	\$		\$		\$			
		Cents per								
1.13	SF	SHEETING		125		125				
		Dollars and	\$		\$		\$			
		Cents per								

				BASE BID - STA 131+84 TO STA		AD	ADD ALTERNATIVE #1 - STA		ADD ALTERNATIVE #3 - GOODWIN	
1			-		141+00		141+00 TO STA 154+49		PARK	
BID ITEM	UNITS		UNIT PRICE	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	
1.15A	LS	HEALTH & SAFETY PLAN		1		0				
		Dollars and	\$		\$		S			
		Cents per			·					
1.15B.A	LS	MANAGEMENT OF SOILS & MATERIALS (BASE BID)		1		0		-		
		Dollars and	\$		\$		s			
		Cents per	÷		Ψ		·			
1.15B.B	LS	MANAGEMENT OF SOILS & MATERIALS (ADD ALT #1)		0		1				
		Dollars and	\$		\$		\$			
		Cents per								
1.15C	Ton(*)	LOAD AND HAUL SURPLUS REGULATED SOILS & MATERIALS (WHERE DIRECTED)		300		300		-		
		Dollars and	\$		\$		\$			
		Cents per								
1.15D	Ton(*)	DISPOSAL OF SURPLUS REGULATED SOILS & MATERIALS (WHERE		300		300		-		
		DIRECTED)	\$		\$		\$			
		Dollars and	·		·		۰ 			
1.15E.A	Allow	Analytical Testing of Soils (where directed) (Base Bid)		1		0				
		FIVE THOUSANDDollars and	\$5,000		\$5.000		\$			
		ZERO Cents per								
1.15E.B	Allow	Analytical Testing of Soils (where directed) (Add Alt #1)		0		1				
		FIVE THOUSAND Dollars and	\$5,000		\$		\$5,000			
		ZERO Cents per								
1.15F.A	Allow	Disposal of Regulated Groundwater (where directed) (Base Bid)		1		0				
		FIVE THOUSANDDollars and	\$5,000		\$5,000		\$			
		ZERO Cents per								
1.15F.B	Allow	Disposal of Regulated Groundwater (where directed) (Add Alt #1)		0		1				
		FIVE THOUSAND Dollars and	\$5,000		\$		\$5,000			
		ZERO Cents per								
1.16.A	Allow	Rework Interior Plumbing (Base Bid):		1		0				
		TEN THOUSAND Dollars and	\$10,000		\$10,000		\$			
		ZERO Cents per								
1.16.B	Allow	Rework Interior Plumbing:		0		1				
		TEN THOUSAND Dollars and	\$10,000		\$		\$10,000			
		ZERO Cents per								

			BASE BID - STA 131+84 TO STA		ADI	ADD ALTERNATIVE #1 - STA		ADD ALTERNATIVE #3 - GOODWIN	
[1			141+00	141+00 TO STA 154+49		PARK		
BID ITEM	UNITS	UNIT PRICE	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	
1.17	LF	POST CONSTRUCTION VIDEO OF SEWER MAINS	580		1,310				
		Dollars and \$		\$		\$			
		Cents per							
1.18	EA	LOCATE EXISTING SEWER SERVICES BY VIDEO INSPECTION, TRANSMITTER AND LOCATOR:	15		17		_		
		Dollars and \$		\$		s			
		Cents per							
6.5	CY(*)	TRENCH LEDGE REMOVAL & DISPOSAL (\$120/CY MIN.) - SEWER	100		300		-		
		Dollars and \$		\$		\$			
		Cents per							
				\$		\$		\$ <u>N/A</u>	
		TOTAL SCHEDULE I			-		-		
SCHEDUL	E 2 - WA	ATER		1		7			
3.1.04	LF	4" DIAMETER DUCTILE IRON WATER SERVICE PIPING	10		130				
		Dollars and \$		\$		\$			
		Cents per							
3.1.06	LF(*)	6" DIAMETER DUCTILE IRON WATERMAIN	100		100				
		Dollars and \$		\$		\$			
		Cents per							
3.1.08	LF	8" DIAMETER DUCTILE IRON WATERMAIN	240		290				
		Dollars and \$		\$		\$			
		Cents per							
3.1.16	LF	16" DIAMETER DUCTILE IRON WATERMAIN	900		1,360				
		Dollars and \$		\$		\$			
		Cents per							
3.1.20	LF	20" DIAMETER DUCTILE IRON WATERMAIN	0		40				
		Dollars and \$		\$		s			
		Cents per							
3.3.1	LF	1" COPPER WATER SERVICE PIPE	430		230				
		Dollars and \$		\$		s			
		Cents per							
3.3.1.5	LF	1.5" COPPER WATER SERVICE PIPE	20		40				
		Dollars and \$		\$		\$			
		Cents per							

				BASE BID - STA 131+84 TO STA		ADD ALTERNATIVE #1 - STA		ADD ALTERNATIVE #3 - GOODWIN		
					141+00		141+00 TO STA 154+49	PARK		
BID ITEM	UNITS		UNIT PRICE	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	
3.3.2	LF	2" COPPER WATER SERVICE PIPE		20		160				
		Dollars and	¢		¢		¢			
					φ		۹			
2.4.1	E 4			10						
3.4.1	EA	1" WATER SERVICE CONNECTIONS		18		11				
		Dollars and	\$		\$		\$			
		Cents per								
3.4.1.5	EA	1.5" WATER SERVICE CONNECTION		1		2				
		Dollars and	\$		\$		s			
		Conto non	·		φ		·			
3.4.2	FΔ	2" WATER SERVICE CONNECTION		2		7				
5.4.2	1.11			2		, ,				
		Dollars and	\$		\$		\$			
		Cents per								
3.5.04	EA	4" GATE VALVE ASSEMBLY		1		5				
		Dollars and	\$		\$		\$			
		Cents ner								
3.5.06	EA	6" GATE VALVE ASSEMBLY		1		0				
		Dollow and								
		Donars and	\$		\$		\$			
		Cents per								
3.5.08	EA	8" GATE VALVE ASSEMBLY		7		9				
		Dollars and	\$		\$		\$			
		Cents per								
3.5.16	EA	16" BUTTERFLY VALVE ASSEMBLY		6		4				
		Dollars and	¢		¢		¢			
			\$		¢		°			
2.5.20	EA			0						
5.5.20	EA	20 BUTTERFLT VALVE ASSEMBLT		0						
		Dollars and	\$		\$		\$			
		Cents per								
3.5A	EA	ADDITIONAL ADJUSTMENT OF VALVE COVERS AND WATER SHUT OFF VALVES		31		38				
		Dollars and	\$		\$		\$			
3.64	FΔ	Cents per		2		2				
5.0A	DA.	I NE IT DAANT ASSEMBET		5		3				
		Dollars and	\$		\$		\$			
		Cents per								

			BAS	<u>E BID</u> - STA 131+84 TO STA 141+00	AD	ADD ALTERNATIVE #1 - STA 141+00 TO STA 154+49		ADD ALTERNATIVE #3 - GOODWIN PARK	
BID ITEM	UNITS	UNIT PRICE	EST. QUANT	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	
3.7	EA	REMOVE EXISTING HYDRANT ASSEMBLIES	0		1				
		Dollars and \$		s		\$			
		Cents per	_						
3.8A	LF	TEMPORARY WATER SYSTEM (POTABLE)	900		1,360				
		Dollars and S		\$		s			
		Cents ner	_	Ф		۰ <u>ــــــــــــــــــــــــــــــــــــ</u>			
3.8B	EA	TEMPORARY WATER SERVICE CONNECTIONS (UP TO 2" DIA)	17		11				
		Dollars and s		s		¢			
		v	_	φ		φ			
3.8C	EA	TEMPORARY WATER SERVICE CONNECTIONS (GREATER THAN 2")	1		7				
		Dollars and		¢		¢			
			_	۵		\$			
6.5	CY(*)	TRENCH LEDGE REMOVAL & DISPOSAL (\$120/CY MIN.) - WATER	50		200				
		Dollars and							
		Donais and \$	-	\$		\$			
		Cents per			_				
		TOTAL SCHEDULE 2		\$		\$		\$N/A	
SCHEDU	F 3 - DF	PAIN							
202.41	LF(*)	REMOVAL OF EXISTING DRAIN PIPE	1,705		2,660				
		Dollars and S		s		S			
		Cents per	_						
202.43	LF(*)	REMOVAL OF EXISTING ASBESTOS CEMENT (AC) PIPE, ALL SIZES	150		150				
		Dollars and s		s		s			
			_	φ		Ψ			
202.5	EA	REMOVAL OF EXISTING DRAIN MANHOLES AND CATCH BASINS	7		15				
		Dollars and e		¢		¢			
			-	۵		۵			
593.211	SY(*)	CLASS 1 NON-WOVEN GEOTEXTILE	150		150				
		Dollars and a							
		Donars and5	_	»		\$			
603.0001	LF	Cents per VIDEO INSPECTION OF DRAIN LINES. WHERE DIRECTED	710		1.290				
00010001			,10		1,220				
		Donars and \$	-	5		\$			
		Cents per							

			Ē	BASE BID - STA 131+84 TO STA		ADD ALTERNATIVE #1 - STA		ADD ALTERNATIVE #3 - GOODWIN	
					141+00		141+00 TO STA 154+49		PARK
BID ITEM	UNITS	UNIT P	PRICE	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL
603.31	EA	CAST IRON DOWNSPOUT BOOTS		29		14			
		Dollars andS			\$		s		
		Canto par							
603.82206	LF(*)	6" POLYETHYLENE PIPE - LATERALS (SMOOTH INTERIOR)		860		630			
		Dollars and \$			\$		\$		
		Cents per							
603.82208	LF	8" POLYETHYLENE PIPE (SMOOTH INTERIOR)		0		20			
		Dollars and \$			\$		\$		
		Cents per							
603.82212	LF	12" POLYETHYLENE PIPE (SMOOTH INTERIOR)		730		620			
		Dollars and S			\$		s		
		Cante par			*		·		
603.82215	LF	15" POLYETHYLENE PIPE (SMOOTH INTERIOR)		20		450			
		Dollars and \$			\$		\$		
		Cents per							
603.82218	LF	18" POLYETHYLENE PIPE (SMOOTH INTERIOR)		30		220			
		Dollars and \$			\$		\$		
		Cents per							
604.0007	EA	POLYETHYLENE LINERS		11		16			
		Dollars and S			\$		s		
		Canto non			Ψ		·		
604.0008	EA	CATCH BASIN HOODS (12" TO 18" DIAMETER)		11		16			
00110000						10			
		Dollars and \$			\$		\$		
		Cents per							
604.124	VF	CATCH BASIN TYPE B - 4' DIA		60		105			
		Dollars and \$			\$		\$		
		Cents per							
604.184	VF	CATCH BASIN WITH CURB INLET - 4' DIA		9		36		-	
		Dollars and \$			\$		s		
		Cents per			·				
604.292	VF	2' DIA CURB INLET		8		32			
		Dellegend							
		Donars and \$			\$		\$		
		Cents per							

			BAS	<u>E BID</u> - STA 131+84 TO STA	ADI	<u> DALTERNATIVE #1</u> - STA	ADD AI	TERNATIVE #3 - GOODWIN
0				141+00	141+00 TO STA 154+49		PARK	
BID ITEM	UNITS	UNIT PRICE	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL
604.324	VF	4' DIA DRAIN MANHOLE (INCLUDES FRAME AND COVER)	17		9			
		Dollars and \$		\$		\$		
		Cents per						
604.4	VF	RECONSTRUCTING/ADJUST EXISTING CATCH BASINS	4		14			
		Dollars and \$		\$		\$		
		Cents per						
604.5	VF	RECONSTRUCTING/ADJUST EXISTING MANHOLES	10		26			
		Dollars and \$		\$		\$		
		Cents per						
604.811	EA(*)	FIELD CORE CATCH BASINS OR MANHOLES (UP TP 18" DIA.)	4		6			
		Dollars and \$		\$		\$		
		Cents per						
6.5	CY(*)	TRENCH LEDGE REMOVAL & DISPOSAL (\$120/CY MIN.) - DRAIN	50		200			
		Dollars and §		\$		\$		
		Cents per						
		TOTAL SCHEDULE 3		\$		\$		\$N/A
SCHEDUL	E 4 ROA	DWAY						
203.1	CY	COMMON EXCAVATION (F)	4,375		6,060		100	
		Dollars and \$		\$		\$		\$
		Cents per						
203.2	CY (*)	ROCK EXCAVATION	100		100			
		Dollars and \$		\$		\$		
		Cents per						
304.3	CY	CRUSHED GRAVEL (F)	3,375		4,600		60	
		Dollars and \$		\$		\$		\$
		Cents per						
403.11	TON	HOT BITUMINOUS PAVEMENT, MACHINE METHOD	1,350		1,730			
		Dollars and \$		\$		\$		
		Cents per						
403.12	TON	HOT BITUMINOUS PAVEMENT, HAND METHOD	250		384			
		Dollars and \$		\$		s		
		Cents per						

				BASE BID - STA 131+84 TO STA		ADD ALTERNATIVE #1 - STA		ADD ALTERNATIVE #3 - GOODWIN	
					141+00		141+00 TO STA 154+49		PARK
BID ITEM	UNITS		UNIT PRICE	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL
403.6	LF	PAVEMENT JOINT ADHESIVE		4,000		5,000			
		Dollars and	\$		s		s		
			\$		۵ <u> </u>		۵		
		Cents per							
410.22	GAL	ASPHALT EMULSION FOR TACK COAT		250		350			
		Dollars and	\$		\$		\$		
		Cents per							
417	SY (*)	COLD PLANING BITUMINOUS SURFACES		50		50			
		Dollars and	\$		\$		\$		
		Carto e a	Ф		÷		·		
615.004	EA	Cents per		0		4		-	
015.004	LA	IKAITIC SIGN RELOCATE		Ū		· ·			
		Dollars and	\$		\$		\$		
		Cents per							
615.5	EA	TRAFFIC SIGN - POST ONLY		25		63			
		Dollars and	\$		\$		s		
		Cents per							
615.61	SF	TRAFFIC SIGN TYPE A (F)		16		76		-	
		Dellars and							
		Dollars and	\$		\$		\$		
		Cents per							
615.62	SF	TRAFFIC SIGN TYPE B (F)		30		40			
		Dollars and	\$		\$		\$		
		Cents per							
615.63	SF	TRAFFIC SIGN TYPE C (F)		20		60			
		Dollars and	e.		e		e		
			2		\$		\$		
	0.5	Cents per						_	
615.64	SF	TRAFFIC SIGN TYPE AA (F)		17		26			
		Dollars and	\$		\$		\$		
		Cents per							
615.65	SF	TRAFFIC SIGN TYPE BB (F)		13		15			
		Dollars and	\$		s		s		
		Cante nar	*		·				
615.66	SF	TRAFFIC SIGN TYPE CC (F)		0		22		-	
012100				Ŭ					
		Dollars and	\$		\$		\$		
		Cents per							

			BAS	<u>E BID</u> - STA 131+84 TO STA	AD	<u>D ALTERNATIVE #1</u> - STA	ADD AI	LTERNATIVE #3 - GOODWIN
				141+00		141+00 TO STA 154+49		PARK
BID ITEM	UNITS	UNIT PRICE	EST. QUANT	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL
616.191	U	TRAFFIC SIGNAL MODICATIONS AT CABOT STREET	1		0			
		Dollars and \$		\$		s		
		Cents ner	-					
632.0104	LF	RETROREFLECTIVE PAINT PAVE. MARKING, 4" LINE	5,000		8,000			
		Dollars and e		c.		0		
			-	\$		»		
622.0106	IF	Cents per	500		500		_	
033.0100	LI	RETROREFLECTIVE FAINT FAVE. MARKING, 0 LINE	500		500			
		Dollars and \$	-	\$		\$		
		Cents per						
632.0112	LF	RETROREFLECTIVE PAINT PAVE. MARKING, 12" LINE	1,100		1,400			
		Dollars and \$	_	\$		\$		
		Cents per						
632.02	SF	RETROREFLECTIVE PAINT PAVE. MARKING, SYMBOL OR WORD	100		100		-	
		Dollars and S		s		s		
		Cents per	-					
632.3112	LF	RETROREFLECT. THERMOPLAS. PAVE. MARKING, 12" LINE	1,100		1,400		-	
		Dollars and		c		0		
			-	2		2		
632.32	SF	Cents per	100		100		-	
052.52	51	RETRORET ELECTIVE THERWOLEASTIC, STRIBGE OK WORD	100		100			
		Dollars and \$	-	\$		\$		
		Cents per						
1010.2A.A	Allow	ASPHALT CEMENT ADJUSTMENT	1		0			
		TEN THOUSAND Dollars and \$10,000		\$10,000		\$		
		ZERO Cents per						
1010.2A.B	Allow	ASPHALT CEMENT ADJUSTMENT	0		1			
		TEN THOUSAND Dollars and \$10,000		\$		\$10,000		
		ZERO Cents per				,		
		TOTAL SCHEDULE 4		\$		\$		\$
SCHEDLY	E E OF				_		1	
608.12	E 5 - SII SY (*)	2" BITUMINOUS SIDEWALK	50		50			
		Dollars and		c		c		
			-	φ		۵		
		Cents per						

				BAS	E BID - STA 131+84 TO STA	AD	D ALTERNATIVE #1 - STA	ADD AI	LTERNATIVE #3 - GOODWIN
					141+00		141+00 TO STA 154+49		PARK
BID ITEM	UNITS		UNIT PRICE	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL
608.249	SY	BRICK SIDEWALK		530		940		125	
		Dollars and	\$		\$		\$		\$
		Cents per							
608.259	SY (*)	GRANITE COBBLE STONE		10		10			
		Dollars and	\$		\$		\$		
		Cents per							
608.35	SY	5-IN REINFORCED CONCRETE SIDEWALK		800		1,240		45	
		Dollars and	\$		\$		\$		\$
		Cents per							
608.36	SY	6-IN REINFORCED CONCRETE SIDEWALK		50		100			
		Dollars and	\$		\$		\$		
		Cents per							
608.54	EA	DETECTABLE WARNING DEVICES, CAST IRON		20		25			
		Dollars and	\$		\$		\$		
		Cents per							
609.01	LF	STRAIGHT GRANITE CURB		1,440		1,940			
		Dollars and	\$		\$		\$		
		Cents per							
609.02	LF	CURVED GRANITE CURB		380		460			
		Dollars and	\$		\$		\$		
		Cents per							
609.21	LF (*)	STRAIGHT GRANITE SLOPE CURB		40		60			
		Dollars and	\$		\$		\$		
		Cents per							
609.23	LF (*)	CURVED GRANITE SLOPE CURB		40		60			
		Dollars and	\$		\$		\$		
		Cents per							
609.50	LF (*)	RESET GRANITE CURB		40		60			
		Dollars and	\$		\$		\$		
		Cents per							
609.812	LF (*)	BITUMINOUS CURB, TYPE A		40		60			
		Dollars and	\$		\$		\$		
		Cents per							

				BAS	E BID - STA 131+84 TO STA	AD	<u>D ALTERNATIVE #1</u> - STA	ADD AI	LTERNATIVE #3 - GOODWIN
					141+00		141+00 TO STA 154+49		PARK
BID ITEM UNITS	3		UNIT PRICE	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL
614.511 EA	CONCRETE PULL BOX, 14"			6		4			
		Dollars and	\$		s		s		
	Carte a re		•		<u>۲</u>		· · · · · · · · · · · · · · · · · · ·		
614 7114 J.F.	1" PVC PLASTIC CONDUIT SCHEDULE 40			0		0		450	
014./114				Ŭ		Ŭ		450	
		Dollars and	\$		\$		\$		\$
	Cents per								
614.7214 LF	2" PVC PLASTIC CONDUIT, SCHEDULE 40			1,400		2,300			
		Dollars and	\$		\$		\$		
	Cents per								
614.7218 LF	2" PVC PLASTIC CONDUIT, SCHEDULE 80			170		250			
		Dollars and	¢		e		c		
			\$		\$		3		
(14.70) (17	Cents per			-		0			
614./314 LF	3" PVC PLASTIC CONDUIT, SCHEDULE 40			50		0			
		Dollars and	\$		\$		\$		
	Cents per								
614.7318 LF	3" PVC PLASTIC CONDUIT, SCHEDULE 80			200		100			
		Dollars and	\$		s		s		
	Cents per						·		
625.20 EA	LIGHT POLE BASE			12		20			
		Donars and	\$		\$		\$		
	Cents per								
650.20 U	LANDSCAPING			1		1		1	
		Dollars and	\$		\$		\$		\$
	Cents per								
665.17 EA	STREET LIGHT POLE AND FIXTURE			12		20			
		Dollars and	s		s		S		
	Cente per		*				*		
614.91 U	LIGHTING CONTROL CABINET			1		0			
		Dollars and	\$		\$		\$		
	Cents per								
614.91A U	LIGHTING SYSTEM WIRING			1		1			
		Dollars and	\$		\$		\$		
	Cents per								

				BAS	E BID - STA 131+84 TO STA	ADI	<u> DALTERNATIVE #1</u> - STA	ADD AI	LTERNATIVE #3 - GOODWIN
					141+00		141+00 TO STA 154+49		PARK
BID ITEM	UNITS		UNIT PRICE	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL
661.1A	EA	TREE GRATE (2.5' x 5')		9		0			
		Dollars and	s		s		s		
		Carte and	۰		÷				
661.1B	FΔ	TREE GRATE (3' x 5')		2		24			
001.115				2		24			
		Dollars and	\$		\$		\$		
		Cents per							
661.24	EA	TREE GUARD (4' TALL)		9		14			
		Dollars and	\$		\$		\$		
		Cents per							
661.25	EA	TREE GUARD (5' TALL)		2		16		-	
		Dollars and	\$		\$		s		
		Conto non	۵ <u>ــــــ</u>		φ		φ		
661.20	EA	TREE BOX FILTER		0		6		-	
				Ť					
		Dollars and	\$		\$		\$		
		Cents per							
661.30	EA	GRANITE PLANTER		2		8			
		Dollars and	\$		\$		\$		
		Cents per							
661.41	U	STRUCTURAL TREE ROOT CELLS - SILVA CELLS (UNIT = 2'X4' CELL)		50		70			
		Dollars and	\$		\$		s		
		Cents per	*				·		
661.42	CY	STRUCTURAL TREE ROOT CELL - STRUCTURAL SOILS		50		70		-	
		Dellage and							
		Donars and	\$		\$		\$		
		Cents per							
661.50	EA	BICYCLE RACKS		0		0			
		Dollars and	\$		\$		\$		
		Cents per							
661.60	EA	BENCH		0		2		4	
		Dollars and	\$		s		\$		\$
		Cents per							
661.62	EA	GRANITE BLOCK BENCH, 10 FT LONG		0		3			
		Dollars and							
		Donars and	\$		2		»		
		Cents per							

			BAS	<u>E BID</u> - STA 131+84 TO STA	ADI	<u>D ALTERNATIVE #1</u> - STA	ADD AI	<u>LTERNATIVE #3</u> - GOODWIN
				141+00		141+00 TO STA 154+49		PARK
BID ITEM	UNITS	UNIT PRICE	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL
661.70	EA	TRASH RECEPTACLE	0		0		1	
		Dollars and \$		s		s		\$
		Canto par						
665 18B	U	EXTENSION OF LIGHTING SYSTEM	0		0		1	
005.105			v		Ŭ			
		Dollars and \$		\$		\$		\$
		Cents per						
625.90	EA	LIGHTING BOLLARDS	0		0		6	
		Dollars and \$		\$		s		\$
		Cents per						
607.484	LS	3" ALUMINUM FENCE POST FOR CORNERS	0		0		70	
		Dollars and		ø		¢		¢.
		Domais and \$		\$		\$		\$
605.00		Cents per	-					
607.80	LF	ALUMINUM ORNAMENTAL FENCE	0		0		250	
		Dollars and \$		\$		\$		\$
		Cents per						
	·							
		TOTAL SCHEDULE 5		\$		\$		\$
SCHEDU	F6 CC	NMON						
618.61A	Allow	UNIFORMED OFFICERS WITH VEHICLE	1		0			
		TEN THOUSAND Dollars and @10.000		\$10,000				
		Donars and \$10,000		\$10,000		\$		
(18 (1 D	A 11	ZERO Cents per	0					
018.01.B	Allow	UNIFORMED OFFICERS WITH VEHICLE	0		1			
		FIFTEEN THOUSAND Dollars and \$15,000		\$		\$15,000		
		ZERO Cents per						
618.7	HR	FLAGGERS	5,000		7,700			
		Dollars and \$		\$		s		
		Cents per						
619.1	U	MAINTENANCE OF TRAFFIC	1		1			
		Dollars and						
		Dutats and \$		\$		\$		
(10.252	11/1/		20					
619.253	WK	PUK I ABLE UHANGEABLE MESSAGE SIGN	20		42			
		Dollars and \$		\$		s		
		Cents per						

				BAS	E BID - STA 131+84 TO STA	ADD ALTERNATIVE #1 - STA		ADD ALTERNATIVE #3 - GOODWIN	
					141+00		141+00 TO STA 154+49		PARK
BID ITEM	UNITS		UNIT PRICE	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL
628.3	LF	SAWED PAVEMENT		1,000		1,500			
		Dollars and	¢		¢.		c		
			φ		φ		σ		
(15.7	T.	Cents per		1		1		_	
645./	U	STORM WATER POLLUTION PREVENTION PLAN		1		1			
		Dollars and	\$		\$		\$		
		Cents per							
645.71	HR	MONITORING SWPP AND EROSION AND SEDIMENT CONTROLS		40		90		-	
		Dollars and	¢		¢.		c		
			φ		φ		σ		
646.51	cv	Cents per		00		75		_	
040.31	51	TOKF ESTABLISHMENT WITH MOLCH, TACKIFIERS AND LOAM		90		15			
		Dollars and	\$		\$		\$		
		Cents per							
692	U	MOBILIZATION (10%)		1		1			
		Dollars and	s		\$		s		
		Cents per					*		
1010.15A	Allow	Fuel Adjustment (Base Bid)		1		0			
						-			
		TWENTY THOUSAND Dollars and	\$20,000		\$20,000		\$		
		ZERO Cents per							
1010.15B	Allow	Fuel Adjustment (Add Alt #1)		0		1			
		THIRTY THOUSAND Dollars and	\$30,000		\$		\$30,000		
		ZERO Cents per							
6.1A	Allow	Vibration Monitoring (Base Bid)		1		0			
		TEN THOUSAND Dollars and	¢10.000		#10.000				
		Donars and	\$10,000		\$10,000		\$		
		ZERO Cents per							
6.1.B	Allow	Vibration Monitoring (Add Alt #1)		0		1			
		TEN THOUSAND Dollars and	\$10,000		\$		\$10,000		
		ZERO Cents per							
6.2A	Allow	Archeological Monitoring & Delays (Base Bid)		1		0			
		FIVE THOUSAND Dollars and	\$5 000		\$5.000		S		
		ZEDO Coste ace	\$3,000		φυ,000				
62B	Allow	Cents per Cents per Archeological Monitoring & Delays (Add Alt #1)		0		1		4	
0.2.1	2 thow			0					
		FIVE THOUSAND Dollars and	\$5,000		\$		\$5,000		
		ZERO Cents per							

				BAS	<u>E BID</u> - STA 131+84 TO STA	AD	D ALTERNATIVE #1 - STA	ADD AI	L <u>TERNATIVE #3</u> - GOODWIN
					141+00		141+00 TO STA 154+49		PARK
BID ITEM	UNITS		UNIT PRICE	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL
6.3	EA(*)	UNKNOWN UTILITY CROSSING		10		10			
		Dollars and	\$		\$		\$		
		Cents per							
6.4	EA(*)	REPAIR OF UNKNOWN OR MISMARKED UTILITY		5		5			
		Dollars and	s		s		s		
		Cents per							
6.6A	CY(*)	ADDITIONAL TRENCH EXCAVATION (WHERE DIRECTED)		25		25		-	
		Dollars and	s		\$		s		
		Cents per			*		*		
6.6B	CY(*)	EXCAVATION & DISPOSAL OF UNSUITABLE MATERIALS (UN-		25		25			
		REGULATED)							
		Dollars and	\$		\$		\$		
		Cents per							
6.7	CY(*)	ADDITIONAL SCREENED GRAVEL		25		25			
		Dollars and	\$		\$		\$		
		Cents per							
6.8	EA(*)	EXPLORATORY TEST PIT EXCAVATION (WHERE DIRECTED)		4		6			
		Dollars and	\$		\$		\$		
		Cents per							
6.9A	Allow	Geotechnical Testing (Base Bid)		1		0			
		TEN THOUSAND Dollars and	\$10,000		\$10,000		\$		
		ZEROCents per			,				
6.9.B	Allow	Geotechnical Testing (Add Alt #1)		0		1			
		TEN THOUSAND Dollars and	\$15,000		\$		\$15,000		
		ZERO Cents per							
6.10	LF(*)	2"X 24" RIGID INSULATION		200		300			
		Dollars and	s		s		s		
		Cents per							
6.11	Lbs(*)	CALCIUM CHLORIDE FOR DUST CONTROL		5,000		10,000			
		Dollars and	\$		s		s		
		Cents per							
6.12A	Allow	Contingency (Base Bid)		1		0			
		ONE HUNDRED THOUSANDDollars and	\$100.000		\$100.000		S		
		ZERO Cents per	\$100,000		\$100,000		*		
1	1	Cons por		1					

				BAS	<u>E BID</u> - STA 131+84 TO STA	ADI	<u> ALTERNATIVE #1</u> - STA	ADD A	LTERNATIVE #3 - GOODWIN
		-	-		141+00		141+00 TO STA 154+49		PARK
BID ITEN	4 UNITS		UNIT PRICE	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL
6.12.B	Allow	Contingency (Add Alt #1)		0		1			
		ONE HUNDRED THOUSAND Dollars and	\$100,000		\$		\$100,000		
		ZERO Cents per							
					\$		\$		\$N/A
						T		-	
			TOTAL	BASE BIE	\$				
			_				-]	
			1	OTAL BA	SE BID + ADD ALT #1 (BASIS OF	AWARD)	\$	_	
						TOTA	AL BASE BID + ADD ALT #1 + AI	DD ALT #3	\$
ADD AL	Г #2 - PV(C C900 WATER MAIN							
3.1.04	LF	4" DIAMETER DUCTIL IRON WATER SERVICE PIPING		-10		-130			
		Dollars and	\$		\$		\$		
		Cents per							
3.1.06	LF(*)	6" DIAMETER DUCTILE IRON WATERMAIN		-100		-100		-	
		Dollars and	\$		\$		\$		
		Cante per	Ф		Ψ		Ψ		
3.1.08	LF	8" DIAMETER DUCTILE IRON WATERMAIN		-240		-290			
			\$		\$		\$		
		Cents per							
3.1.16	LF	16" DIAMETER DUCTILE IRON WATERMAIN		-900		-1,360			
		Dollars and	\$		\$		\$		
		Cents per							
3.1.20	LF	20" DIAMETER DUCTILE WATERMAIN		0		-40			
		Dollars and	\$		\$		\$		
		Cents per							
3.2.04	LF	4" DIAMETER PVC C900 WATER SERVICE PIPING		10		130			
		Dollars and	¢		¢		¢		
			φ		φ		Ø		
3 2 06	I F(*)	Cents per		100		100			
5.2.00	L I(')	U BEUNETEK I VO OPUU WATEKMAIN		100		100			
		Dollars and	\$		\$		\$		
		Cents per							

CONTRACTOR'S BID SCHEDULE

				BAS	E BID - STA 131+84 TO STA	ADI	D ALTERNATIVE #1 - STA	ADD AI	TERNATIVE #3 - GOODWIN
					141+00		141+00 TO STA 154+49		PARK
BID ITEM	UNITS		UNIT PRICE	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL	EST. QUANT.	EXTENDED TOTAL
3.2.08	LF	8" DIAMETER PVC C900 WATERMAIN		240		290			
		Dollars and	\$		\$		\$		
		Cents per							
3.2.16	LF	16" DIAMETER PVC C900 WATERMAIN		900		1,360			
		Dollars and	\$		\$		\$		
		Cents per							
3.2.20	LF	20" DIAMETER PVC C900 WATERMAIN		0		40			
		Dollars and	\$		\$		\$		
		Cents per							
3.9	EA	SERVICE SADDLES		20		25			
		Dollars and	\$		\$		\$		
		Cents per							
		Add Alt #2 - PVC C900 Water Mai	n		s		\$		\$N/A
						_		_	
Name of	Contractor.	:							
Authorized	Signature.	:							
Notes to Bide	ders:								
	1 The basis 2 The Own	s of award will be the lowest price from a qualified bidder based on the Engineer's ner reserves the right to select any, all, or no alternatives in any combination in any	Estimate of Quantities and Con- order.	tractor's Bid f	or the total of Schedules 1 thru 6 for the Base	Bid + Add A	Alt #1		
	3 * Means	Indeterminate Quantity.			4 in in 41 in ann 1 an interna				
	4 The Own 5 Cells sha	er reserves the right to waive any informalities or minor bid descrepancies, or to re ided gray do not have any anticipated work for that portion of the Bid Alternate	gect any or all bids, and to take	any action tha	t is in their own best interest.				

5 Cells shaded gray do not have any anticipated work for that portion of the Bid Altermate

A-4.1

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned,	
	as Principal, and
	as Surety, are hereby
held and firmly bound unto <u>The City of Portsmouth, NH</u>	as OWNER
in the penal sum of	
for the payment of which, well and truly to be made, we hereby jointly and ourselves, successors and assigns.	l severally bind
Signed, this day of	
The Condition of the above obligation is such that whereas the Principal ha	as submitted to
a certain BID, attached hereto and hereby made a part hereof to enter into a	a contract in writing, for
the <u>Islington Street Corridor Improvements – Phase 2</u>	

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:	
J	

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

B-1.1

NOTICE OF INTENT TO AWARD

	Dated	, 20 22
TO:		
	(BIDDER)	
ADDRESS:		
OWNER'S PROJECT NO:		
PROJECT: Islington Street Corridor Impro-	vements - Phase 2	
OWNER'S CONTRACT NO:		
CONTRACT FOR: _Islington Street Cor	ridor Improvements - Pha	ase 2
(Insert name o	of contract as it appears in the Bid Doc	uments)
You are notified that your Bid dated	for tl	he above Contract has been
considered. You are the apparent successful	l bidder and have been aw	varded a contract for:
Islington Street Corridor Improvements - I	Phase 2 Base Bid and Alte	ernates (TBD)
(Indicate total	Work, alternates or sections of Work a	warded)
The Contract Price of your contract is		
	Dollars (\$).
Which includes		and does not
copies of each of the proposed Constraints Notice of Award. The same number of sets otherwise made available to you immediate	ontract Documents (excep of the Drawings will be d ely.	ot Drawings) accompany this lelivered separately or

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

1. You must provide documentation if supply chain for obtaining materials will impact the start of the work.

2. 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 page.

3. You must deliver with the executed Agreement the Contract Security (Bonds) as specified in the Information for Bidders and General Conditions.
4. (List other conditions precedent).

Provide insurance certificates with coverage limits in accordance to section SC 5.04. Provide Performance and Maintenance Bonds for review and acceptance prior to execution of Contract.

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)

Ву _____

(Judie Belanger)

(Director of Finance and Administration)

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged

Ву		
The	day of	, 20
Ву		
Title		
Copy to ENG	NEER	

(Use Certified Mail, Return Receipt Requested)

B-2.1

AGREEMENT

THIS AGRE	EMENT, made this	day of	by and
between	City of Portsmouth, NH (Name of Owner)	, ł	nereinafter called "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

Islington Street Corridor Improvements - Phase 2 (Project)

2. The **CONTRACTOR** will furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of the **PROJECT** described herein.

3. The CONTRACTOR will commence the work required by the CONTRACT

DOCUMENTS within 10 calendar days after the date of the NOTICE TO PROCEED unless

the period for completion is extended otherwise by the **CONTRACT DOCUMENTS**.

Completion time for the base bid project will be calculated as calendar days (exclusive of winter shut down) from the date specified in the **NOTICE TO PROCEED**:

Substantial Completion

- <u>200</u> calendar days for the Base Bid (Islington Street from the vicinity of Dover Street (STA 131+50) to the vicinity of Cornwall Street (STA 141+00), 950 LF)
- <u>300</u> calendar days for Add Alternate #1
 - Islington Street from the vicinity of Cornwall Street (STA 141+00) to Maplewood Avenue (STA 154 50), 1, 350
- <u>30</u> calendar days for Add Alternate #2 (Goodwin Park Improvements, DWG L2.0

Final Completion

• <u>60</u> calendar days from the date of substantial completion of the Base Bid plus any or no alternatives excluding final pavement overlays.

Liquidated damages will be in the amount of 1,000.00 for each calendar day of delay from the date established for substantial completion and 1,000.00 for each calendar day of delay from the date established for final completion

B-2.2

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 <u>\$</u>, or as shown in the **NOTICE OF INTENT TO AWARD**.

- 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 INTENT TO 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) GENERAL CONDITIONS
 - (S) SUPPLEMENTAL SPECIFICATIONS AND SPECIAL PROVISIONS
 - (T) DRAWINGS prepared by:

Underwood Engineers, Inc.		numbered
1 through [] (Dated [], 2022)	

(T) SPECIFICATIONS prepared or issued by: Underwood Engineers, Inc.

and dated _____, 20<u>22</u>

(U) ADDENDA:

No <u>.</u> ,	dated	, 2022
No <u>. </u>	dated	,2022
No <u>.</u> ,	dated	, 2022

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 _____ 4 ____ copies, each of which shall be deemed an original on the date first above written.

OWNER: City of Portsmouth, New Hampshire

By:_____ Name: _____Karen Conard, City Manager

(Please type)

(SEAL)
ATTEST:

Title:

CONTRACTOR: _____

By: _____

Name: _____

Address: _____

(SEAL)

Name:

ATTEST:

Name: _____

Title:

B-3.1

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 Security)
(Address of Surety)
nereinanter called Surety, are held and firmly bound unto
City of Portsmouth, New Hampshire
(Name of Owner)
1 Junkins Avenue, Portsmouth, NH 03801
(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 ofDollars,
(\$) 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:
Islington Street Corridor Improvements - Phase 2

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

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

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

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

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

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

		(number)	
which shall be deemed an original, this		_day of	, 20
ATTEST:			
₹v:	-	Pri	ncipal
(Principal) Secretary SEAL)	BY		
	-	(A	.ddress)
Зу:	-		
Witness as to Principal			
(Address)			
		(Sure	ty)
ATTEST:	BY	Attornay	in Foot
		Auomey -	111 - 1 act
Witness as to Surety		(Address)	
(Address)			

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

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

B-3.3

B-4.1

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that

(Name of Contractor)			
(Address of Contractor)			
a	, hereinafter ca	alled Principa	1,
(Corporation, Partnership or Individual)		1	,
and			
(Name of Surety)			
(Address of Surety)			
hereinafter called Surety, are held and firmly bound unto			
City of Portsmouth, New Hampshire			
(Name of Owner)			
Department of Public Works, 680 Peverly Hill Road, Ports	mouth NH 03801		
(Address of Owner)			
hereinafter called OWNER, in the total aggregate penal sur	m of		
	Dollars,	\$ ()
in lawful money of the United States, for the payment of wh	hich sum well and tru	ly to be made	e, we
bind ourselves, our heirs, executors, administrators success	ors, and assigns, joint	tly and several	lly,
firmly by these presents.			
THE CONDITION OF THIS OBLIGATION is such that	t whereas, the Princip	pal entered int	to 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:		
Islington Street Corridor Improvements - Phase 2			

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

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

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

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

IN WITNESS WHEREOF, this instrument	is executed	in <u>4</u> co	ounterparts, each one of
which shall be deemed an original, this		day of	, 20 .
ATTEST:			
3v:	-		Principal
(Principal) Secretary	DV		
(SEAL)	ВҮ		
	-		(Address)
Зу:	-		
Witness as to Principal			
(Address)			
		(Surety)
ATTEST:	BY	Attor	ney - in - Fact
Ву			-
Witness as to Surety		(A	ddress)

(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

B-5.1

NOTICE TO PROCEED

		Dated	_, 20 _22
TO:			
(Insert Name of ADDRESS:	Contractor as it appears in the Bid Documents)	
OWNER'S PROJECT	NO		
PROJECT: Islington S	<u>treet Corridor Improvements</u>	- Phase 2	
OWNER'S CONTRAC	CT NO. <u>Bid #</u>		
CONTRACT FOR: <u>I</u>	slington Street Corridor Imp	covements - Phase 2	
You are no	otified that the Contract Time up	nder the above contract will com	nmence to run

on ______ (see Information for Bidders, Page A-2.2 for mutually agreed start date). 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 ______ and _____ respectively (excluding any winter shutdown periods to be added via future change order).

Before you may start any Work at the site, Paragraph 2.01B of the General Conditions provides that you shall deliver to the OWNER (with a copy to ENGINEER) certificate(s) of insurance which is required to be purchased and maintained in accordance with the Contract Documents. Also before you may start any Work at the site, you must:

Have an approved Traffic Control Plan (TCP), Stormwater Pollution Prevention Plan (SWPPP), pertinent shop drawings for work to be complete, and schedule (sequence of work).

	(add other requirements)			
Copy to ENGINEER				
(Use certified Mail, re	eturn Receipt Requested)	City of Portsmouth, New Hampshire		
		(owner)		
	Ву			
		(Peter Rice, P.E.)		
	_	(Director of Public Works)		
	ACCEPTANCE	OF NOTICE		
Receipt of the above 1	NOTICE TO PROCEED is he	reby acknowledged by:		
	(Contrac	ctor)		
		Employer Identification		
this the	, 20	Number:		
Ву:				
(Contractor)				

B-6.1

CHANGE ORDER

	No			
PROJECT: Islington Street Corridor Improvements -	Phase 2 DATE OF ISSUANCE:			
OWNER: City of Portsmouth, New Hampshire				
1 Junkins Avenue, Portsmouth, NH 03801				
(Address)				
CONTRACTOR:OV	VNER's Project No.			
CONTRACT FOR: <u>Islington Street Corridor Impre</u>	ovements - Phase 2			
ENGINEER: <u>Underwood Engineers, Inc.</u> EN	GINEER's Project No			
You are directed to make the following changes in the Contract Documents. Description: Purpose of Change Order: Justification:				
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 Order				
*	(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			
Ψ	(days)			
Contract Price with all approved Change Orders	Contract Time with all Change Orders			
Ψ	(days or date)			

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

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

RECOMMENDED:	APPROVED:	APPROVED:	APPROVED:	APPROVED:
By:	By:	By:	By:	By:
Engineer	Karen Conard City Manager	Owner/DPW	Owner/Finance	Contractor
Date	Date	Date	Date	Date

R-	7		1
D-	1	٠	T

CERTIFICATE OF SUBSTANTIAL COMPLETION

OWNER's Project No.:	ENGINEER's Project No.:			
Project: Islington Street Corridor In	nprovements - Phase 2			
CONTRACTOR:				
Contract For:	Contract Date:			
This Certificate of Substantial Completion applies to all Work under the Contract Documents or to the following specified parts thereof:				
To: City of Portsmouth New Hampshire				
(0	wner)			
And To:(Con	tractor)			

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

(Date of Substantial Completion)

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

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

RESPONSIBILITIES	S:			
OWNER	t:			
CONTRACTOR	l:			
The following documents	are attached to and n	nade a part of this (Certificate:	
This certificate does not c nor is it a release of CON Documents.	onstitute an acceptan FRACTOR's obligati	on to complete the	Work in accordance	e with the Contract
Executed by ENGINEER	on		, 20	
·				
		(Enginger)		
	D	(Engineer)		
	Ву:			
CONTRACTOR accepts	this Certificate of Sub	ostantial Completio	n on	, 20
		(Contractor)		
	By:			
OWNER accepts this Cer	tificate of Substantial	Completion on		, 20
-		_		
		(Owner)		
	Bv	· /		
	<u> </u>			

B-8.1

CERTIFICATE OF FINAL COMPLETION

Owner's Proje	ect No			
Project:	Islington Street Corridor Improvements - Phase 2			
Owner:	: City of Portsmouth, New Hampshire			
Contractor:				
Engineer:	Underwood Engineers, Inc.	_		
Agreement Da	ate:			
Notice to Proc	ceed Date:			
Contractual Su Actual Substan	ubstantial Completion Date as modified by Change Orders:			
Contractual Fi	inal Completion Date as modified by Change Orders:			
The Work to v Owner, Contra Contract is her Documents on	which this Certificate applies has been inspected by authorized representative actor and Engineer, the punch list has been completed and the Work of the reby declared to be Finally Complete in accordance with the Contract n:	vesof		
This Certificat Contract Docu accordance wi to the date of S	te does not constitute an acceptance of any Work not in accordance with the uments nor is it a release of Contractor's obligation to complete the Work in ith the Contract Documents. The Warranty for all Work completed subsequ Substantial Completion expires one year from the date of this Final Accepta	ent ance.		
Executed by E	Engineer on:, <u>20</u>			
By:				
Contractor Ac	ccepts this Certificate of Final Completion on:, 20			
By:				
Owner Accept	ts this Certificate of Final Completion on:, <u>20</u>			
By:				

B-9.1

CONTRACTOR'S AFFIDAVIT

STATE OF:	
COUNTY OF:	
Before me, the undersigned, a	
(Notar in and for said County and State personally appeared,	y Public, Justice of Peace, Alderman)
	(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 outs	standing claims and indebtedness of whatever
nature arising out of the performance of the contract	
between <u>The City of Portsmouth, New Hampshire</u>	
andof	
dated for the construction	(Address) of the <u>Islington Street Corridor Improvements - Phase 2</u> (Project Name)
and necessary appurtenant installations have been paid	in full.
(Individual, Partner, or du	ly authorized representative of corporate contractor)

(Title)

Sworn to and subscribed before me

this_____day of_____, 20 ____

Notary Public

B-10.1

CONTRACTOR'S FINAL RELEASE AND WAIVER OF LIEN

Project/Owner	<u>Contractor</u>
Project: <u>Islington Street Corridor Improvements</u> <u>- Phase 2</u>	Name
Address:_ <u>N/A</u>	Address:
PortsmouthNH03801CityStateZip	City State Zip
Owner_City of Portsmouth, New Hampshire	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
------------	--------	----

Witness to Signature

By_____

Title_____

Title

C. GENERAL CONDITIONS

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly by









AMERICAN COUNCIL OF ENGINEERING COMPANIES

ASSOCIATED GENERAL CONTRACTORS OF AMERICA

AMERICAN SOCIETY OF CIVIL ENGINEERS

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE A Practice Division of the NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

Endorsed by



CONSTRUCTION SPECIFICATIONS INSTITUTE

These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor (EJCDC C-520 or C-525, 2007 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the Narrative Guide to the EJCDC Construction Documents (EJCDC C-001, 2007 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (EJCDC C-800, 2007 Edition).

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

TABLE OF CONTENTS

Article 1 –	Definitions and Terminology	1
1.01	Defined Terms	1
1.02	Terminology	5
Article 2 –	Preliminary Matters	6
2.01	Delivery of Bonds and Evidence of Insurance	6
2.02	Copies of Documents	6
2.03	Commencement of Contract Times; Notice to Proceed.	6
2.04	Starting the Work	7
2.05	Before Starting Construction	7
2.06	Preconstruction Conference; Designation of Authorized Representatives	7
2.07	Initial Acceptance of Schedules	7
		_
Article 3 –	Contract Documents: Intent, Amending, Reuse	8
3.01	Intent	8
3.02	Reference Standards	8
3.03	Reporting and Resolving Discrepancies	8
3.04	Amending and Supplementing Contract Documents	9
3.05	Reuse of Documents	10
3.06	Electronic Data	10
A 1 A		
Article 4 –	Availability of Lands; Subsurface and Physical Conditions; Hazardous Environmental	10
	onditions; Reference Points	10
4.01	Availability of Lands	10
4.02	Subsurface and Physical Conditions	11
4.03	Differing Subsurface or Physical Conditions	11
4.04	Underground Facilities	13
4.05	Reference Points	14
4.06	Hazardous Environmental Condition at Site	14
Article 5 –	Bonds and Insurance	16
5.01	Performance Payment and Other Bonds	10
5.02	I icensed Sureties and Insurers	10
5.02	Certificates of Insurance	10
5.03	Contractor's Insurance	10
5.04	Owner's Lightlity Insurance	1/ 19
5.05	Owner 5 Liaounity insurance	10 10
5.00	r toperty insulance	01
5.07	waiver of Kignis	20
5.08	Receipt and Application of Insurance Proceeds	21

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5.09	Acceptance of Bonds and Insurance: Option to Replace	21	
5.10	Partial Utilization. Acknowledgment of Property Insurer	21	
2.110			
Article 6 –	Contractor's Responsibilities	22	
6.01	Supervision and Superintendence	22	
6.02	Labor: Working Hours		
6.03	Services. Materials. and Equipment		
6.04	Progress Schedule	23	
6.05	Substitutes and "Or-Equals"	23	
6.06	Concerning Subcontractors Suppliers and Others	25	
6.07	Patent Fees and Royalties	23 27	
6.08	Permits	27 27	
6.09	I aws and Regulations	27 27	
6.10	Tavas		
6.11	Use of Site and Other Areas	20 28	
6.12	Baserd Decuments	20 20	
0.12 6.13	Sefety and Drotantian	······29 20	
0.13	Safety Democentative		
0.14	Safety Representative		
0.13	Finance of the second s		
0.10	Emergencies		
0.17	Shop Drawings and Samples		
0.18	Continuing the work		
6.19	Contractor's General warranty and Guarantee		
6.20			
6.21	Delegation of Professional Design Services		
Article 7	Other Work at the Site	25	
7 01	Delated Work at the Site		
7.01	Coordination		
7.02	Coordination	······	
7.03	Legal Relationships		
Article 8	Owner's Responsibilities	36	
8 01	Communications to Contractor		
8.01	Penlacement of Engineer		
8.02 8.03	Furnish Data		
8.03	Pau When Due		
8.04 8.05	Lands and Essemants, Departs and Tests		
8.03	Lands and Easements; Reports and Tests		
8.00	Change Orders		
8.07	Change Orders		
8.08	Inspections, Tests, and Approvals		
8.09	Limitations on Owner's Responsibilities		
8.10	Undisclosed Hazardous Environmental Condition		
8.11	Evidence of Financial Arrangements		
8.12	Compliance with Safety Program		
A		27	
	Chymer's Demogentative		
9.01	Units to Oits		
9.02	V ISIIS ID BILE		
	EJCDC C-700 Standard General Conditions of the Construction Contract Copyright © 2007 National Society of Professional Engineers for EJCDC. All rights reserved.		
Page ii			

9.03	Project Representative	
9.04	Authorized Variations in Work	
9.05	Rejecting Defective Work	
9.06	Shop Drawings, Change Orders and Payments	
9.07	Determinations for Unit Price Work	
9.08	Decisions on Requirements of Contract Documents and Acceptability of Work	
9.09	Limitations on Engineer's Authority and Responsibilities	
9.10	Compliance with Safety Program	40
Article 10 -	- Changes in the Work; Claims	
10.01	Authorized Changes in the Work	40
10.02	Unauthorized Changes in the Work	40
10.03	Execution of Change Orders	41
10.04	Notification to Surety	41
10.05	Claims	41
Article 11 -	- Cost of the Work; Allowances; Unit Price Work	42
11.01	Cost of the Work	
11.02	Allowances	45
11.03	Unit Price Work	45
Article 12 -	- Change of Contract Price; Change of Contract Times	46
12.01	Change of Contract Price	
12.02	Change of Contract Times	47
12.03	Delays	47
Article 13 -	- Tests and Inspections; Correction, Removal or Acceptance of Defective Work	48
13.01	Notice of Defects	
13.02	Access to Work	
13.03	Tests and Inspections	
13.04	Uncovering Work	49
13.05	Owner May Stop the Work	50
13.06	Correction or Removal of Defective Work	
13.07	Correction Period	
13.08	Acceptance of Defective Work	
13.09	Owner May Correct Defective Work	51
Article 14 -	- Payments to Contractor and Completion	
14.01	Schedule of Values	
14.02	Progress Payments	
14.03	Contractor's Warranty of Title	
14.04	Substantial Completion	55
14.05	Partial Utilization	
14.06	Final Inspection	
14.07	Final Payment	57
14.08	Final Completion Delayed	
14.09	Waiver of Claims	

EJCDC C-700 Standard General Conditions of the Construction Contract Copyright © 2007 National Society of Professional Engineers for EJCDC. All rights reserved. Page iii

Article 15 -	- Suspension of Work and Termination	
15.01	Owner May Suspend Work	
15.02	Owner May Terminate for Cause	
15.03	Owner May Terminate For Convenience	
15.04	Contractor May Stop Work or Terminate	
Article 16 -	- Dispute Resolution	61
16.01	Methods and Procedures	
Article 17 –	- Miscellaneous	61
17.01	Giving Notice	
17.02	Computation of Times	61
17.03	Cumulative Remedies	
17.04	Survival of Obligations	
17.05	Controlling Law	
17.06	Headings	

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 Defined Terms

- A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
 - 1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 - 2. *Agreement*—The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.
 - 3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 - 4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
 - 5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 - 6. *Bidder*—The individual or entity who submits a Bid directly to Owner.
 - 7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).
 - 8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.
 - 9. *Change Order*—A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.
 - 10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.
 - 11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

- 12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
- 13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
- 14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.
- 15. Contractor—The individual or entity with whom Owner has entered into the Agreement.
- 16. Cost of the Work—See Paragraph 11.01 for definition.
- 17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as sodefined.
- 18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
- 19. Engineer—The individual or entity named as such in the Agreement.
- 20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
- 21. General Requirements—Sections of Division 1 of the Specifications.
- 22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
- 23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
- 24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
- 25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
- 26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

- 27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
- 28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.
- 29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
- 30. PCBs—Polychlorinated biphenyls.
- 31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
- 32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
- 33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
- 34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
- 35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
- 36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.
- 37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
- 38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
- 39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

- 40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
- 41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
- 42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
- 43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
- 44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.
- 45. Successful Bidder—The Bidder submitting a responsive Bid to whom Owner makes an award.
- 46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.
- 47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
- 48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
- 49. Unit Price Work—Work to be paid for on the basis of unit prices.
- 50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
- 51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an

addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 Terminology

- A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. Intent of Certain Terms or Adjectives:
 - 1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.
- C. Day:
 - 1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. Defective:

- 1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).
- E. Furnish, Install, Perform, Provide:

- 1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
- 2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
- 3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
- 4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

- 2.01 Delivery of Bonds and Evidence of Insurance
 - A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
 - B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.
- 2.02 Copies of Documents
 - A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.
- 2.03 Commencement of Contract Times; Notice to Proceed
 - A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

2.04 Starting the Work

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 Before Starting Construction

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:
 - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;
 - 2. a preliminary Schedule of Submittals; and
 - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 Preconstruction Conference; Designation of Authorized Representatives

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 Initial Acceptance of Schedules

- A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
 - 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of

the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

- 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
- 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 Intent

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.
- C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 Reference Standards

A. Standards, Specifications, Codes, Laws, and Regulations

- 1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the ContractDocuments.
- 2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 Reporting and Resolving Discrepancies

A. Reporting Discrepancies:

- 1. Contractor's Review of Contract Documents Before Starting Work: Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
- 2. Contractor's Review of Contract Documents During Performance of Work: If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation , (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.
- 3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.
- B. Resolving Discrepancies:
 - 1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
 - a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 Amending and Supplementing Contract Documents

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.
- B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:
 - 1. A Field Order;
 - 2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or

3. Engineer's written interpretation or clarification.

3.05 Reuse of Documents

- A. Contractor and any Subcontractor or Supplier shall not:
 - 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or
 - 2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 Electronic Data

- A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
- C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

- 4.01 Availability of Lands
 - A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the

Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.
- 4.02 Subsurface and Physical Conditions
 - A. Reports and Drawings: The Supplementary Conditions identify:
 - 1. those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and
 - 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).
 - B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
 - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
 - 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 - 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, or information.
- 4.03 Differing Subsurface or Physical Conditions
 - A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:
 - 1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
 - 2. is of such a nature as to require a change in the Contract Documents; or

- 3. differs materially from that shown or indicated in the Contract Documents; or
- 4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

- B. *Engineer's Review*: After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.
- C. Possible Price and Times Adjustments:
 - 1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and
 - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.
 - 2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
 - a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
 - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 4.03.A.
 - 3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other
professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 Underground Facilities

- A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
 - 1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and
 - 2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all such information and data;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents;
 - c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and
 - d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. Not Shown or Indicated:

- 1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such UndergroundFacility.
- 2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price

or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 Hazardous Environmental Condition at Site

- A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
 - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 - 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 - 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
- D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by

Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.

- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.
- F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.
- G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 Performance, Payment, and Other Bonds

- A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.
- B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.
- C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 Licensed Sureties and Insurers

A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 Certificates of Insurance

A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.

- B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.
- C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
- D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.
- E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the ContractDocuments.

5.04 Contractor's Insurance

- A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may beliable:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
 - 2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
 - 3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
 - 4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:
 - a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
 - b. by any other person for any other reason;
 - 5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
 - 6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.
- B. The policies of insurance required by this Paragraph 5.04 shall:

- 1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;
- 2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
- 3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
- 4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);
- remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
- 6. include completed operations coverage:
 - a. Such insurance shall remain in effect for two years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 Owner's Liability Insurance

- A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.
- 5.06 Property Insurance
 - A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

- 1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;
- 2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.
- 3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
- 4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
- 5. allow for partial utilization of the Work by Owner;
- 6. include testing and startup; and
- 7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.
- B. Owner shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.
- C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.
- D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property

insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

5.07 Waiver of Rights

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:
 - 1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
 - 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery

against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 Receipt and Application of Insurance Proceeds

- A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.
- B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of suchduties.

5.09 Acceptance of Bonds and Insurance; Option to Replace

A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 Partial Utilization, Acknowledgment of Property Insurer

A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use oroccupancy.

ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES

6.01 Supervision and Superintendence

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

6.02 Labor; Working Hours

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 Services, Materials, and Equipment

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.
- B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 Progress Schedule

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.
- 6.05 Substitutes and "Or-Equals"
 - A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.
 - 1. "Or-Equal" Items: If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and
 - 3) it has a proven record of performance and availability of responsive service.
 - b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

- 2. Substitute Items:
 - a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.
 - b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.
 - c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.
 - d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - 1) shall certify that the proposed substitute item will:
 - a) perform adequately the functions and achieve the results called for by the general design,
 - b) be similar in substance to that specified, and
 - c) be suited to the same use as that specified;
 - 2) will state:
 - a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,
 - b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
 - c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
 - 3) will identify:
 - a) all variations of the proposed substitute item from that specified, and
 - b) available engineering, sales, maintenance, repair, and replacement services; and

- 4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.
- B. Substitute Construction Methods or Procedures: If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.
- C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.
- D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- E. *Engineer's Cost Reimbursement*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- F. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 Concerning Subcontractors, Suppliers, and Others

- A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.
- B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or

other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:
 - 1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor
 - 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.
- F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 Patent Fees and Royalties

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the ContractDocuments.

6.08 Permits

A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 Laws and Regulations

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all

court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 Taxes

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.
- 6.11 Use of Site and Other Areas
 - A. Limitation on Use of Site and Other Areas:
 - 1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
 - 2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
 - 3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.
 - B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
 - C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor

shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 Record Documents

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

6.13 Safety and Protection

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.

- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 Safety Representative

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 Hazard Communication Programs

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.16 Emergencies

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 Shop Drawings and Samples

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

- 1. Shop Drawings:
 - a. Submit number of copies specified in the General Requirements.
 - b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.
- 2. Samples:
 - a. Submit number of Samples specified in the Specifications.
 - b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.
- B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. Submittal Procedures:
 - 1. Before submitting each Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
 - 2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.
 - 3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop

Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

- D. Engineer's Review:
 - 1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
 - 2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
 - 3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.
- E. Resubmittal Procedures:
 - 1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 Continuing the Work

- A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.
- 6.19 Contractor's General Warranty and Guarantee
 - A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.
 - B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

- 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
- 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 - 1. observations by Engineer;
 - 2. recommendation by Engineer or payment by Owner of any progress or finalpayment;
 - 3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 - 4. use or occupancy of the Work or any part thereof by Owner;
 - 5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;
 - 6. any inspection, test, or approval by others; or
 - 7. any correction of defective Work by Owner.

6.20 Indemnification

- A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may beliable.
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor,

Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

- C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
 - 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 - 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 Delegation of Professional Design Services

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.
- B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 Related Work at Site

- A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
 - 1. written notice thereof will be given to Contractor prior to starting any such other work; and
 - 2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.
- B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors between Owner and such utility owners and other contractors.
- C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 Coordination

- A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:
 - 1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
 - 2. the specific matters to be covered by such authority and responsibility will be itemized; and
 - 3. the extent of such authority and responsibilities will be provided.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 Legal Relationships

- A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.
- B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions orinactions.
- C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

- 8.01 Communications to Contractor
 - A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.
- 8.02 Replacement of Engineer
 - A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.
- 8.03 Furnish Data
 - A. Owner shall promptly furnish the data required of Owner under the Contract Documents.
- 8.04 Pay When Due
 - A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.
- 8.05 Lands and Easements; Reports and Tests
 - A. Owner's duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.
- 8.06 Insurance
 - A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 5.
- 8.07 Change Orders
 - A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

EJCDC C-700 Standard General Conditions of the Construction Contract
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Page 36 of 62

8.08 Inspections, Tests, and Approvals

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 Limitations on Owner's Responsibilities

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the ContractDocuments.
- 8.10 Undisclosed Hazardous Environmental Condition
 - A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.
- 8.11 Evidence of Financial Arrangements
 - A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.
- 8.12 Compliance with Safety Program
 - A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed pursuant to Paragraph 6.13.D.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

- 9.01 Owner's Representative
 - A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the ContractDocuments.
- 9.02 Visits to Site
 - A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits

and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 Project Representative

A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 Authorized Variations in Work

A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 Rejecting Defective Work

A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 Shop Drawings, Change Orders and Payments

A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.

- B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.
- C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.
- D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 Determinations for Unit Price Work

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

9.08 Decisions on Requirements of Contract Documents and Acceptability of Work

- A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.
- B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.
- C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.
- D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 Limitations on Engineer's Authority and Responsibilities

A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the ContractDocuments.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.
- 9.10 Compliance with Safety Program
 - A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

- 10.01 Authorized Changes in the Work
 - A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
 - B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.
- 10.02 Unauthorized Changes in the Work
 - A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.D.

10.03 Execution of Change Orders

- A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:
 - 1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
 - 2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and
 - 3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 Notification to Surety

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

10.05 Claims

- A. *Engineer's Decision Required*: All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.
- B. Notice: Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The

opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

- C. *Engineer's Action*: Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
 - 1. deny the Claim in whole or in part;
 - 2. approve the Claim; or
 - 3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.
- D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.
- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.
- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

- 11.01 Cost of the Work
 - A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:
 - 1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on

Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

- 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
- 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.
- 4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
- 5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
 - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.
- B. Costs Excluded: The term Cost of the Work shall not include any of the following items:
 - 1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.
 - 2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
 - 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
 - 4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
 - 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.
- C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. Cash Allowances:
 - 1. Contractor agrees that:
 - a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. Contingency Allowance:
 - 1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

- D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:
 - 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 - 2. there is no corresponding adjustment with respect to any other item of Work; and
 - 3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

- 12.01 Change of Contract Price
 - A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
 - B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:
 - 1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
 - 2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
 - 3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).
 - C. Contractor's Fee: The Contractor's fee for overhead and profit shall be determined as follows:
 - 1. a mutually acceptable fixed fee; or
 - 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;

- c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;
- d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
- e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
- f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 Change of Contract Times

- A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 Delays

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.
- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the

control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.

- D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

- 13.01 Notice of Defects
 - A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.
- 13.02 Access to Work
 - A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.
- 13.03 Tests and Inspections
 - A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
 - B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
 - 1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
 - 2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and
 - 3. as otherwise specifically provided in the Contract Documents.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.
- E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 Uncovering Work

- A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.
- B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.
- C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.
- D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 Owner May Stop the Work

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any ofthem.

13.06 Correction or Removal of Defective Work

- A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).
- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 Correction Period

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. repair such defective land or areas; or
 - 2. correct such defective Work; or
 - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute

resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation orrepose.

13.08 Acceptance of Defective Work

A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and for the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 Owner May Correct Defective Work

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and

equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

- C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

- 14.01 Schedule of Values
 - A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.
- 14.02 Progress Payments
 - A. Applications for Payments:
 - 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
 - 2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the

Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. Review of Applications:

- 1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
- 2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
- 3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
- 4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or

- b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
- c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
- d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
- e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
- 5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
 - d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.
- C. Payment Becomes Due:
 - 1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.
- D. Reduction in Payment:
 - 1. Owner may refuse to make payment of the full amount recommended by Engineerbecause:
 - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
 - b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - c. there are other items entitling Owner to a set-off against the amount recommended; or

- d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.
- 2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.
- 3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 Contractor's Warranty of Title

A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of allLiens.

14.04 Substantial Completion

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities

pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.

E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

14.05 Partial Utilization

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.
 - 2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
 - 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 Final Inspection

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 Final Payment

- A. Application for Payment:
 - 1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.
 - 2. The final Application for Payment shall be accompanied (except as previously delivered)by:
 - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;
 - b. consent of the surety, if any, to final payment;
 - c. a list of all Claims against Owner that Contractor believes are unsettled; and
 - d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
 - 3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.
- B. Engineer's Review of Application and Acceptance:
 - 1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.
- C. Payment Becomes Due:

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 Final Completion Delayed

A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 Waiver of Claims

- A. The making and acceptance of final payment will constitute:
 - 1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and
 - 2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

- 15.01 Owner May Suspend Work
 - A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.
- 15.02 Owner May Terminate for Cause
 - A. The occurrence of any one or more of the following events will justify termination for cause:

- 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
- 2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
- 3. Contractor's repeated disregard of the authority of Engineer; or
- 4. Contractor's violation in any substantial way of any provisions of the Contract Documents.
- B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:
 - 1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);
 - 2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere; and
 - 3. complete the Work as Owner may deem expedient.
- C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.
- D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
- E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

15.03 Owner May Terminate For Convenience

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;
 - 3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
 - 4. reasonable expenses directly attributable to termination.
- B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 Contractor May Stop Work or Terminate

- A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 Methods and Procedures

- A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph10.05.E.
- B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.
- C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:
 - 1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or
 - 2. agrees with the other party to submit the Claim to another dispute resolution process; or
 - 3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 – MISCELLANEOUS

17.01 Giving Notice

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
 - 1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or
 - 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 Computation of Times

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

17.03 Cumulative Remedies

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 Survival of Obligations

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

17.05 Controlling Law

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

17.06 Headings

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

SECTION 00800

SUPPLEMENTARY CONDITIONS

ARTICLE 1. DEFINITIONS & TERMINOLOGY

SC-1.01 Defined Terms:

SC-1.01

Delete definition 1.01 A.19 entitled "Engineer" in the General Conditions in its entirety and insert the following in its place:

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

SC-1.01

Delete definition 1.01 A.42 entitled "Specifications" in the General Conditions in its entirety and insert the following in its place:

"Sections included under Division D and Division E of the Contract Documents."

SC-1.01

Delete the definition 1.01 A.44 entitled "Substantial Completion" in the General Conditions in its entirety and add the following in its place:

"The Work (or a specified part thereof) required by the Contract has been completed except for work (or a specified part thereof) having a Contract Price of less than one percent of the then adjusted total contract price, or substantially all of the Work (or a specified part thereof) has been completed and opened to Owner's use except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the Work (or a specified part thereof) required by the Contract."

ARTICLE 2. PRELIMINARY MATTERS

SC-2.01 Delivery of Bonds and Evidence of Insurance

Delete paragraph 2.01B of the General Conditions in its entirety and insert the following in its place:

B. Evidence of Insurance: Before any work at the site is started, CONTRACTOR shall deliver to OWNER, with a copy to ENGINEER, certificates of insurance (and other evidence of insurance requested by OWNER) which CONTRACTOR is required to purchase and maintain in accordance with the requirements of Article 5.

SC-2.02 Copies of Documents

Delete Paragraph 2.02.A in its entirety and insert the following in its place:

A. Owner shall furnish Contractor up to 6 printed or hard copies of the Drawings and Project Manual and one set in electronic format. Additional printed copies will be furnished upon request at the cost of reproduction.

SC-2.03 Commencement of Contract Times; Notice to Proceed:

Delete paragraph 2.03A of the General Conditions in its entirety and insert the following in its place:

A. The Contract Time will commence to run on the thirtieth day following the effective date of the Agreement, or if a Notice to Proceed is issued, the Contract Time will commence to run on the date of the Notice to Proceed.

ARTICLE 3. CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

SC-3.01 Intent:

Add a new paragraph immediately after paragraph 3.01A of the General Conditions which is to read as follows:

- 1. Each and every provision of law and clause required by law to be inserted in the Contract shall be deemed to be inserted herein, and the Contract shall be read and enforced as though they were included herein. If through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party, the Contract shall forthwith be physically amended to make such insertion.
- 2. Sections of Division I General Requirements govern the execution of the work for other sections of the specifications.

ARTICLE 4. AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS

SC-4.02 Subsurface and Physical Conditions:

Delete paragraph 4.02A of the General Conditions in its entirety and insert the following in its place:

- A. Reports and Drawings: In the preparation of Drawings and Specifications, Engineer or Engineer's Consultants have relied upon:
 - 1. Data obtained from subsurface investigations made at the site in the form of test borings. Such data is in the form of boring logs which are included in Appendix A to the Specifications. The locations of the test borings are indicated on the Drawings.

SC-4.06 Hazardous Environmental Conditions at Site:

Delete Paragraph 4.06.G and add the following new paragraph 4.06.G immediately after Paragraph 4.06.F:

G. To the fullest extent permitted by Laws and Regulations, Owner shall release Contractor, Subcontractors, and Engineer, and officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses and damages arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Conditions: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall constitute an indemnity of obligation.

ARTICLE 5. BONDS AND INSURANCE

SC-5.02 Licensed Sureties and Insurers:

Insert the following paragraphs at the end of Paragraph 5.02.A.:

B. The insurance policies and surety bonds required to be provided by the Contractor shall be written by a company or companies licensed by the State of New Hampshire which company or companies shall have not less than an A rating and a Class XV financial status as reported in the latest edition of Best's Insurance Guide. In addition all carriers are subject to approval by the OWNER.

C. The CONTRACTOR shall name the OWNER and Underwood Engineers, Inc. as an Additional Insured on a primary and non-contributory basis to all polices except Works Compensation and Professional Liability.

SC-5.03 Certificates of Insurance:

Delete paragraph 5.03B of the General Conditions.

SC-5.04 Contractor's Insurance:

Add the following new paragraph immediately after Paragraph 5.04.B.:

- C. The limits of liability for the insurance required by Paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:
 - 1. Worker's Compensation, and related coverage under Paragraphs 5.04.A.1 and 5.04.A.2 of the General Conditions:

a.	State:	Statutory
b.	Applicable Federal	
	(e.g., Longshoreman's):	Statutory

- 2. Contractor's General Liability under Paragraphs 5.04.A.3 through 5.04.A.6 of the General Conditions which shall include completed operations and product liability coverage's and eliminate the exclusion with respect to property under the care, custody, and control of Contractor or provide equivalent coverage under Builders Risk:
 - a. General Aggregate including per project aggregate endorsement: (Except Products-Completed Operations): \$2,000,000
 - b. Products-Completed Operations Aggregate: \$2,000,000
 - c. Each Occurrence
 (Bodily Injury and Property Damage): \$ 2,000,000
 Property Damage liability insurance shall include Collapse and Underground coverages
 - d. If blasting is to be used, include explosion coverage. Occurrence: \$2,000,000 Aggregate: \$2,000,000
- 3. Automobile Liability under Paragraph 5.04.A.6 of the General Conditions:
 - 1. Combined Single Limit for bodily injury
and property damage:\$ 2,000,000

4. The Contractual Liability coverage required by Paragraph 5.04.B.3 of the General Conditions shall provide coverage for not less than the following amounts:

a.	Bodily Injury:	
	Each Accident	\$ 2,000,000
	Annual Aggregate	\$ 2,000,000
b.	Property Damage:	
	Each Accident	\$ 2,000,000
	Annual Aggregate	\$ 2,000,000

- 5. Owner does not have pollution property or liability coverage. Contractor shall maintain Pollution Liability Coverage of at least \$1,000,000 for this Project.
- 6. Coverage amounts may be satisfied by excess or umbrella policies provided Owner is satisfied as to the form of coverage.
- 7. Owner shall be listed as an additional insured on all liability policies. The City of Portsmouth shall be named as additional insured as follows:

City of Portsmouth Attn: Legal Department 1 Junkins Avenue Portsmouth, NH 03801

SC-5.06 Property Insurance:

Delete Paragraph 5.06 in its entirety and insert the following in its place:

A. Owner will maintain an Installation Floater for its interest in the Work. Owner's policy is available for review. Contractor and subcontractors shall be responsible for insuring their own interests in the event of loss.

SC-5.07

Delete Section 5.07 in its entirety.

SC-5.08

Delete section 5.08 in its entirety.

ARTICLE 6. CONTRACTOR'S RESPONSIBILITIES

SC-6.01 Supervision and Superintendance

Delete paragraph 6.01B of the General Conditions in its entirety and replace with the following:

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

SC-6.04 Progress Schedule

Add the following paragraph after paragraph 6.04A.2 of the General Conditions:

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

SC-6.05 Substitutes and "Or Equals":

Add the following new paragraphs immediately after Paragraph 6.05.F.:

1. When a substitute item of material or equipment is proposed by Contractor and accepted by Engineer, and the substitution will require a change in any of the Contract Documents to adapt the design to the proposed substitute, Contractor shall notify Engineer of the changes and be responsible for the costs involved to revise the design and to make modifications or changes to the construction, including the costs associated with the Work of other contractors due to such changes in design or space requirements.

a. Redesign and drawing revisions will be prepared by Engineer and Contractor shall reimburse Owner for charges of Engineer for redesign and drawing preparation.

b. Reimbursement of Engineer shall be based on Engineer's direct labor costs, indirect labor costs, profit on the total labor, and any direct non-labor expenses such as travel or per diem.

SC-6.06 Concerning Subcontractor's, Suppliers, and Others:

Renumber subparagraph 6.06F to 6.06G and subparagraph 6.06G to 6.06H and add new subparagraph as follows:

F. Owner or Engineer may furnish to any such Subcontractor, Supplier, or other person or organization, to the extent practicable, information about amounts paid to Contractor in accordance with Contractor's Applications for Payment on account of the particular Subcontractor's, Suppliers, other person's, or other organization's Work.

SC-6.08 Permits:

Delete the last sentence in Paragraph 6.08.A. in its entirety and replace with the following:

Unless otherwise specified in the General Requirements or Specifications, Contractor shall pay all charges of utility owners for connections for providing permanent service to the Work.

SC-6.16 Emergencies:

Add the following new paragraph immediately after Paragraph 6.16.A.:

B. In emergencies affecting the safety or protection of persons or property or maintenance of temporary construction at the Site or adjacent thereto, and Contractor cannot be reached, Owner may act to attempt to prevent threatened damage, injury, or loss. Owner will give Contractor and Engineer prompt written notice of such action and the cost of the correction or remedy shall be charged against Contractor. A Change Order will be issued to document the change in Contract Price.

SC-6.17 Shop Drawings and Samples:

F. samples, or other items requiring approval and Contractor shall reimburse Owner for Engineer's charges for such time.

G. After Engineer has reviewed and approved a Shop Drawing or Sample, Contractor shall provide the material or equipment approved. Engineer will not review subsequent submittals of a different manufacturer or Supplier unless Contractor provides sufficient information to Engineer that the approved material or equipment is unavailable, time of delivery will delay the construction progress but not as a result of Contractor's failure to timely pursue the Work or to coordinate various activities properly, or Owner requests a different manufacturer or Supplier.

SC-6.19 Contractor's General Warranty and Guarantee

Add the following new paragraph to Article 6.19, of the General Conditions:

D. The Contractor warrants the Work for a period of one year from substantial completion of the entire project or a part thereof, unless a longer warranty is specified for a particular item or element of the project, in which case the longer warranty period shall govern.

ARTICLE 7. OTHER WORK AT THE SITE

SC-7.04 Damage to the Work or Properties:

Add the following new paragraph 7.04 at the end of Article 7 of the General Conditions:

A. Should Contractor cause damage to the work or property of any separate contractor at the site, or should any claim arising out of Contractor's performance of the Work at the site be made by any separate contractor against Contractor, Owner, Engineer, Engineer's Consultants, or any other person, Contractor shall promptly attempt to settle with such other contractor by agreement, or to otherwise resolve the dispute by arbitration or at law. Contractor shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold Owner, Engineer, and Engineer's Consultants, harmless from and against all claims, damages, losses, and expenses (including, but not limited to, fees of engineers, architects, attorneys, and other professionals, and court and arbitration costs) arising directly, indirectly, or consequentially out of any action, legal or equitable, brought by any separate contractor against Owner, Engineer, or Engineer's Consultants, to the extent based on a claim arising out of the Contractor's performance of the Work. Should a separate contractor cause damage to the Work or property of Contractor or should the performance of Work by any separate contractor at the site give rise to any other claim, Contractor shall not institute any action, legal or equitable, against Owner, Engineer or Engineer's Consultants, or permit any action against any of

them to be maintained and continued in its name or for its benefit in any court or before any arbiter which seeks to impose liability on or to recover damages from Owner, Engineer, or Engineer's Consultants, on such damage or claim. If Contractor is delayed at any time in performing or furnishing Work by any act or neglect of a separate contractor and Owner and Contractor are unable to agree to the extent of any adjustment in Contract Times attributable thereto, Contractor may make a claim for an extension of times in accordance with Article 12. An extension of the Contract Times shall be Contractor's exclusive remedy with respect to Owner, Engineer, and Engineer's Consultants, for any delay, disruption, interference or hindrance caused by any separate contractor. This paragraph does not prevent recovery from Owner, Engineer, or Engineer's Consultant, for activities that are their respective responsibilities.

ARTICLE 8. OWNER'S RESPONSIBILITIES

SC-8.02 Replacement of Engineer

Delete the phrase "to whom the CONTRACTOR makes no reasonable objection."

SC-8.09 Limitations on Owner's Responsibilities

Insert the following after the first sentence:

However, the OWNER shall have the right to direct the CONTRACTOR to perform the Work according to any sequence schedule set forth in the Contract Documents or established pursuant thereto.

ARTICLE 9. ENGINEER'S STATUS DURING CONSTRUCTION

SC-9.01 Owner's Representative

Add a new paragraph 9.01B after paragraph 9.01A of the General Conditions, which is to read as follows:

A. Nothing contained in the Contract Documents shall be construed to create a contractual relationship of any kind (1) between the ENGINEER and CONTRACTOR,(2) between the OWNER and a Subcontractor or Subcontractors, or (3) between any person or entities other than the OWNER and CONTRACTOR. The ENGINEER shall, however, be entitled to performance and enforcement of obligations under the CONTRACT DOCUMENTS intended to facilitate performance of the ENGINEER'S duties.

SC-9.10 Compliance with Safety Program:

Add the following new paragraph immediately after Paragraph 9.10.A.:

In the event Engineer and/or Owner determines that Contractor's safety plans, programs, and procedures do not provide adequate protection for Engineer and/or Owner, Engineer and/or Owner may direct its employees to leave the Project Site or implement additional safeguards for Engineer's protection. If taken, these actions will be in furtherance of Engineer and/or Owner's responsibility to its own employees only, and Engineer and/or Owner will not assume any responsibility for protection of any other persons affected by the Work. In the event Engineer and/or Owner observes situations which appear to have potential for immediate and serious injury to persons, Engineer may warn the persons who appear to be affected by such situations. Such warnings, if issued, shall be given based on general humanitarian concerns, and Engineer and/or Owner will not, by the issuance of any such warning, assume any responsibility to issue future warnings or any general responsibility for protection of persons affected by the Work.

ARTICLE 10 - CHANGES IN THE WORK; CLAIMS

SC-10.01 Authorized Changes in the Work:

Add the following new subparagraph immediately after Paragraph 10.01.B.:

H. By submission of a Claim, Contractor certifies that the claim is made in good faith, that the supporting data are accurate and complete to the best of Contractor's knowledge and belief, and that the amount or time requested accurately reflects the Contract adjustment for which Contractor believes Owner is liable.

SC-10.03 Execution of Change Orders:

Delete Paragraph 10.03.A.3 in its entirety and replace with the following:

Changes in the Contract Price or Contract Times, and agreed to by owner, which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

SC-10.05 Claims:

Delete paragraph 10.05.A, 10.05.B, 10.05.C and 10.05.E in there entirety and replace with the following:

- Engineer's Decision Required: All Contractor claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by the Contractor of any rights or remedies the Contractor may otherwise have under the Contract Documents or by Laws and Regulations in respect of such claims.
- Notice: Written notice stating the general nature of each Claim shall be delivered by the Contractor to Engineer and Owner promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the Contractor. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the Owner within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by Contractor's written statement that the adjustment claimed is the entire adjustment to which the Contractor believes it is entitled as a result of said event.
- Engineer's Action: Engineer will review each Claim and, within 30 days after receipt shall take one of the following actions in writing:
 - deny the Claim in whole or in part;
 - approve the Claim; or
 - notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of Claim, such notice shall be deemed a denial.
- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon the Contractor, unless the Contractor invokes the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.

ARTICLE 11. COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

SC-11.01 Cost of the Work:

In the second sentence of Paragraph 11.01.A.1, delete the word "superintendents."

SC-11.01 Cost of the Work:

In Paragraph 11.01.B.1 add "superintendents" after "engineers" in the first sentence.

SC-11.02 Allowances:

In Paragraph 11.02.B.1.b, add "Except where Contractor's costs are allowed in the description of the bid item in Section 01025 - Measurement and Payment," prior to the first sentence.

SC-11.03 Unit Price Work:

Delete Paragraph 11.03.D in its entirety and insert the following in its place:

- The unit price of an item of Unit Price Work shall be subject to reevaluation and adjustment under the following conditions:
 - If the Bid price of a particular item of Unit Price Work amounts to 5 percent or more of the Contract Price and the variation in the quantity of that particular item of Unit Price Work performed by Contractor differs by more than 25 percent from the estimated quantity of such item indicated in the Agreement.
 - If there is no corresponding adjustment with respect to any other item of Work.
 - If Contractor believes that Contractor has incurred additional expense as a result thereof or if Owner believes that the quantity variation entitles Owner to an adjustment in the unit price, either Owner or Contractor may make a claim for an adjustment in the Contract Price in accordance with Article 10 if the parties are unable to agree as to the effect of any such variations in the quantity of Unit Price Work performed.

ARTICLE 12. CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

SC-12.01 Change of Contract Price:

Delete paragraph 12.01.C.1 in its entirety.

SC-12.02 Change of Contract Times:

Delete Paragraph 12.02.A in its entirety and replace with the following:

A. The Contract Times may only be changed by a Change Order. Contractor's Claim for an adjustment in the Contract Times shall be based on written notice submitted in accordance with the provisions of Paragraph 10.05.

SC-12.04 Liquidated Damages

Add new paragraph F. immediately after paragraph 12.03E of the General Conditions to read as follows:

F. If the Contractor shall fail to achieve Substantial Completion and/or Final Completion within the times stipulated in the Contract, it shall be liable to pay the Owner the daily amount as stipulated in the Contract not as a penalty, but as fixed and agreed upon damages for breach of contract. The said amount is fixed and agreed upon because of the difficulty of ascertaining the Owner's actual damages. It is mutually understood that the amount is a reasonable approximation or estimate thereof as of the date of the Contract. The said amount may be withheld from periodic or final payments due to the Contractor, in addition to retainage and other back charges.

ARTICLE 14. PAYMENTS TO CONTRACTOR AND COMPLETION

SC-14.02 Progress Payments:

Delete paragraph 14.02.A.3 of the General Conditions in its entirety and replace with the following:

3. Partial payments will be made on a monthly basis during the contract period. From the total amount ascertained as payable, an amount equivalent to ten percent (10%) of the total contract value will be deducted and retained by the Owner up until fifty percent (50%) completion of the work. Five Percent (5%) of the total contract value will be deducted and retained by the Owner up until substantial completion. At which point the Contractor can request a reduction down to two percent (2%) in accordance with Final Payment.

Add new paragraphs immediately after paragraph 14.02A.3 of the General Conditions to read as follows:

- 4. Equipment accepted for delivery at the site or at a local bonded warehouse and included in progress estimates in advance of actual requirement will be subject to all conditions stated below.
- 5. Materials and equipment will not be included in progress estimates until the following requirements have been fulfilled.
 - a. The Contractor must present an invoice to the Engineer for each item of equipment he is requesting payment for. The invoice must be broken down to show the costs for the actual equipment, and reasonable costs for O&M Manuals, spare parts, start-up certification, training, testing, final acceptance testing, and any other services required by Contract.
 - b. Sufficient monies have been allocated in the payment requisition line items to cover all of the costs listed in "a" above, plus the costs of physically installing the equipment.
 - c. The equipment has been submitted and accepted for use in this Project.
 - d. The equipment is acceptably stored and protected. Storage in a bonded warehouse will require proof of bonding, and insurance coverage specifically for the item being stored.
 - e. The manufacturer's short and/or long-term storage requirements have been received by the Engineer, prior to payment.

- f. The Contractor has established a program to implement the manufacturer's required storage procedures. Said program to consist of at the very least a written schedule of daily, weekly, monthly, etc., routine maintenance requirements for each piece of equipment. A copy of this schedule to be presented to the Engineer prior to each requisition submittal, signed by the Contractor, stating that the required maintenance has been performed.
- g. Signed, notarized Title Transfers, format to be furnished by the Engineer, must be furnished for each item of equipment.
- 6. When the above have been complied with to the satisfaction of the Engineer, payment will be authorized for the full invoice values of the item of equipment, less normal retainage and less all costs for O&M Manuals, spare parts, start-up certification, training, testing, final acceptance testing, and installation.

SC-14.02 Progress Payments:

Amend Paragraph 14.02.C.1. by striking out the words "Ten days" and inserting the words "Thirty days" in their place.

SC-14.02 Progress Payments:

Delete paragraph 14.02.D.1 in its entirety and replace with the following:

- 1. Owner may refuse to make payment of the full amount recommended by Engineer for reasons that may without limitation include:
 - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
 - b. Owner requires additional supporting documentation of the work;
 - c. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

- d. there are other items entitling Owner to a set-off against the amount recommended; or
- e. Owner has a reasonable belief of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.

SC-14.02 Progress Payments:

Delete paragraph 14.02.D.3 in its entirety.

ARTICLE 16. DISPUTE RESOLUTION

SC-16.01 Methods and Procedures:

Delete Paragraphs 16.01.A, B, and C. in their entirety and replace with the following:

- A. Either Owner or Contractor may request mediation of any Claim or dispute. The parties will endeavor to identify a mutually agreeable mediator and share the costs for such mediation equally. Neither party shall be required to agree to mediation.
- B. Owner and Contractor shall participate in any mediation process in good faith. If held, the process shall be concluded within 60 days of filing of the request.

ARTICLE 17. MISCELLANEOUS

SC-17.06 Headings

Delete paragraph 17.06 in its entirety and replace with the following:

A. The headings or titles of any article, paragraph, subparagraph, section, subsection, or part of the Contract Documents shall not be deemed to limit or restrict the article, paragraph, section, or part.

SC-17.07 Legal Address of Contractor

Add new paragraph immediately after paragraph 17.06 of the General Conditions as follows:

17.07 Legal Address of Contractor:

A. Contractor's business address and his office at or near the site of the Work are both hereby designated as places to which communications shall be delivered. The depositing of any letter, notice, or other communication in a postpaid wrapper directed to the Contractor's business address in a post office box regularly maintained by the Post Office Department or the delivery at either designated address of any letter, notice, or other communication by mail or otherwise shall be deemed sufficient service thereof upon Contractor, and the date of such service shall be the date of receipt. The first-named address may be changed at any time by an instrument in writing, executed and acknowledged by Contractor and delivered to Engineer. Service of any notice, letter, or other communication upon the Contractor personally shall likewise be deemed sufficient service.

Insert the following Article immediately after Paragraph 17.01 of the General Conditions as follows:

ARTICLE 18. OSHA CONSTRUCTION SAFETY PROGRAM

18.01 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.

18.02 Any employee required to complete the OSHA 10-hour construction safety program, and who cannot within 15 days provide documentation of completion of such program, shall be subject to removal from the job site.

18.03 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.

END OF SECTION

D. FUNDING REQUIREMENTS

CITY OF PORTSMOUTH CORONAVIRUS GRANT RECIPIENT TERMS AND CONDITIONS

The City of Portsmouth is the recipient of the Coronavirus Local Fiscal Recovery Fund Grant. Funds received under this Grant are limited to use on specific projects which may include any Agreement with Vendor. Therefore, Vendor is required to assure compliance with certain federal requirements.

Specifically, Vendor assures compliance with section 603(c) of the Social Security Act (the Act), Treasury's regulations implementing that section, and guidance issued by Treasury regarding the foregoing. Additionally, Vendor agrees to comply with all other applicable federal statutes, regulations, and executive order including but not limited to:

(i) Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, 2 C.F.R. Part 200;

(ii) Universal Identifier and System for Award Management, 2 C.F.R. Part 25;

(iii) Reporting Subaward and Executive Compensation Information, 2 C.F.R Part 170;

(iv) OMB Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement), 2 C.F.R. Part 180;

(v) Recipient Integrity and Performance Matters 2 C.F.R. Part 200 and Appendix XII; (vi) Governmentwide Requirements for Drug-Free Workplace, 31 C.F.R. Part 21;

- (vii) New Restrictions on Lobbying, 31 C.F.R. Part 21;
- (viii) Uniform Relocation Assistance and Real Property Acquisitions Act of 1970
- (ix) Generally applicable federal environmental laws and regulations.

The City further encourages Vendor to adopt and enforce on-the-job seatbelt policies and programs for when operating company-owned, rented, or personally owned vehicles, and to adopt and enforce policies that ban text messaging while driving pursuant to Executive Orders 13043 and 13513 respectively.

Finally, Vendor assures compliance with statutes and regulations prohibiting discrimination including but not limited to Title VI of the Civil Rights Act of 1964 (42 U.S.C. §§ 2000d et seq.), the Hatch Act (5 U.S.C. §§ 1501-1508 and 7324-7328), and Protections for Whistleblowers in accordance with 41 U.S.C. § 4712. Specifically, the subgrantee, contractor, subcontractor, successor, transferee, and assignee shall comply with Title VI of the Civil Rights Act of 1964, which prohibits recipients of federal financial assistance from excluding from a program or activity, denying benefits of, or otherwise discriminating against a person on the basis of race, color, or national origin (42 U.S.C. § 2000d et seq.), as implemented by the Department of the Treasury's Title VI regulations, 31 CFR Part 22, which are herein incorporated by reference and made a part of this contract (or agreement). Title VI also includes protection to persons with "Limited English Proficiency" in any program or activity receiving federal financial assistance, 42 U.S.C. § 2000d et seq., as implemented by the Department of the Treasury's Title VI regulations, 31 CFR Part 22, and herein incorporated by reference and made a part of this contract or agreement.

Projects funded solely with SFLRF/ARPA funds are not subject to Davis Bacon Act except when addition funding sources require compliance. Vendor agrees to comply with Davis Bacon and Related Act (DBRA) when applicable. Vendor will also comply with Executive Orders 11625 and 12432 (Concerning Minority Business Enterprise) and 12438 (Concerning Women's Business Enterprise) when applicable.

VENDOR

Duly Authorize

E. TECHNICAL SPECIFICATIONS

Scope of Work

The scope of this Division covers the General Administrative Requirements and the general work-related provisions of the Construction Contract.

Contents of Division

Section No.	Section Title
POW	Prosecution of Work
01010	Summary of Work
01020	Coordination
01025	Measurement and Payment
01070	Abbreviations and Symbols
01090	Reference Standards
01200	Project Meetings
01201	Community Information
01310	Construction Schedules
01340	Submittals
01382	Video Inspection
01515	Temporary Water (Potable)
01518	ByPass Pumping
01546	Use of Explosives
01548	Vibration Monitoring
01562	Dust Control
01570	Traffic Regulation
01580	Project Identification
01590	Temporary Field Office
01611	Owner's Right to Material
01630	Substitution and Product Options
01701	Project Closeout Procedures
01710	Project Cleaning
01720	Project Record Documents
PROSECUTION OF WORK

The Prosecution of Work is intended to provide the Contractor a summary of project requirements for easy reference. It is not intended to provide all requirements. Refer to Technical Specifications and Drawings for details.

1. DESCRIPTION OF WORK

The project has been divided into 3 parts:

- Base Bid: Islington Street from the vicinity of Dover Street (STA 131+50) to the vicinity of Cornwall Street (STA 141+00).
- Add Alt.#1: Vicinity of Cornwall Street (STA 141+00) to Maplewood Avenue (STA 154+50)
- Add Alt #2: Improvements at Goodwin Park.

Bid item quantity estimates are similarly divided into the 3 parts according to the work proposed for the total base bid and alternatives. Quantities may vary based on actual limits of work as determined in the field. This will be the case particularly with roadway, sidewalk, and landscape items. Limits of work for these items could fluctuate $50^{\circ}\pm$ in either direction based on chosen transition areas.

Work to be completed for this project includes the following:

- New Sanitary Sewers:
 - o 8" to 18" PVC, all depths
 - Replacement of all sanitary sewer service laterals to property line
 - New sanitary sewer service on private property (where shown or as directed)
 - $\circ~$ Interior plumbing and building foundation penetrations (where shown or as directed)
 - Maintenance of sewer flows including combined sewer flows where they exist.

• New Storm Sewer Drains

- \circ 12" to 18", all depths
- Installation of 6" dia. Laterals whether public or private (for inflow removal)
- Maintain drainage until completion of new systems

• Water Distribution Improvements

- o 6" and 16" DICL52 poly encased water pipe
- Replacement of all water service laterals
- Maintenance of water system without interruption to service to users

• Temporary Water systems (unit items provided)

Roadway & Property Restoration

- Roadway reconstruction including excavation of in situ materials for placement of select gravels and fine grading to elevations shown on the plans or as directed
- Pavement & curb Installations
- Concrete and Brick sidewalk installation
- Driveway and apron construction
- Complete restoration of all properties, public and private
- Perform testing of new water and sewer systems prior to paving

• Traffic Signals

- Maintain operation of existing traffic signals until new signals are operational (subsidiary to Item 619.1 of Traffic Maintenance)
- Construct new signal foundations and signal supports
- Installation of all signal hardware, pull boxes, conduit, wiring, controllers, detection and preemption as shown on the plans, as specified and as directed
- Remove existing traffic signals
- Perform testing and adjustment until accepted

• Street Lighting

- Installation of new light poles, foundations, conduit, wiring, load centers and cabinets, fixtures and lamps as shown on the plans, as specified and as directed
- Perform testing and adjustment until accepted

• Landscaping

- o Removal of existing trees and plantings as shown on the plans and as directed
- Installation of new street trees at the locations shown on the plans or as directed, including tree grates and tree guards and structural tree root cells and planting soil where indicated to promote tree health.
- Perform regular watering as specified.

• Traffic Items

- Maintain existing traffic control signs to the greatest extent possible. Existing traffic regulation signs (i.e., stop signs) distributed during construction need to be reset or placed on barricades until proposed permanent signs are installed. Subsidiary to Item 619.1, Maintenance of Traffic.
- Install new signs on posts as specified and shown on the plans, and as directed
- $\circ~$ Install new pavement markings as specified and shown on the plans, or where directed

• Install temporary pavement markings on binder course pavement to provide traffic control until final paving, as specified and as directed

• Coordination and Protection of Utilities

- Coordinate utility relocation work (by others) with utility companies
- Coordinate protection of existing gas mains with Unitil. Unitil' s existing cast iron gas mains within the project limits of work were replaced by Until in 2017 with new 8" PE main. New mains were located taking this project into consideration and avoiding potential conflicts with proposed utilities to the greatest extent practical. However, some conflicts with existing plastic (PE) gas mains or gas service lines may exist. Contractor shall contact Unitil to coordinate work near gas lines.
- Coordinate temporary water shutdowns with Portsmouth Water Department.

• Protection of Workers and Site Personnel

Site safety shall be the Contractor's responsibility. The Contractor shall prepare a Health and Safety Plan. Refer to Section 13710 of the Project Manual.

2. <u>SPECIAL SEQUENCEING OF WORK</u>

Prior to the start of any work, the Contractor shall submit for approval a proposed work schedule and sequence of work. The Contractor shall sequence the work to accomplish final paving and property restoration in 500 LF segments unless otherwise approved by the City of Portsmouth. Schedule updates or alterations should be presented at regular progress meetings. The Contractor will need to consider the following items pertaining to general sequencing of the work:

2.1 Road Reconstruction

The following in situ road base materials may be encountered during excavation:

- Pavement depth typically ranges from of 5-1/2 to 8 inches
- It is reported that there is a double layer of brick, 4 inches thick. (Brick removal will be subsidiary to Item 203.1 Common Excavation)
- Removal of railroad ties where existing will be paid under Item 6.6B Excavation and Disposal of Unsuitable Materials
- Removal of steel trolley tracks where existing will be subsidiary to Item 203.1 Common Excavation
- Removal of concrete panels under sidewalks where existing will be subsidiary to Item 203.1 Common Excavation
- Removal of reinforced concrete panels under roadway, if encountered, will be paid as Item 203.2, Rock Excavation.

Roadway reclamation for temporary stabilization materials is not expected to be viable partially due to the conditions above. Once roadway re-construction begins, a maximum of 1,000 LF of unpaved roadway will be tolerated. This is intended to allow for utility work to continue beyond the limits of phased roadway restoration.

The Contractor will be responsible for maintaining traveled way in a stable condition (free of rutting and dust) for the duration of the project. Utility testing shall be successfully completed prior to pavement installation.

Structures and castings shall be raised to binder elevation, unless otherwise directed, and final adjustment of castings and wearing course pavement shall be completed following one freeze-thaw winter season.

2.2 Utility Installation

This project consists of complex pipe sequencing issues. It will be necessary to maintain all existing sewage/drainage (combined in some areas), gas lines and water systems throughout the duration of the Project. The Contractor shall review sewer, water, and drainage sequencing with the Owner and Engineer. The existing combined sewer and drain systems will need to be maintained to prevent flooding and/or surcharging until new systems are operational. Water and gas systems will also be maintained and/or protected from damage while other utilities are installed. The need for temporary utilities will depend on the contractor's operations. Temporary systems (water and sewer) installed by the Contractor to maintain or protect utilities from damage will be measured for payment only to the amounts identified in the Bid Schedule. Additional systems are subsidiary and will not be measure for payment, and the Contractor will need to consider this in the preparation of their bid.

As noted above in paragraph 3.1, brick and concrete are likely to be encountered beneath existing pavements. It is expected that surplus material generated as work progresses will be used to replace any asphalt, brick, and concrete encountered during excavation Contractor will be expected to manage and use surplus material (Item 1.15B) to backfill trench to grade. Additional material required to backfill trench to grade for daily restoration and traffic management due to miss management of surplus materials generated will be subsidiary to the respective utility installation and will not be considered for payment.

2.3 Testing

Coordinate all testing and acceptance of new utilities with Engineer, NHDES and Owner, prior to paving.

2.4 Property Restoration

Loam, seed & mulch and complete property restorations as work progresses.

3. TRAFFIC CONTROL

A Traffic Control Plan (TCP) shall be submitted to the Engineer for review and will require approval by the City of Portsmouth. Construction warning signs must conform to MUTCD standards, as applicable. The Contractor shall provide a minimum of two (2) portable message boards for this project and will be responsible for siting and/or locating message boards as designated, and for maintenance of the messages throughout construction (Item 619.253). Trenches will be backfilled, and roads shall be re-opened to provide safe two way vehicular and pedestrian traffic at the end of each working day. The Plan shall also include the anticipated number of flaggers to be used for a given work area. Police details shall be used at signalized intersections (Bartlett

Street) and as directed by the Engineer and Portsmouth DPW. The Engineer reserves the right to request more or fewer flaggers as work progresses and conditions change. Variations to the TCP will be dependent on the Contractor's schedule and operations. Short duration road closures to through traffic and detours (excepting local traffic) are anticipated to aid in facilitating completion of the work. Any detours shall only be during working hours and traffic shall be restored at the end of each day. All temporary detours require approval from the Portsmouth DPW. The Contractor will not be permitted to use private properties and parking lots (i.e., Plaza 800) as detour routes. The Contractor shall coordinate implementation of detours with the DPW. However, the Contractor shall maintain access to all property's businesses throughout construction, to the maximum extent that is possible.

EQUIPMENT

Provide necessary barricades, signs and traffic control devices in accordance with approved TCP, NHDOT Section 619, and MUTCD (latest edition). All barrels used will be required to have blinking yellow light for additional visibility at night.

BUSINESS, RESIDENCE, AND PARKING ACCESS

The Contractor will be required to maintain access to all businesses at all times. Temporary and alternate access may be provided in coordination with the business owners, consistent with the limitations within these Construction Documents. This may include temporary entrances, temporary parking, temporary pedestrian ways and oneway traffic. The Contractor shall also provide individual signs for each parcel in the work area that state "All BUSINESSES OPEN." It is anticipated at least two signs shall be provided per business. Signs shall be professionally made. Handwritten signs will not be permitted. Temporary access may constitute removal and reset of existing curbing (Item 609.5) and existing landscaping to accommodate construction of temporary vehicular access. Approved devices (barrels and or barricades) will be required to prevent passage of vehicular traffic through temporary access points when not in use and are subsidiary to Item 619.1X. Temporary access of parking lots through an adjacent property will only be permitted with written permission from both property owners and approval from the Owner and the Engineer. Temporary access to a parking lot from the street must be reviewed and approved by the City, Engineer, and the Property Owner."

4. <u>CONSTRUCTION LAYOUT</u>

Work is to be generally constructed as shown on the drawings. The Contractor will be responsible for all construction layouts. A list of available horizontal control points (and coordinates) and TBM's will be provided by the Engineer and confirmed by the Contractor, for reference throughout the project. The Engineer and/or Owner's Representative, together with the Project Superintendent will review utility corridors, considering dig-safe markings and Contractor's work plan. The Contractor will advise the Engineer, in advance, of potential conflicts concerning execution of his work. It will be the responsibility of the Contractor to protect and maintain TBM's, layout and control points provided by the Engineer. The Engineer will provide an electronic copy of plans and coordinates to the Contractor upon request to facilitate the Contractor's layout, providing the Contractor executes a release

concerning the information transmitted.

5. <u>REUSE OF MATERIALS</u>

Re-use of crushed concrete and/or reclaimed pavement can be used for sidewalk base or driveway restoration but will only be allowed if it meets the specified gradation and does not include silt, loam, humus, woody or other non-granular or material considered unsuitable by the engineer.

6. <u>TEMPORARY WATER</u>

The use of a temporary water system will be necessary for the contractor to sequence his work, to prevent damage to existing water systems or to minimize interruptions to water services to the public. Payment will be made for temporary water systems up to the quantity provided for in the bid schedule. Temporary water systems exceeding the quantities provided for in the bid schedule are subsidiary to the Contractor's operations and will not be measured for payment. Temporary service connections shall be made at the curb stop. Bypass of water meters and back flow preventers will not be allowed. It is expected that the Contractor has taken the need for temporary water systems into account in preparation of his bid.

The Contractor will be required to submit a plan for temporary water systems to the Engineer for review. Plans for water installations and/or temporary systems are subject to and approval by the City Water Department. Interruptions to homeowners and businesses need to be scheduled one week (5 business days) in advance and be conducted in manners that will not inconvenience or impact property owners. Two (2) business days (48-hours) verbal and written notice shall be given to homeowners and businesses prior to scheduled interruptions in service.

The following unit items have been provided for temporary water systems:

- Item No. 3.7A Temporary Water Mains (Potable)
- Item No. 3.7B Temporary Water Services (up to 2" diameter)
- Item No. 3.7C Temporary water services (greater than 2" diameter)

7. <u>CONFLICTS AND COORDINATION WITH EXISTING UTILTIES</u>

It will be the Contractor's responsibility to coordinate with the utility companies for identification and re-location, if necessary, of any utilities that are interfering or conflicting with the work shown on the drawings. Loss of production or crew downtime relating to utility work by others will not be considered for additional payment.

8. OTHER BURIED UTILITIES AND SERVICE PIPES

All service pipes for gas, sewer and water utilities are not shown on the drawings but one (1) of each are to be expected for each building unit. Where buildings have multiple units, multiple services can be expected. Additional or unknown utility crossings will be measured for payment as described in Item 6.3. The Contractor is expected to coordinate utility markings through Dig Safe, Unitil and the City of Portsmouth, Water and Sewer Department before proceeding with this work. Utility Markings for sewer and water are based on information on file and should be considered approximate. Repairs to unknown, unmarked or mismarked utilities will be measured for payment as described in item 6.7. Repairs to damaged utilities either shown on the plans or through markings on the ground will not be measured for

payment. Direct conflicts with utilities resulting in the need for relocation of utilities will be measured for payment, utilizing contract unit items, as deemed appropriate by the Engineer. Additional compensation beyond unit items for loss of production, delays or downtime will not be considered.

9. <u>MEETINGS</u>

Public Information Meetings:

The Contractor, together with City Officials and the Engineer, shall schedule and attend one public information meeting with residents and business owners prior to the start of construction and at the beginning of construction following any temporary disruptions of the work (i.e., winter shutdown).

Project Meetings:

It is anticipated that regularly scheduled meetings will be held with Owner's Representatives, Contractor, sub-contractors and regulatory representatives will be held at a maximum frequency of twice monthly, unless weekly meetings are considered necessary by the Contractor, Owner or Engineer.

Coordination Meetings

Informal weekly meetings are anticipated between the Contractor's Superintendent, Owner, and Resident Project Representative to review progress/schedule, sequence and other day to day issues.

10. TEMPORARY EROSION CONTROL

The Contractor's attention is directed to the provisions of NHDOT Section 645 of the Project Manual. The Contractor shall exercise caution to minimize the intrusion of any spillage, sediment, turbidity, or pollution into the waterways or adjacent properties around the project area, as this watershed drains to waters of the state, including North Mill Pond and the Piscataqua River. Sediment and erosion controls shall be operational prior to commencing trench de-watering operations.

A Storm Water Pollution Prevention Plan (SWPPP) will be required and must be kept on site at all times. The Contractor will be responsible for filing the NOI and maintaining the SWPPP onsite at all times. The NOI must be submitted to the EPA at least seven (7) days prior to the start of construction. The SWPPP must be in place prior to submittal of the NOI.

The SWPPP may be amended as necessary to provide continued erosion and sediment control throughout the project. Appropriate measures shall be implemented to prevent sedimentation migration resulting from the Contractor's construction operations.

11. CONSTRUCTION DEWATERING (Also, refer to Section 02402)

Trench dewatering may be required to complete the work. The Contractor shall comply with the Environmental Protection Agency's (EPA) National Pollutant Discharge Elimination System (NPDES) General Permit for Construction Dewatering before proceeding with the work. It is anticipated that well point dewatering may be required to complete the work and has been included in the Base Bid as Item 1.12.

This NPDES general permit covers construction dewatering discharges defined as pumped or drained discharges of groundwater and/or storm water from excavations or other points of accumulation associated with a construction activity. Qualified dischargers must submit a Construction Dewatering NOI to EPA-NE to be covered and will receive a written notification from EPA-NE of permit coverage. The EPA-NE contact for NOI forms is Shelley Puleo at (617) 918-1545. The DES contact for this permit is Stergios Spanos at (603) 271-6637.

Appropriate sediment and erosion controls shall be operational prior to commencing trench dewatering operations. Construction dewatering is incidental. See specification Sections 02402 and 02650 for additional information.

12. <u>SIDEWALKS</u>

The project includes the construction of new sidewalks however, not all adjacent sidewalks will be replaced. The Contractor shall protect from damages sidewalks designated to remain, to the greatest extent possible. Sidewalks specified to remain that are damaged as a result of the Contractor's operations or equipment, will be repaired at the Contractor's own cost. Cross sections and grading plans are provided for grading of sidewalks. Sidewalks shall slope towards the curb line, unless otherwise shown or directed. Careful grading around doorways and steps is required to prevent puddling or uneven steps. Sidewalk grading shall be in accordance with ADA requirements. Contractor shall review sidewalk grading with the Resident Project Representative before concrete is placed.

13. GRANITE CURBING

All existing 8" wide granite curbing shall be reincorporated into the project to the maximum extent possible (Item 609.5). Any existing curbing (8" wide) removed and not re-set shall remain property of the Owner and shall be delivered to a stockpile location as directed by the Owner, unless Owner determines that the City has no need for the curbing, in which case the curbing will become the property of the Contractor and shall be removed. New granite curbing provided shall be a 6" wide. All granite curbing, new or reset, shall be installed throughout the project as shown on the plans or as directed.

14. RAISING STRUCTURE COVERS AND GRATES

The Contractor shall include one initial structure and casting (sewer, water, drainage, etc.) adjustment to be considered subsidiary to the bid items. The City may request additional adjustment of structures following placement of the pavement binding course. This second adjustment, if requested, will be paid under adjustment bid items included in the bid schedule.

15. GEOTECHNICAL INFORMATION

To assist the Contractor in preparing a bid, borings logs, groundwater readings, and a geotechnical report are included in Appendix A of the Project Manual. Fluctuations in groundwater may exist.

16. CONTAMINATED SOILS vs. URBAN FILL

The contractor is responsible for management and disposal of all surplus soils and materials. Available information of potential soil and groundwater remediation sites within or adjacent to the project area is provided in Appendix C. Regulated soils are anticipated throughout the project area, particularly in the rail yard area. Unit items are provided to facilitate payment for varying site conditions that may exist.

16.1 Baseline Requirements:

Item 1.15A: Health and Safety Plan

The contractor will be responsible for the safety and protection of site personnel. A HASP is required, refer to Section 13710 of the Project Manual for requirements.

Item 1.15B: Management of Soils and Materials

The contractor will be responsible for management of soils in accordance with regulatory guidelines, and in the Owner's best interest. The Contractor should anticipate varying soil conditions in preparation of their bid. Management of Soils, Item 1.15B includes the following work:

- Attend a meeting with the Owner and their representatives to discuss management of soils prior to the start of the work.
- Recognizing and segregating non-regulated materials from regulated materials.
- Contractor shall collaborate with the Owner to develop a plan to characterize materials. This work will include separate stockpiling of materials, where contaminants are suspected, until characterization is complete.
- Where regulated materials are encountered (or are suspect), they need to be incorporated as backfill into the project as a first priority, unless directed otherwise.
- Coordination and management of all surplus materials.
- Prompt and immediate notification to Owner upon encountering soils that are regulated (or suspected to be regulated) for disposal by NHDES. Regulated materials shall be immediately separated from non-regulated materials. The contractor should recognize that certain materials are exempt from regulation including masonry, pavement, and concrete. These materials, if encountered, should be separated from regulated materials.
- Management & Disposal of Soils & Groundwater is included in Section 13100 of the Project Manual.
- Trucking and disposal of all un-regulated surplus materials will be the Contractor's responsibility.

Un-regulated Soils

Defined: Soils and materials that do not fall under NHDES regulation.

<u>Urban Fill</u>

Defined: Soils that come from the project site and are incorporated into the project for backfill and do not need to be disposed of at a permitted landfill. These soils may contain regulated contaminants, but because it is incorporated back into the project do not require further regulations. These do not include unregulated soils. All urban fill shall be incorporated back into the project as a first priority, unless directed otherwise by the Engineer.

Regulated Soils

Defined: Soils that are regulated as a solid waste (i.e., exceed NHDES SRS S-1 Standards). Regulated solid waste soils (i.e., urban fill) originating from the site may be incorporated into the project for backfill and should be as a first priority. Soils that cannot be incorporated back into the project may require disposal at a permitted landfill. Characterization efforts and disposal of regulated soils require prior approval from the Owner and the Engineer. The Owner, in cooperation with the permitting authority, will maintain the right to determine the limits of regulated soils requiring disposal.

Regulated Groundwater

Defined: Groundwater requiring special treatment (or offsite disposal) that cannot be discharged to sewers or surface waters utilizing normal turbidity and erosion control BMPs <u>and</u> requires specialized treatment systems such as filtration tanks, carbon contactors, water stripping towers, etc. The Owner, in cooperation with the permitting authority, will maintain the right to determine protocols and procedures for disposal of regulated groundwater.

16.2 Contingency Items (Where Directed):

Item 1.15C: Loading and Hauling Surplus Regulated Soils

Where the Contractor cannot incorporate regulated soils into backfill <u>and</u> where directed by the Owner, regulated materials will be taken to a disposal facility. This item only involves transport of regulated surplus materials and does not apply to un-regulated materials or materials falling under the solid waste exemption (pavement, concrete, and masonry, etc.).

Item 1.15D: Disposal of Regulated Soils & Materials

Where the Contractor cannot incorporate regulated soils into backfill <u>and</u> where directed by the Owner, regulated materials will be taken to a disposal facility. This item only involves disposal cost/tipping fees (other than transport) and does not apply to unregulated materials or materials falling under the solid waste exemption (pavement, concrete, and masonry, etc.).

Item 1.15E.X: Analytical Sampling

Where directed, the Contractor is to solicit services form a 3rd party testing company, approved by the Owner, for analytical soil testing. An allowance for Contractor re-imbursement is provided.

Item 1.15F.X: Disposal of Regulated Groundwater

Where directed, the Contractor shall dispose of regulated groundwater, in cooperation with the Owner and regulatory agency. Work for this item includes special handling and does not include discharge to existing sewers, infiltration beds or sediment control devices. An allowance for Contractor re-imbursement is provided.

17. <u>DUST CONTROL (refer to Section 01562)</u>

Due to the proximity of businesses and homes to the work zone, the Contractor is required to use a mechanically enclosed street sweeper on paved surfaces when necessary to control dust. Water and/or Calcium Chloride are required on unpaved surfaces to control dust.

The City will enforce a strict dust control policy for this project as described in the above referenced section.

18. <u>PEDESTRIAN TRAFFIC</u>

The work areas are in residential and commercial neighborhoods and pedestrian traffic corridors need to be maintained on a daily basis. The Contractor will need to separate work zones from pedestrian corridors.

19. WORK HOURS (Refer to Section 01010)

It is anticipated that the Work will be completed Monday through Friday during daylight hours (7 AM to 5 PM) unless specifically noted otherwise. Requests to perform nighttime or weekend operations must be approved by the City at least 2 weeks prior to the anticipated construction operations. Additional costs associated with nighttime or weekend operations will be at the Contractor's expense.

20. STAGING AREA

The Contractor is required to locate and secure all staging and material storage areas. All staging areas to be secured by the Contractor must be approved in advance by the City. Contractor shall provide a Hold Harmless Release to the City prior to start of use of the staging area. At the completion of work, the Contractor shall receive a release from the property owners of the staging area(s) and a copy of each release shall be provided to the City prior to final acceptance of the project.

With City approval, the Contractor may use the side of the roadway for staging of pipe and structures (CB's and manholes) providing the following conditions are met (unless approved otherwise by the City).

- A. That structures are placed no sooner than one (1) week preceding installation.
- B. Sidewalks and driveways are unimpeded and a minimum of 20 feet of roadway is maintained as a smooth traveling surface for vehicular traffic.
- C. That the Contractor will relocate structures upon notification by the City, if deemed necessary to maintain public relations and/or public safety.

21. <u>PAVEMENT MARKINGS</u>

Pavement markings on binder course and wearing course pavement are to be reviewed with the Owner's Representative prior to placement. Markings not approved shall be removed at the Contractor's own expense, if requested by the Owner. Temporary pavement markings applied to non-permanent or temporary pavement will be subsidiary to Item 619.1 of Traffic Maintenance

22. WINTER MAINTENANCE SEASON

Prior to the winter shutdown season, the Contractor shall meet with the Owner and the Engineer relative to the condition of the project site that is to remain for the winter shutdown

period. This is to ensure that the roadways and sidewalks are in a condition which is satisfactory from a maintenance, safety and functionality standpoint for the winter season.

23. <u>SALVAGE OF MATERIALS (Refer to Section 01611)</u>

Existing drainage catch basin grates and frames, granite curb inlets, shall be salvaged to the City of Portsmouth. All items selected by the City for salvage shall be delivered to a location specified by the City. The City has the right to salvage additional materials as requested. Contractor is to coordinate delivery of materials within the City.

24. <u>ABANDONMENT OF EXISTING PIPE</u>

All pipes to be abandoned (water, sewer, drain, etc.) smaller than 12-inch diameter shall be cut and capped, unless shown otherwise on the Drawings. Existing pipe 12-inches or larger and structures located outside normal excavation limits, to be abandoned, shall be filled with flowable fill or removed. All pipes and structures within the excavation limits shall be removed and disposed of by the Contractor at his own cost.

25. <u>VIBRATION MONITORING</u>

Vibration Monitoring in addition to the vibration monitoring for blasting, required by state and local ordinances, will be provided by the Contractor upon request, if deemed necessary to monitor vibration resulting from the Contractor's equipment, compaction efforts or operations. Vibration monitoring for blasting operations is provided at the Contractors own expense.

26. ARCHEOLOGICAL SENSITIVITY

No known archeologically resources are identified within the project area, however the area of new underground utility construction between Albany Street and Dover Street requires early targeted archaeological monitoring. In the event archaeological resources are discovered, the Contractor and the Owner's Representatives will meet to discuss protocols to be employed by the Contractor. Should delays occur during access and observation of these areas the Contractor will be compensated as stipulated by Items 6.2A and 6.2B.

27. WORK ON PRIVATE PROPERTY & INTERNAL PLUMBING MODIFICATIONS

There are properties where plumbing modifications may be required (both interior and exterior) to re-route sewer services from the rear of a structure to new sewer in the street. Any buildings requiring plumbing modifications will be confirmed following additional field evaluations during construction.

The City will obtain homeowner authorization through a Memorandum of Understanding (MOU) for work on private property. The Contractor will review all sewer and/or drain connection work, pipe locations and grades with the City in advance. Work on private property will need to be scheduled in advance, and the homeowner shall be notified of the Contractor's schedule a week in advance. The City reserves the right to request additional sanitary sewer or storm sewer work, with homeowner's approval, if the work is considered necessary to re-route flows from sewers that will be abandoned by the City. Property restoration, excluding any approved tree removal that may be necessary, is subsidiary to the work and will not be measured for payment. Property restoration will be completed by the Contractor to the existing or better condition.

Internal plumbing modifications will be required for homes currently connected to cross country sewers to be abandoned. The Contractor will be responsible for coordinating with a licensed plumber to complete any required internal modifications. Internal plumbing modifications will be deemed necessary to minimize excavations within the yard area, or to prevent unnecessary bends in buried piping.

Work requiring access to buildings will need to be coordinated with the Owner of the property, the Engineer and/or the Portsmouth Sewer Department. Interior plumbing modifications at building interior, pipe penetration and materials through foundation, and connection outside the foundation, will need to be inspected by the City's Plumbing Inspector. Materials and workmanship shall meet all local ordinances.

28. <u>TREE REMOVAL</u>

Islington Street is relatively devoid of trees within the public right-of-way. It may be necessary for the Contractor to remove existing trees and shrubs from specific areas, as shown on the Landscape and Lighting plans or as directed. No trees shall be removed without prior approval from the Mayor's Blue Ribbon Trees and Public Greenery Committee (City of Portsmouth) and/or abutting property owner. The City will obtain this approval.

29. TRIMMING OF TREES

Tree trimming, if required, shall be completed by the City. Prior to the start of the project, or a particular phase of the project, the Contractor shall walk the site and mark all the limbs that will require trimming to complete the work and minimize further damage to the tree. Upon approval by the Engineer and the Owner for all the limbs to be cut, the Contractor shall then coordinate with the City to have the required limbs cut. This work shall be incidental and shall not be measured for payment.

30. <u>PROTECTION OF TREES</u>

The Contractor will endeavor to prevent damage to all trees that are not designated for removal. Tree limbs that impede normal construction operations will be removed as described in Paragraph 29 above. A penalty will be assessed to the Contractor for damage to trees as follows:

- <u>Limbs damaged following trimming (Paragraph 29):</u> \$100/limb (in addition. damaged limbs will require further trimming by Contractor as directed)
- <u>Tree bark or surface scarring:</u> \$10/sq. in. of impact area (\$100 MIN. and \$1000 MAX.) In addition, Contractor shall remove trees that are, in the opinion of the Owner, significantly altered or cosmetically impaired or terminally damaged.

END OF SECTION

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

A.

1.1 WORK UNDER THIS CONTRACT

- The work to be completed under this Contract includes but is not limited to:
 - 1. Work shown on the Drawings included in the Bid Schedule or included within the Project Specifications.
 - 2. Work described in the Prosecution of Work, Section POW.
 - 3. Temporary water systems and continuous maintenance of water system to provide uninterrupted water service and fire flows wherever possible.
 - 4. Maintenance of sanitary and stormwater flows.
 - 5. Piping and structure modifications necessary to tie into existing systems.
 - 6. Removal and/or filling existing systems that will be abandoned.
 - 7. Complete restoration of all properties both public and private.
 - 8. All other work required for completion of the work as shown on the Drawings and as specified.

1.2 CONTRACTORS RESPONSIBILITIES

- A. The General Contractor shall have the following responsibilities:
 - 1. Prosecution of Work The Contactor will perform work in accordance with the Prosecution of Work Section of these specifications.
 - 2. Traffic Control Coordinate with the City of Portsmouth Department of Public Works and provide all necessary barricades, signs and traffic control devices in accordance with Specification Section 01570 Traffic Regulation.
 - 3. Furnish all labor, materials, equipment and incidentals required to complete all work in accordance with the Contract Documents within the allotted time schedule and maintain required warranties.
 - 4. Protect against vandalism. All losses incurred through vandalism are to be reimbursed by the Contractor or Contractor's insurance company.
 - 5. Coordinate with the Department of Public Works, including securing any required permits, on all work accomplished within City roadway rights-of-way.
 - 6. Perform all work within City right-of-way or limits of easements as shown on the Drawings unless written authorization is provided for further occupation of private properties.
 - 7. Coordinate activities involving other utilities with the respective utility companies.
 - 8. Obtain all necessary environmental and other permits required by federal, state and local authorities.
 - 9. The work also includes but is not limited to furnishing all materials, labor and equipment to perform the following activities:
 - a. Preparation and submittal of Contract specified submittals.
 - b. Testing of materials as specified herein.
 - 10. NPDES Permit Requirements The Contractor shall prepare a Stormwater Pollution Prevention Plan (SWPPP) and submit a Notice of Intent (NOI) to

the USEPA in accordance with the EPA Stormwater requirements associated with Construction Activities prior to construction. See specification section 02540 – Temporary Erosion Control.

11. Contractor shall maintain sanitary and storm flow during construction.

1.3 ENUMERATION OF DRAWINGS

- A. The following drawings which form a part of this contract are:
 - 1. Sheet No's 1 47, entitled "Islington Street Corridor Improvements Phase 2."

1.4 ENUMERATION OF SPECIFICATIONS

The following specifications which form a part of this Contract are:

- A. Bid Requirements
- B. Contract
- C. General Conditions
- D. Technical Specifications
- E. Appendix A Geotechnical Information
- F. All addendum issued during the bidding process also form a part of this contract

PART 2 - PRODUCTS

(NOT PART OF THIS SECTION)

PART 3 - EXECUTION

3.1 WORK SEQUENCE

- A. No work may commence until the following plans have been submitted and approved by the Owner and the Engineer:
 - 1. Traffic Control Plan
 - 2. Maintenance of Sewers Bypass Plan
 - 3. Stormwater Pollution Prevention Plan (SWPPP) including the submission of the "Notice of Intent" to the US EPA
- B. It is the intention that the work required to be completed under this Contract be performed in an organized and workmanlike manner. Sewer work shall proceed in accordance with approved scheduling to ensure that the new sewer system is tied into the existing sewer system as intended in the Contract and as shown on the Drawings. Construction areas shall be restored as soon as practical in an effort to minimize disturbance to private and public property. The Contractor is responsible for scheduling work to meet these objectives.
- C. Proposed test pits, as shown on the Drawings or as directed by the Engineer, shall be excavated in the presence of the Engineer. Test pits shall be excavated prior to the start of work so that adequate time is allowed to address any required field changes and to allow for sufficient material lead time.
- D. The work will be constructed from lowest elevations to highest elevations or as otherwise approved by the Engineer.

3.2 SPECIAL REQUIREMENTS

- A. Contractor shall maintain existing utilities to all existing users at all times.
- B. Where possible the Contractor shall maintain access to all properties during construction.
- C. Temporary trench pavement repairs shall be required at the end of each week unless approved otherwise.
- D. Contractor shall maintain repair parts on-site for emergency repair of water system, sewer system, drain lines, etc.
- E. Contractor to receive approval from the City prior to initiating any traffic restrictions and detours, if any.
- 3.3 WORK RESTRICTIONS
 - A. Work on the project will only be allowed Monday through Friday between the hours of 7:00 a.m. and 5:00 p.m., excluding holidays, except during emergencies unless otherwise approved in advance by the Owner.
 - B. Work hours may be limited on days preceding federal holidays

END OF SECTION

SECTION 01020

COORDINATION

PART 1 – GENERAL

1.1 <u>DESCRIPTION</u>

- A. All damage to existing structures, utilities, or pipelines, as a result of digging test pits, shall be paid by the Contractor. All materials shall be the responsibility of the Contractor. The Contractor will be responsible for replacing pavement around test pits for this Contract.
- B. Coordinate operation of utilities with the owner of the utility. Do not interrupt utility services to businesses or homeowners without the Owner's prior approval.
- C. The Contractor, by nature of this project, will be working in close proximity to residents, businesses and traveled ways. The Contractor, under this Contract, will be responsible for coordinating construction activities with the City of Portsmouth, where traffic control is involved, and with property owners in a manner that will lessen impacts, to the extent possible, and to ensure that residents, business services, facilities, and safe working conditions are maintained.
- D. Any damage to existing structures, equipment and property as a result of the Contractor's or their subcontractor's operations shall repaired/restored by the Contractor at no additional cost to the Owner.
- E. The Contractor will be responsible for developing a Traffic Control Plan and for coordinating its implementation with the City, local businesses and residents. The Contractor shall coordinate the relocation of Traffic Control measures and devices as needed to move traffic through and/or around the Work Zone or as directed by the Public Works Departments.
- F. The Contractor will be responsible for developing an Erosion and Sediment Control and Storm Water Management Plan, for obtaining all necessary permits and for implementing the Plan.
- G. The Contractor shall be responsible for maintaining Potable Water service and for all coordination with the City Water Department and with the local residents, businesses and facilities.
- H. The contractor shall be responsible for the maintenance of sanitary and storm flows during construction
- I. The Owner will be responsible for the operation of all existing facilities and any new facilities accepted during the construction period.
- J. The Contractor shall notify the Engineer in writing when, in his opinion, a portion of the construction is ready to be accepted by the Owner. After inspection of the work the Engineer will either recommend that the Owner accept the portion of construction or shall identify remedial work needed to be performed by the Contractor.
- K. All damage to existing or accepted equipment or structures, as a result of the Contractor's or his Subcontractor's operations shall be paid by the Contractor at no additional cost to the Owner.

1.2 <u>COORDINATION WITH OTHERS:</u>

- A. It will be the responsibility of the Contractor to complete all coordination required with all other utilities, homeowners and City sub-contractors to complete the work. The City may be available upon request to provide limited support for homeowner coordination.
- B. City of Portsmouth:
 - 1. Contractor shall coordinate access, egress, detours and traffic control, if required, with the City of Portsmouth's Police Department. The Contractor shall notify the Portsmouth Police, Fire Department and Rescue Squad at least 24 hours in advance of any street closings or detours. All fees for police traffic control details shall be paid by the Contractor (Item 618.61X).
 - 2. The Contractor shall be responsible for coordinating and maintaining public services to all public and private properties.

C. City of Portsmouth: Department of Public Works (DPW)

- 1. The Contractor shall be responsible for obtaining all opening and utility location permits.
- 2. The Contractor shall be responsible for coordinating access, egress, detours and traffic control on all City roadways with the City DPW.
- 3. The Contractor shall be responsible for coordinating the operation of valves and work in the vicinity of water lines with the DPW.

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Portsmouth Water/Sewer Division
600 Peverly Hill Road
Portsmouth, NH 03801
(603) 427-1552 (Primary contact, DPW Dispatch)
Dispatch (City Emergency Services)
(603) 427-1530
Jim Tow (Sewer and Water)
(603) 812-9174
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- D. Power, Cable, and Phone
 - 1. The Contractor shall be responsible for coordinating and providing temporary utilities (power, phone, internet) to the construction site.
 - 2. The Contractor shall be responsible for coordinating all work in and around existing utility facilities (aerial and below ground) and bear all costs of inspection requirements, temporary facilities relocation and all other requirements.
 - 3. The Engineer has made initial contact to the utilities regarding the relocation of poles to accommodate the proposed work. It shall be the Contractor's responsibility to coordinate the relocation work so that it does not interrupt the day to day operations of the work to be completed.
 - 4. The following is a list of contacts for utilities in the project area:

Eversource Richard St. Cyr, Field Technician Specialist (603) 436-7708 X 5641 Fairpoint Joe Considine 1575 Greenland Road Greenland, NH (603) 427-5525 (phone) (603) 427-2090 (fax)

Comcast (Cable) Mike Collins 334B Calef Highway Epping, NH 03042 (603) 679-5695 X 1037

- E. New Hampshire Department of Environmental Services (NHDES) and EPA The Owner shall be responsible for compliance with conditions of permits obtained, for execution of the work, and for securing other permits that pertain to the Contractor's own operations.
- F. Public Services to Private Properties The Contractor shall be responsible for coordinating and maintaining public services to all properties. The Contractor shall notify police and fire departments and rescue squad at least 24 hours in advance of any street closings and detours.
- G. Gas
 - 1. All gas mains within the project area have been upgraded to plastic pipe prior to the commencement of this work. The Contractor shall be responsible to coordinate protection of all existing gas mains in close proximity to the proposed work.

<u>Unitil (Gas Division)</u> 325 West Road Portsmouth, NH 03801 (603) 294-5157

- H. The Contractor shall coordinate and sequence daily operations with all businesses in the project area.
- I. The Contractor shall coordinate and sequence daily operations with the City school bus company.
- J. The Contractor shall sequence daily operations to accommodate the weekly trash and recycling pickup. The day and time of pick-up may vary based on location of work.

PART 2 - PRODUCTS

(NOT PART OF THIS SECTION)

PART 3 - EXECUTION

(NOT PART OF THIS SECTION)

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. For all items other than those to be paid for by lump sum amounts, after the work is completed and before final payment is made therefore, the Owner's Representative shall make final measurements to determine the quantities of various items of work accepted as the basis for final settlement. The Contractor, in the case of unit price items, will be paid for the actual amount of work accepted and for the actual amount of materials in place, as shown by the final measurements.
- B. 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.
- C. At the end of each day's work, the Contractor's Superintendent or other authorized representative of the Contractor shall meet with the Owner's Representative and determine and agree upon the quantities of unit price work accomplished and/or completed during the work day.
- D. The Representative will then prepare a "Field Report" which shall be signed by both the Representative and Contractor's Representative indicating complete agreement and approval of the quantities listed.
- E. Once each month the Representative will prepare a "Monthly Progress Summation" form from the month's accumulation of "Field Report" which shall also be signed by both the Representative and Contractor's Representative indicating complete agreement and approval of quantities listed.
- F. 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 <u>Field</u> <u>Report</u> and <u>Monthly Progress Summation</u> may not be included for payment. Items appearing on forms not properly signed by the Contractor may not be included for payment.
- G. The Contractor will prepare and submit the Pay Application for approved work completed in the payment period to the Engineer. The Engineer will provide a recommendation for payment to the Contractor. Upon recommendation from the Engineer, the Owner will complete a final review and approve the Pay Application for payment.
- H. Samples of the above referenced forms are included at the end of this section of the Specifications.
- I. The Contractor shall submit a cost breakdown of all lump sum items for payment purposes. This cost breakdown shall be submitted prior to Contract signing and shall be approved by the Engineer.
- J. Payment Application will only be prepared in a form acceptable to the Owner and approved by the Engineer. The form shall be in a computer spreadsheet format and exportable to MS EXCEL. (Sample Forms attached).

1.2 <u>SCOPE OF PAYMENT</u>

- A. Payments to the Contractor will be made for the actual quantities of Contract items performed and accepted in accordance with the plans and specifications. 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, except as provided hereinafter.
- B. The Contractor shall accept compensation, as herein provided, in full payment for furnishing all materials, labor, tools, equipment and incidentals necessary to complete the work and for performing all work included in the Contract; 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 replace any defective parts of the construction or to be responsible for damage due to such defects.

1.3 PAYMENT FOR INCREASED OR DECREASED QUANTITIES

A. When alterations in the quantities of work not requiring supplemental agreements 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 <u>ELIMINATED ITEMS</u>

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. All partial payments shall be subject to correction in the final quantity invoice and payment.
- B. No monthly payment shall be required to be made when, in the judgment of the Engineer, the work is not proceeding in accordance with the provisions of the Contract, or when, in his judgment, the total value of the work done since the last payment amounts to less than \$1,000.00.
- C. The partial payments will be based upon invoices prepared by the Engineer of the value of the work performed, and materials complete in place in accordance with the Contract. Retainage shall be as specified in Paragraph 24.2 of the General Conditions as modified by the Supplemental General Conditions. The Owner shall pay the Contractor within 45 days of receipt of the Engineer approved invoiced amount.

1.6 PAYMENT FOR MATERIAL DELIVERED ON LUMP-SUM PROJECTS

- A. At the discretion of the Owner, the Engineer may act upon the request of the Contractor, prepare an invoice, accompanied by receipted bills for payment of all or part of the value of acceptable, nonperishable materials and equipment which are to be incorporated into lump sum type contracts, and which have been delivered to the site of the work or in acceptable storage places, and not used at the time of such invoice. Materials, when so paid for by the Owner, shall become the property of the Owner, and in the event of default on the part of the Contractor, the Owner may use, or cause to be used, these materials in the construction of the work provided for in the Contract. The Contractor shall be responsible for any damage to, or loss of, these materials in accordance with Contract insurance requirements. The amount thus paid by the Owner shall go to reduce estimated amounts due the Contractor as the material is used in the work.
- B. No partial payment shall be made upon fuels, supplies, lumber, false work, or other materials, or on temporary structures of any kind which are not a permanent part of this Contract.

1.7 FINAL PAYMENT

- A. The Engineer shall make, as soon as practicable after the completion of the project, a final quantity invoice of the amount of work performed under the Contract and establish the value of such work.
- B. The Owner shall retain <u>a sum determined in accordance with the General Conditions</u> <u>and Supplemental Provisions</u> of the final Contract cost for an one-year warranty period commencing on the date of substantial completion.
- C. The Owner shall then pay the entire sum found to be due, after deducting there from all previous payments and the aforementioned retainage. In addition, any amounts to be retained or deducted under the provisions of the Contract may be held by the Owner for a period of sixty (60) days after the completion of the final quantity invoice, or until such time as the Contractor submits satisfactory evidence that all bills for labor and materials used under this Contract have been paid and all required documents submitted to the Engineer.

1.8 INCIDENTAL OR SUBSIDIARY WORK

- A. Incidental work items for which separate payment is not measured includes the following items:
 - 1. Clearing, Grubbing and Stripping.
 - 2. Clean Up.
 - 3. Sod or Loam and Seeding unless paid for under other items.
 - 4. Restoration of property or repairs to any facilities that are impacted from construction performed by the Contractor unless otherwise paid for.
 - 5. Cooperation with utility companies, Owner's representatives, or other Contractors employed by the Owner.
 - 6. Utility crossings, unless otherwise paid for.
 - 7. Utility relocation unless otherwise paid for.
 - 8. Minor items Such as replacement/relocation of mailboxes, guard rails, signs, rock walls, etc. where separate items are not provided.

- 9. Dewatering, unless otherwise paid for.
- 10. Steel and/or wood sheeting utilized by the Contractor other than sheeting left in place or removed when directed by the Engineer and paid for under a separate item.
- 11. Repair to utilities damaged as a result of Contractor operations
- 12. **Temporary water systems exceeding the quantity provided for on the Bid Schedule**, necessary for the Contactor to perform the work without disruption to the existing facilities, <u>will not</u> be measured for payment.
- 13. Maintenance of Sanitary/Storm Sewerage flows (by-pass pumping) is subsidiary to sewer construction, unless otherwise included in the bid schedule for payment.
- 14. Temporary roadway stabilization materials (crushed gravel, pavement millings or reclaimed asphalt product).
- 15. Prosecution of Work in accordance with project specifications.
- 16. Dust control is included in Item 6.5B and is required on a daily basis.
- 17. Any work shown or described on the drawings or in the Contract Documents, for which no pay item exists, shall be considered subsidiary to the project and will not constitute additional payment.

1.9 DESCRIPTION OF PAY ITEMS

- A. The following sections describe the measurement of and payment for the work to be done under the respective items listed in the Bid (form).
- B. Each unit or lump sum price stated in the Bid (form) shall constitute full compensation, as herein specified, for each item of the work completed.
- C. Refer to Division E NHDOT Technical Specifications, and Amendments for Measurement and Payment of unit items not described in this Section.
- D. Measurement and Payment of unit items that are not included in the NHDOT Standard Specifications or Amended Sections and Special Provisions of Division E are described, as follows:

ITEM NO. 1X: MAINTENANCE OF COMBINED SANITARY AND STORM SEWER FLOW

- A. Method of Measurement
 - 1. Maintenance of combined sewer flows will be measured as a lump sum item
 - 2. Measurement will be based on the percentage of work completed as determined by the Engineer.
 - 3. Note: "X" Equals:
 - A. Base Bid
 - B. Add Alternate #1
- B. Basis of Payment
 - 1. Maintenance of combined sewer flows will be paid at the contract unit price, complete and in place.
 - 2. Said payment will be considered full compensation to furnish all materials, tools, equipment and labor required to install all bypass piping and/or pumping systems necessary to construct new piping systems, including testing.

- 3. Said payment will also be considered full compensation for all pumps, piping, electrical systems, fuel, alarms, and control systems.
- 4. Said payment will also be considered full compensation for completing all temporary connections from new work to existing systems including, excavation, PVC piping, fittings, concrete encasement (as required), and flexible couplings required to complete the connection.

ITEM NO. 1.1. XX: FURNISH AND INSTALL SEWER PIPE (ALL SIZES)

- A. Method of Measurement:
 - 1. The length of pipe **for sewer mains** shall be measured by the linear foot along the horizontal centerline of the pipe including service connection fittings as laid from the inside edge of the manhole to the inside edge of the next manhole.
 - 2. The length of pipe **for service laterals** shall be measured horizontally along the top of the completed pipe over its centerline within the limits indicated on the drawings or as ordered. Vertical cleanout pipe and fittings will be considered subsidiary to the service lateral items and will not be measured for additional payment.
 - a. Lateral work complete within the City Right of way shall be paid under Item 1.1.06A (generally to behind the proposed sidewalk, including the clean out).
 - b. Lateral work complete on private property shall be paid under Item 1.1.06B (generally from the back of proposed sidewalk to the limits shown on the drawings or as directed, including additional clean out(s) as shown in the drawings).
 - 3. Note: XX=pipe diameter in inches
- B. Basis of Payment:
 - 1. Pipe shall be paid for at the Contract price per foot.
 - 2. Said unit price shall constitute full compensation for furnishing and installing all materials, fittings and adapters, stubs with cap ends, sewer lateral cleanouts, materials, labor, equipment and tools necessary for hauling, handling, laying, jointing and testing pipe, complete and in place as shown on the drawings.
 - 3. Said unit price payment will also be considered full compensation for all necessary clearing and grubbing, earth excavation, removal of existing structures, existing (non asbestos) pipe removal and disposal, bedding, backfill, compaction, rigid insulation (as directed), cleaning and other incidental items, such as, segregation of suitable backfill materials, stockpiling and placement of pavement reclamation materials and roadway gravels, and the disposal of excess fill material.
 - 4. Said unit price shall include full compensation for installing and maintaining trench dewatering systems (i.e. trench sump dewatering) required to install the pipe in the dry as specified.
 - 5. WellPoint (engineered) dewatering systems specified under Section 026540 used to pre-drain soils prior to final excavation and to install sewers in the dry will be paid as Item 1.12.

- 6. Said unit prices for each pipe bid item shall also constitute full compensation for the following:
 - a. Maintenance of existing sewer service through temporary connections or bypass pumping, unless paid for under a separate item.
 - b. Restoration of all property to pre-construction conditions.
 - c. Restoration of curb to pre-construction conditions (unless expressly shown as paid for under a separate bid item).
- 7. Said price shall also include manhole corings, fittings, adapters, and joining not covered under a separate bid item.
- 8. Said unit price shall also include any fittings or adapters required to repair existing sewer damaged during construction unless paid under separate item.
- 9. Said unit price shall include furnishing and installing "Inserta-Tee" connections for Sewer Services on mains greater than or equal to 15 inches (all types).
- 10. Maintenance of existing sewer flows will be paid under Item 1.0.
- 11. Said unit price shall also include full compensation for coordination with utility companies, for the relocation of utilities, including but not limited to water service pipes (less than 6 inch in diameter), gas, drain, electric and telephone, which interfere with the proposed sewer, unless payment is provided for under another item.
- 12. Said unit price shall also constitute full compensation for the removal and replacement of bushes, plantings, sod, loaming and reseeding of grassed areas disturbed by the Contractor's operations, and replacement of curb, unless payment is provided for under another item.
- 13. Management of surplus soils for use as trench backfill to replace asphalt, brick, and concrete removed from roadway will be paid under Item 1.15B.
- 14. **Payment for sewer mains** shall be broken down in accordance with the following percentages:
 - a. Sewer main line in place and backfilled 90%
 - b. Sewer main line successfully cleaned and tested 10%. A sewer main will only be considered tested when pressure, deflection and lamping tests have all been completed and accepted by the Owner, Engineer and NHDES.
- 15. **Payment for service laterals** shall be broken down in accordance with the following percentages:
 - a. Service lateral in place and backfilled 90%.
 - b. Service laterals successfully cleaned, tested and re-connected to the existing service (for live connections), and restoration complete 10%.

ITEM NO. 1.1.06C: FURNISH AND INSTALL SEWER SERVICE CHIMNEY

- A. Method of Measurement
 - 1. Sewer service chimneys shall be measured per each installed as directed by the Engineer.

- B. Basis of Payment
 - 1. Sewer service chimneys shall be paid for at the contract unit price per each installed as directed by the Engineer.
 - 2. Said unit price shall be considered full compensation for furnishing and installing sewer chimneys as shown on the drawings including: excavation, all required fittings (tees, single or double wyes, and plugs), 6" PVC pipe (all lengths), permanent vertical form (sonnet tube), concrete encasement (as required), sand bedding material and insulation (as required).
 - 3. Said unit price shall be considered full compensation for furnishing all tools, materials, equipment and labor required to complete the work described above
 - 4. Chimneys installed not directed by the Engineer will not be considered for payment and will be incidental to the work being complete.

ITEM NO. 1.1.06D: FURNISH AND INSTALL CAST IRON COVERS FOR SEWER SERVICE CLEANOUTS

- A. Method of Measurement:
 - 1. Cast iron covers for sewer service cleanouts in paved areas will be measured by each cover installed.
- B. Basis of Payment:
 - 1. Cast iron covers for sewer service cleanouts in paved areas shall be paid for at the contract price per each
 - 2. Said unit price shall constitute full compensation for the furnishing of all materials including labor, equipment and tools necessary for hauling, handling and installing covers complete and in place.
 - 3. Said unit price shall constitute full compensation for all necessary excavation, backfill, compaction, sheeting, bracing, cleaning and other incidental work not specifically included for payment under other items.
 - 4. Said unit price shall constitute full compensation for the removal and replacement of curbs, bushes, plantings, sod, loaming and reseeding of grassed areas disturbed by the Contractor's operations, unless otherwise paid for.

ITEM NO. 1.5. X: FURNISH AND INSTALL SEWER MANHOLES (ALL DIAMETERS)

- A. Method of Measurement:
 - 1. Sewer manholes will be measured in vertical feet from the invert of the lowest sewer pipe in the manhole to the top of the manhole frames.
 - 2. Note: X=inside diameter in feet
- B. Basis of Payment:
 - 1. Manholes shall be paid at the Contract unit price per vertical foot.
 - 2. Said unit price shall be considered full compensation for furnishing and installing precast sections or cast in place structures with penetrations and boots, frames and covers, screened gravel subbase, concrete and masonry materials, water-proofing as specified, construction fabric, manhole testing, and all work incidental thereto.

- 3. Said unit price shall be considered full compensation for the furnishing of materials, labor, tools and equipment necessary to complete the above described work.
- 4. Said unit price shall constitute full payment to <u>raise structures once</u>, to binder course grade or finish elevation as directed.
- 5. Said unit price shall also constitute payment for all field core penetrations, sealing devices, (i.e., boots) and stub pipes and caps for future connections of the size and type as shown on the drawings and as specified herein.
- 6. Said unit cost shall include full compensation for additional concrete or brick masonry as necessary to construct inverts and special structures as shown on the Drawings.
- 7. Said unit price shall be considered full compensation for maintenance of sewer flows through bypass pumping, unless paid for under a separate item.
- 8. Said unit price shall include full compensation for installing and maintaining trench dewatering systems (i.e. trench sump dewatering) required to install the pipe in the dry as specified.
- 9. WellPoint (engineered) dewatering systems specified under Section 026540 used to pre-drain soils prior to final excavation and to install sewers in the dry will be paid as Item 1.12.
- 10. Removal and disposal of existing structures for the installation of new structures shall be incidental to this item.
- 11. Actual payment for these shall be broken down in accordance with the following percentages:
 - a. Manhole in place and backfilled 80%.
 - b. Manhole successfully tested 10%.
 - c. Manhole cleaned and invert built -10%

ITEM NO. 1.5A: ADDITIONAL ADJUSTMENT OF SEWER MANHOLE COVERS (TO FINAL PAVEMENT ELEVATION)

- A. Method of Measurement
 - 1. Adjusting new and existing sewer manhole frame and cover assemblies to will be measured per each additional adjustment to final pavement elevation.
 - 2. The initial adjustment of sewer manhole frames and covers to binder grade and/or finish grade, if directed, is subsidiary to sewer manholes, Item 1.5.X, and will not be measured for payment.
 - 3. Sewer manhole frames and covers adjusted for the contractor's convenience will not be measured for payment.
- B. Method of Payment
 - 1. Payment under this item will be at the contract unit price for each structure that requires a second adjustment to finish elevation.
 - 2. Said unit price shall constitute full payment for demolition required to uncover the existing frame and cover, removal and replacement of existing brick, mortar and concrete, adjusting frame and cover to line and/or grade, replacement of gravels and pavement, and backfilling structure and compacting as required.

3. Said unit price shall be considered full compensation for furnishing the tools, materials, labor, and equipment necessary for adjusting sewer manhole frames and cover assemblies.

ITEM NO. 1.6: FURNISH AND INSTALL INSIDE DROP STRUCTURE FOR SEWER MANHOLE

- A. Method of Measurement:
 - 1. Drop structures for all diameter pipes will be measured by the vertical foot from the invert in to the lower invert, of the constructed drop connection.
- B. Basis of Payment:
 - 1. Payment under this item shall be at the Contract unit price per vertical foot.
 - 2. Said unit price will be considered full compensation for furnishing and installing internal drop structure, including pipe and fittings, stainless steel straps, holes and other modifications to manhole base and risers, and other features as shown on the drawings.

ITEM NO. 1.8X: FURNISH AND INSTALL GEOTEXTILE (Fabric & Geogrid), WHERE DIRECTED

- A. Method of Measurement
 - 1. Geotextile fabric and geogrid installed to the limits shown on the drawing, and where directed, shall be measured per linear foot for installations complete and in place as shown on the drawings.
 - 2. Double layers of geogrid (below catch basin and/or manhole structures) will be measured for each layer (2 times the linear foot measurement)
 - 3. Note: X shall be the following:
 - A = Geotextile fabric around sewer bedding
 - B = Geogrid trench stabilization under pipe or structures
- B. Basis for Payment:
 - 1. Payment of geotextile fabric and geogrid installed to the limits shown on the drawing, and where directed, shall be paid for at the Contract unit price per linear foot, complete and installed as shown on the drawings.
 - 2. Said unit price shall constitute full compensation for the furnishing of all materials, labor, equipment, and tools necessary for the installation and maintenance of construction fabric.
 - 3. Said unit price shall constitute full compensation for any "lost production" time incurred as a result of the installation.

ITEM NO. 1.9X: FIELD CORE SEWER MANHOLES AND FOUNDATIONS (FOR RELOCATED SERVICES) INCLUDING PIPE CONNECTION SYSTEM

- A. Method of Measurement:
 - 1. The coring shall be measured for each field coring as noted on the Drawings or at the direction of the Engineer.
 - 2. Note: X shall be the following:
 - A = 4" through 15" field cores
 - B = 18" through 30" field cores
 - C = Field core through stone or granite foundation

- 3. Foundation cores shall only be measured for payment after successful inspection by the City of Portsmouth Plumbing Inspector.
- B. Basis of Payment:
 - 1. Payment under this item shall be at the Contract unit price for each coring in the appropriate diameter range.
 - 2. Said unit price will be considered full compensation for furnishing and installing the coring including fittings, stainless steel straps, holes and other modifications to manholes.
 - 3. Payment under this item shall constitute full compensation for all materials, equipment, labor and tools necessary to complete the work described.
 - 4. Said payment shall be considered full compensation for coordination with homeowners to schedule work and to coordinate inspection of foundation core by the City of Portsmouth Plumbing Inspector.

ITEM NO. 1.10: REMOVE SEWER MANHOLES

- A. Method of Measurement:
 - 1. Removal of sewer manholes shall be measured as a single unit for each manhole removed as shown on the drawings, or as directed.
 - 2. Measurement will only be considered if more than half the width of the structure is outside normal excavation limits for any proposed utility.
 - 3. Normal excavation limits is defined as excavation pay limits specified in the construction documents plus 1' either side.
 - 4. Structures removed that do not meet the criteria outlined above will not be measured for payment and will be subsidiary to said utility work being completed.
- B. Basis of Payment:
 - 1. Payment under this item shall be at the Contract unit price for each manhole removed in accordance with the drawings and specifications.
 - 2. Payment under this item shall constitute full compensation for all materials, equipment, labor and tools necessary to remove and properly dispose of existing structures
 - 3. Payment shall also be considered full compensation for compacted granular backfill required to replace the removed structure.
 - 4. Structures removed and replaced with new structures (or pipe) will not be considered for payment under this item.
 - 5. Payment shall include cutting and capping (or plugging) existing lines in and out of the structure where abandoned.

ITEM NO. 1.11: FURNISH AND INSTALL FLOWABLE FILL

- A. Method of Measurement:
 - 1. Flowable fill shall be measured per cubic yards in place, as shown on the Drawings or as ordered.
- B. Basis of Payment:
 - 1. Flowable fill shall be paid for at the Contract unit price per cubic yard.

- 2. Said unit price shall constitute full compensation for the furnishing of all material, labor, equipment and tools necessary for pumping flow fill into the cavity of abandoned pipe, to a depth not less than 85% of the pipe depth.
- 3. Said unit price shall also be considered full compensation to provide a written narrative and/or schematic describing ports of entry for flow fill and how calculations will be made to determine that pipe is adequately filled.
- 4. Said unit price shall be considered full compensation for all materials, tools, equipment, and labor required to construct bulkheads, fill ports, and vent ports, as required including excavation to expose all parts and access points at the time of placing flow fill.
- 5. Payment will be considered full compensation for any excavation and backfill required to access limits of pipe abandonments to construct bulkheads and ports as required.
- 6. **Payment for flowable fill** shall be broken down in accordance with the following percentages:
 - a. Flowable fill placed 80%
 - b. Flowable fill verified in place 20%

ITEM NO. 1.12: WELLPOINT DEWATERING SYSTEM

- A. Method of Measurement:
 - 1. The wellpoint dewatering system will be measured by the linear foot, along the projected centerline of the sewer main to the nearest 1.0 foot.
 - a. There will be no additional measurements for parallel header pipes installed on either side of the roadway.
 - 2. Well point systems at locations not receiving prior approval by the Engineer will not be measured for payment.
- B. Basis of Payment:
 - 1. The well point dewatering system will be paid for at the contract unit price per linear foot.
 - 2. Payment will be considered full compensation for all materials, equipment, tools and labor to pre-drain soils using a wellpoint dewatering system in accordance with Section 02650. Payment for trench dewatering using sumps is subsidiary to pipe installations and will not be paid under this item.
 - 3. Said payment will be considered full compensation for installation, operation, and maintenance of, pumps, wellpoints, temporary pipe, temporary observation wells, discharge controls and other systems required to lower groundwater below the bottom of the trench as described in the specifications.
 - 4. Payment will also be considered full compensation for preparation and submittal of an initial dewatering plan and the required discharge permits, if required.
 - 5. Payment will also be considered full compensation for any loss in production for the sewer installation associated with installation, operation, and maintenance of the pre-drain dewatering system.

ITEM NO. 1.13: SHEETING

- A. Method of Measurement:
 - 1. Sheeting, where directed, will be measured by the square foot for sheeting installed, per an approved plan in accordance with Section 02369.
 - 2. Said measurement will be the nominal width times the depth, from the pipe invert to the ground surface.
 - 3. Steel plates driven alongside trench boxes, or other conventional excavation shoring systems are subsidiary to pipe installations and will not be measured for payment.
- B. Basis of Payment:
 - 1. Sheeting, where directed, will be paid at the Contract unit price per square foot for sheeting installed per an approved plan in accordance with Section 02369.
 - 2. Said unit price shall be considered full compensation for the design and submittal of an approved sheeting plan to accomplish the objectives described herein and as deemed necessary.

ITEM NO. 1.15A: HEALTH AND SAFETY PLAN

- A. Method of Measurement:
 - 1. The Health and Safety Plan (HASP) will be measured as a lump sum unit complete, as described in Section 13710.
- B. Basis of Payment:
 - 1. The Contractor will prepare a HASP which will identify procedures and protocols for handling regulated sols or groundwater, if encountered. The HASP will be paid at the contract unit price in accordance with the following percentages:
 - a. Preparation of the HASP 70%
 - b. Delivery of the Closeout Safety Report 30%
 - 2. Said unit price will be considered full compensation for the work as described in Section 13710 - Health and Safety Plan requirements, including air monitoring equipment and Personal Protection Equipment (PPE) identified within Section 13170.

ITEM NO. 1.15B.X: MANAGEMENT OF SOILS & MATERIALS

- A. Method of Measurement:
 - 1. Management of Soils and materials including regulated soils and materials, unregulated soils, surplus soils, surplus materials and separation of materials will be measured will be measured as a lump sum unit.
 - 2. Note: "X" Equals:
 - A. Base Bid
 - B. Add Alternate #1
- B. Basis of Payment:
 - 1. Management of Soils including regulated soils and materials, un-regulated soils, surplus soils, surplus materials and separation of materials will be paid for at the contract unit price per lump sum based on percent complete.

- 2. Said unit price will be considered full compensation for all activities associated with management of soils, including:
 - a. Identification and characterization of soil regulated by the State of New Hampshire Department of Environmental Services (NHDES).
 - b. Segregation of regulated soils from non-regulated soils.
 - c. Incorporating regulated soils back into the project as backfill trenches wherever possible.
 - d. Coordination with 3rd party for analytical testing of soils, where directed.
 - e. Maintenance of stockpiles and material staging areas in accordance with applicable state and federal regulations.
 - f. Trucking and disposal of non-regulated surplus materials including exempt materials such as pavement, concrete, masonry, stumps, brush, etc.
 - g. Said payment will also be considered full compensation for covering regulated soils and materials to prevent leaching or migration of contaminants into ground water.
- 3. Trucking and disposal of surplus regulated soils and materials is included in items 1.15C and 1.15D and is not included in this item.
- 4. Said unit price shall be considered full compensation for management of surplus soils to be used as common fill to replace asphalt, brick, and concrete removed during utility installations.

ITEM NO. 1.15C: LOAD AND HAUL SURPLUS REGULATED SOILS & MATERIALS (WHERE DIRECTED)

- A. Method of Measurement:
 - 1. Load and Haul surplus regulated soils and materials (where directed) will be measured by the ton based on weight slips from a certified scale at a landfill disposal facility that is approved by the Owner. Copies of slips shall be provided.
 - 2. Measurement will include trucking within 30 miles (one way) of the project site (Turnkey, Rochester NH). Measurement for disposal sites less or greater than 30 miles will be based on the proportionate distances as follows:
 - Ton delivered x Actual distance/30 miles
 - 3. Loading, Hauling and Disposal of non-regulated soils will not be measured for payment
- B. Basis of Payment:
 - 1. Loading and hauling surplus regulated soils and materials (where directed) will be paid for at the Contract Unit Price per ton delivered to disposal location approved by the Owner.
 - 2. Said unit price shall be considered full compensation for all materials, labor and equipment necessary for loading and hauling to the approved disposal site.
 - 3. Said payment will be considered full compensation for decontamination and cleanup of equipment and staging areas if needed.
 - 4. Disposal of regulated soils and materials (where directed) is included in Item 1.15D and is not included in this item.

ITEM NO. 1.15D: DISPOSAL OF REGULATED SOILS & MATERIALS (WHERE DIRECTED)

- A. Method of Measurement:
 - 1. Disposal of regulated soils and materials will be measured by the ton based on weight slips from a certified scale at landfill disposal facility approved by the Owner. Copies of slips shall be provided.
- B. Basis of Payment:
 - 1. Disposal of contaminated soils and materials will be paid for at the Contract Unit Price per ton delivered to the approved disposal location.

ITEM NO. 1.15E.X: ANALYTICAL TESTING OF SOILS (WHERE DIRECTED)

- A. Method of Measurement:
 - 1. Analytical testing of soils (where directed) will be measured as an allowance, based on the dollar amount of invoices from an approved 3rd party testing company experienced with NHDES soil disposal regulations, submitted without Contractor markup.
 - 2. The dollar limit (allowance) prescribed in the Bid Schedule shall not limit the Engineer or Owner in determination of the value of the work.
 - 3. Analytical testing not approved by the Owner will not be measured.
 - 4. Note: "X" Equals:
 - A. Base Bid
 - B. Add Alternate #1
 - C. Add Alternate #2
- B. Basis of Payment:
 - 1. Payment for Analytical testing of soils will be based on actual invoices from approved 3rd party testing company experienced with NHDES soil disposal regulations. Payment shall be without markup.
 - 2. Coordination of 3rd party testing (where directed) is included in Item 1.15B and is not included in this item.

ITEM NO. 1.15F.X: DISPOSAL OF REGULATED GROUNDWATER (WHERE DIRECTED)

- A. Method of Measurement:
 - 1. Disposal of regulated groundwater will be measured in accordance with General Conditions Article 17, the same manner as extra work. An allowance has been included in the Bid Schedule.
 - 2. Groundwater that can be discharged to sanitary or storm sewers using temporary erosion and silt control measures will not be measured for payment.
 - 3. Note: "X" Equals:
 - A. Base Bid
 - B. Add Alternate #1
- B. Basis of Payment:
 - 1. Disposal of regulated groundwater will be on a dollar amount basis in accordance with General Conditions Article 10. The dollar limit (allowance) prescribed in the Bid Schedule shall not limit the Engineer or Owner in determination of the value of the work.

ITEM NO. 1.16X: REWORK OF INTERIOR PLUMBING

- A. Method of Measurement:
 - 1. Work authorized under this item will be measured in the same manner as extra work.
 - 2. An allowance has been included in the bid schedule.
 - 3. Note: "X" Equals:
 - A. Base Bid
 - B. Add Alternate #1
- B. Basis of Payment:
 - 1. Payment for work authorized will be made on a dollar basis as invoiced according to section 10 of the Contract General Conditions. The dollar limit (allowance) prescribed in the bid schedule shall not limit the Engineer, or Owner, in determination of the value of the work.
 - 2. Payment of the allowance in the bid schedule will not be on lump sum basis, only the amount determined for the value of the work will be paid.
 - 3. Payment for this work is limited to work inside the building walls. All other work shall be paid by separate items.
 - 4. Payment shall be considered full compensation for additional administrative, coordinating, and supervising costs incurred while directing the sub-contractor.

ITEM NO. 1.17: POST CONSTRUCTION VIDEO OF SEWERS

- A. Method of Measurement:
 - 1. Post-construction video of sewers, where directed, will be measured per the linear foot.
- B. Basis of Payment:
 - 1. Video inspection will be paid for at the Contract unit price per linear foot upon completion and submittal of DVD video record in accordance with Section 01382.

ITEM NO. 1.18: LOCATION OF SEWER SERVICES BY VIDEO INSPECTION

- A. Method of Measurement:
 - 1. Location of sewer services by video inspection and locator shall be measured for each service located.
 - 2. Video location, if completed by the City of Portsmouth, will not be measured for payment.
- B. Basis of Payment:
 - 1. Location of sewer services shall be paid at the Contract unit price for each service successfully located and staked on the ground.
 - 2. Said unit price shall constitute full compensation for coordinating with the homeowner to access the sewer service, securing a point of entry, televising to determine location and depth at the specified points, recording specified measurements and providing the information as required by the Engineer, removal of television equipment, performing any necessary cleanup on private property as a result of televising, restoring the point of entry to the existing condition.

- 3. Said unit prices shall also constitute full compensation for the maintenance of existing sewer service flow.
- 4. This work does not include cleaning, jetting, or other methods required to remove obstructions from the sewer service. If it is not possible to televise the sewer service, the Contractor will notify the Engineer of this and other means of locating the sewer service may be necessary (including but not limited to test pits under Item 6.4, as approved by the Engineer).
- 5. If it is not possible to gain access, the Contractor will notify the Engineer of this and other means of locating the sewer service may be necessary (including but not limited to test pits under Item 6.4, as approved by the Engineer).

ITEM NO. 3.X.YY: FURNISH AND INSTALL DUCTILE IRON WATER PIPE (ALL SIZES)

- A. Method of Measurement:
 - 1. Ductile iron pipe shall be measured per linear foot.
 - 2. Pipe shall be measured along the horizontal centerline of the pipe as laid.
 - 3. No deduction shall be made for the space occupied by fittings.
 - 4. Note: X=1 DI
 - X=2 C-900
 - YY=pipe diameter in inches
 - 5. Six inch (6") branch pipe for hydrants is included in Item 3.6A and will not be measured under this item
- B. Basis of Payment:
 - 1. Pipe shall be paid for at the Contract price per linear foot.
 - 2. Said unit price shall constitute full compensation for furnishing and installing all materials (including polyethylene encasement), labor, equipment and tools necessary for hauling, handling, laying, jointing and testing pipe.
 - 3. Said unit price shall include all necessary earth excavation, bedding, sheeting, backfill, compaction, rigid insulation, cleaning and testing and other incidental work including removal, stockpiling and replacement of select reclaimed pavement and roadway gravels.
 - 4. Said unit price shall include full compensation for installing and maintaining trench dewatering systems, where necessary, to install the pipe in the dry, unless otherwise paid under a separate item.
 - 5. WellPoint (engineered) dewatering systems specified under Section 02650 used to pre-drain soils prior to final excavation and to install sewers in the dry will be paid as Item 1.12.
 - 6. Said price shall include any fittings, tees, wyes, adapters, couplings, thrust restraint fittings and thrust blocks, etc. not covered under separate bid items which are required to connect existing pipe to the proposed water main.
 - 7. Said unit price shall include full compensation for the relocation of utilities (including but not limited to gas, electric and telephone) which interfere with the proposed water main as shown on the Drawings, and for the repair of utilities damaged by the Contractor not paid for under a separate item

- 8. Said unit price shall include temporary piping, temporary facilities, and temporary services, not included or paid for under separate items, as necessary to maintain water service during construction.
- 9. Said unit price shall include removal and proper disposal of (non-asbestos) existing water main, in-line valves, and other items that are abandoned and are required to be removed. Unit price shall include caps for pipes abandoned in place.
- 10. Said unit price shall include restoration to existing conditions including, but not limited to driveways (paved and gravel), lawns, curbs, drainage, etc., unless specifically paid under a separate pay item.
- 11. Said unit price shall include sheeting and bracing (if necessary).
- 12. Said unit price shall include disinfection, de-chlorination, bacteriological, and pressure testing.
- 13. Said unit price shall include installation and removal of temporary blowoffs, including any corporations, pipes and shut-offs needed to flush lines and chlorinate the system when this cannot be accomplished through an existing hydrant.
- 14. Management of surplus soils for use as trench backfill to replace asphalt, brick, and concrete removed from roadway will be paid under Item 1.15B.
- 15. Actual payment for this item shall be broken down in accordance with the following percentages:
 - a. Water pipe in place and backfilled 90%
 - b. Water pipe successfully cleaned and tested, and cleanup and/or corrections completed 10%
- 16. Unit item will include compensation for sequencing required to connect new water systems into the existing systems not paid for under separate items.

ITEM NO. 3.3.X: FURNISH AND INSTALL COPPER SERVICE PIPE (ALL SIZES)

- A. Method of Measurement:
 - 1. Copper service pipe shall be measured per linear foot.
 - 2. Measurement shall be along the centerline of the pipe including the tapping saddle (if necessary), corporation stop, through the curb stop to the connection to the existing service line.
 - 3. Note: X=pipe diameter in inches
- B. Basis of Payment:
 - 1. Pipe shall be paid for at the Contract price per linear foot.
 - 2. Said unit price shall constitute full compensation for furnishing and installing all materials, labor, equipment and tools necessary for hauling, handling, laying, jointing and testing pipe.
 - 3. Said unit price shall also include all necessary earth excavation, dewatering, bedding, backfill, sheeting/bracing, compaction, cleaning and testing, and other incidental work.
 - 4. Said unit price shall also constitute full compensation for the removal and replacement of curbs, drives (paved and gravel), bushes, plantings, sod, and all necessary grading and reseeding of grassed areas disturbed by the Contractor's operations, not paid for under separate items.
5. Said unit price shall also constitute full payment for copper service pipes previously installed by contractor which require relocation or replacement because of proposed sewer or drain interferences.

ITEM NO. 3.4.X: FURNISH AND INSTALL WATER SERVICE CONNECTIONS

- A. Method of Measurement:
 - 1. Measurement for these items shall be for each service connection completed.
 - 2 Note: X=size in inches
- B. Basis of Payment:
 - 1. Water service connections complete in place shall be paid at the Contract price for each.
 - 2. Said unit price shall constitute payment for tapping water main wet or dry; furnishing and installing corporation, curb stop, curb box; cleaning, testing and connection to the existing service as shown on the Drawings and as specified herein.
 - 3. Said price shall be considered compensation for furnishing any fittings, tees, wyes, adapters, couplings, etc. not covered under separate bid items which are required to connect the proposed water main to the existing house service, where indicated on the Drawings.
 - 4. Said unit price shall also constitute full compensation for all necessary excavation, dewatering, backfill, compaction, sheeting, bracing, cleaning and other incidental work not specifically included for payment under other items.
 - 5. Said unit price shall also include removal and proper disposal of existing curb stops and boxes except for salvage quantity identified in Section 01611.
 - 6. Said unit price shall also constitute full compensation for the removal and replacement of curbs, drives (paved and gravel), bushes, plantings, sod, and all necessary grading and reseeding of grassed areas disturbed by the Contractor's operations not paid for under separate items.

ITEM NO. 3.5.XX: FURNISH AND INSTALL VALVE ASSEMBLIES (ALL SIZES) AND TYPES

- A. Method of Measurement:
 - 1. Valves shall be measured per each valve and valve box assembly installed.
 - 2. Note: XX=diameter in inches
- B. Basis of Payment:
 - 1. Valves shall be paid at the Contract unit price per each valve and valve box assembly installed.
 - 2. Said unit price shall be full compensation for furnishing all materials, labor, equipment, and tools; for installing, setting, joining; for restraining joints and/or thrust blocks; for testing all valves; and for all other incidental work and expenses.
 - 3. Said unit price shall also include one adjustment of valve boxes to pavement elevation (binder and wearing course).

ITEM NO. 3.5A: ADDITIONAL ADJUSTMENT OF GATE VALVE BOXES AND WATER SHUTOFFS (TO FINAL PAVEMENT ELEVATION)

- A. Method of Measurement:
 - 1. Valve box adjustment shall be measured per each adjusted to final pavement grade.
 - 2. Existing valve boxes shall be adjusted to binder pavement grade and to final pavement grade and will only be measured for payment once. The initial adjustment is subsidiary and will not be measured for payment.
 - 3. New riser sections shall be measured for payment under another item.
- B. Basis of Payment:
 - 1. Payment under this item shall be at the contract unit price for each valve box adjusted.
 - 2. Payment shall be considered full compensation for excavation, raising existing top section, cutting, removal and replacement of pavement to facilitate adjustment to the final elevation.
 - 3. Said unit price shall be considered full compensation for furnishing the tools, materials, labor, and equipment necessary for adjusting valve boxes and shut-off valves.

ITEM NO. 3.6A: FURNISH AND INSTALL HYDRANT ASSEMBLIES

- A. Method of Measurement:
 - 1. Hydrant assemblies shall be measured each assembly installed in the field as indicated on the Drawings or in a location as directed by the Engineer.
 - 2. Note: X = Hydrant type
 - A = Fire Hydrant Assemblies
 - B = Yard Hydrant Assembly
- B. Basis of Payment:
 - 1. Fire Hydrant assemblies shall be paid at the Contract price per each assembly, including tee at main, 6" ductile iron branch piping from the main gate valve, valve box, mechanical joint fittings, and thrust restraint as specified.
 - 2. Yard Hydrant Assemblies shall be paid at the Contract unit price per each installed including threaded DI cap connection to main, 2" copper tubing for branch piping, 2" corporation curb stop with box, required fittings, and thrust restraint as specified.
 - 3. Said unit price shall also constitute payment for tools, labor, materials, and equipment necessary to furnish and install hydrant, branch piping from the main line regardless of the length of branch piping installed, anchoring tee, gate valve (curb stop and box for yard hydrant), mechanical joint retainer glands, valve box, thrust block, cleaning, testing, and painting as shown on the Drawings and as specified herein.
 - 4. Said unit price shall also constitute full compensation for tools, materials, labor and equipment necessary for excavation, dewatering, backfill, compaction, sheeting, bracing, cleaning and other incidental work not specifically included for payment under other items.

- 5. Said unit price shall also constitute full compensation for the removal and replacement of curbs, drives (paved and gravel), bushes, plantings, sod, and all necessary grading and reseeding of grassed areas disturbed by the Contractor's operations, not paid for under separate unit items.
- 6. Said unit price shall also constitute payment for removal and disposal of existing hydrant as indicated on the Drawings. Existing hydrant assemblies including valves shall remain the property of the Owner and be delivered to the Owner, when requested.
- 7. Actual payment for this item shall be broken down in accordance with the following percentages:
 - a. Hydrant assembly in place and backfilled 70%
 - b. Hydrant assembly successfully cleaned and tested, and cleanup and/or corrections completed 30%

ITEM NO. 3.7: REMOVE EXISTING HYDRANT ASSEMBLIES

- A. Method of Measurement:
 - 1. Existing fire hydrants removed shall be measured per each.
 - 2. Existing hydrants removed for replacement with new hydrants within normal excavation limits (payable trench width plus 1' either side) will not be measured for payment under this item.
- B. Basis of Payment:
 - 1. Hydrant removal shall be paid for at the Contract unit price per each.
 - 2. Said unit price shall also constitute payment for removal and disposal of existing hydrant as indicated on the Drawings. Existing hydrant assemblies including the valves shall remain the property of the Owner and be delivered to the Owner, when requested.
 - 3. The said unit price for hydrant assemblies removed shall include furnishing and installing caps or plugs necessary to facilitate abandonment in place of existing main.
 - 4. Said unit price shall also constitute full compensation for all necessary excavation, dewatering, backfill, compaction, sheeting, bracing, cleaning and other incidental work not specifically included for payment under other items.
 - 5. Said unit price shall also constitute full compensation for the removal and replacement of curbs, drives (paved and gravel), bushes, plantings, sod, and all necessary grading and reseeding of grassed areas disturbed by the Contractor's operations.

ITEM NO. 3.8A: TEMPORARY WATER MAIN (POTABLE)

- A. Method of Measurement:
 - 1. Measurement for payment shall be by linear foot of street serviced by temporary systems, <u>up to the quantity provided for in the bid schedule</u>, for furnishing, installing, maintaining, and removing the temporary water system as measured along the roadway as described.
 - 2. Temporary water systems or piping exceeding the quantity provided for on the Bid Schedule <u>will not</u> be measured for payment.

- 3. Measurement shall be to the nearest foot.
- 4. Parallel temporary water mains will not be measured separately for payment.
- B. Basis of Payment:
 - 1. The temporary water system shall be paid for at the Contract unit price per linear foot of roadway where temporary systems are used.
 - 2. Said unit price shall constitute full compensation for the furnishing of all labor, equipment and materials associated with installing, maintaining, and removing the temporary water system in accordance with the Contract Drawings and Specifications.
 - 3. Said unit price shall include, but not be limited to; furnishing a detailed temporary water system design (including required submittals or resubmittals); excavating and backfilling to install mains across streets and driveways, including furnishing and installing temporary pavement; furnishing, installing, and removing hard-pack for driveway crossings; furnishing, installing, disinfecting, and maintaining the system; providing 24-hour maintenance of the system; removing of the system; furnishing and installing bituminous pavement for street and driveway crossings; restoring all surfaces to their original condition; and all other work required for or incidental to the satisfactory completion of this item.
 - 4. Twenty-five percent of the unit price shall be held until the entire system has been removed and all surfaces have been successfully restored.

ITEM NO. 3.8B: TEMPORARY WATER SERVICE CONNECTION (UP TO 2" DIAMETER)

- A. Method of Measurement:
 - 1. Measurement of temporary water service connections (up to 2") shall be per each service successfully connected to the tested temporary water main.
- B. Basis of Payment:
 - 1. Payment of temporary water service connections (up to 2") shall be per each.
 - 2. Said unit price shall constitute full compensation for the furnishing of all labor, equipment and materials (as approved in the temporary water system design, Item 3.7A) associated with each temporary connection in accordance with the Contract Drawings and Specification, including connection of temporary service underground at the existing curb stop.
 - 3. Said unit price shall include, but not be limited to; excavating and backfilling to install temporary services across sidewalks and driveways to prevent tripping and/or driving hazards, including furnishing and installing temporary pavement; furnishing, installing, and removing hard-pack to stabilize areas with pedestrian of vehicular traffic; flushing, restoring all surfaces to their original condition; and all other work required for or incidental to the satisfactory completion of this item.
 - 4. Payment shall be considered compensation for notification and coordination with property owners of the interruption in water service while the services are being transferred to and from the temporary water system. Additional payment will not be considered for any time lost or crew down time due to lack of notification and coordination with the owner.

- 5. Said unit price shall include protection of any temporary piping that is placed on the surface or buried and repair of said tubing upon notification
- 6. Twenty-five percent of the unit price shall be held until the entire system has been removed and all surfaces have been successfully restored.

ITEM NO. 3.8C: TEMPORARY WATER SERVICE CONNECTION (GREATER THAN <u>2" DIAMETER)</u>

- A. Method of Measurement:
 - 1. Measurement of temporary water service connections (greater than 2") shall be per each service successfully connected to the tested temporary water main.
- B. Basis of Payment:
 - 1. Payment of temporary water service connections (greater than 2") shall be per each.
 - 2. Said unit price shall constitute full compensation for the furnishing of all labor, equipment and materials (as approved in the temporary water system design, Item 3.7A) associated with each temporary connection in accordance with the Contract Drawings and Specification, including connection of temporary service underground at the existing curb stop.
 - 3. Said unit price shall include, but not be limited to; excavating and backfilling to install temporary services across sidewalks and driveways to prevent tripping and/or driving hazards, including furnishing and installing temporary pavement; furnishing, installing, and removing hard-pack to stabilize areas with pedestrian of vehicular traffic; flushing, restoring all surfaces to their original condition; and all other work required for or incidental to the satisfactory completion of this item.
 - 4. Payment shall be considered compensation for notification and coordination with property owners of the interruption in water service while the services are being transferred to and from the temporary water system. Additional payment will not be considered for any time lost or crew down time due to lack of notification and coordination with the owner.
 - 5. Said unit price shall include protection of any temporary tubing that is placed on the surface or buried and repair of said tubing upon notification
 - 6. Twenty-five percent of the unit price shall be held until the entire system has been removed and all surfaces have been successfully restored.

ITEM NO. 3.9: FURNISH AND INSTALL WATER SERVICE SADDLES (ALL SIZES)

- A. Method of Measurement:
 - 1. Water service saddles shall be measured per each service saddle installed where shown or as directed.
- B. Basis of Payment:
 - 1. Water service saddles complete in place shall be paid at the Contract unit price for each.
 - 2. Said unit price shall also constitute full compensation all tool, equipment, and labor required to furnishing and installing new service saddles, all additional excavation required to expose the entire pipe, dewatering,

backfill, compaction, sheeting, bracing, cleaning of pipe to exterior and other all incidental work not specifically included for payment under other items required to install service saddles in accordance with manufacturer's instructions.

ITEM NO. 6.1X: CONSTRUCTION VIBRATION MONITORING

- A. Method of Measurement:
 - 1. Construction vibration monitoring for this item will be measured for any additional monitoring that is beyond what is required by state and local ordinances, for blasting.
 - 2. Vibration monitoring for blasting will not be measured for payment under his item.
 - 3. Engineer must approve use of vibration monitoring prior to installation of monitoring devices. Vibration monitoring initialized prior to Engineer's approval will not be eligible for payment.
 - 4. Note: "X" Equals:
 - A. Base Bid
 - B. Add Alternate #1
- B. Basis of Payment:
 - 1. Payment for vibration monitoring shall be based on actual invoices from the subcontractor and submitted to the Engineer. <u>Payment shall be without markup</u>.
 - 2. Said allowance shall constitute full compensation for the furnishing of all labor, equipment and materials associated with providing vibration monitoring services in accordance with the Contract Drawings and Specifications.
 - 3. Said unit price shall include, but not be limited to; coordinating, scheduling, and paying for all services; providing support services for the vibration monitoring firm; and all other work required for or incidental to the satisfactory completion of this item.

ITEM NO. 6.2X: ARCHAEOLOGICAL MONITORING AND DELAYS

A. Method of Measurement:

5.

- 1. This item is intended to provide and pay for certain measures and delays which may be required during construction due to archaeologically sensitive areas within the project limits. Engineering judgment indicates that a reasonable estimated dollar allowance is appropriate in setting up the contract.
- 2. This item will be measured in terms of delay and potential remobilization within the project limits.
- 3. A delay of one hour will be measured as a single occurrence which will require a payment of \$800.00 lump sum.
- 4. Reimbursement cost for Archaeological Consultant (consultant to be approved by the City) will be at cost with 10% mark-up allowance for administration.
 - Note: "X" Equals:
 - A. Base Bid
 - B. Add Alternate #1

- B. Basis of Payment:
 - 1. The Contractor may be required to delay or cease operations in the archaeologically sensitive areas of the project as identified on the plans, under the direction of the Archaeological Representative.
 - 2. A qualified representative from an archaeological consulting firm shall be present during the removal of any existing materials. This person has the authority to instruct the Contractor to discontinue the work operation for the investigation and assessment of potential archaeological resources. Reimbursement cost for Archaeological Consultant (consultant to be approved by the City) will be at cost with 10% mark-up allowance for administration.
 - 3. The Contractor is to provide aid and assistance in assessing the potential resource, as practicable.
 - 4. The Contractor shall provide all necessary aid, assistance, traffic control, and maintenance of traffic measures necessary to make the assessment of significance and during the documentation period.
 - 5. If a delay is to occur, payment for work authorized under this section will be made as an \$800.00 lump sum payment per occurrence. The Contractor may need to provide a man (laborer), the piece of equipment performing the excavation activities, the operator of that piece of equipment, and employee of sufficient authority over the worksite to assist during these delays for as long as necessary.
 - 6. Work associated with providing aid and assistance in making an assessment and potential documentation will be subsidiary to the lump sum payment.
 - 7. All costs associated with mobilization and remobilizations associated with these delays are subsidiary to the payment per occurrence.
 - 8. Payment of traffic control and maintenance of traffic measures required will be paid under the appropriate item numbers.
 - 9. If the assessment and documentation of an occurrence requires that a man (laborer), a piece of equipment, and/or foreman be present following the initial hour delay period, these time and material costs will be paid for as stipulated in the General Conditions.
 - 10. No allowance for overtime pay will be allowed during the assessment and documentation period.
 - 11. The Bidder's attention is called to the dollar amount inserted in the proposal under these items, which dollar amount is the allowance set up for the special work. This figure must not be altered by the Bidder on the proposal, and must be included to obtain the grand total.
 - 12. Payment shall also include cost to retain the City's independent project archeologist to monitor work. Invoices shall be submitted for payment with no mark-up.

ITEM NO. 6.3: UNKNOWN UTILITY CROSSING

- A. Method of Measurement:
 - 1. Unknown utility crossing will be measured as a single unit for each utility pipe crossing that exceeds what normally can be anticipated, defined as follows:

- a. The Contractor can anticipate that each unit or building has one service lateral each for gas, sewer and water unless additional crossings are shown on the drawings. Additional utility crossings (more than one of each) will be measured for payment under this item.
- 2. Unmarked or mismarked utility crossings will not be measured for payment under this item unless they exceed what normally can be anticipated as defined in line 1.a above
- 3. Utility crossings, delineated or otherwise, indicated on the drawings will not be measured for payment under this item.
- 4. Repair of unknown/unmarked or mismarked utility crossings will be measured and paid under Item 6.4.
- B. Basis of Payment:
 - 1. Unknown utility crossing will be paid for at the contract unit price per each crossing as measured in A, above.
 - 2. Said unit price will be considered full compensation for the Contractor's crew, labor and equipment, and any lost time or production that is associated with the unknown utility crossing as identified in A, above.
 - 3. Repair of unknown utility will be paid for in accordance with Item 6E and is not included in the payment of this item.
 - 4. An unknown or mismarked utility will only be considered once for payment.

ITEM 6.4: REPAIR OF UNKNOWN UTILITIES OR MISMARKED UTILITIES

- A. Method of Measurement:
 - 1. Repair of unknown utilities or mismarked utilities will be measured as a single unit for each utility pipe that requires repair, regardless of the size or material of the utility conduit.
 - 2. To be eligible for measurement under this item, the Contractor shall review the utility discovered with the Owner's Representative to determine that the utility repairs are required.
 - 3. Repair of utilities that are marked by Dig-Safe or indicated on the drawings will not be measured for payment, unless they are 6-feet beyond the locations indicated as determined and measured by the Engineer.
- B. Basis of Payment:
 - 1. Repair of unknown utilities or mismarked utilities will be paid for at the contract unit price for each utility repaired as measured in A, above.
 - 2. To be eligible for payment under this item, the Contractor shall review the utility discovered with the Owner's Representative to determine that the utility repairs are required. Any utility repaired without approval from the Owner's Representative will not be considered for payment.
 - 3. Said unit price will be considered full compensation for all materials, equipment and labor, necessary to repair unknown or unmarked utilities to original or better condition using similar or compatible materials, as approved by the Engineer or Owner's representatives.

- 4. Repairs using dissimilar sizes or materials, or utility repairs that are not properly aligned as determined by the Engineer will not be considered for payment.
- 5. An unknown or mismarked utility will only be considered once for payment.

ITEM NO. 6.5: TRENCH LEDGE REMOVAL AND DISPOSAL

- A. Method of Measurement:
 - 1. Ledge removal and disposal shall be measured per cubic yard of ledge removed within payment limits indicated on the Drawings or as directed by the Engineer.
 - 2. Measurement beyond the limits indicated on the plans will only be considered if such limits have been authorized in writing by the Engineer, in which case measurement shall be made to the authorized limits.
 - 3. The field representative shall make field measurements for ledge removal either in place before excavation or by measuring the length and average depth of ledge removed.
 - 4. Payment width (w) for ledge excavation shall be as follows:
 - a. For pipes 15 inches nominal diameter or less, W shall be no more than 36 inches.
 - b. For pipes greater than 15 inches in nominal diameter, W shall be 24 inches plus pipe outside diameter (O.D.).
 - 5. Logs for borings taken along the project are recorded in the Appendix of this Contract.
 - 6. Boulders measuring less than two cubic yards will not be measured for payment.
 - 7. Ledge that breaks apart using standard excavating methos (i.e. excavator bucket) without significant additional effort or "wear and tear" as described in paragraph 1.1A.2 of Section 02224 will not be measured for payment.
- B. Basis of Payment:
 - 1. Ledge excavation shall be paid for at the Contract unit price per cubic yard.
 - 2. Said unit price shall constitute full compensation for the furnishing all labor, equipment, and materials associated with ledge excavation and disposal.
 - 3. Said unit price shall include full payment of the furnishing and installation of suitable backfill for trench.
 - 4. Said unit price shall also include full compensation for all permits, insurances, pre-blast surveys, blast monitoring etc. if the use of explosives is the selected method of ledge demolition.
 - 5. Boulders removed from the trench shall be removed from the work area immediately after measurement.
 - 6. Rock removal shall be consistent with current City Blasting Ordinance.

ITEM NO. 6.6X: ADDITIONAL EXCAVATION AND EXCAVATION OF UNSUITABLE MATERIALS

- A. Method of Measurement:
 - 1. Additional excavation below normal depth or excavation of unsuitable material below normal depth shall be measured per cubic yard, as ordered

by the Engineer. Unsuitable materials may include but not be limited to: peat, muck, stumps, wood debris, etc.

- 2. The volume shall be determined by multiplying the average pay width by the average length by the average depth as measured by the Engineer.
- 3. The quantities of additional excavation shall be cumulative; that is an increase on any part of the work shall offset a decrease on any other part of the work, and the final adjustment shall be based on the net increase or decrease for these items.
- 4. For changes in line or grade of the sewers or drain as directed by the Engineer, the first 1 foot depth of additional excavation shall be incidental to the pipe installation item. Additional depth exceeding 1 foot shall be measured for payment under this item.
- 5. Note: X shall be:
 - A Additional trench excavation (where directed)
 - B Excavation and disposal of unsuitable materials (un-regulated)
- 6. Additional excavation for roadway work shall be paid for under Item 6.6A.
- 7. Handling of contaminated soils will be as provided in Items 1.15B, 1.15C, and 1.15D and will not be measured for payment under this item.
- B. Basis of Payment:
 - 1. Additional excavation and excavation of unsuitable materials shall be paid for at the Contract unit price per cubic yard.
 - 2. Said unit price shall constitute full compensation for the furnishing of all material, labor, equipment and tools necessary for additional excavation and disposal of all unsuitable materials.
 - 3. Said unit price shall be considered full compensation for proper disposal of unsuitable materials.

ITEM NO. 6.7: FURNISH AND INSTALL ADDITIONAL SCREENED GRAVEL (CRUSHED STONE) (WHERE ORDERED BY THE ENGINEER)

- A. Method of Measurement:
 - 1. Additional screened gravel shall be measured per cubic yard measured in place after compaction, used as backfill below normal depth.
 - 2. Measurement shall be by multiplying the ordered width by the ordered length by the depth after compaction.
 - 3. Measured quantity shall be the same as that number of cubic yards of additional earth excavation required below normal depth which said gravel replaces.
 - 4. Screened gravel used for bedding pipe backfill unauthorized excavations, backfill rock excavations, replacing unsuitable trench material, or as indicated on the Drawings, for which appropriate payment items have been provided, shall not be included for payment under this item.
- B. Basis of Payment:
 - 1. Additional screened gravel shall be paid for at the Contract unit price per cubic yard.

2. Said unit price shall constitute full compensation for the furnishing of all materials, labor, equipment, and tools necessary for furnishing, placing and compacting screened gravel as specified.

ITEM NO. 6.8: EXPLORATORY TEST PIT EXCAVATION

- A. Method of Measurement:
 - 1. Test pits shall be measured per each individual test pit completed.
 - 2. Test pits will only be measured for payment if shown on the drawings or at locations approved by the Engineer. Test pits or exploratory excavation completed in the absence of the Engineer will not be considered for payment.
 - 3. Locations shown on the drawings are approximated and installation at these locations shall be coordinated with the Engineer.
 - 4. Test pits completed to locate individual sewer services shall not be paid for under this item unless previously approved by the Engineer. Unit Item 1.17 has been provided to locate individual sewer services
- B. Basis of Payment:
 - 1. Test pits shall be paid at the Contract unit price per each.
 - 2. Payment under this item shall be full compensation for furnishing all equipment, labor, and materials for excavation, location of existing utilities, backfill, property restoration and all else incidental for which separate payment is not provided for under other items.
 - 3. Payment for individual test pits exceeding 10 CY will constitute additional payment based on the proportional increase of the test pit excavation.
 - 4. Said unit price shall constitute full compensation for any repairs to existing utilities that result from exploratory test pit excavation.

ITEM NO. 6.9X: GEOTECHNICAL FIELD TESTING

- A. Method of Measurement:
 - 1. Field testing of subgrade and fill or backfill layers shall be measured for payment when directed by the Engineer and performed with satisfactory results.
 - 2. Tests for which results do not meet specified requirements shall not be considered for payment.
 - 3. Note: "X" Equals:
 - A. Base Bid
 - B. Add Alternate #1
- B. Basis of Payment:
 - 1. Payment for field testing shall be based on actual invoices from the testing agency and submitted to the Engineer. Payment shall be without markup.
 - 2. Work by the Contractor to coordinate and support testing shall be incidental.
 - 3. Gradation analysis and Proctor tests (i.e., laboratory work) for select aggregates shall be incidental to other items. Engineer may order additional Proctors/Gradations when sampling/test results vary (also incidental).

ITEM NO. 6.10 – 2" INCH THICK x 24" WIDE RIGID POLYSTYRENE INSULATION

- A. Method of Measurement:
 - 1. Rigid insulation installed as directed by the Engineer shall be measured by the linear foot along the centerline of the pipe to the nearest foot.
 - 2. Rigid insulation installed in areas other than that shown on the drawings or not previously approved by the Engineer will not be measured for payment.
- B. Basis of Payment:
 - 1. Rigid polystyrene insulation shall be paid at the contract price per linear foot.
 - 2. Said unit price shall constitute full compensation for furnishing and installing all materials, labor, equipment, and tools necessary for installation of insulation.

ITEM NO. 6.11 - CALCIUM CHLORIDE FOR DUST CONTROL

- A. Method of Measurement:
 - 1. The quantity of calcium chloride to be measured for payment shall be on a per pound basis as ordered and approved by the engineer.
 - 2. Water applications and street sweeping for dust control are included in Item and will not be measured under this Item.
 - 1. B. Basis of Payment Dust control shall be paid for at the Contract per unit price.
 - 2. Said unit price shall constitute full compensation for the furnishing of all labor, equipment and materials associated with providing dust control in accordance with the Contract Drawings and Specifications.
 - 3. Said unit price shall include, but not be limited to; furnishing and placing calcium chloride and all other work required for or incidental to the satisfactory completion of this item.

ITEM NO. 6.12X – CONTINGENCY

- A. Method of Measurement
 - 1. Extra work to be measured for payment shall be on an allowance basis and shall only be authorized by Change Order. This amount or a portion of this amount may only be used if additional scope and cost is required and only if it is authorized in advance by an executed Change Order.
 - 2. The actual amount approved will be as stated in the Change Order.
 - 3. Note: "X" Equals:
 - A. Base Bid
 - B. Add Alternate #1
- B. Basis of Payment
 - 1. Payment will be made for extra work as stipulated in the Change Order.

PART 2 - PRODUCTS

(NOT PART OF THIS SECTION)

PART 3 - EXECUTION

(NOT PART OF THIS SECTION)

FIELD REPORT

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Contractor's Application for Payment No. 10

Payment of:

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Application Period: June 27, 2009 to August 1, 2009 From Contractor: Contract: Contractor's Project No. Application Date: August 6, 2009 Via Engineer: Underwood Engineers, Inc.

Engineer's Project No.:

Owner's Project No. 01-08-08 **Funding Agency Project No.**

Application for Payment

	Change Order Summary		Payment Summar	y
Approved Change Orders			1. Orignal Contract Price	\$4,463,686.70
Number	Additions	Deductions	2. Net Change by Change Order	\$109,107.37
			3. Current Contract Price (Line 1±2)	\$4,572,794.07
#1 executed 12/12/08	\$82,207.37		4a Total Completed	\$3,668,435.80
#2 executed 3/08/09	\$26,900.00		4b. Total Stored	\$0.00
#3 executed	\$0.00	\$0.00	4. Total completed and Stored	\$3,668,435.80
			5a 5 % x Current Contract Price (Line 3)	\$228,639.70
			So. N x Stored Materials	\$0.00
			8. Total Retainage (Line 5a. + 5b.)	\$228,639.70
Totals:	\$109,107.37	\$0.00	Amount Eligible for Payment (Line 4-5)	\$3,439,796.10
Net Change by Change Order		\$109,107,37	Less Previous Payments	\$3,000,135.87
			8. Amount Due this Application (Line 6-7)	\$439,660.23
			9. Balance to Finish plus Retainage (Line3-6)	\$1,132,997.97

Contractor's Certifications

The undersigned Contractor certifies that: (1) all previous progress payments received from Owner on account of Work done under the Contract have been polied on account to discharge Contractor's legitimate obligations incurred in connection with Work covered by prior Applications for Payment; (2) title of all Work, materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to Owner at time of payment free and clear of all Liens, security interests and encumbrances (except such as are covered by a Bond acceptable to Owner indemnifying Owner against any such Liens, security interest or encumbrances); and (3) all Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

Contractor

ecommended by:	Underwood Engineers, Inc.	(Date)
Payment of	\$439,660	0.23
is approved by:	Owner	(Date)
Approved by:	N/A (Funding Agency)	(Date)

\$439.660.23

(Line 8 or other - attach explanation of other amount)

Approved by:

By:

N/A (Funding Agency) (Date)

(Date)

PAY APPLICATION

Prepared by: Underwood Engineers, Inc.

Contractor: Address:

Attn:

Printed on: 4/8/2022 8:33

Item No.	Item Description	Estimated Quantity	Units	Unit Cost	Total Cost	Quantity Installed this Period	Value Earned this Period	Quantity Installed Previous	Value Earned Previous	Quantity Installed to Date	Value Earned to Date	Materials Stored	Percent Earned
PART 1 - SEWER	1												
202.41A	Removal of existing pipe:	2030	LF	\$10.00	\$20,300.00			980.0	\$9,800.00	980.0	\$9,800.00		48.28%
202.43	Removal of existing asbestos cement (AC) sewer pipe:	50	LF	\$50.00	\$2,500.00								
202.5A	Removal of existing sewer manholes:	5	EA	\$350.00	\$1,750.00			9.0	\$3,150.00	9.0	\$3,150.00		180.00%
1A	6" SDR 35 sewer pipe (services): 80%	2895	LF	\$28.00	\$81,060.00			2155.5	\$60,354.00	2155.5	\$60,354.00		74.46%
1A	6" SDR 35 sewer pipe (services) (TESTED): 20%	2895	LF	\$7.00	\$20,265.00	179.0	\$1,253.00	1867.0	\$13,069.00	2046.0	\$14,322.00		70.67%
1B	8" SDR 35 sewer pipe: 80%	3915	LF	\$51.20	\$200,448.00			3849.0	\$197,068.80	3849.0	\$197,068.80		98.31%
1B	8" SDR 35 sewer pipe (TESTED): 20%	3915	LF	\$12.80	\$50,112.00			3770.0	\$48,256.00	3770.0	\$48,256.00		96.30%
1C	8" DR 25 sewer pipe: 80%	1210	LF	\$52.00	\$62,920.00		\cap	1227.0	\$63,804.00	1227.0	\$63,804.00		101.40%
1C	8" DR 25 sewer pipe (TESTED): 20%	1210	LF	\$13.00	\$15,730.00			17.0	\$221.00	17.0	\$221.00		1.40%
1D	Geotextile wrap around sewer bedding:	3975	LF	\$4.00	\$15,900.00		$(\cap))'$	667.0	\$2,668.00	667.0	\$2,668.00		16.78%
1E	Geotextile between bedding and blanket materials:	1200	LF	\$2.00	\$2,400.00			531.0	\$1,062.00	531.0	\$1,062.00		44.25%
2	Sewer manhole, 4' dia (including frame and cover): 70%	29	EA	\$1,540.00	\$44,660.00		ND	29.0	\$44,660.00	29.0	\$44,660.00		100.00%
2	Sewer manhole, 4' dia (TESTED): 10%	29	EA	\$220.00	\$6,380.00	$\overline{)}$] •	30.0	\$6,600.00	30.0	\$6,600.00		103.45%
2	Sewer manhole, 4' dia (INVERT CONSTRUCTED): 10%	29	EA	\$220.00	\$6,380.00	DU		12.0	\$2,640.00	12.0	\$2,640.00		41.38%
2	Sewer manhole, 4' dia (FRAME AT FINAL GRADE): 10%	29	EA	\$220.00	\$ 5,380.9 0								
3	Field core existing structures:	1	U	\$1,000.00	\$1,000,00	V		4.0	\$4,000.00	4.0	\$4,000.00		400.00%
4	Adjust existing sewer manhole covers and frames:	5	U	\$250.00	\$1,250.00								
5	Sewer main insulation:	500	SF*	\$3.00	\$1,500.00			167.0	\$501.00	167.0	\$501.00		33.40%
6	Predrained soil dewatering system:	2000	LF	\$0.01	\$20.00								
7	Trench Dam:	4	EA	\$250.00	\$1,000.00								
					\$541,955.00		\$1,253.00		\$457,853.80	84.71%	\$459,106.80		
PART 2 - WATEI	2												
202.41B	Remove existing water main:	965	LF	\$10.00	\$9,650.00			587.0	\$5,870.00	587.0	\$5,870.00		60.83%
11	Additional cost for removal of existing water in proposed gas trench:	4050	LF	\$8.00	\$32,400.00	1338.0	\$10,704.00	3116.0	\$24,928.00	4454.0	\$35,632.00		109.98%
12	Temporary water system (including services): 75%	400	LF	\$7.50	\$3,000.00			1230.0	\$9,225.00	1230.0	\$9,225.00		307.50%
12	Temporary water system (REMOVED): 25%	400	LF	\$2.50	\$1,000.00			1230.0	\$3,075.00	1230.0	\$3,075.00		307.50%
13A	4" and 6" ductile iron water main: 80%	430	LF	\$43.20	\$18,576.00			353.5	\$15,271.20	353.5	\$15,271.20		82.21%
13A	4" and 6" ductile iron water main (TESTED): 20%	430	LF	\$10.80	\$4,644.00	16.5	\$178.20	205.0	\$2,214.00	221.5	\$2,392.20		51.51%
13B	8" ductile iron water main: 80%	965	LF	\$44.00	\$42,460.00			728.5	\$32,054.00	728.5	\$32,054.00		75.49%
13B	8" ductile iron water main (TESTED): 20%	965	LF	\$11.00	\$10,615.00			728.5	\$8,013.50	728.5	\$8,013.50		75.49%
13C	10" and 12" ductile iron water main: 80%	5265	LF	\$52.80	\$277,992.00	50.0	\$2,640.00	5096.0	\$269,068.80	5146.0	\$271,708.80		97.74%
13C	10" and 12" ductile iron water main (TESTED): 20%	5265	LF	\$13.20	\$69,498.00			4080.0	\$53,856.00	4080.0	\$53,856.00		77.49%
14A	4" and 6" fittings:	14	EA	\$300.00	\$4,200.00	6.0	\$1,800.00	26.0	\$7,800.00	32.0	\$9,600.00		228.57%
14B	8" fittings:	28	EA	\$450.00	\$12,600.00			29.0	\$13,050.00	29.0	\$13,050.00		103.57%
14C	10" and 12" fittings:	44	EA	\$550.00	\$24,200.00	3.0	\$1,650.00	41.0	\$22,550.00	44.0	\$24,200.00		100.00%

Item No.	Item Description	Estimated Quantity	Units	Unit Cost	Total Cost	Quantity Installed this Period	Value Earned this Period	Quantity Installed Previous	Value Earned Previous	Quantity Installed to Date	Value Earned to Date	Materials Stored	Percent Earned
15A	4" and 6" valve and box:	18	EA	\$750.00	\$13,500.00			17.0	\$12,750.00	17.0	\$12,750.00		94.44%
15B	8" Valve and box:	15	EA	\$950.00	\$14,250.00			14.0	\$13,300.00	14.0	\$13,300.00		93.33%
15C	10" and 12" Valve and box:	10	EA	\$1,600.00	\$16,000.00			9.0	\$14,400.00	9.0	\$14,400.00		90.00%
16A	4" and 6" insert valve and box:	7	EA	\$4,400.00	\$30,800.00			9.0	\$39,600.00	9.0	\$39,600.00		128.57%
16B	8" insert valve and box:	6	EA	\$5,100.00	\$30,600.00			6.0	\$30,600.00	6.0	\$30,600.00		100.00%
16C	10" and 12" insert valve and box:	7	EA	\$11,500.00	\$80,500.00			6.0	\$69,000.00	6.0	\$69,000.00		85.71%
17A	1" corporation:	91	EA	\$250.00	\$22,750.00	26.0	\$6,500.00	64.0	\$16,000.00	90.0	\$22,500.00		98.90%
17B	2" corporation:	6	EA	\$350.00	\$2,100.00			7.0	\$2,450.00	7.0	\$2,450.00		116.67%
18A	1" Curb stop:	91	EA	\$250.00	\$22,750.00	26.0	\$6,500.00	64.0	\$16,000.00	90.0	\$22,500.00		98.90%
18B	2" Curb stop:	6	EA	\$400.00	\$2,400.00		<u></u>	7.0	\$2,800.00	7.0	\$2,800.00		116.67%
19A	1" plastic service water pipe:	2080	LF	\$20.00	\$41,600.00	640.0	\$12,800.00	1417.0	\$28,340.00	2057.0	\$41,140.00		98.89%
19B	2" plastic service water pipe:	145	LF	\$22.00	\$3,190.00	52.0	\$1,144.00	150.0	\$3,300.00	202.0	\$4,444.00		139.31%
20	Fire hydrants:	13	EA	\$1,900.00	\$24,700.00	3.0	\$5,700.00	11.0	\$20,900.00	14.0	\$26,600.00		107.69%
21	Removal of fire hydrants:	2	EA	\$350.00	\$700.00			2.0	\$700.00	2.0	\$700.00		100.00%
22	Water Main Insulation:	500	SF	\$3.00	\$1,500.00	$(\langle \langle \rangle) \rangle$							
23	Adjust existing valve boxes:	4	EA	\$100.00	\$400.00								
24	Gate valve box riser section:	4	EA	\$100.00	\$400.00	$\land \land \lor$	\$49 616 20		\$737 115 50	96.06%	\$786 731 70		
PART 3 - DRAINA	CF				- 1 1	$+ \vee -$	\$49,010.20		\$757,115.50	20.0070	\$700,751.70		
202 41C	Removal of existing drain pipe:	2000	IE	\$10.00	N soloho da	25.0	\$250.00	42.0	\$430.00	78.0	\$780.00		2 0.0%
202.41C	Removal of existing drain pipe.	10	EA	8350.00	\$3,500.00	3.0	\$1.050.00	43.0	\$450.00	6.0	\$780.00		60.00%
603.82204	basins: 4" & 6" plastic pipe (smooth interior):	800	LF	\$35.00	\$28,000.00	7.0	\$245.00	231.0	\$8.085.00	238.0	\$8,330.00		29.75%
603.82212	12" plastic pipe (smooth interior):	2675	LF	\$59.00	\$133,750,00	701.0	\$35,050,00	2022.0	\$101 100 00	2723.0	\$136 150 00		101 79%
603.82215	15" plastic pipe (smooth interior):	2450	LE	\$72.00	\$127,400,00	144.0	\$7 488 00	2215.0	\$115 180 00	2359.0	\$122,668,00		96 29%
603.82218	18" plastic pipe (smooth interior):	425	LF	\$56.00	\$23,800,00	3.0	\$168.00	388.5	\$21,756,00	391.5	\$21,924.00		92.12%
603.82221	21" plastic pipe (smooth interior):	980	LF	\$73.00	\$71.540.00	5.0	\$100.00	20012	\$21,750.00	57115	021,921100		,2.112,70
603.82224	24" plastic pipe (smooth interior):	100	LF	\$73.00	\$7,300.00	1037.0	\$75,701.00			1037.0	\$75,701.00		1037.00%
605.82151	6" underdrain with fabric around stone:	620	LF	\$18.00	\$11,160,00	679.0	\$12,222.00			679.0	\$12,222.00		109.52%
604.124	Catch basin type B - 4' Dia:	66	U	\$1,600.00	\$105,600.00	22.0	\$35,200.00	50.0	\$80,000.00	72.0	\$115,200.00		109.09%
604.125	Catch basin type B - 5' Dia:	1	U	\$2,000.00	\$2,000.00	1.0	\$2,000.00	1.0	\$2,000.00	2.0	\$4,000.00		200.00%
604.222	Drop inlet type B - 2' Dia:	1	U	\$1,200.00	\$1,200.00								
31	Catch basin protection:	155	EA	\$150.00	\$23,250.00	17.0	\$2,550.00	26.0	\$3,900.00	43.0	\$6,450.00		27.74%
604.324	4' Dia drain manhole:	14	EA	\$2,200.00	\$30,800.00	2.0	\$4,400.00	9.0	\$19,800.00	11.0	\$24,200.00		78.57%
604.4A	Adjust existing catch basin frame and grates:	20	EA	\$250.00	\$5,000.00			1.0	\$250.00	1.0	\$250.00		5.00%
604.4B	Modifying existing DMH's and CB's structures:	1	EA	\$1,500.00	\$1,500.00								
					\$595,800,00		\$176.424.00		\$353.551.00	88.95%	\$529,975,00		
PART 4 - ROADW	AV						<i>Q</i> ,						
203.31	Unclassified excavation - asphalt road, drives,	15560	SY	\$3.00	\$46,680.00	1120.0	\$3,360.00	14815.0	\$44,445.00	15935.0	\$47,805.00		102.41%
203.32	Unclassified excavation - concrete road	13300	SY	\$5.00	\$66 500 00			11386.0	\$56,930,00	11386.0	\$56,930,00		85.61%
203.33	Unclassified excavation - concrete walks and	7530	SY	\$5.00	\$37,650.00			4640.0	\$23,200.00	4640.0	\$23,200.00		61.62%
41	Temporary roadway gravels for construction	1	LS	\$10,000.00	\$10,000.00			75%	\$7,500.00	75%	\$7,500.00		75.00%
304.2	pnasing: Bankrun gravel:	11100	CV	\$12.00	\$133 200 00			8828.0	\$105.936.00	8828.0	\$105.936.00		70 520/
304.2	Crushed gravel - roads:	5550	CV	\$12.00	\$135,200.00			4652.0	\$74 422 00	4652.0	\$74 422 00		82 820/
304.35	Crushed gravel - driveways:	360	CY	\$20.00	\$7,200,00	32.0	\$640.00	128.5	\$2 570.00	4052.0	\$3 210 00		44 58%
100.44	Bituminous pavement (wearing course)	500		\$20.00	\$7,200.00	52.0	\$0 - 0.00	128.5	\$2,570.00	100.5	φ5,210.00		
403.11	machine method:	2435	ION	\$81.00	\$197,235.00								
403.11A**	Bituminous pavement (binder course) machine method:	5175	TON	\$71.00	\$367,425.00	118.0	\$8,378.00	1222.0	\$86,762.00	1340.0	\$95,140.00		61.77%
403.11A (escalation)*	Hand Method Pavement adjusted for Novemebr placement (November 17, 2008 Liquid asphalt index)	-	TON	\$85.75	-			1856.4	\$159,186.30	1856.4	\$159,186.30		-

Item No.	Item Description	Estimated Quantity	Units	Unit Cost	Total Cost	Quantity Installed this Period	Value Earned this Period	Quantity Installed Previous	Value Earned Previous	Quantity Installed to Date	Value Earned to Date	Materials Stored	Percent Earned
403.12**	Bituminous pavement - drives, sidewalks, and hand method (Including compensation for sidewalk concrete:	290	TON	\$145.00	\$42,050.00	180.0	\$26,100.00	451.0	\$65,395.00	631.0	\$91,495.00		297.41%
403.12 (escalation)*	Hand Method Pavement adjusted for Novemebr placement (November 17, 2008 Liquid asphalt index)	-	TON	\$159.75	-			149.5	\$23,882.63	149.5	\$23,882.63		-
403.12 (escalation)*	Hand Method Pavement adjusted for April placement (April 15, 2009 Liquid asphalt adjustmentp index)	-	TON	\$149.77	-		\cap	60.0	\$8,986.20	60.0	\$8,986.20		-
403.12 (escalation)*	Hand Method Pavement adjusted for May placement (May 19, 2009 Liquid asphalt adjustmentp index)	-	TON	\$145.27	-		\mathcal{O}	22.0	\$3,195.94	22.0	\$3,195.94		
608.28A	Concrete drives 8" thick:	80	SY	\$55.00	\$4,400.00	1		ſ					
632.0104	RPPM - 4" line:	50000	LF	\$0.15	\$7,500.00	\cap	$\langle \rangle \rangle \rangle$	8021.0	\$1,203.15	8021.0	\$1,203.15		16.04%
632.0108	RPPM - 8" line:	3300	LF	\$1.00	\$3,300.00	VAL	\mathbb{N}	556.0	\$556.00	556.0	\$556.00		16.85%
632.0118	RPPM - 18" line:	525	LF	\$3.00	\$1,575.00								
632.02	RPPM - crosswalk symbols:	16	EA	\$250.00	\$4,000.00	$ \rangle \rangle \rangle$							
42	Imprinted crosswalks:	860	SY	\$63.00	\$5 4 ,T80.00	5 m							
43	Brick crosswalks:	55	SY	\$125.00	\$6,875.00	۱ <u>۲</u>							
44	Parking meter posts:	30	LS	\$150.00	\$4,500)00	V		15.0	\$2,250.00	15.0	\$2,250.00		50.00%
					\$1,083,070.00		\$38,478.00		\$666,430.22	65.08%	\$704,908.22		
PART 5 - CURB A	ND SIDEWALK												
202.6	Granite curb removal for storage:	975	LF	\$8.00	\$7,800.00			224.0	\$1,792.00	224.0	\$1,792.00		22.97%
202.61	Removal of concrete and bituminous curb:	2250	LF	\$4.00	\$9,000.00			1382.0	\$5,528.00	1382.0	\$5,528.00		61.42%
304.35A	Crushed gravel - sidewalks:	1235	CY	\$20.00	\$24,700.00	430.6	\$8,612.00	1117.0	\$22,340.00	1547.6	\$30,952.00		125.31%
608.24	Concrete sidewalk 4" thick:	6640	SY	\$38.00	\$252,320.00	1822.0	\$69,236.00	3085.4	\$117,245.20	4907.4	\$186,481.20		73.91%
608.26	Concrete sidewalk 6" thick:	230	SY	\$42.00	\$9,660.00	23.8	\$999.60	94.0	\$3,948.00	117.8	\$4,947.60		51.22%
608.28	Concrete sidewalk 8" thick:	700	SY	\$48.00	\$33,600.00	736.9	\$35,371.20	208.6	\$10,012.80	945.5	\$45,384.00		135.07%
608.4	Brick sidewalk:	25	SY	\$125.00	\$3,125.00	13.0	\$1,625.00	6.5	\$812.50	19.5	\$2,437.50		78.00%
608.52	ADA compliant ramp panels (cast iron truncated domes):	52	EA	\$350.00	\$18,200.00	14.0	\$4,900.00	25.0	\$8,750.00	39.0	\$13,650.00		75.00%
609.01	Straight granite curb (5"x18"):	9400	LF	\$19.00	\$178,600.00			6789.0	\$128,991.00	6789.0	\$128,991.00		72.22%
609.01A	Straight granite curb (6"x24"):	100	LF	\$55.00	\$5,500.00	112.0	\$6,160.00	692.5	\$38,087.50	804.5	\$44,247.50		804.50%
609.02	Curved granite curb (5"x18"):	740	LF	\$30.00	\$22,200.00	31.0	\$930.00	651.5	\$19,545.00	682.5	\$20,475.00		92.23%
609.812	Bituminous curb (Type A):	85	LF	\$20.00	\$1,700.00								
					\$566,405.00		\$127,833.80		\$357,052.00	85.61%	\$484,885.80		
PART 6 - COMMO	ON IMPROVEMENTS												
50	Allowance for hiring an Arborist:	1	ALL	\$5,000.00	\$5,000.00	\$240.00	\$240.00	\$2,430.00	\$2,430.00	\$2,670.00	\$2,670.00		53.40%
201.22	Removal of large trees:	6	EA	\$550.00	\$3,300.00	4.0	\$2,200.00	7.0	\$3,850.00	11.0	\$6,050.00		183.33%
201.32	Tree trimming:	40	HR	\$125.00	\$5,000.00			52.5	\$6,562.50	52.5	\$6,562.50		131.25%
202.31	Fill abandoned pipe:	20	CY	\$150.00	\$3,000.00			3.0	\$450.00	3.0	\$450.00		15.00%
203.1	Common excavation:	19650	CY	\$8.00	\$157,200.00	384.0	\$3,072.00	15828.5	\$126,628.00	16212.5	\$129,700.00		82.51%
203.2	Rock excavation:	40	CY	\$25.00	\$1,000.00			45.9	\$1,147.50	45.9	\$1,147.50		114.75%
206.19	Common structure excavation - exploratory (test pit):	12	EA	\$350.00	\$4,200.00	3.0	\$1,050.00	25.0	\$8,750.00	28.0	\$9,800.00		233.33%
304.1	Sand:	435	CY	\$12.00	\$5,220.00	484.6	\$5,815.20	/8/.0	\$9,444.00	12/1.6	\$15,259.20		292.32%
304.4A	3/4" crushed stone:	375	CY	\$25.00	\$9,375.00	6102.50	¢102.50	183.6	\$4,590.00	183.6	\$4,590.00		48.96%
618.61	Uniformed officer with vehicle:	1	ALL	\$230,000.00	\$230,000.00	\$192.50	\$192.50	\$72,670.00	\$72,670.00	\$72,862.50	\$/2,862.50		31.68%
018.7	Flagger:	6300	нк	\$25.00	\$157,500.00	394.0	\$9,850.00	3773.5	\$94,557.50	4167.5	\$104,187.50		66.15%
619.1	Establish and maintain traffic control plan:	1	U	\$50,000.00	\$50,000.00			75.0%	\$37,500.00	/5.0%	\$37,500.00		75.00%
619.255	50%	2	U	\$10,000.00	\$20,000.00			2.0	\$20,000.00	2.0	\$20,000.00		100.00%
619.255	50%	2	U	\$10,000.00	\$20,000.00								
51A	Dust control - calcium chloride:	31030	LB	\$0.50	\$15,515.00	7050.0	\$3,525.00	49699.0	\$24,849.50	56749.0	\$28,374.50		182.88%
51B	Dust control - water:	515	HR	\$0.01	\$5.15	3.0	\$0.03	33.0	\$0.33	36.0	\$0.36		6.99%
51C	Dust control - street sweeper:	155	HR	\$0.01	\$1.55			16.0	\$0.16	16.0	\$0.16		10.32%
52	Allowance for geotechnical testing:	1	ALL	\$5,000.00	\$5,000.00	\$2,023.50	\$2,023.50	\$10,160.20	\$10,160.20	\$12,183.70	\$12,183.70		243.67%

Item No.	Item Description	Estimated Quantity	Units	Unit Cost	Total Cost	Quantity Installed this Period	Value Earned this Period	Quantity Installed Previous	Value Earned Previous	Quantity Installed to Date	Value Earned to Date	Materials Stored	Percent Earned
53	Adjust existing telephone and/or electric manhole covers and frames:	12	EA	\$350.00	\$4,200.00								
641	Loam & seed:	11575	SY	\$3.00	\$34,725.00	4074.0	\$12,222.00	3007.0	\$9,021.00	7081.0	\$21,243.00		61.17%
652.10	Deciduous tree (non-invasive):	5	EA	\$550.00	\$2,750.00								
692	Misc. work & cleanup:	1	LS	\$110,000.00	\$110,000.00			75%	\$82,500.00	75%	\$82,500.00		75.00%
					\$842,991.70		\$40,190.23		\$514,890.69	65.85%	\$555,080.92		
PART 7 - GAS IN	STALLATION												
54	Excavation and backfill - gas main:	126	HR	\$115.00	\$14,490.00	51.0	\$5,865.00	285.0	\$32,775.00	336.0	\$38,640.00		266.67%
	·				\$14,490.00		\$5,865.00		\$32,775.00		\$38,640.00		

			Original	Contract Total:	\$4,463,686.70	\$439,660.23		\$3,119,668.21		\$3,559,328.44	79.74%
CHANGE ORDER	RS		0	-			-		_		
Change Order #1											
23	Adjusting valve boxes	4	EA	\$100.00	\$400.00		4.0	\$400.00	4.0	\$400.00	100.00%
201.22	Removal of large trees	2	EA	\$550.00	\$1,100.00		2.0	\$1,100.00	2.0	\$1,100.00	100.00%
403.11	Bitiminous wearing course	431	TON	\$81.00	\$34,911.00		431.0	\$34,911.00	431.0	\$34,911.00	100.00%
403.11 (Oct '08)	Bitiminous wearing course (escalation)	431	TON	\$18.72	\$8,068.32		431.0	\$8,068.32	431.0	\$8,068.32	100.00%
403.12	Bitiminous drives (hand method)	100	TON	\$145.00	\$14,500.00		100.0	\$14,500.00	100.0	\$14,500.00	100.00%
403.12 (Aug '08)	Bitiminous drives (hand method) (escalation)	100.3	TON	\$18.50	\$1,855.05		100.3	\$1,855.05	100.3	\$1,855.05	100.00%
603.82212	12" plastic pipe (smooth interior)	34	LF	\$50.00	\$1,700.00		34.0	\$1,700.00	34.0	\$1,700.00	100.00%
604.4A	Adjust existing CB grate and frame	8	EA	\$250.00	\$2,000.00		8.0	\$2,000.00	8.0	\$2,000.00	100.00%
608.2	Sawed bitiminous pavement	372	LF	\$2.00	\$744.00		372.0	\$744.00	372.0	\$744.00	100.00%
608.24	Concrete sidewalk (4")	237	SY	\$38.00	\$9,006.00		237.0	\$9,006.00	237.0	\$9,006.00	100.00%
608.28	Concrete sidewalk (8")	50	SY	\$48.00	\$2,400.00		50.0	\$2,400.00	50.0	\$2,400.00	100.00%
611.A	Intersection connections	1	EA	\$1,500.00	\$1,500.00		1.0	\$1,500.00	1.0	\$1,500.00	100.00%
641	Loam and seed	1341	SY	\$3.00	\$4,023.00		1341.	\$4,023.00	1341.0	\$4,023.00	100.00%
					\$82,207.37	1	$ \land \land$	\$82,207.37		\$82,207.37	
Change Order #2							\sim				
203.32A	Crushing Concrete	1	LS	\$26,900.00	\$26,900.00	_	()	326,900.00	1.0	\$26,900.00	100.00%
					\$26,900.00			\$26,900.00		\$26,900.00	
					\$109,107.37	~ 1) / /	\$109,107.37		\$109,107.37	
u											· · · · · ·

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rders Total:	\$109,107.37	R	Mu	\$109,107.37	\$109,107.37	
tract Value:	\$4,572,794.07	CIL	\$439,660.23	\$3,228,775.57	\$3,668,435.80	80.22%
		Sr	RETAINAGE (5	% of Current Contract Value):	\$228,639.70	
		\cup	PR	EVIOUS DISBURSEMENTS:	\$3,000,135.87	
00 per Ton at bio .00 per Ton at b	d, 5.8% difference bid, 5.5% difference	;		AMOUNT DUE:	\$439,660.23	
r it	r ders Total: ract Value:) per Ton at bi)0 per Ton at bi	corr, c	ders Total: \$109,107.37 ract Value: \$4,572,794.07	ders Total: \$109,107.37 ract Value: \$4,572,794.07) per Ton at bid, 5.8% difference 00 per Ton at bid, 5.5% difference	obsystement obsystement iders Total: \$109,107.37 ract Value: \$4,572,794.07 State \$3,228,775.57 RETAINAGE (5% of Current Contract Value): PREVIOUS DISBURSEMENTS: 0 per Ton at bid, 5.8% difference 00 per Ton at bid, 5.5% difference	State State <th< td=""></th<>

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	1										
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										
ASH & AE	American Society of Heating and Air Conditioning										
	Engineers										
ASME	American Society of Mechanical Engineers										
ASTM	American Society of 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										
CIPRA	Cast Iron Pipe Research Association										
CSI	Construction Specifications Institute										
c.y.	Cubic Yards										
DC	Direct Current										
DEP	Department of Environmental Protection										

01070-2 ABBREVIATIONS & SYMBOLS

DES	Department of Environmental Services
DI	Ductile Iron
DOT	Department of Transportation
EDR	Equivalent Directional Radiation
EPA	U.S. Environmental Protection Agency
FmHA	Farmers Home Administration (RD)
fps	Feet Per Second
ft.	Feet
gal.	Gallons
gpd	Gallons Per Day
gpm	Gallons Per Minute
HDPE	High Density Polyethylene
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 Circuit Board
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
PE	Polyethylene
ppm	Parts Per Million
9%0	Percent
psi	Pounds Per Square Inch
psig	Pounds Per Square Inch Gage
PVC	Polyvinyl Chloride
R.D.	Rural Development (Formerly FmHA)
rpm	Revolutions Per Minute
s.f.	Square Foot
STL W.G.	U.S. Steel Wire, Washburn and Moen, American
	Steel and Wire Cos., or Roebling Gage
S.V.	Square Yard
TDH	Total Dynamic Head
	···· _ J····· ····

01070-3 ABBREVIATIONS & SYMBOLS

USAS	Standards of the United States of America Standard								
	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.								

PART 2 - PRODUCTS

(Not part of this Section)

PART 3 - EXECUTION

(Not part of this Section

SECTION 01090

REFERENCE STANDARDS

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

- A. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on the date of Contract Documents.
- C. Should specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.2 <u>SCHEDULE OF REFERENCES</u>

AA	Aluminum Association	
AABC	Associated Air Balance Council	
AASHTO	American Association of State Highway and Transportation Officials	
ACI	American Concrete Institute	
ADC	Air Diffusion Council	
AGC	Associated General Contractors of America	
AI	Asphalt Institute	
AIA	American Institute of Architects	
AISC	American Institute of Steel Construction	
AISI	American Iron and Steel Institute	
AITC	American Institute of Timber Construction	
AMCAAir Movement and Control Association		
ANSI	American National Standards Institute	
APA	American Plywood Association	
ARI	Air-Conditioning and Refrigeration Institute	
ASHRAE	American Society of Heating, Refrigerating,	
ASME	American Society of Mechanical Engineers	
ASPA	American Sod Producers Association	
ASTM	American Society for Testing and Materials	
AWI	Architectural Woodwork Institute	
AWPA American Wood-Preservers' Association		
AWS	American Welding Society	
AWWA	American Water Works Association	
BIA	Brick Institute of America	

BOCA	Building Officials and Code Administrators		
CDA	Copper Development Association		
CLFMIChain I	Link Fence Manufacturers Institute		
CRSI	Concrete Reinforcing Steel Institute		
DHI	Door and Hardware Institute		
EJCDCEngine	ers' Joint Contract Documents Committee		
EJMA	Expansion Joint Manufacturers Association		
FGMA Flat Gl	ass Marketing Association		
FM	Factory Mutual System		
FS	Federal Specification		
GA	Gypsum Association		
ICBO	International Conference of Building Officials		
IEEE	Institute of Electrical and Electronics Engineers		
IMIAC International Masonry Industry All-Weather Council			
MBMA	Metal Building Manufacturer's Association		
MFMA	Maple Flooring Manufacturers Association		
MIL	Military Specification		
ML/SFA	Metal Lath/Steel Framing Association		
NAAMM	National Association of Architectural Metal		
NCMA	National Concrete Masonry Association		
NEBB	National Environmental Balancing Bureau		
NEMA Nation	al Electrical Manufacturer's Association		
NFPA	National Fire Protection Association		
NFPA	National Forest Products Association		
NSWMA	National Solid Wastes Management Association		
NTMANation	al Terrazzo and Mosaic Association		
NWMA	National Woodwork Manufacturers Association		
PCA	Portland Cement Association		
PCI	Prestressed Concrete Institute		
PS	Product Standard		
RIS	Redwood Inspection Service		
RCSHSB	Red Cedar Shingle and Handsplit Shake Bureau		
SDI	Steel Deck Institute		
SDI	Steel Door Institute		
SIGMA	Sealed Insulating Glass Manufacturers Association		
SJI	Steel Joist Institute		
SMACNA	Sheet Metal and Air Conditioning Contractors'		
SSPC	Steel Structures Painting Council		
TCA	Tile Council of America, Inc.		
UL	Underwriters' Laboratories, Inc.		
WCLIB	West Coast Lumber Inspection Bureau		
WWPA	Western Wood Products Association		

PART 2 - PRODUCTS

(NOT PART OF THIS SECTION)

PART 3 - EXECUTION

(NOT PART OF THIS SECTION)

SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL

1.1 INTRODUCTION

A. Project meeting requirements

1.2 PROJECT MEETINGS (FORMAL)

- A. The Contractor shall attend project meetings throughout the progress of the work.
- B. Meetings shall be held at a frequency no greater than twice per month.
- C. The following representatives of the Contractor shall attend:
 - 1. Superintendent or authorized representative
 - 2. Representative of major subcontractors (when requested)
 - 3. Representatives of major suppliers (when requested)
 - 4. Other representatives as appropriate to agenda topics
- D. The Engineer shall prepare and distribute project meeting notes.
- E. Sample Agenda
 - 1. Work progress
 - 2. Progress schedule
 - 3. Delivery schedules
 - 4. Submittals
 - 5. Payment applications
 - 6. Change Orders and Field Orders
 - 7. Other items

1.3 WEEKLY COORDINATION MEETINGS (INFORMAL)

A. The contractor's superintendent, the owner, and the resident engineer shall meet weekly to informally discuss the project progress/schedule, sequence, and other issues.

PART 2 - PRODUCTS

(NOT PART OF THIS SECTION)

PART 3 - EXECUTION

(NOT PART OF THIS SECTION)

SECTION 01201

COMMUNITY INFORMATION

PART 1 - GENERAL

1.1 INTRODUCTION

A. Community information requirements of the Contractor.

1.2 COMMUNITY INFORMATION REQUIREMENTS

- A. The Contractor shall be responsible for keeping the Public informed of the progress of the work on a weekly basis. On Thursday of each week, the Contractor will provide a summary update on the work planned for the following week including:
 - 1. Work zones
 - 2. Work tasks and disciplines
 - 3. Traffic conditions, planned interruptions to water service or any other impacts to the public.
- B. On the date of each scheduled formal project meeting, the Contractor shall complete the following (minimum) requirements:
 - 1. Prepare and post a map representing the work locations for the next two week period of each work crew.
 - 2. Prepare a brief written narrative of upcoming work and deliver to the Owner for public information and for posting on the local Website.
 - 3. Provide a system for tracking complaints (sample form attached).
- C. The Contractor shall provide a twenty-four (24) hour contact person for emergencies.

1.3 PUBLIC INFORMATION MEETINGS

- A. The Contractor shall schedule and conduct public information meetings to relay project schedules and other pertinent information to the Community.
 - 1. The meeting shall be held each construction season prior to beginning construction.
- B. The meetings shall be scheduled during the evening hours.
- C. There shall be at least a two week advance notice regarding the meetings.
- D. The Owner shall post and advertise for the meetings.
- E. The Owner will provide the site for the meeting.

1.4 <u>RESIDENT COMPLAINTS</u>

- A. The Contractor is responsible for resolution of resident complains that may arise as a result of his work operations.
- B. Verbal complaints should be addressed promptly as they occur. If immediate resolution is not possible, the complaint should be recorded in writing for further follow up and action by the Contractor (sample form attached)

PART 2 - PRODUCTS

(NOT PART OF THIS SECTION)

PART 3 - EXECUTION

(NOT PART OF THIS SECTION)

Complaint No._____ (Assigned by Engineer)

COMPLAINT FORM

Name	Date:
Address:	
	Tel:
Location of Problem:	
Nature of Complaint:	
	(Signature)
Attach additional pages if required. Attach c	opies of receipts or estimates if applicable.

Attach additional pages if required. Attach <u>copies</u> of receipts or estimates if applic Retain copies of all correspondence.

Remit form to Contractor: (Insert Contractor's Name Address, Telephone & Fax Number) *Carbon Copy Engineer*: Underwood Engineers, Inc. 25 Vaughan Mall Portsmouth, New Hampshire 03801

SECTION 01310

CONSTRUCTION SCHEDULES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Within ten days after the effective date of the Agreement between Owner and Contractor, submit to the Engineer an estimated progress schedule.
- B. Form of Schedules:
 - 1. Narrative: Completely describe the construction methods to be employed.
 - 2. Horizontal Bar Chart (i.e., Gantt chart):
 - a. Provide a separate horizontal bar column for each trade or operation.
 - b. Order: Chronological, for each trade and/or operation.
 - c. Horizontal scale: Identify first work day of each week, allow space for updating and revision.
- 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 (when applicable).
 - c. 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. The schedules shall be updated at least every month and for each project meeting.
 - 2. Show all changes occurring since previous submission.
 - 3. 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.
- E. Standard Holidays Holidays observed by the City include:
 - New Year's Day
 - Memorial Day
 - Fourth of July
 - Labor Day
 - Columbus Day
 - Veterans Day
 - Thanksgiving
 - Day after Thanksgiving
 - Christmas

Project work will not be permitted on these dates unless approved by advance (72 hours) written request to the Owner.

1.2 SUBMITTALS

- A. Submit periodically updated schedules when requested by the Engineer.
- B. Submit 4 copies of initial and updated schedules to the Engineer.

PART 2 - PRODUCTS

(NOT PART OF THIS SECTION)

PART 3 - EXECUTION

(NOT PART OF THIS 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. Alternates
 - 1. If the Contractor elects to submit an Alternate that is considered an alternate, the Contractor will be responsible to make all modifications to the Work resulting from the use of the Alternate at no additional cost to the Owner.
 - 2. If the Contractor elects to submit an Alternate, the Contractor must follow the procedures listed in Section 01630 <u>Substitutions & Product Options.</u>

1.2 <u>SHOP DRAWINGS</u>

- 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 resubmission.
- 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
- D. The Contractor shall provide a copy of a completed submittal certification form 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. 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.

- F. 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.
- G. 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.
- H. 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) 8-1/2 inches by 11 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 re-submittal without being reviewed.
- I. 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.
- J. 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.
- K. 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.
- L. 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 <u>SAMPLES</u>

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

- A. The Contractor shall furnish the Engineer six (6) copies of a complete instruction manual for installation, operation, maintenance, and lubrication of each item specified. At least 3 months prior to the expected substantial completion date, the Contractor shall submit to the Engineer all manuals in accordance with the requirements specified herein.
- B. Manuals shall include operating and maintenance information on all systems and items of equipment. The data shall consist of catalogs, brochures, bulletins, charts, schedules, equipment numbers, shop drawings corrected to as-built conditions, wiring diagrams, and assembly drawings which shall describe location, operation, maintenance, lubrication, operating weight, lubrication charts showing manufacturer recommended lubricants for each rotating or reciprocating unit, and other necessary information for the Engineer to establish a complete maintenance program.
- C. The submittal shall also include details of all replacement parts; "Nameplate" data for all equipment; detailed instructions for start-up, normal operation, shutdown procedures, and control techniques; and a guide to troubleshooting the system.

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.
- C. Certified performance test data will also be submitted to the Engineer as required by the specifications.

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. Submittals shall include:
 - 1. Date and revision dates.
 - 2. Project title and number.
 - 3. The names of:

- a. Engineer.
- b. Contractor.
- c. Subcontractor.
- d. Supplier.
- e. Manufacturer.
- f. Separate detailer when pertinent.
- 4. Identification of product or material.
- 5. Relation to adjacent structure or materials.
- 6. Field dimensions, clearly identified as such.
- 7. Specification section number.
- 8. Applicable standards, such as ASTM number or Federal Specification.
- 9. A blank space, 4" x 4", for the Engineer's stamp.
- 10. Identification of deviations from Contract Documents.
- 11. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements and compliance with Contract Documents.
- 12. Where specified or when requested by the Engineer, manufacturer's certification that equipment, accessories and shop painting meet or exceed the Specification requirements.
- 13. Where specified, manufacturer's guarantee.

1.7 <u>RESUBMISSION REQUIREMENTS</u>

- 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.

PART 2 -- PRODUCTS

(NOT PART OF THIS SECTION)

PART 3 -- EXECUTION

(NOT PART OF THIS SECTION)

SUBMITTAL CERTIFICATION FORM

PROJECT:	CONTRACTOR'S PROJ. NO:
CONTRACTOR:	ENGINEER'S PROJ. NO:
ENGINEER:	
TRANSMITTAL NUMBER:	SHOPDRAWING NUMBER:
SPECIFICATION SECTION OR DRAWI	NG NO:
DESCRIPTION:	
MANUFACTURER:	
The above referenced submittal has be the material and/or equipment meets or	een reviewed by the undersigned and I/we certify that exceeds the project specification requirements with
NO DEVIATIONS	
or	
A COMPLETE LIST OF DE	VIATIONS AS FOLLOWS ^a :
By:	_By:
Contractor ^b	Manufacturer ^c
Date:	Date:

^a 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.

^b Required on all submittals

^c When required by specifications
VIDEO INSPECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Post Construction Video Recording of new sewers shall include the following work:
 - 1. Television inspection following the completion new sewer mains and service laterals will be required where directed.
 - 2. Sewer lines shall be cleaned and flushed prior to television inspection.
 - 3. Pipe shall be inspected for cracks, joint gaps, deformation, and other visual defects.
 - 4. A written report shall be provided. Condition of the sewer shall be documented.
 - 5. A video shall be provided in digital formats acceptable to the Engineer, complete with audio narrative. Both video and audio will be reviewed for clarity.
 - 6. Documentation shall include any feature specifically requested by the Engineer.
 - 7. Video files not properly labeled or that not of acceptable quality will not be accepted.
 - 8. Finish pavement courses shall not be completed until video is reviewed and accepted.
- B. Location of Existing Sewer Services by Video Inspection shall include the following work:
 - 1. Coordinating with the property owner/homeowner to gain access to the sewer service from inside a home or business.
 - 2. Trace the location and depth of the service lines by television inspection.
 - 3. Record the location and depth of the service lines.
 - 4. A video shall be provided in digital formats acceptable to the Engineer.
 - 5. Restore all private property and sewer service access point to existing conditions.
 - 6. Obtain City photo identification badges from City Resources Department, prior to entering properties.

1.2. SUBMITTALS

- A. Post Construction Video Recording:
 - 1. Submit all reports and video (digital format) to the Engineer following the completion of the sewer.
 - 2. TV inspection required prior to substantial completion certification.
- B. Location of Sewer Services by Video Inspection:
 - 1. Before the work begins:
 - a) Submit the names of all personnel completing the work.
 - b) Submit the schedule and procedure for entering properties (photo identification badges required).

- 2. After the work is completed:
 - a) Submit location information, include on Record Drawings.
 - b) Submit video record (digital format) of services that are located with property locations clearly identified. (Payment may be withheld until video record is submitted to the Engineer.)

PART 2 - PRODUCTS

2.1 <u>QUALITY</u>

- A. Post Construction Video Recording:
 - 1. Quality of video records (digital format) shall be such that the condition of the sewer following construction can be readily determined. The video shall include an audio narrative.
 - 2. The Video shall be able to verify the quality of the pipe installation and not be limited by poor lighting, poor picture quality, water flow, or pipe length.
 - 3. Necessary sewer repair identified during the TV inspection shall be corrected by the Contractor at no cost to the owner.
 - 4. Any video record considered to be poor quality must be re-recorded and resubmitted for review at no additional cost to the Owner.
 - 5. Payment (if a separate item is provided) may be withheld if video record is considered by the Owner or the Engineer to be poor quality.
- B. Location of Sewer Services by Video Inspection or an unacceptable format:
 - 1. The camera must have a transmitter that can be traced by a locator outside the house.
 - 2. Equipment shall be capable of locating the sewer line within twelve inches (12") of it actual horizontal and vertical.

PART 3 - EXECUTION

3.1 <u>GENERAL</u>

- A. Post Construction Video Recording:
 - 1. The color camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the sewer's condition. In no case will the television camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. If, during the inspection operation, the television camera will not pass through the entire manhole section, the Contractor shall set up his equipment so that the inspection can be performed from the opposite manhole. If, again, the camera fails to pass through the entire manhole section, the inspection will be required.
 - 2. When manually-operated winches are used to pull the television camera through the line, telephones, radios or other suitable means of communication shall be set

up between two manholes of the section being inspected to insure good communications between members of the crew.

- 3. The importance of accurate distance measurements is emphasized. Measurement for location of defects shall be above ground by means of a meter device. Marking on the cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Accuracy of the distance meter shall be checked by use of a walking meter, roll-a-tape, or other suitable device, and the accuracy shall be satisfactory to the Owner's Representative.
- 4. Documentation of the television results shall be as follows:
 - a. Television Inspection Logs: Printed location records shall be kept by the Contractor and will clearly show the location in relation to an adjacent manhole of each cracked or offset joint observed during inspection. In addition, other points of significance such as locations of building sewers, cracked or broken pipe, protruding service connections, roots, storm sewer connections, and other discernable features will be recorded, and a copy of such records will be supplied to the Owner.
 - b. Videotape Recordings: The Contractor shall furnish all equipment for color video tape recordings. All sewer inspections shall be recorded on digital formatting and compatible (proprietary/third party) software for viewing on the video computer drive shall be provided if required or upon request.
- B. Location of Sewer Services by Video Inspection:
 - 1. Cleaning of the existing sewer service is not considered part of this work. If the sewer service cannot be televised due to obstructions, or if the sewer service is not accessible from the basement (i.e. no cleanout), it may be necessary to use other means to locate the sewer service, such as test pits. The use of test pits to locate a sewer service will be considered with approval of the Engineer if sewer service is not accessible.
 - 2. The sewer service must be located on the ground and recorded on the plans, both horizontally and vertically at the following locations:
 - a. As it exits the foundation (or passes the vertical plane of the foundation if sewer exits below basement floor level)
 - b. The property line
 - c. At the sewer main
 - d. At bends
 - 3. Ties and depth shall be recorded by the Contractor at each of the above listed locations and provided to the Engineer on an approved form. The Engineer will provide a sample format for the required documentation.
 - 4. This work shall be coordinated well in advance of sewer installation so that wye connections can be installed at the appropriate location

TEMPORARY WATER (POTABLE)

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Summary
 - 1. Water service must be maintained to the customers. The Contractor may, after review of the project documents, determine that temporary bypass piping during construction is the most cost-effective method of maintaining water service to the construction area.
 - 2. The local Fire Department must review and approve any plan to interrupt fire suppression system services.
 - 3. Temporary water systems are subject to approval by the City of Portsmouth DPW and the Fire Department
- B. Work Included:
 - 1. Prepare and submit a detailed pan as outlined in Part 3 of this section.
 - 2. Provide and pay for all temporary systems to assure the uninterrupted flow of safe drinking water around the Work Area at no additional cost to the Owner including the placement, maintenance and removal of these systems.
 - 3. Provide temporary services.
 - 4. Make all necessary arrangements for power.
 - 5. Furnish, install, maintain and remove bypass piping, appurtenances and temporary connections to water users, where necessary.
 - 6. Excavate and backfill for connection to service pipes or branches at streets which are not otherwise served.
 - 7. Provide forty-eight (48) hour notices to all users regarding any disruption of service.
 - 8. Disinfect the temporary piping in accordance with Section 02160, Part 3.3.
 - 9. If the source of water for the temporary water system creates a higher pressure than is normally provided to the user, a pressure reducing valve shall be installed, if necessary, to maintain pressures at or below the normal pressure for all downstream services. Temporary main-line pressure reducing valves shall be incidental.
 - 10. Temporary lines are to be buried below surface at roadway and driveway crossings. Avoid placing temporary piping in high traffic areas, walkways etc.

1.2 QUALITY ASSURANCE

A. Comply with all Local, State and Federal requirements.

1.3 <u>RELATED SECTIONS</u>

- A. Section 01020 Coordination
- B. Section 01310 Construction Schedule
- C. Section 02610 Pipe & Pipe Fittings General

PART 2 - PRODUCTS

2.1 MATERIALS

- A. The temporary main shall be:
 - 1. Class 160 Yelomine PVC pipe as manufactured by Certainteed.
 - 2. Or approved equivalent.
- B. Size shall be equal to or larger than existing water main to be bypassed.
- B. Coupling between pipes shall be solid PVC with rubber splines to restrain the pipe.
- C. Adequate piping, free of leaks, to bypass water around the work area.
- D. The Contractor shall take necessary steps to protect the temporary water main and services from freezing.
- E. Contractor shall submit certification that the pipe is either new or has been used exclusively for potable water only.
- F. Services shall consist of the following:
 - 1. Service saddle.
 - 2. A shutoff at the main.
 - 3. Polyethylene tubing running to the sill cock, to the existing service below grade or other approved tie-in location.
 - 4. A wye connection at the sill cock to allow the sill cock to be used by the homeowner.
 - 5. Fire Service Connections shall be 6-inch minimum and shall connect to the existing fire lines below grade.

PART 3 - EXECUTION

3.1 <u>SUBMITTALS</u>

- A. The Contractor shall submit a detailed description and plan showing the proposed temporary water service main and services at least fourteen (14) days prior to the planned start of the work.
- B. The submission shall include the following:
 - 1. Identify the sections to be bypassed.
 - 2. Type of materials.
 - 3. Locations of mains, services, and connections.
 - 4. Methods of protection of mains and services at crossings.
 - 5. Method of filling temporary water line and evacuating air.
 - 6. The names and telephone and pager numbers for three (3) contact persons that will be on 24-hour notice to maintain the temporary water system.
 - 7. Methods to provide fire flows if necessary.

3.2 <u>PERFORMANCE</u>

- A. The Contractor shall be responsible for providing temporary connections and valving for all components in bypass piping.
- B. If hydrants are used, a valve shall be installed to the connection of the bypass piping to isolate hydrant.
- C. Maintain and operate the system to assure water flow around the work area as long as work requires replacement of active water mains.
- D. Protect the piping from damage caused by vehicular traffic or other outside influences.
- E. Maintain all system elements in a sanitary working order free of leaks.
- F. All work shall be performed in a manner to insure the health and welfare of the general public from contamination of the water supply.
- G. The Contractor shall maintain access and operation of all hydrants, branches, and services where bypass pipes are used.
- H. The Contractor shall take all necessary steps to protect the temporary water main and services from freezing.
- I. Where taps are made into existing pipes, place 12" of sand over all exposed components.
- J. All services shall be adequately valved and meet the approval of the Engineer.
- K. Services may be tied into existing exterior sill cocks, if existing. If a sill cock does not exist, or in the case where a fire service line connection is needed, the Contractor shall make the connection, below grade, at the property line where the existing water service is located.
- L. The Contractor shall make all necessary modifications to existing water meters, backflow preventers, pressure reducers, etc. in order to make the temporary connection. All modifications shall have to be approved by the Owner.
- M. If any service connection bypasses an individual pressure reducing valve, the Contractor shall install a pressure reducing valve on the temporary service lines for that building.
- N. The interior of the temporary water system shall be chlorinated and bacteria tested in accordance with Section 02610 Pipe & Pipe Fittings General when it is initially installed and after each subsequent breakdown and relocation of the system.

3.3 LAYOUT REQUIREMENTS

General Requirements:

- 1. A valve shall be installed at all source locations (i.e. hydrants).
- 2. In-line valves shall be installed at 500-foot intervals.
- 3. Manual air releases shall be installed at the end of all dead-end branches and at high points.
- 4. Temporary water mains shall be installed along the road edge or curb line and buried at driveways and street crossings.
- 5. The main shall be secured from movement with sand bags or other approved devices.

BYPASS PUMPING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. Provide all labor, power, equipment, and materials and pay for all temporary systems to assure the uninterrupted flow of Sanitary Sewage around the Work Area at no additional cost to the Owner including the placement, maintenance and removal of these systems.
 - 2. Make all necessary arrangements for power. The type of pump power and refueling requirements are to be outlined in the proposed plan. If 24 hour bypass is needed in residential areas, use only ultra-quiet power sources.

1.2 <u>SUBMITTALS</u>

- A. The Contractor shall submit a detailed description and plan showing the proposed bypass pumping system within ten days after the effective date of the Agreement between Owner and Contractor, and at least seven (7) days prior to commencement of any construction that will affect the existing pump station operation.
- B. The submission shall include the following:
 - 1. A description of the overall procedure to be used.
 - 2. Identify the sections to be bypassed.
 - 3. Type of equipment and materials to be used.
 - 4. Size of the pumps.
 - 5. Temporary wet well location.
 - 6. Backup power source.
 - 7. Locations of temporary force mains.
 - 8. Methods of protection of mains at crossings.
 - 9. The names and telephone and pager numbers for three (3) Contractor contact persons that will be on 24-hour notice to maintain the temporary pumping system.
- C. Submit manufacturer's literature, test reports, and certificates in accordance with the General Conditions and Section 01340 Submittals.

1.3 QUALITY ASSURANCE

A. Comply with all Local, State and Federal requirements forbidding the discharge of untreated effluent into other than a functional sanitary sewer facility.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. For each location where temporary bypass systems are employed, the system shall consist of the following:
 - 1. Two operable pumps each of which has a discharge rate sufficient to handle peak flow rates. One to be on line, the other as back-up.
 - 2. Adequate discharge piping, free of leaks, to carry the effluent from source to an adequate sanitary discharge point.
 - 3. Provide adequate plugs to insure that no effluent flows into the work area.

PART 3 - EXECUTION

3.1 <u>PERFORMANCE</u>

- A. Provide power supply from a secure source.
- B. Maintain adequate power at all times, whether by refueling or standby generator.
- C. Maintain and operate the system to assure uninterrupted sewage flow around the work area as long as work requires replacement of active sewers and/or other related systems.
- D. Protect the discharge piping from damage caused by vehicular traffic or other outside influences.
- E. Maintain all system elements in a sanitary working order free of leaks.
- F. All work shall be performed in a manner to insure the health and welfare of the general public from accidental or intentional discharge of untreated effluent into other than a sanitary sewer system.

3.2 TEMPORARY FORCE MAIN REQUIREMENTS

- A. If a temporary force main is to be used, the temporary force main shall be installed along the road edge or curb line.
- B. The main shall be secured from movement with approved devices.
- C. Protect the piping from damage caused by vehicular traffic or other outside influences.
- D. Street crossings shall be installed below the pavement. The pipe shall be covered by a minimum of 3" of gravel and 2" of bituminous pavement.
- E. Driveway crossing can be either installed below the pavement (with 3" minimum cover) or over the pavement if a hard-pack ramp (with 3" minimum cover) is constructed on either side of the main. If the ramp creates a problem for vehicles entering the driveway, the crossing shall be moved below the pavement at no cost to the Owner.

3.3 MAINTENANCE

A. Repairs to the system shall be made by the Contractor immediately upon notification of damage or malfunction. During non-business hours, notification shall go to the 3 individuals on the Contractor's contact list. If those individuals cannot be reached, the repair(s) shall be made by the Owner and the Contractor

shall be billed for the time and materials required to make the repair. The minimum charge for the Owner making the repair is \$500.

3.4 REMOVAL

- A. Following completion of work requiring bypassing, the Contractor shall remove the entire temporary bypass pumping system and restore all affected areas to preconstruction condition.
- B. The Contractor shall restore growth to all disturbed areas.
- C. The Contractor shall remove all hard-pack ramps and pave all temporary water trenches (unless they are to be incorporated into the final service patch).

USE OF EXPLOSIVES

PART 1 - GENERAL

1.1 <u>DESCRIPTION</u>

A. Work Included:

- 1. Provide all materials and perform all work necessary to insure safe use and storage of explosives.
- 2. Contractor shall be responsible for any and all damage resulting from use of explosives.
- 3. Complete all blasting in accordance with the City of Portsmouth Blasting Rules and Procedures amended December 2020. The rules are provided at the end of this section for reference.

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 (see City of Portsmouth Blasting Rules and Procedures, attached).

PART 2 - PRODUCTS

2.1 <u>MATERIALS</u>

- 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 <u>PERFORMANCE</u>

A. Preparation:

- 1. Blasting, if required, shall be performed only after approval has been given by the Owner for such operation.
- 2. Do not bring explosives to the site or use any explosives without obtaining all necessary permits and the written consent of authorities having jurisdiction. Such written consent will not relieve the Contractor of total responsibility for any injury to persons or for any damage to property due to blasting operations.
- 3. Designate as a BLASTING AREA all sites where electric blasting caps are located and where explosive charges are being placed.

- 4. Mark all blasting areas with signs as required by law.
- 5. 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.
- 6. The Contractor shall conduct a Pre-blast Survey of all structures within the blasting area and provide the Engineer a written report of the Pre-blast Survey.
- 7. Notify each property owner and public utility company having structures in proximity to the site of the work sufficiently in advance to enable them 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.
- 8. 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.
- B. Blasting:
 - 1. All blasting shall be performed in accordance with all pertinent provisions of the "Manual of Accident Prevention in Construction" issued by the Associated General Contractors of America, Inc..
 - 2. Provide watchmen during the loading period and until charges have been exploded.
 - 3. Provide adequate protective covering over all charges before being exploded.
 - 4. Blasting Log:
 - 1. The Contractor shall provide the Engineer with a blasting log for the work. The blasting log shall contain the following information:
 - a. Location.
 - b. Time and date.
 - c. Location of explosives.
 - d. Amount of type of explosives used at each location.
 - e. The names of persons, companies, corporations or public utilities that own, lease or occupy property or structures in proximity to the site of the work and were contacted about the Contractor's intention to use explosives.



CITY OF PORTSMOUTH DEPARTMENT OF PUBLIC WORKS (DPW) BLASTING RULES AND PROCEDURES

1.0 General:

All blasting work shall comply with the following regulations:

- City Ordinance, Chapter 5, Article VII: Section 5:701 Blasting Permit Required;
- State of New Hampshire Department of Transportation Standard Specifications for Road and Bridge Construction dated 2016;
- Storage and Transportation of explosives shall be in accordance with State of New Hampshire Code of Administrative Rules: Chapter/Part Saf-C 1600.
 In case of conflict, the more stringent regulation shall govern.

2.0 Insurance:

- 2.1 The blasting contractor shall procure and maintain \$5,000,000 of personal injury and property damage liability insurance covering the permitted blasting operations, or such an amount as may be determined necessary by extraordinary circumstances.
- 2.2 The Certificate shall name the City as an additional insured.

3.0 Blasting Permit Process:

- 3.1 The blasting contractor shall apply for a permit online through the City's permitting center at: <u>https://portsmouthnh.viewpointcloud.com</u> before commencing the pre-blast survey procedure.
- 3.2 At the time of application, the blasting contractor shall provide the following items:
 - a) Plan showing location, extent and purpose of proposed blasting operations.
 - b) Project narrative describing scope of work, proposed dates of work, office phone number and twenty-four (24) hour cell phone number for the project manager on company letterhead.
 - c) Copy of valid New Hampshire License to Use, Purchase and Transport Explosives for the blasting company.
 - d) Copy of valid New Hampshire Certificate of Competency For Blasting Operations for each operator.
 - e) Copy of valid Insurance Certificate as required by Article VII, Section 5:701 and defined in Section 2.0.
 - f) Additional documentation required as noted below in Section 4.0.

4.0 **Pre-Blast Condition Surveys:**

- 4.1 Pre-blast surveys shall be performed as required in City Ordinance, Chapter 5, Article VII, Section 5:701, and the following procedures will apply.
- 4.2 The pre-blast condition survey shall consist of a written description of the interior and exterior condition of each of the structures examined. Descriptions shall locate any existing cracks, damage or other defects and shall include such information so as to make it possible to determine the effect, if any, of the construction operations on the defect. Where significant cracks or damage exist, or for defects too complicated to describe in words, photographs shall be taken. A video survey with appropriate audio description of locations, and conditions, and defects can be used.
- 4.3 The contractor shall send a pre-blast survey letter by certified mail to all abutters within a 500-foot radius of the blasting site. A copy shall be sent to the following City Departments:

Director of Public Works 680 Peverly Hill Road Portsmouth, NH 03801

Fire Chief 170 Court Street Portsmouth, NH 03801

Zoning Officer City Hall, Legal Dept. 1 Junkins Avenue Portsmouth, NH 03801

Environmental Planner City Hall, Planning Dept. 1 Junkins Avenue Portsmouth, NH 03801 City Manager City Hall 1 Junkins Avenue Portsmouth, NH 03801

Chief of Police 3 Junkins Avenue Portsmouth, NH 03801

Chief Building Inspector City Hall 1 Junkins Avenue Portsmouth, NH 03801

- 4.4 The pre-blast survey company shall make at least three (3) attempts over a minimum 1-week period to contact a property owner before that property is listed as nonrespondent.
- 4.5 Copies of the pre-blast condition survey shall be made available to the Department of Public Works and/or the property owner upon request. The blasting company shall maintain copies of all pre-blast survey records for a period of no less than one year from the completion of the blasting operations.
- 4.6 Before the issuance of a Blasting Permit, the blasting contractor shall submit to the Department of Public Works a list of all properties within the 500-foot radius of the blasting. The list shall include names and addresses, with tax map and lot numbers, of all abutters within the 500-foot radius and the status of the survey (completed, refused or non-respondent).

5.0 Blasting Permit:

- 5.1 The blasting contractor shall upload all documents described in Sections 2, 3 and 4 of these procedures online through the City's permitting center at: <u>https://portsmouthnh.viewpointcloud.com</u>
- 5.2 The review process by City staff may take at least two (2) weeks.
- 5.3 A copy of the blasting notification letter indicating when blasting is scheduled to begin shall be submitted prior to permit issuance. A copy must be sent to the City Manager, Director of Public Works, Chief of Police, Fire Chief, Zoning Officer, Chief Building Inspector and Environmental Planner.
- 5.4 The permit will be approved through the City's permitting center.
- 5.5 The permit fee is \$100.00 *(effective July 1, 2017)*.

6.0 Blasting Operations:

- 6.1 All blasting operations shall be conducted in accordance with State of New Hampshire Department of Transportation Standard Specifications dated 2016.
- 6.2 All blasting operations shall require vibration measuring equipment meeting the following minimum requirements:
 - a) Measure, display, and provide a permanent record on a strip chart of particle velocity components.
 - b) Measure three mutually perpendicular components of particle velocity in directions vertical, radial, and perpendicular to the vibration source.
 - c) Have a velocity frequency response of 2 Hz to 150 Hz and be capable of measuring Peak Particle Velocity (PPV) of up to 250 mm/s (10 in/s).
 - d) All seismographs used shall display the date of the most recent calibration.
 - e) Calibration must have been performed within the last 12 months and must be performed to a standard traceable to the National Institute of Standards and Technology.
- 6.3 The blasting contractor shall maintain daily logs of all blasting activities. Those records, including seismic monitoring records shall be made available to the City of Portsmouth for a period of five (5) years.

Please contact the following City staff member for questions: Amy Chastain Department of Public Works <u>amchastain@cityofportsmouth.com</u> Office phone: (603) 610-4344

VIBRATION MONITORING

PART 1 - GENERAL

1.1 <u>DESCRIPTION</u>

A. Work Included:

- 1. Provide all materials and equipment to perform all work necessary to protect and prevent damage of existing structures due to vibrations generated from construction activities.
- 2. Employ a professional vibration consultant to monitor construction related vibrations and set vibration limits to avoid damaging nearby structures, properties and utilities located on or near the project.
- 3. Sources of construction related vibrations include compaction equipment, hoe ram, sheeting and other construction activities resulting in vibrations to adjacent properties and/or structures.
- 4. Contractor shall secure the services of a qualified Vibration Consultant who shall consult with the Contractor, to mitigate effects from vibration related to construction activities.
- 5. Provide a preconstruction survey including photographic documentation of all existing structures. The preconstruction survey shall include both external and internal, foundations, plaster, masonry and other internal surfaces adjacent to work areas, similar to pre-blast survey requirements.
- 6. Contractor shall be responsible for any and all damage resulting from construction activity vibrations.

PART 2 - PRODUCTS

2.1 <u>MATERIALS</u>

A. All and any equipment necessary for monitoring seismic activity as part of vibration monitoring activities.

PART 3 - EXECUTION

3.1 **PERFORMANCE**

- A. Preparation:
 - 1. Prior to initiating any activity, which in the opinion of the Vibration Consultant requires vibration monitoring, a Vibration Monitoring Plan shall be prepared by the Vibration Consultant and submitted to Contractor to support their methods of construction. The plan may be modified as work progresses based on monitoring results.
 - 2. The Vibration Monitoring Plan shall identify:

- a. Proposed construction activity
- b. The anticipated vibration limits for the construction activity
- c. Historic or significant structures of concern including structures in poor condition, structures supported by vibration sensitive materials which could cause settlement or loss
- d. Procedures, techniques and equipment to be employed by the Contractor to guard against damage to structures in the vicinity of the work area.
- 3. Vibration monitoring equipment shall meet the requirements of 203.3.2.5.6 of the NHDOT Standard Specifications (included by reference).
- 4. The Contractor shall conduct a Pre Construction Condition Survey of existing structures adjacent to the work including interior and exterior building foundations, walls and surfaces, plaster, brick and masonry structures, stone retaining walls and other sensitive areas. Further observation may be required at the discretion of the Contractor's Vibration Consultant. The completed Survey shall be provided to the Engineer as a written report in advance of the work.
- 5. The frequency and duration of vibration monitoring for construction activities shall be identified in the Vibration Monitoring Plan.
- 6. Vibration Monitoring Reports shall be furnished to the Engineer upon request and shall include the following information:
 - a. The name of the Contractor and/or Subcontractors responsible for the particular construction activity.
 - b. The name of the approved Vibration Consultant.
 - c. The name of the operator of the vibration monitoring equipment.
 - d. A sketch indicating the location of the vibration monitors and the particular construction activity.
 - e. Results of monitored vibrations for the particular construction activity. This information should include the frequencies of the measured peak particle velocities.
 - f. Identification of any activity that caused the vibration limits to be exceeded and the time of day that the limits were exceeded.
 - g. A summary of vibration related complaints received.
- 7. If the monitoring data indicates that the ground vibration limits for any of the three mutually perpendicular components have been exceeded, alternate construction methods will need to be considered by the Contractor to safeguard against damage to adjacent structures. It will be the Contractor's responsibility to implement construction methods and techniques in a manner which will mitigate the effects of construction. Damage to existing structures or properties as a result of the Contractor's operations shall be resolved by the Contractor at no additional cost to the Owner.
- 8. The Engineer and/or Owner will notify the Contractor of any complaints concerning vibrations resulting from construction activities.

DUST CONTROL

PART 1 - GENERAL

1.1 DESCRIPTIONS

- A. This project is in an urban residential area and daily dust control utilizing a water truck and mechanical street sweeper is required.
- B. Work Included: Furnish water truck and apply water to the road surfaces on a daily basis, unless rain is imminent. Use mechanical street sweeper on paved surfaces or sweep paved surfaces on a daily basis.
- C. The Contractor shall have a water truck on site <u>at all times.</u>
- D. Dust control operations will be required multiple times daily and on weekends when needed.
- E. Dust control work shall be incidental to the appropriate items of the Contract unless a separate unit item is provided

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.
- C. Street Sweeper: Mechanical street sweeper with watering device able to pick up and haul away debris.

PART 3 - EXECUTION

3.1 <u>APPLICATION</u>

- A. Water: Use suitable equipment including a tank with gauge equipped pump or spray bar. Apply water 2-3 times a day and on weekends as needed.
- B. Calcium Chloride: Apply at a rate sufficient to maintain a damp surface but low enough to assure non-contamination of water courses.

3.2 PROTECTION

- A. Perform all Dust Control Work in a manner that will prevent damage to public and private property from dust and the materials used.
- B. Repair, replace or make payment for all damage caused by Dust Control Work at no additional cost to the Owner.
- C. Street sweeping: Minimum of once per week and as needed or requested by the Engineer.

TRAFFIC REGULATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

- 1. Contractor shall provide a Traffic Control Plan for approval by the Engineer and the Owner. A schematic of project areas is provided at the end of this section for the Contractor's benefit.
- 2. Provide all materials and perform all work necessary to completely regulate traffic in the area of Work.
- 3. Provide Dust Control in accordance with Section 01562.
- 4. Perform all work in such a manner as to provide safe passage at all times for the public and with a minimum of obstruction to traffic.
- 5. Do not close roads or streets to passage of the public without the permission of the Public Works Department.
- B. The City/Town DPW and Police Department will decide if adequate Traffic Control is being maintained and shall have the authority to require the Contractor to take any additional steps necessary to maintain safe passage. If the State furnishes an inspector on the job as a result of poor traffic control by the Contractor, the Contractor shall be responsible for all costs assessed by the State.

1.2 <u>SCHEDULING WORK</u>

- A. Schedule all work so that two adjacent parallel streets are not closed to passage by the public at any one time, if possible.
- B. Revise the plan of work if it will create a traffic hazard or an unreasonably long detour.
- C. Do not start work in any new location without the permission of the Engineer.
- D. Notify all police and fire departments of all scheduled detours and when streets are reopened.

PART 2 - PRODUCTS

2.1 WARNING SIGNS AND BARRICADES

- A. An overview plan of the work area has been provided following this specification for the Contractor's use in developing the traffic control plan.
- B. Do not perform work without providing adequate warning signs, barricades, signal lights, watchmen and take other necessary precautions for the safety of the public.
- C. Provide and illuminate suitable warning signs to show where construction, barricades or detours exist.
- D. Provide barricades of substantial construction and painted with a finish that increases visibility at night.
- E. Keep signal lights illuminated at all barricades and obstructions from sunset to sunrise.

- F. 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.
- G. Traffic control signs for construction work shall be located and of the size and type as outlined in <u>Manual on Uniform Traffic Control Devices for Streets and Highways</u> (latest edition) as published by U.S. Department of Transportation.

PART 3 - EXECUTION

3.1 <u>DETOURS</u>

- 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 landowners along the project to driveways and other normal outlets from their property.

3.3 UNIFORMED POLICE OFFICERS

- A. The Contractor shall only use uniformed police officers in locations required by the Owner.
- B. Arrange police detail with the local Chief of Police.
- C. Any police officers, whether regular, reserve, special or otherwise, shall be employed by the Contractor.

3.4 PEDESTRIANS

- A. Maintain safe pedestrian corridors throughout project area.
- B. Protect and/or barricade uneven or irregular surfaces impacted by construction.

PROJECT IDENTIFICATION

PART 1 -- GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. Furnish and erect a sign at the project site to identify the project and to identify that the Federal and State Governments are participating in the development of the project.
- B. Do not place, or allow the placement of, other advertising sign boards at the project site or along rights-of-way furnished for the project work.

PART 2 -- PRODUCTS

2.1 MATERIALS AND DESIGN

- A. Construct a sign of 3/4 inch exterior grade, high density overlaid plywood or other approved material suitable for signs.
- B. Construct the sign in accordance with the following sample Drawing.

PART 3 -- EXECUTION

3.1 <u>GENERAL</u>

- A. Place the sign in a prominent location approved by the Owner.
- B. The following information should be placed on the sign:
 - 1. Project Name: Islington Street Corridor Improvements Phase 2



Standard Sign Detail

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TEMPORARY FIELD OFFICE

PART 1 - GENERAL

1.1 <u>DESCRIPTION</u>

A. Work Included: Provide and maintain a field office for the exclusive use of the Engineer during the entire life of the Contract.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Provide a separate structure, such as a mobile field office trailer:
 - 1. Size: Equivalent to 10 feet by 30 feet in area.
 - 2. A minimum of two windows arranged for cross ventilation with screens.
 - 3. Door with closer and secure lock.
 - 4. Adequate lights over all work areas and convenient electrical outlets on each wall.
 - 5. Adequate heating and air conditioning system with thermostat control.
 - 6. Sanitary conveniences meeting the requirements of all local and state health codes (portable facilities acceptable).
 - 7. Provide telephone line service for the exclusive use of the Engineer.
 - a. Provide one line for Internet and Fax service.
 - b. Provide one line for voice.
 - 8. Provide internet access (high speed wireless is acceptable) for the exclusive use of the Engineer.
 - a. If wireless internet provided results in connection problems or slow internet speeds that prevent video conferencing, the Engineer reserves the right to request "hard line" connection.
 - 9. Potable water supply (bottled water acceptable).
- B. Provide furnishings:
 - 1. One (1) flat top desk, 30 inches by 60 inches, with drawers at each side.
 - 2. One (1) plywood drawing table with suitable drawing surface, 3 feet by 6 feet.
 - 3. One (1) desk or table suitable for supporting the copy machine, fax machine and computer.
 - 4. Eight (8) straight chairs plus one (1) suitable for use with drawing table.
 - 5. One (1) four-drawer steel filing cabinet with lock and key.
 - 6. One (1) large wastebasket.
 - 7. One (1) rack suitable for storing drawings.
 - 8. One (1) wall mounted fire extinguisher.
- C. Provide equipment:
 - 1. One (1) combination copier/fax/scanner/printer (color) capable of 11" x 17" faxes and copies. Model shall be subject to the approval of the Engineer. Acceptable manufacturers include:
 - a. HP (Hewlett Packard)
 - b. Brother.
 - c. or approved equal.

- 2. Provide one (1) new personal laptop computer with Microsoft Office. Model shall be subject to the approval of the Engineer.
- 3. Provide one (1) phone with answering service (either land line or cellular phone service is acceptable).
- 4. A microwave oven and refrigerator shall be made available for the Engineer to use as needed.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in a location approved by the Owner and properly set up for all anticipated weather conditions.
- B. Provide electric power and heat during the duration of the Work.
- C. The Contractor shall pay all utility charges relating to this Contract.

3.2 <u>CLEANING</u>

- A. Upon completion of the project, remove the Field Office from the site and thoroughly clean the area.
- B. The Field Office and furnishings shall remain the property of the Contractor.

OWNER'S RIGHT TO MATERIAL

PART 1 -- GENERAL

1.1 DESCRIPTION

A. Work Included:

- 1. The Owner retains the right to claim all suitable and unsuitable material including equipment listed below:
 - a. Any material including valves, wiring or equipment as determined by the Owner.
- 2. Contractor shall deliver all material claimed by the Owner to a location designated by the Owner within five (5) miles of the worksite unless otherwise directed by the Engineer.
- B. Work Specified Elsewhere. The following is a list of Sections that note work related to this Section. The list is provided for the Contractor's convenience and is not intended to relieve the Contractor of requirements noted in Sections that are not listed below.
 - 1. Division 2
 - 2. Division 11
 - 3. Division 15
 - 4. Division 16

PART 2 -- PRODUCTS

(NOT PART OF THIS SECTION)

PART 3 -- EXECUTION

(NOT PART OF THIS SECTION)

SUBSTITUTIONS & PRODUCT OPTIONS

PART 1 - DESCRIPTION

1.1 DESCRIPTION

- A. If stated in these Specifications that a substitute that is equal to any material or equipment specified may be furnished, and if the Contractor wishes to furnish or use a substitute, submit a written request to the Engineer for approval of the substitute.
- B. The Engineer shall be the judge of equality.

1.2 SUBMITTALS

- A. Submit approval request promptly after the award of the Contract.
- B. Completely describe the proposed substitution including, as applicable:
 - 1. Manufacturer's catalog data,
 - 2. Illustrations,
 - 3. Specifications,
 - 4. Samples,
 - 5. Copies of previous approvals,
 - 6. Other data that may be requested by the Engineer to determine equality.

PART 2 - PRODUCTS

2.1 <u>CRITERIA</u>

- A. The following criteria will be used by the Engineer in determining the equality of the proposed substitutions:
 - 1. Adaptability to the design,
 - 2. Functional performance,
 - 3. Appearance (when applicable)
 - 4. Quality of materials,
 - 5. Strength of materials,
 - 6. Complexity, frequency and cost of maintenance.

PART 3 - EXECUTION

3.1 ORDERING AND INSTALLING

A. Do not order and do not install any substituted material or equipment without the written approval of the Engineer.

3.2 <u>RESULTING CHANGES</u>

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

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

3.3 ENGINEERING SERVICES

- A. If the Contractor requests substitutions which require design or other engineering services, the services will be provided only by a Professional Engineer registered in the state in which the project is located.
- B. All engineering services for substitutions shall be performed at the expense of the Contractor.

PROJECT CLOSE-OUT PROCEDURES

PART 1 - GENERAL

1.1 INTRODUCTION

A. Contractor's requirements of the Contract to closeout the project.

1.2 PROJECT CLOSE-OUT REQUIREMENTS

- A. Prior to final payment the Contractor shall submit the following to the Engineer:
 - 1. Contractor's Affidavit
 - 2. Consent of Surety to final payment.
 - 3. Certificate of Inspections
 - 4. Evidence of payment and release of liens
 - 5. Project Record Documents (Section 01720)
 - 6. Operation and Maintenance data (Section 01730)
 - 7. Submission of warrantees

PART 2 - PRODUCTS

(NOT PART OF THIS SECTION)

PART 3 - EXECUTION

(NOT PART OF THIS SECTION)

PROJECT CLEANING

PART 1 - 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. Conduct cleaning and disposal operations in accordance with all applicable local and state laws, ordinances, and code requirements.

PART 2 - PRODUCTS

A. Use only cleaning materials recommended by manufacturer of surfaces to be cleaned.

PART 3 - EXECUTION

3.1 <u>PERFORMANCE</u>

- A. Cleaning During Construction (where applicable):
 - 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 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 materials from heights.
 - 7. Where 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 material on project site.
 - 2. Do not dispose of hazardous 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 (where applicable):
 - 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 on the project site.
 - 6. Restore to their original condition those portions of the site not designated for alterations by the Contract Documents.

PROJECT RECORD DOCUMENTS

PART 1 -- GENERAL

1.1 DESCRIPTION

- A. Work Included: Keep accurate files containing original contract as well as copies of all submittals and record all additions, substitutions of material, variations in work, and any other additions or revisions to the Contract, including up-to-date marked up construction drawings and specifications reflecting changes in work and field ties to installed buried/submerged utilities, and as further described in Section 2.1 below.
- B. Provide field survey of the completed work including GPS coordinates and elevations of pipe, fittings, changes in slope and other utilities encountered. Pipe locations shall be recorded on a daily basis. The following information shall be recorded by the Contractor and provided to the Engineer.
 - GPS coordinates of the installed pipe locations
 - Elevation of pipelines as installed
 - GPS coordinates and elevations of changes in pipe slope and/or alignment
 - Elevation and designation of utilities at crossings
 - Final centerline and gutter lines of road reconstruction areas and where grading has changed from existing
 - Paving repairs or pavement restoration limits
 - Field ties to pipe fittings, bends, structures, gate valves, etc.
 - Field ties to any changes in materials

PART 2 -- PRODUCTS

2.1 <u>RECORD DOCUMENTS</u>

- A. Maintain at the job site, one copy each of:
 - 1. Contract Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Reviewed and approved Shop Drawings.
 - 5. Change Orders, Field Orders and Engineering Supplemental Information (ESI's).
 - 6. Any other modifications to the Contract.
 - 7. Field Test Reports.
 - 8. Inspection certificates
 - 9. Manufacturer's certificates
 - 10. Manufacturer's operation and maintenance manuals
 - 11. Red-line record drawings

PART 3 -- EXECUTION

3.1 FIELD ENGINEERING

A. The contractor shall designate personnel who will be responsible for layout, measurements, and as-built survey for the entire project. The contractor shall submit copies of Field Engineering Survey to the Engineer for review on a monthly basis. Plan information provided shall be the same scale and datum as the design drawings.

3.2 STORAGE AND MAINTENANCE

- A. Store Record Documents in approved files and racks apart from documents used for construction.
- B. File Record Documents in accordance with Project Filing Format of Uniform Construction Index.
- C. Maintain Record Documents in clean, dry, legible condition.
- D. Do not use Record Documents for construction purposes.
- E. Make Record Documents available at all times for inspection by the Engineer and Owner.

3.3 <u>RECORDING</u>

- A. Label each document "PROJECT RECORD" in large printed letters.
- **B.** Keep Record Documents current and do not permanently conceal any work until required information has been recorded. **Report on the status of red-line record drawings at each monthly meeting.**
- C. Contract Drawings: Legibly mark to record actual construction (when applicable)
 - 1. Method of locations and recording shall have prior approval of the Engineer.
 - 2. Depths of various elements of foundations in relation to survey datum.
 - 3. Horizontal and vertical locations of underground utilities and appurtenances referenced to permanent surface improvements.
 - a. Include all water, sewer, steam, air, instrumentation and fuel piping systems and all electrical and communications circuits including all direct burial cables.
 - b. Whenever any existing utility line is uncovered in the course of excavation for new utility installation, record the location dimensions of such lines.
 - 4. Location of service connection points with any utility (water, sewer, electrical, telephone, etc.) and the location of capped or plugged ends of these same house service lines.
 - a. Locations shall be recorded by accurate "swing ties" or other methods approved by the Engineer.
 - 5. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
 - a. Electrical equipment such as conduits, piping, instrumentation located in slabs, walls and ceilings and to include approximate locations and routing.
 - b. Schematic diagram of actual electric conduit or instrument tubing routing between equipment and supply.

- 6. Field changes of dimension and detail and changes made by Change Order or Field Order.
- 7. Details not on original Contract Drawings.
- D. Specifications and Addenda: Legibly mark up each Section to record:
 - 1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
 - 2. Changes made by Change Order or Field Order.
- E. Electrical and Instrumentation and Control Record Drawings
 - 1. The contractor will be responsible for preparing CADD drawing record drawings for all electrical and Instrumentation and Control work for review by the Engineer.
 - 2. Electronic CADD files will be provided to the Contractor for his use to prepare record drawings.

3.4 <u>SUBMITTALS</u>

- A. At Substantial Completion of the project, deliver Record Documents to the Engineer.
 - 1. Record Drawings shall be submitted in electronic (PDF) format in addition to full size 22" x 34" hard copy.
- B. Accompany submittal with transmittal letter, in duplicate, containing:
 - 1. Date, project title and number.
 - 2. Contractor's name and address.
 - 3. Title and number of each Record Document with certification that each document is completed and accurate.
 - 4. Signature of Contractor, or his authorized representative.
- C. Failure to record these locations on the Project Record Drawings shall result in non-approval of the final payment to the Contractor and/or if contract time (as specified in the Contract and/or modified in accordance with the Standard General Conditions of the Construction Contract) has elapsed, this shall be grounds for the assessment of the liquidated damages as specified.

Scope of Work

Furnish, install and test all site work and appurtenant work in complete accordance with the Drawings and Specifications.

Contractor's Duties

Except as specifically noted, provide and pay for all labor, materials, equipment, tools, machinery, water, heat, other facilities and services necessary for proper execution and completion of the work.

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Contents	of Division
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Section No.	Section Title
02223	Trench Excavation - Earth
02224	Trench Excavation - Ledge
02229	Backfilling, Compaction Control & Testing
02275	Construction Fabrics
02369	Sheeting
02402	Site Dewatering
02601	Sewer Manholes, Covers and Frames (NH)
02610	Pipe & Pipe Fittings – General
02611	Ductile Iron Pipe and Fittings
02612	Reinforced Concrete Pipe
02622	PVC Pipe & Fittings
02626	Copper Service Pipe
02630	Couplings, Connectors, Caps & Plugs
02640	Rubber Seated Butterfly Valves
02641	Resilient Seated Gate Valves
02642	Corporation Stops
02643	Curb Stops
02644	Hydrant Assemblies
02646	Valve Boxes
02649	Service Saddles
02650	Excavation Dewatering
02651	Final Sewer Testing

TRENCH EXCAVATION - EARTH

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. Trench excavation work in earth includes the removal of sand, gravel, existing utilities, ashes, loam, clay, swamp muck, trolley tracks, 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 two cubic yards for the installation of pipes and appurtenant structures.
 - 2. All trench excavation shall be classed as earth or ledge.
 - 3. Submit details of proposed temporary lateral support for all excavations exceeding 12-feet in depth.

1.2 JOB CONDITIONS

- A. Utilities:
 - 1. The locations of known buried water lines, sewer lines, telephone cables, storm drains, culverts, gas mains, electrical conduits, and other utilities are shown on the Drawings. No guarantee is made as to the correctness of the locations shown and to the completeness of the information given.
 - 2. Discontinue excavation by machinery when the excavation approaches pipes, conduits, or other underground structures of which the approximate locations are known. Use manual excavation methods to locate the obstructions.
- B. Existing Structures:
 - 1. Perform excavation in such a manner that will prevent any possibility of undermining and disturbing the foundations of any existing structures and any work previously completed under this Contract.
 - 2. Where existing buildings and other structures are in close proximity to the proposed construction, exercise extreme caution and utilize sheeting, bracing, and whatever other precautionary measures, that may be required.
- C. Repairing Damage:
 - 1. Repair, or have repaired, all damage to existing utilities, structures, lawns, other public and private property which results from construction operations, at no additional cost to the Owner, to the complete satisfaction of the Owner, the Engineer, the utility company and the property owner.
- D. Backfill of Trenches:
 - 1. Do not leave any trenches open overnight. Unless otherwise approved by the Owner, all trenches shall be completely backfilled at the end of each day

PART 2 – PRODUCTS

- A. Unsuitable Material:
 - 1. If, in the opinion of the Engineer, the material encountered above the indicated grade, shown on the Drawings, for excavation, is unsuitable, remove the material to the widths and depths as directed by the Engineer. Replace this material as specified in the "Backfilling, Compaction, Control & Testing" Section of this Division.
 - 2. If, in the opinion of the Engineer, the material encountered at or below the indicated invert grade shown on the Drawings, for excavation is unstable, remove the material. Replace this material with thoroughly compacted bankrun gravel, screened gravel or stone bedding material as shown on the drawings, or as directed by the Engineer.
- B. Disposal of Material:
 - 1. All surplus and unsuitable material shall become the property of the Contractor unless specified otherwise.
 - 2. Disposal of surplus and unsuitable material is the Contractor's responsibility.
 - 3. The Contractor shall obtain and provide to the Owner a "Hold Harmless Release" from the owner of the property where of any surplus or unsuitable material will be disposed of.
 - 4. The Contractor is responsible for complying with all appropriate local, state and federal regulation governing the placement of fill.
- C. Embankment Material: Obtain prior approval and instructions from the Engineer prior to undertaking the excavation for pipe placement of any fill material that has been in an embankment for less than one year.

PART 3 - EXECUTION

3.1 <u>PERFORMANCE</u>

- A. General:
 - 1. Unless otherwise specifically directed or permitted by the Engineer, begin excavation at the low end sewer lines and proceed upgrade.
 - 2. Perform trench excavation for utilities and structures in a logical sequence, to minimize re-work and prevent damage to surrounding utilities and structures.
- B. Amount of Excavation:
 - 1. Trench width: As shown on the Drawings.
 - 2. Trench depth: As shown on the Drawings.
 - 3. Open Excavation:
 - a. The extent of open excavation shall be controlled by prevailing conditions.
 - b. Open excavation shall, at all times, be confined to the limits acceptable to the Owner.
 - 4. Unauthorized Excavation:
 - a. Backfill to the specified grade, any excavation beyond the limits stated above and as shown on the Drawings (unless specifically

ordered otherwise by the Engineer) with thoroughly compacted crushed stone or screened gravel.

- b. Backfill unauthorized excavation at no additional cost to the Owner.
- C. Excavation Protection:
 - 1. The Contractor shall be responsible for selecting and implementing Excavation Protection Systems required by OSHA and State requirements..
 - 2. Trench width on drawings do not apply to excavation necessary for installation of trench shoring and bracing systems.
- D. Trench Preparation
 - 1. The Contractor shall take all necessary steps to minimize impacts to surrounding property owners.
 - 2. The Contractor shall segregate gravels and select aggregates for reuse. Contractor shall return select aggregates to existing depths or to the limits shown on the drawings.
 - 3. Contractor shall take all necessary steps to minimize the impact of both surface water and ground water within the trench excavation area.
 - 4. When the Contractor approaches the lower limits of the excavations, the Contractor shall take necessary steps to maintain a smooth undisturbed dry bottom. This may include using a smooth excavator bucket and dewatering the excavation in accordance with Section 02650.
 - 5. Over-excavation below limits indicated on the drawings, shall be filled with crushed stone at the Contractors own expense, unless directed otherwise.
TRENCH EXCAVATION - LEDGE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. Trench excavation work in ledge includes the removal of ledge and rock required for the installation of pipes and/or structures.
 - 2. "Ledge" and "rock" includes any natural compound, natural mixture, and chemical element required to be excavated that, in the opinion of the Engineer, can be removed from its existing position and state only by blasting, drilling and blasting, wedging, drilling and wedging, wedging and breaking with power hand tools, or by extending the use of an approved excavating machine beyond normal and design wear and tear. 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.
 - 3. All trench excavation shall be classed as earth or ledge.

1.2 JOB CONDITIONS

- A. Utilities:
 - 1. The locations of known buried water lines, sewer lines, telephone cables, storm drains, culverts, gas mains, electric conduits and other utilities are shown on the Drawings. No guarantee is made as to the correctness of the locations shown and to the completeness of the information given.
 - 2. Use manual excavation methods to locate existing utilities.
- B. Existing Structures:
 - 1. Perform excavation in such a manner that will prevent any possibility of undermining and disturbing the foundations of any existing structures and any work previously completed under this Contract.
 - 2. Where existing buildings and other structures are in close proximity to the proposed construction, exercise extreme caution and utilize whatever precautionary measure that may be required.
- C. Repairing Damage:
 - 1. Repair, or have repaired, all damage to existing utilities, structures, lawns, other public and private property which results from construction operations, at no additional cost to the Owner, to the complete satisfaction of the Owner, the Engineer, the utility company and the property owner.
- D. Backfill of Trenches:
 - 1. Do not leave any trenches open overnight. Unless otherwise approved by the Owner, all trenches shall be completely backfilled at the end of each day

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Disposal of Suitable Material:
 - 1. All material that is, in the opinion of the Engineer, suitable shall remain the property of the Owner.
 - 2. Stockpile all suitable material in locations approved or designated by the Owner.
- B. Disposal of Unsuitable Material:
 - 1. All unsuitable material shall become the property of the Contractor unless specified otherwise in Division 1.
 - 2. Dispose of unsuitable material at the locations acceptable to or designated by the Owner.

PART 3 - EXECUTION

3.1 <u>PERFORMANCE</u>

- A. General:
 - 1. Unless otherwise specifically directed or permitted by the Engineer, begin excavation at the low end of sewer lines and proceed upgrade.
 - 2. Perform excavation for force mains and/or water mains in a logical sequence.
- B. Amount of Excavation:
 - 1. Trench width: As shown on the Drawings.
 - 2. Trench depth: As shown on the Drawings.
 - 3. Open Excavation:
 - a. The extent of open excavation shall be controlled by prevailing conditions.
 - b. Open excavation shall, at all times be confined to the limits acceptable to the Owner.
 - 4. Unauthorized Excavation:
 - a. Backfill to the specified grade, any excavation beyond the limits stated above and as shown on the Drawings (unless specifically ordered otherwise by the Engineer) with thoroughly compacted crushed stone or screened gravel.
 - b. Backfill unauthorized excavation at no additional cost to the Owner.
- C. Shoring and Bracing:
 - 1. As the excavation progresses, install such shoring and bracing (i.e., trench box) necessary to prevent caving and sliding and to meet the requirements of the State and OSHA safety standards.

BACKFILL AND COMPACTION

PART 1 -- GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. Work includes backfilling trenches and/or excavation around structures with suitable material removed in the course of excavating and other suitable materials.
 - 2. Testing soils.
- B. Work Specified Elsewhere. This Section is not a stand-alone Section. Other requirements which relate to this Section are noted elsewhere in these documents. The Contractor and all Subcontractors are required to review this entire document along with the Drawings in an effort to identify all requirements.

1.2 <u>REFERENCE STANDARDS</u>

- A. Sieve Analysis of Fine and Coarse Aggregates: ASTM C136
- B. Sampling Aggregates: ASTM D75
- C. Moisture Density Relations of Soils (Modified Proctor): ASTM D1557
- D. Density of Soil In-Place by Nuclear Methods: ASTM D2922
- E. State of New Hampshire Department of Transportation (NHDOT) Standard Specifications for Road and Bridge Construction (latest edition)

1.3 QUALITY ASSURANCE

- A. The Contractor shall obtain and pay for all services of a geotechnical testing firm to perform the necessary soil and compaction tests. The independent soils laboratory shall be approved by the Engineer prior to testing.
- B. The Contractor shall make necessary arrangements to allow compaction testing to be performed at a time, place and elevation determined by the Engineer.
- C. Pre-placement testing.
 - 1. The Contractor shall take one sample of each material proposed to be used on the project. The samples shall be taken in the presence of the Engineer and in accordance with ASTM D75.
 - 2. Subgrade Material: Proctor density tests shall be performed on the existing subgrade in accordance with the following schedule and in accordance with ASTM D1557:
 - a. At the bottom of excavations where structures or slabs will be placed.
 - b. One after every 5,000 cubic yards has been relocated on the site.
 - c. Whenever the material has changed in the opinion of the Engineer.
 - 3. Select and Borrow Materials: Sieve and modified proctor density tests shall be performed on all select and borrow material in accordance with the following schedule and in accordance with ASTM C136 and ASTM D1557:
 - a. Before any materials are brought to the site.

- b. One after every 5,000 cubic yards has been brought to the site.
- c. Whenever the source changes.
- 4. The result shall be submitted to the Engineer for approval prior to placement.
- 5. The Contractor shall obtain representative samples for ongoing trench backfill operations.
 - a. Samples may be obtained in-situ at time of testing provided they are, in the Engineers opinion, representative of ongoing operations.
 - b. Samples may be obtained from stockpiles provide the stockpiled material is thoroughly mixed to represent ongoing operations.
 - c. Samples shall also be obtained for select materials such as reclaimed asphalt or gravels previously excavated from the trench.
- D. Post-placement testing:
 - 1. The trench and/or excavation shall be prepared using the normal backfill technique employed by the Contractor. No special or additional preparation will be allowed.
 - 2. Determine in-place density in accordance with ASTM D2922 or by other methods as approved by the Engineer.
 - 3. Compaction tests shall be made in accordance with the following table:

	Material	Testing Frequency	Percent Compaction
Under	Slabs or Structures:		
	Native material or	One for every 500 s.f. of	95%
	borrow material	surface area of the slab for	12" lifts
		every 2 lifts of material placed.	
	Structural fill or	One for every 500 s.f. of	95%
	crushed gravel	surface area of the slab for	6" lifts
		every lift of material placed	
Aroun	d Structures:		
	Borrow material or	One for every 500 l.f. of wall	95%
	other material noted	for every 2 lifts of material	12" lifts
	on the drawings	placed.	
In Trenches:			
	Native material or	From the blanket material to the	95%
	borrow material	underside of the gravel or loam.	12" lifts
		See Note #1 Below	
	Gravels or loam	See requirements for Under	See below
		paved Areas and Grassed Areas	
		for requirements below	
Under	Paved Areas:		
	Native material or	One for every 10,000 s.f. of	95%
	borrow material	surface area for every 2 lifts of	12" lifts
		material placed.	
	Gravel	One for every 10,000 s.f. of	95%
		surface area for every lift of	6" lifts

	material placed.	
Crushed Gravel	One for every 10,000 s.f. of surface area for every lift of material placed.	95% 6" lifts

Under			
	Native material or borrow material	One for every 20,000 s.f. of surface area for every 2 lifts of material placed.	90% 12" lifts

Notes:

- The Contractor shall propose a method for backfill on the first day 1. of work. This proposed method will be tested and modified as required to meet the compaction requirements noted in the above table. Testing shall be completed on a minimum of 4 lifts compacted using the contractor's proposed method. The approved compaction method shall be used until, in the opinion of the Engineer, the soil characteristics have changed or the contractor has changed compaction equipment. At that point new compaction tests shall be performed to determine if the requirements are still being met. If they are. the method shall continue, if they are not, the method shall be modified until the requirements are met. Even if the soil characteristics have not changed, confirmatory compaction tests shall be taken every 3 weeks. Confirmatory testing shall include testing of a minimum of 2 lifts. The Engineer shall determine the location of all tests.
- 4. Should compaction tests fail to meet the specified densities, the Contractor shall modify backfill methods as necessary to obtain passing results. The modified method shall be used from that point on.

1.4 SUBMITTALS

- A. The Contractor shall submit at the preconstruction meeting his proposed compaction technique which shall include compaction around field structures (i.e manholes, catch basins, etc.) and valve boxes.
- B. The Contractor shall submit sieve and proctor curves to the Engineer for approval 7 days before any material is brought to the site.
- C. The Contractor shall submit compaction test result sheets to the Engineer no later than 7 days after the test were performed.

PART 2 -- PRODUCTS

2.1 MATERIALS

- A. Excavated Material Suitable for Reuse:
 - 1. Material shall be friable natural material comprised of gravels, sand, silts, or clayey gravel and sands.
 - 2. Material shall be free from peat, muck, other organic matter, frozen material, ice, and/or snow.
 - 3. Material shall be free from stones, ledge/rock fragments, and asphalt over 8" in the largest dimension.
 - 4. The material shall not have a moisture content over 2% of its optimum moisture content.
- B. Select and Borrow Materials:
 - 1. Crushed Stone (Bedding Material):
 - a. Crushed stone shall be well graded in size from 1/4 inch to 3/4 inch and conform to ASTM C33 stone size No. 67.
 - b. Clean, hard, and durable particles or fragments.
 - c. Sieve Analysis:

Sieve	% Passing by Weight
Designation	Square Opening
1"	100
3/4"	90 - 100
3/8"	20 - 55
No. 4	0 - 10
No. 8	0 - 5
No. 200	1% Max.

- 2. Sand (Sand Blanket or Bedding):
 - a. Clean, hard and durable particles or fragments.
 - b. Sieve Analysis:

Sieve	% Passing by Weight
Designation	Square Opening
3/8"	100
No. 4	95 - 100
No. 16	50 - 85
No. 50	10 - 30
No. 100	2 - 10

- 3. Crushed Gravel or Structural Fill (Crushed Gravel Base Course):
 - a. Well graded granular crushed gravel material for use as a crushed gravel base.
 - b. Material shall be hard and durable, free from frost, organic material, loam, debris and other unsuitable material.
 - c. At least 50% of material retained on the 1 inch sieve shall have a fractured face.
 - d. Sieve Analysis:

Sieve % Passing	by Weight
Designation Square (Dpening
3" 10	0
2" 95 -	100
1" 55 -	85
No. 4 27 -	52
No. 200 0 –	12 (of the sand portion)

- 4. Bank Run Gravel or Granular Gravel Borrow (Gravel Subbase Course):
 - a. Well graded granular bank-run gravel material for use as gravel subbase.
 - b. Material shall be hard and durable, free from frost, organic material, loam, debris and other unsuitable material. Shall not have excess amounts of clay or silt and shall be so sized that the material can be laid out and graded in smooth uniform 8" lifts.
 - c. Sieve Analysis:

Sieve	% Passing by W	eight
Designation	Square Openin	ng
6"	100	
No. 4	25 - 70	
No. 200	0 - 12	(of the sand portion)

- 5. Common Borrow (i.e. Sand):
 - a. Consist of earth suitable for embankment construction; free from frozen material, perishable rubbish, peat and other unsuitable material.
 - b. The moisture content shall be sufficient to provide the required compaction and stable embankment. In no case shall the moisture content exceed 4 percent above optimum.
 - c. The optimum moisture content shall be determined in accordance with AASHTO T 180, Method C or D.
 - d. 100% shall pass the 3" sieve and 70-100% shall pass the No. 4 sieve.
- 6. Gravel Borrow (i.e. Gravel):
 - a. Well graded granular material suitable for placement in authorized excavations below the bottom of the bedding layer to replace deficient

excavated material, for road construction, pipeline construction, and other designate uses.

b. 95-100% shall pass the 3" sieve and 25-70% shall pass the No. 4 sieve.

PART 3 -- EXECUTION

3.1 PERFORMANCE

A. General:

- 1. Provide and place all necessary backfill material.
- 2. Do not allow large masses of backfill to be dropped into the excavation, as from a grab bucket, in such a manner that may endanger pipes and structures.
- 3. Place material in a manner that will prevent stones and lumps from becoming nested.
- 4. Completely fill all voids between stones with fine material.
- 5. Do not place backfill on or against new concrete until it has attained sufficient strength to support loads without distortion, cracking, and other damage.
- 6. Deposit backfill material evenly on all sides of structures to avoid unequal soil pressures.
- 7. Place backfill material evenly in the trench in an effort to maximize compaction.
- 8. Do not backfill with, or on, frozen materials.
- 9. Remove, or otherwise treat as necessary, previously placed material that has frozen prior to placing backfill.
- 10. Do not mechanically or hand compact material that is, in the opinion of the Engineer, too wet. Fill material that is too wet to be properly placed back in the trench it its current state shall be dried (disced, harrowed, etc.) to within 2% of optimum moisture content. This material shall not be classified as unsuitable material and ineligible for payment as such.
- 11. Material made unsuitable by the Contractor's construction methods shall be replace with Gravel Borrow at no additional cost to the Owner.
- 12. Fill that is too dry shall be uniformly watered. The water shall be placed over a loose lift to allow for the water to migrate through the entire lift before compaction.
- 13. Do not continue backfilling until the previously placed and/or new materials have dried sufficiently to permit proper compaction.
- 14. When original excavated material is, in the opinion of the Engineer, unsuitable, use only approved gravel borrow for backfilling.
- 15. Backfill excavation/trench as early as possible to allow for the maximum time for natural settlement.
- 16. Slope grade away from structures at a minimum slope of 1.5%.
- 17. The Contractor shall remove excess fill material from the site.

- B. Sheeting:
 - 1. Leave sheeting in place when damage is likely to result from its withdrawal. This shall only be allowed with written approval of the Engineer.
 - 2. Completely fill with suitable material and thoroughly compact all voids left by the removal of sheeting.
 - 3. Sheet shall be left in-place and incrementally moved up to allow for a safe work environment in which to properly compact the excavation/trench.
 - 4. See Section 02369 Sheeting.
- C. Backfilling Around Trench Obstacles
 - 1. Material must be properly compacted around trench obstacles (i.e. manholes, catch basin, valve boxes, etc.). Uncompacted fill will not be allowed to be placed around these obstacles.
 - 2. The Contractor shall provide adequate excavation supports to allow for a safe work environment in which to properly compact the excavation/trench.
 - 3. The Contractor shall use methods that compensate for the space limitations in the immediate area around these obstacles.
- D. Backfilling in Paved Areas:
 - 1. Backfill trenches in streets and other paved areas by maintaining a moisture content within 2% of optimum.
 - 2. In an effort to allow the road to heave uniformly, backfill material that was removed from the top portion of the trench shall be replaced back into the top of the trench. Similarly, the material removed from the middle of the trench shall be replaced back into the middle of the trench. Existing material removed from the bottom of the trench (i.e. where the pipe box is located) shall be stockpiled for later use.
 - 3. Backfill in such a manner as to permit the rolling and compaction of the filled trench with the adjoining material to provide the required bearing value for paving immediately after backfilling is completed.
 - 4. Where required, place excavated material, that is acceptable to the Engineer for surfacing or pavement subbase, at the top of the backfill to the depths as needed to adequately support pavement.
- E. Backfilling Trenches in Nonpaved Areas:
 - 1. Grade the ground to a reasonable uniformity.
 - 2. Leave the mounding over the trenches in a uniform and neat condition, satisfactory to the Engineer.
- F. Bedding & Backfilling of Pipelines:
 - 1. Install pipe bedding and cushion and primary backfill in accordance with the requirements noted herein, in the specific pipe Specification Section, and on the Drawings.
 - 2. Deposit and thoroughly compact the remainder of the backfill as noted herin.
- G. Placing and Compacting Backfill:
 - 1. Water Jetting: Shall not be allowed without the approval of the Engineer. a.
 - 2. Puddling: Shall not be allowed without the approval of the Engineer.
 - 3. Tamping:

- a. Deposit and spread the backfill material in uniform parallel layers not exceeding the lift thicknesses noted herein.
- b. Tamp each layer as required to obtain a thoroughly compacted mass.
- c. If necessary, furnish and use an adequate number of power driven tampers, each weighing at least 150 lbs.
- 4. Rolling:
 - a. Compact material by rolling only when the width and depth of the excavation are sufficient to accommodate the rollers, dozers, mechanical tampers, or other similar powered equipment, as may prove to be acceptable, and when it can be performed without causing damage to pipes and structures installed in the excavation.
 - b. Deposit and spread the backfill material in uniform parallel layers not exceeding the lift thicknesses noted herein.
 - c. Roll each layer as required to obtain a thoroughly compacted mass.
- 5. Other placing and compacting methods may be employed only when approved by the Engineer.
- H. Improper Backfill
 - 1. When, in the opinion of the Engineer, 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, compacting work and testing performed to correct improper backfilling shall be performed at no additional cost to the Owner.

CONSTRUCTION FABRICS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish and install the appropriate construction fabric at locations shown on the Drawings.
- B. Related Work Specified Elsewhere:
 - 1. Temporary Erosion Control Section 02540.
 - 2. Pipe and Pipe Fittings General Section 02610
 - 3. Earthwork Section 02200

1.2 SUBMITTALS

A. Shop drawings for each type of fabric to be used on the project shall be submitted to the Engineer for approval prior to installation. The Contractor will demonstrate that the strength of the chosen fabrics, while meeting the physical characteristics given below, shall withstand without failure the stresses which will be applied by his equipment and activity using his proposed construction techniques.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Construction fabrics shall be divided into four categories:
 - 1. Soil Stabilization Geogrid (TRIAX)
 - 2. Erosion Control
 - 3. Sediment Control
 - 4. Drainage/Soil Separation (trench)

2.2 SOIL STABILIZATION (GEOGRID)

- A. The geogrid material shall be manufactured from a polypropylene sheet, oriented in three (3) equilateral directions.
- B. The fabric shall be inert to commonly encountered chemicals, liquids and other material, and shall be resistant to ultraviolet light, mildew, rot or other deterioration.
- C. The fabric shall have the following physical characteristics:
 - 1. Rib pitch 1.6 inches (nominal)
 - 2. Radial stiffenings 20,000 lb/ft at 0.5% strain ASTM D 6637-01 (at low strain)
- D. Acceptable manufacturers:
 - 1. Tensar International
 - 2. or equivalent

2.3 PERMANENT EROSION CONTROL

- A. The fabric specified herein is suitable for medium duty applications beneath riprap or revetments.
- B. Material shall be a woven or non-woven fabric made of polypropylene or polyester fabric.
- C. The fabric shall be inert to commonly encountered chemicals, liquids and other material, and shall be resistant to ultraviolet light, mildew, rot or other deterioration.
- D. The fabric shall have the following physical characteristics:

1.	Grab Tensile Strength	lbs.	150	ASTM D 4632
2.	Apparent Opening Size	US Standard Sieve	100	ASTM D 4751
3.	Water Flow Rate	gal/min/SF	100	ASTM D 4491
4.	Grab Elongation	%	40	ASTM D 4632
5.	Trap Tear Strength	lbs.	90	ASTM D 4533
6.	Mullen Burst Strength	psi	300	ASTM D 3786
7.	Permittivity	sec. ⁻¹	1.5	ASTM D 4491
8.	Weight	oz./sy	7.0	
		021/05	,	

- E. Acceptable manufacturers:
 - 1. Amoco
 - 2. Mirafi
 - 3. or equivalent

2.4 <u>SEDIMENT CONTROL</u>

- A. The fabric specified herein is suitable for general purpose siltation fencing.
- B. Material shall be a woven fabric made of polypropylene or polyester mono-filaments.
- C. The fabric shall be inert to commonly encountered chemicals, liquids and other material, and shall be resistant to ultraviolet light, mildew, rot or other deterioration.
- D. The fabric shall have the following physical characteristics:

1.	Grab Tensile Strength	lbs.	100	ASTM D 4632
2.	Water Flow Rate	gal/min/SF	35	ASTM D 4491
3.	Grab Elongation	%	30	ASTM D 4632
4.	Trap Tear Strength	lbs.	70	ASTM D 4533
5.	Mullen Burst Strength	psi	300	ASTM D 3786
6.	Permittivity	sec. ⁻¹	1	ASTM D 4491

- E. The fabric shall be supported on a 1 1/2 inch hardwood stake spaced a 6 foot (max) intervals.
- F. Fabric may be stapled or fastened to the stake with loops designed to adequately support the weight of the fabric and siltation load.
- G. Acceptable manufacturers:
 - 1. Amoco
 - 2. Mirafi
 - 3. or equivalent

2.5 DRAINAGE AND SOIL SEPARATION (TRENCH)

- A. The fabric specified herein is suitable for medium duty applications to sequester drainage stone or retain bedding stone around a pipe.
- B. Material shall be a non-woven fabric made of polypropylene or polyester fabric.
- C. The fabric shall be inert to commonly encountered chemicals, liquids and other material, and shall be resistant to ultraviolet light, mildew, rot or other deterioration.
- D. The fabric shall have the following physical characteristics:

1.	Grab Tensile Strength	lbs.	160	ASTM D 4632
2.	Apparent Opening Size	US Standard Sieve	70	ASTM D 4751
3.	Water Flow Rate	gal/min/SF	130	ASTM D 4491
4.	Grab Elongation	%	50	ASTM D 4632
5.	Trap Tear Strength	lbs.	80	ASTM D 4533
6.	Mullen Burst Strength	psi	350	ASTM D 3786
7.	Permittivity	sec. ⁻¹	2	ASTM D 4491
8.	Weight	oz./sy	6.0	

- E. Acceptable manufacturers:
 - 1. Amoco
 - 2. Mirafi
 - 3. or equivalent

PART 3 - EXECUTION

3.1 STORAGE AND HANDLING

A. The fabric shall be stored and handled in such a way as to prevent any damage and according to manufacturer's recommendations.

3.2 INSTALLATION

- A. The fabric shall be installed to in strict accordance with the manufacturer's recommendations.
- B. The fabric shall be staked, stapled, joined or overlapped, as may be appropriate for the application according to the manufacturer's recommendation or as shown on the drawings.

SHEETING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish, install and maintain sheeting and bracing in the location(s) shown on the Drawings and as required to comply with all applicable State and Federal Regulations including the Occupational Safety and Health Act.
- B. Design: Insure that the sheeting is properly designed and installed to sustain all existing and expected loads to prevent all movement of earth which could in any way cause injury to workmen, delay the work or endanger adjacent structures. Submit details of proposed temporary lateral support systems to the Engineer for review before excavation.

1.2 JOB CONDITIONS

- A. Utilize dewatering devices to facilitate excavation within the sheeted area.
- B. Dewatering shall be considered incidental to excavation and no separate payment for dewatering will be made, unless specified elsewhere.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All materials shall conform to all applicable State and Federal regulations including the Occupational Safety and Health Act.
- B. Sheeting shall consist of driving timber or steel uprights ahead of open excavation to be held rigidly opposite each other forming the walls of the trench and to be held rigidly by horizontal cross members (braces) and longitudinal members (walers).

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install sheeting in accordance with all applicable State and Federal regulations including the Occupational Safety and Health Act.
- B. Backfill as specified in these Specifications. When the level of compacted backfill reaches the location of bracing and wales, remove these items from the trench or other excavation.
- C. Cut the sheeting as shown on the Drawings.
- D. Complete backfilling as specified in these Specifications.

DEWATERING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. The Contractor shall provide all materials, equipment, and labor necessary for the removal of surface water and as required to provide silt and erosion control devices.
 - 2. The Contractor shall build all drains and do all ditching, pumping, bailing, and all other work necessary to keep the excavation clear of ground water, sewage, or storm water during the progress of the work and until the finished work is safe from damage.

1.2 Recommended Guides

- A. <u>AASHTO Highway Drainage Guidelines, Volume III, Guidelines for Erosion and Sediment Control in Highway Construction</u>, American Association of State Highway and Transportation Officials, Inc., 444 North Capital St. N.W., Suite 249, Washington, D.C. 20001.
- B. <u>Stormwater Management and Erosion and Sediment Control Handbook for Urban and</u> <u>Developing Areas in New Hampshire</u>, New Hampshire Department of Environmental Services, Public Information Office, P.O. Box 95, 6 Hazen Drive, Concord, New Hampshire.
- C. <u>Storm Water Phase II Compliance Assistance Guide, Section 5 Small Construction</u> <u>Activity</u>, United State Environmental Protection Agency, Publication No. 833-R-00-003.

1.3 SUBMITTALS

- A. The Contractor shall furnish to the Engineer and the USEPA, in writing, the Erosion and Sediment Control and Stormwater Management Plan (ESCSMP) plan for dewatering and diverting surface water before beginning the construction work for which the diversion is required. Acceptance of this plan will not relieve the Contractor of responsibility for completing the work as specified.
- B. The Contractor shall provide the appropriate National Pollutions Discharge Elimination System (NPDES) permit number prior to the start of construction.

PART 2- PRODUCTS

(NOT PART OF THIS SECTION)

PART 3 – EXECUTION

3.1 <u>REMOVAL OF WATER</u>

A. Water pumped from excavations shall be piped to points discharging into approved treatment facilities prior to discharging into water courses

3.2 DIVERTING SURFACE WATER

A. The Contractor shall build, maintain, and operate all cofferdams, channels, flumes, sumps, and other temporary diversion and protection works needed to divert streamflow and other surface water through or around the construction site and away from the construction work while construction is in progress. Unless otherwise specified, stream diversion must discharge into the same natural drainageway in which its headworks are located. Storm runoff from disturbed areas must discharge into a sedimentation pond prior to discharge into a natural drainageway.

3.4 EROSION CONTROL PROVISIONS

- A. The discharge from pumping operations during dewatering operations shall be contained by a device so constructed as to prevent silt from spreading off-site.
- B. Prior to removal of all sediment control devices all retained silt or other materials shall be removed at no additional cost to the Owner.

3.5 <u>REMOVAL OF TEMPORARY WORKS</u>

A. After the temporary works have served their purpose, the Contractor shall remove them or level and grade them to the extend required to present a sightly appearance and to prevent any obstruction of the flow of water or any other interference with the operation of or access to the permanent works.

3.6 ENVIRONMENTAL PERMITS (IF APPLICABLE)

A. All work under this section shall be done in accordance with all federal, state, and local regulations, laws, and rules which may apply and any individual permits that have been obtained for the project.

SEWER MANHOLES, COVERS AND FRAMES (NH)

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish and install manholes, cast iron frames and covers in conformance with the dimensions, elevations, and locations shown on the Drawings and as specified herein.
- B. Test manholes upon installation, prior to paving.

1.2 QUALITY ASSURANCE

- A. Construct all manholes in conformance with the New Hampshire Department of Environmental Services Water Division- Standards of Design and Construction for Sewerage and Wastewater Treatment Facilities.
- B. Construct all manholes of a quality to withstand loads of 8 tons (H-20 loading) without failure for a period of time in excess of 25 years.
- C. Construct all manholes of a quality to prevent leakage in excess of 1 gallon per day per vertical foot of manhole.
- D. Construct all manholes throughout the entire project from the same materials unless otherwise shown on the Drawings.
- E. All castings shall be at least Class 30 conforming to ASTM Standard Specifications for Gray Iron Casting, Designation A40.
- F. All essential details of design shall be as shown on the Drawings.
- G. Frames and covers shall be New Hampshire Standard.
- H. Masonry: See specification Section 04201.
- I. Waterproofing: Shall be with a product with demonstrated five (5) years successful use in similar applications.

1.3 SUBMITTALS TO THE ENGINEER

- A. Submit shop drawings in accordance with the General Conditions of the Construction Contract.
- B. A description of all methods of jointing.
- C. All Certificates of Compliance.
- D. Provide Fabrication Schedule that shows:
 - a. Orientation and elevation of opening.
 - b. Section dimensions and assembly order.
- 1.4 SUPPLEMENTAL INFORMATION
 - A. For work performed in the City of Portsmouth, New Hampshire the Contractor shall provide certification that all frames and covers were manufactured in the United States.

PART 2 - PRODUCTS

2.1 PRECAST MANHOLE SECTIONS

A General

- 1. Risers and tops shall be precast reinforced or non-reinforced concrete, or cast-in-place reinforced or non-reinforced concrete.
- 2. Manhole bases shall be monolithic to a point 6 inches above the crown of the incoming pipe and shall be constructed of reinforced or non-reinforced concrete.
- 3. Use concrete that conforms to the requirements of Class A concrete in Section 520 of the N.H.D.O.T. Standard Specifications for manhole bases and cast-in-place manholes.
- 4. Use reinforcing steel for cast-in-place concrete that conforms to the requirements of the N.H.D.O.T. Standard Specifications for Billet-Steel Bars or Welded Steel Wire Fabric.
- 5. Construct pipe to manhole joints that are approved by the New Hampshire Department of Environmental Services Water Division. In general, use approved non-shrinking mortar or elastomeric or mastic like sealants to unsure these joints are watertight.
- 6. Do not install manhole steps unless shown on the Drawings.
- 7. All sewer manhole covers shall be 30 inches in diameter unless shown otherwise on the Drawings and have the letter "S" or the word "SEWER" in 3-inch letters cast into the top surface.
- 8. All castings shall be of good quality, strong, tough, even-grained cast iron, smooth, free from scale, lumps, blisters, sandholes, and defects of every nature which would render them unfit for the service for which they are intended.
- 9. Contact surfaces of covers and frame seats shall be machined at the foundry before shipment to prevent rocking of covers in any orientation.
- 10. All castings shall be thoroughly cleaned and subject to a careful hammer inspection.
- 11. Prior to being shipped from the foundry, castings shall be sandblasted.
- 12. Repair all coatings that have been damaged in transit or handling to the satisfaction of the Engineer.
- 13. Drain manholes shall be provided in accordance to Section 604 of the NHDOT Standard Specifications.
- B. Openings:
 - 1. Provide openings in the risers to receive pipes entering the manhole.
 - 2. Make openings at the manufacturing plant.
 - 3. Size: To provide a uniform annular space between the outside wall of pipe and riser.
 - 4. Location: To permit setting of the entering pipes at the correct elevations.
 - 5. Openings shall have a flexible watertight union between pipe and the manhole base.
 - a. Cast into the manhole base and sized to the type of pipe being used.
 - b. Type of flexible joint being used shall be approved by the Engineer. Install materials according to the Manufacturer's instructions.
 - 1. Lock Joint Flexible Manhole Sleeve made by Interpace Corporation.

- 2. Kor N Seal made by National Pollution Control System, Inc.
- 3. Link Seal by Thunderline Corporation (Wayne, MI).
- 4. Approved Equal.
- C. Joints:
 - 1. Joint gaskets to be flexible self-seating butyl rubber joint sealant installed according to manufacturer's recommendations. For cold weather applications, use adhesive with joint sealant as recommended by manufacturer. Acceptable Materials:
 - a. Kent-Seal No. 2
 - b. Ram-Nek
 - c. Or equivalent.
 - 2. Joints between precast sections shall conform to related standards and manufacturer's instructions.
 - 3. All manholes greater than 6 ft. diameter and all manholes used as wet wells, valve pits and other dry-pit type structures shall be installed with exterior joint collars. The joint collar shall be installed according to the manufacturer's instructions. Acceptable materials:
 - a. MacWrap exterior joint sealer as manufactured by Mar-Mac Manufacturing Company.
 - b. Or equivalent.
- D. Waterproofing:
 - 1. The exterior surface of all manholes shall be given two coats of bituminous waterproofing material.
 - 2. The coating shall be applied after the manholes have cured adequately and can be applied by brush or spray in accordance with the manufacturer's written instruction.
 - 3. Sufficient time shall be allowed between coats to permit sufficient drying so that the application of the second coat has no effect on the first coat.

2.2 FRAMES AND COVERS

A. Hinged Sewer manhole frame and cover assemblies will be provided by the Owner.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Manhole Bases:
 - 1. Place bases on a 6-inch layer of compacted bedding consisting of crushed stone and/or natural stone graded to the following specifications:
 - a. 100 percent passing a 1-inch screen.
 - b. 90 to 100 percent passing a 3/4-inch screen.
 - c. 20 to 55 percent passing a 3/8-inch screen.
 - d. 0 to 10 percent passing a number 4 sieve.
 - e. 0 to 5 percent passing a number 8 sieve.
 - f. Equivalent to Standard Stone Size Number 67, Section 703 of N.H.D.O.T. Standard Specifications.

- 2. Properly dewater the excavation while placing the bedding material and placing the structure or concrete.
- 3. Use waterstops at the horizontal joint of cast-in-place manholes.
- B. Construct inlet and outlet stubs as shown on the Drawings.
- C. Invert Channels:
 - 1. Construct smooth and semicircular in shape conforming to the inside of the adjacent sewer section.
 - 2. Make changes in direction of flow with smooth curves having a radius as large as permitted by the size of the manhole.
 - 3. Stop the pipes at the inside face of the manhole where changes of direction occur.
 - 4. Form invert channels as shown on the Drawings.
 - 5. Slope the floor of the manhole outside the flow channel as shown on the Drawings or as directed by the Engineer.
- D. Precast Risers and Tops:
 - 1. Use the appropriate combinations of risers and top lengths.
 - 2. Seal joints with an approved type mastic as shown on the Drawings.
 - 3. Test the manhole as soon as practical after installation.
 - 4. Perform jointing in accordance with the manufacturer's recommendations and as approved by the Engineer.
 - 5. Install risers and tops level and plumb.
 - 6. Do not permit water to rise over newly made joints until after inspection by the Engineer.
 - 7. Make all joints watertight.
 - 8. Solidly fill annular spaces around pipes entering the manholes with non-shrink mortar or as otherwise shown on the Drawings.
 - 9. When necessary, core openings carefully to prevent damage to risers and tops. Replace all damaged risers and tops at no additional cost to the Owner.
 - 10. Cutting opening shall not be allowed without the expressed written permission of the Engineer.
- E. Cast-In-Place Manholes:
 - 1. Place a special plastic waterstop in the joint between the base and the sides of all manholes.
 - 2. Obtain the Engineer's approval of the type of waterstop and the installation.
 - 3. Cast all pipes entering the manholes in accordance with pipe manufacture recommendations.
- F. Drop Manholes:
 - 1. No free drop shall be permitted at the pipe inlet.
 - 2. Where the vertical distance between inlet and outlet pipe inverts exceeds 24 inches, construct a drop manhole as shown on the Drawings.
- G. Adjustment to Grade: If necessary, adjust tops of manholes to grade, a maximum of 12 inches, with brick masonry.
- H. Set manhole frames with the tops conforming accurately to the grade of the pavement or finished ground surface or as shown on the drawings.
- I. Hinged manhole covers shall be rotated so they open towards on-coming vehicular traffic.

- J. Set frames concentric with the top of the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flange at the frame shall be completely filled and made watertight.
- K. Place a thick ring of mortar extending to the outer edge of the masonry all around and on the top of the bottom flange.
- L. Finish the mortar so that it will be smooth and have a slight slope to shed water away from the frame.
- M. When the work on each manhole is complete, clean the frame seat and set the cover in place.

3.2 LEAKAGE TESTS

- A. General:
 - 1. Perform vacuum tests on all manholes.
 - 2. The Engineer shall observe tests.
 - 3. Repairs to manholes found to leak by any test method shall be performed both inside and outside the structure by a method approved by the Engineer.
- B. Preparation:

1.

4.

- 1. After manholes have been assembled in place, fill and point all lifting holes.
- 2. Test all manholes with pipes and or stubs installed. Testing with through pipes to be removed and replaces is not acceptable.
- 3. Manholes in which the pipe to manhole connection is disassembled after testing shall be retested at the Contractors expense.
- 5. Make the tests prior to placing the shelves and inverts and before filling and pointing the horizontal joints below the 6-foot depth line.
- 6. Suitably plug all pipes and other openings into the manholes.
- C. Test Procedure: Vacuum
 - Use only an approved testing machine.
 - a. National Pollution Control, Inc.
 - b. Or equal.
 - 2. Securely brace all plugs.
 - 3. Check cone section to insure good seal with Test Machine Bladder.
 - Bring test vacuum to 10 in. Hg gauge.
 - a. Time:

Manholes 0'-10' - 2 minutes Manholes 10'-15'- 2.5 minutes Manholes 15'-25'- 3 minutes

- b. Allowable leakage is 1" Hg or less per times given.
- c. If pressure drop exceeds 1" Hg in the required time, the manhole shall be repaired and retested.
- d. If the manhole fails after being repaired, the manhole shall be "Water Exfiltration Tested" according to the criteria of the specification.
- 5. When a leak is identified, repair the area from both inside and out by a method approved by the Engineer. Methods to be considered include parging with hydraulic cement and pressure application of polyurethane grout.
- E. Backfilling:
 - 1. Manhole testing shall be conducted before backfilling around the manhole. However, if the Contractor elects to backfill prior to testing, for any reason, it

shall be at Contractor's own risk and it shall be incumbent upon the Contractor to determine the reason for any failure of the test.

- 2. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorption, etc. It shall be assumed that all loss during the test is a result of leaks through the joints or through the concrete.
- F. All repairs to manholes shall be performed to the exterior of the structure.
- G. Accident Prevention: Following the satisfactory completion of the leakage test, place the frame and cover on the top, or provide other means of preventing accidental entry by unauthorized persons, children, animals, etc., until ready to make final adjustment to grade.

PIPE & PIPE FITTINGS - GENERAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section includes general specifications for pipe appurtenances and specialty items typical to a wide range of pipe types and application. It also provides general information on pipe inspection, installation, cleaning and testing. This section is not all inclusive and may be supplemented by the Engineer as needed.

1.2 SUBMITTALS TO THE ENGINEER

- A. Submit shop drawings in accordance with the General Conditions of the Construction Contract.
- B. If requested by the Engineer, submit manufacturer's "Certification of Conformance" that pipe and pipe fittings meet or exceed the requirements of these Specifications.
- C. Submit other documents as specified in the appropriate Sections of this Division.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Exercise care during loading, transporting, unloading, and handling to prevent damage of any nature to interior and exterior surfaces of pipe, fittings and appurtenances.
- B. Do not drop pipe and fittings.
- C. Store materials on the project site in enclosures or under protective coverings in accordance with manufacturer's recommendations and as directed by the Engineer.
- D. Assure that materials are kept clean and dry. If appropriate protect from freezing.
- E. Do not store materials directly on the ground.
- F. Follow manufacturer's specific instructions, recommendations and requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. See appropriate specification section for detailed pipe specification.
- B Ductile Iron Pipe & Fittings
 - 1. Conform to the latest AWWA Standard
 - a. Cement lined class 52 unless otherwise noted
 - b. Mechanical restrained joint
 - c. Standard gaskets
- C. PVC Sewer Pipe
 - 1. Shall conform to the following ASTM as appropriate for the pipe size.

Pipe Size	Generic Material	ASTM
4"-15"	PVC Solid Wall	D3034
18"-60"	PVC Solid Wall	F679
4"-48"	PVC, dual wall Corrugated	F794
All Sizes	PVC Recycled	F1780
All Sizes	PVC Pressure Pipe	D2241 and D1784

D. High Density Polyethylene

- 1. Pipe shall be high density polyethylene (PE) conforming to the following standard referenced specifications:
 - a. ASTM: D3035 Polyethylene Pipe SDR-PR design
 - b. ASTM: D1248 Polyethylene Molding & Extrusion materials.
 - c. CSA: 41-GP-25 Standard for polyethylene pipe.
- E. Corrugate Polyethylene Drain Pipe
 - a. Pipe shall be high density polyethylene (HDPE) conforming to the following standard referenced specifications:
 - b. AASHTO M294
 - c. ASTM: D1248 Polyethylene Molding & Extrusion materials.
 - d. ASTM D3350 Polyethylene Plastic Pipes and Fittings.
- F. Copper Service Pipe
 - a. Seamless copper water tube, ASTM B88.
 - b. Type K, soft annealed 3/4" (minimum) through 1".
 - c. Type K, hard tempered, 1-1/4 inches and larger.
- G. Marking Tape
 - 1. Shall be coded in accordance with the NPWA Standards.
 - 2. Shall be indelibly marked indicating the type of utility it is placed over.
 - 3. Shall be six (6) inches wide Terra Tape Sentry Line 1350 (Detectable) by Reef Industries, Houston, TX, or approved equal.
 - 4. Marking tape is required even in cases when tracer wire is installed.
- H. Pipe Lubricant or glue
 - 1. Use only lubricants or glues suitable for the type of pipe and application.
 - 2. For potable water pipe use only lubricants or glues clearly marked "NSF 61 approved For Use with Potable Water.
- I. Geotextile
 - 1. Unless specified elsewhere, geotextile fabric used to encase pipe and bedding material in the trench shall be Application 2 Separation, Class 3 Low Strength, Nonwoven fabric.
 - 2. Acceptable Manufactures shall be listed in the The National Transportation Product Evaluation Program (NTPEP) for Application, Strength Class and Structure
- J. Tracer Wire:
 - 1. Tracer Wire shall be No. 10 AWG copper clad steel wire with HDPE insulation.
 - a. Insulation shall be blue for drinking water lines.
 - b. Insulation shall be green for sewers, forcemains and low pressure sewers.
 - 2. Tracer wire connections will be made with DryConn® by King Innovation waterproof connectors for direct bury, for #22 to #8 AWG wire, part #31556 or approved equal.
 - 3. Install marking tape even when tracer wire is installed. (See Section G.)
- K. Pipe Insulation:
 - 1. Where shown on the plans for shallow depth, for separation between pipes or as directed, extruded polystyrene shall be installed.
 - 2. Insulation shall be Dow[®] StyrofoamTM Highload 100 or equivalent. Insulation shall be appropriate for direct bury.

- 3. Thickness shall be as shown on the drawings but in no case less than 2 inches. Insulation thickness shall be appropriate for the actual depth of bury for the pipe.
- 4. Width and length shall be as shown or as directed but in no case less than 2 feet wide.
- L. Thrust Restraint is required for all pressure pipe.
 - 1. Mechanical Joint Restrainer fittings with the appropriate retainer rings shall be installed at all mechanical joints.
 - a. Additional restraint at pipe bells on either side of the mechanical joint fitting may be required based on thrust restraint calculation available online. Programs are available from Ductile Iron Pipe Association, PVC Pipe Association, Romac Industries, Ebba Iron, etc.
 - Thrust Blocks of appropriate size and dimensions.
 - a. Thrust blocks shall be cast in place.
 - b. Precast thrust blocks may only be used with the written permission of the Owner and upon approval of supporting calculations relative to size.

PART 3 - EXECUTION

2.

- 3.1 INSPECTION
 - A. Provide all labor and equipment necessary to assist the Engineer to inspect pipe, fittings, gaskets, and other materials.
 - 1. This shall include all air quality testing equipment, harnesses and manlifts necessary to comply with the appropriate OSHA regulation.
 - 2. The Engineer shall comply with the Contractors regulations and policies regarding below grade or confined space entry.
 - B. Carefully inspect all materials at the time of delivery and just prior to installation.
 - C. Carefully inspect all pipe and fittings for:
 - 1. Defects and damage.
 - 2. Deviations beyond allowable tolerances for joint dimensions.
 - 3. Removal of debris and foreign matter.
 - D. Examine areas and structures to receive piping for:
 - 1. Defects, such as weak structural components, which adversely affect the execution and quality of work.
 - 2. Deviations beyond allowable tolerances for pipe clearances.
 - E. All materials and methods not meeting the requirements of these Specifications shall be rejected.
 - F. Immediately remove all rejected materials from the project site.
 - G. Start work only when conditions are corrected to the satisfaction of the Engineer.

3.2 INSTALLATION

- A. General:
 - 1. Install all pipe and fittings in strict accordance with the manufacturer's instructions and recommendations and as instructed by the Engineer.
 - 2. Install all pipes and fittings in accordance with the lines and grades shown on the Drawings and as required for a complete installation.
 - 3. Install adapters, approved by the Engineer, when connecting pipes constructed from different materials.

- 4. When applicable, support all piping not being installed in trenches in accordance with the "Pipe Hangers & Supports" Section of these Specifications.
- B. Installation and Trenches:
 - 1. Firmly support the pipe and fittings on bedding material as shown on the Drawings and as specified in the appropriate Sections of these Specifications.
 - a. Where, in the opinion of the Engineers, the subgrade material is unsuitable to support the pipe, over-excavate the unsuitable material and replace the same with suitable gravel or granular borrow.
 - b. If the subgrade material encountered consists of saturated clays or silts, the Engineer may direct the installation of the bedding material and pipe inside a construction fabric wrap as shown on the Drawings.
 - 2. Do not permanently support the pipe or fittings on saddles, blocking stones, or any material which does not provide firm and uniform bearing along the outside length of the pipe.
 - 3. Thoroughly compact the material under the pipe to obtain a substantial unyielding bed shaped to fully support the pipe.
 - 4. Excavate suitable holes for the joints so that only the barrel of the pipe receives bearing pressure from the supporting material after placement.
 - 5. Lay each pipe length so it forms a close joint with the adjoining length and bring inverts to the required grade.
 - 6. Set the pipe true to line and grade. Use a transit for line. Use a laser beam aligner for grade.
 - 7. Do not drive the pipe down to grade by striking it with a shovel handle, timber, rammer or any other unyielding object.
 - 8. Make all pipe joints watertight with no sand, silt, clay or soil of any description entering the pipeline at the joints.
 - 9. Immediately after making a joint, fill the holes for the joint with bedding material, and compact.
 - 10. When each pipe length has been properly set, place and compact enough of the bedding material between the pipe and the sides of the trench to hold the pipe in correct alignment.
 - 11. After filling the sides of the trench, place and lightly tamp bedding material to complete the bedding as shown on the Drawings.
 - 12. Take all necessary precautions to prevent flotation of the pipe in the trench.
 - 13. Where there is evidence of water or soil entering the pipeline, repair the defects to the satisfaction of the Engineer.
 - 14. Tracer wire shall be positively attached at 3:00 or 9:00 to the non-metallic buried utilities by plastic wire ties every ten (10) feet.
 - 15. Ends of the tracer wire shall be exposed either in a manhole, above grade at a curb box or valve box or bonded to the curb box or valve box.
 - 16. Trace wire shall be continuous between access points and shall be tested for continuity in the presence of the RPR or Owner.
- C. Temporary Plugs:
 - 1. When pipe installation work in trenches is not in progress, close open ends of the pipe with temporary watertight plugs.
 - 2. If water is in the trench when work is resumed, do not remove plugs until all danger of water entering the pipe is eliminated.
 - 3. Do not use the pipe lines as conductors for trench drainage during construction.

- D. Protection of Water Supplies:
 - 1. There shall be no physical connection between a public or private potable water supply system and a sewer.
 - 2. Sewer shall be a minimum of ten feet horizontally unless shown otherwise on the drawings.
 - 3. Whenever sewers must cross water mains, the sewer shall be constructed as follows (unless shown otherwise on the Drawings):
 - a. Sewer pipe shall be class 52 ductile iron or PVC pressure rated pipe (DR-25 min. or SDR-32.5 min.) for a minimum distance of 9 feet each side of the crossing.
 - b. Joints shall be mechanical type water pressure rated with zero leakage when tested at 25 pounds per square inch for gravity sewers and 1-1/2 times working pressure for force mains and joints shall not be located within 9 feet of the crossing.
 - c. Vertical separation of sewer and water main shall not be less than 18".

3.3 <u>CLEANING AND TESTING</u>

- A. Cleaning and Testing Piping General:
 - 1. Thoroughly clean all piping prior to testing. Remove all dirt, dust, oil, grease and other foreign material. Exercise care while cleaning to avoid damage to linings and coatings.
 - 2. When the installation is complete, test all pipelines, including service laterals, in the presence of the Engineer and the plumbing or building inspector in accordance with the requirements of the local and state plumbing codes and the appropriate Sections of these Specifications, at no additional cost to the Owner.
 - 3. Equipment: Supply all labor, equipment, materials, gages, and pumps required to conduct the tests.
 - 4. Retesting: Perform all retesting required due to failure at no additional cost to the Owner and to the complete satisfaction of the Engineer.
- B. Outside Potable Water Piping (When Applicable)
 - 1. Pressure Test:
 - a. Perform testing in accordance with Section 5 of AWWA Standard C600.
 - b. Hydrostatic testing is required.
 - 2. Chlorination of Pipelines:
 - a. Prior to chlorination thoroughly flush the lines at sufficient volume to remove any debris and contamination from the pipe.
 - b. Chlorinate all new potable water lines in accordance with the procedure outlined in AWWA C651 Disinfecting Water Mains, latest revision.
 - c. Locate chlorination and sampling points as approved by the Engineer.
 - d. Use a dosage which will produce not less that 10.0 ppm chlorine residual after a contact period of not less than 24 hours.
 - e. During the chlorination period, exercise care to prevent the contamination of water in existing water mains.
 - f. After chlorination, flush the piping with clean potable water until there is only background chlorine residual.
 - g. Chlorinated effluent shall be dechlorinated prior to release to surface waters.

- 3. Bacteriological Testing:
 - a. Test all new potable water lines for total Coliform bacteria in accordance with AWWA C651 Disinfecting Water Mains (latest edition) at no additional cost to the Owner.
 - b. Bacteriological samples shall be taken after the chlorinated main has been flushed and allowed to rest for 16 hours minimum prior to sampling.
 - c. The length of pipe to be tested and the time of the test shall be as approved by the Engineer.
 - d. The Engineer will observe the taking of samples.
 - e. Have all samples tested by a laboratory approved by the State and submit test results to the Engineer.
 - f. Any segment of a potable water line shall be considered unsuitable for service if a Coliform bacteria count is obtained from that sample.
 - g. Re-disinfect all segments of piping considered unsuitable and retest. Continue to disinfect and test until no Coliform bacteria are present.
 - h. Place piping into service when it has been successfully tested for pressure, leakage and total Coliform bacteria.
- C. Building Interior Potable Water Lines (When Applicable):
 - 1. Clean and test in accordance with the "Plumbing General" Section in these Specifications.
 - 2. Test in accordance with local building codes as applicable.
- D. Sewer Lines:
 - 1. Outside Sewer Lines: Test with a low pressure air test, a visual inspection, and for PVC or other flexible piping, test with a deflectometer after suitable settling time has elapsed.
 - 2. Pressure sewers shall be tested in accordance with Section 5 of AWWA C-600 latest edition to 1.5 time maximum operating pressure or 100 psi, whichever is greater.
 - 3. Building Interior Sewer System: Clean and test in accordance with the "Plumbing General" Section in these Specifications.
 - 4. Test in accordance with local building codes as applicable.
- E. All Other Piping Systems:
 - 1. Pressure Test:
 - a. Perform a pressure test for all other piping systems at 1-1/2 times maximum system pressure, or at the maximum working pressure of the piping system, or at a pressure indicated in the appropriate Sections of this Specification.
 - b. Tests shall be hydrostatic water, or air pressure as specified or as approved by the Engineer.
 - 2. Cleaning: Perform all specialized cleaning as specified or required by system.

DUCTILE IRON PIPE & FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install ductile iron pipe and ductile iron fittings of the type(s) and size(s) in the location(s) shown on the Drawings and as specified herein.

1.2 QUALITY ASSURANCE

A. Standards:

- 1. Cement-mortar lining for water: ANSI A21.4/AWWA C104.
- 2. Rubber gasket joints: ANSI A21.11/AWWA C111.
- 3. Ductile iron pipe thickness: ANSI A21.50/AWWA C150.
- 4. Ductile iron pipe, centrifugally cast: ANSI A21.51/AWWA C151.
- 5. Threaded flanges: ANSI A21.15/AWWA C115.
- 6. Ductile iron fittings: ANSI 21.53/AWWA C153.
- 7. Pipe flanges and fittings: ANSI B16-1, ANSI A-21.12.
- 8. Bolts: COR-TEN ASTM A588.
- 9. Polyethylene encasement: ANSI/A21.5/AWWA C105

1.3 SUBMITTALS TO THE ENGINEER

- A. Submit shop drawings in accordance with the General Conditions of the Construction Contract.
- B. If requested by the Engineer, submit manufacturer's "Certification of Conformance" that pipe and fittings meet or exceed the requirements of these Specifications.
- C. If joint restraints are to be used in place of thrust blocks, submit restraint calculations for review by the Engineer. Restraint calculation shall be in accordance with DIPRA and AWWA standards.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Exercise extra care when handling pipe and fittings.
- B. Exercise extra care when handling cement lined pipe and fittings because damage to the lining will render it unfit for use.
- C. Protect the spherical spigot ends and the plain ends of all pipe during shipment by wood lagging securely fastened in place.

1.5 INSPECTION

- A. Provide all labor necessary for the Engineer to inspect pipe, fittings, gaskets, and other materials.
- B. Carefully inspect all materials at the time of delivery and just prior to installation.
- C. Carefully inspect all pipe and fittings for:
 - 1. Defects and damage.
 - 2. Deviations beyond allowable tolerances for joint dimensions.

- 3. Removal of debris and foreign matter.
- D. Examine areas and structures to receive piping for:
 - 1. Defects, such as weak structural components that adversely affect the execution and quality of work.
 - 2. Deviations beyond allowable tolerances for pipe clearances.
- E. All materials and methods not meeting the requirements of the Contract Documents will be rejected.
- F. Immediately remove all rejected materials from the project site.
- G. Start work only when conditions are corrected to the satisfaction of the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Pipe:
 - 1. All pipes shall conform to the latest AWWA specification C151. Unless otherwise shown on the Drawings, the minimum thickness of ductile iron pipe shall be:
 - a. All ductile iron pipe shall be Class 52, double cement lined.
 - b. Pipe with flanges: Class 53 (formerly Class 3).
 - c. All ductile iron pipe shall have cement lining of double thickness.
 - 2. Pipe for use with sleeve type couplings shall have plain ends (without bells or beads) cast or machined at right angles to the axis.
 - 3. Pipe for use with split type couplings shall have ends with cast or machined shoulders or grooves that meet the requirements of the manufacturer of the couplings.
 - 4. Factory applied bituminous coatings, as approved by the Engineer, shall be furnished for all underground piping.
 - 5. Each ductile iron pipe shall have conspicuously marked on the exterior the pressure, class, and weight of the pipe.
 - 6. All ductile iron pipe furnished to the project shall be one uniform length, either 18 feet or 20 feet.
- B. Joints (as shown on the Drawings, specified and applicable):
 - 1. General: All joints shall be the same pressure class as the pipe unless otherwise shown on the Drawings.
 - 2. Flanged:
 - a. Provide specially drilled flanges when required for connection to existing piping or special equipment.
 - b. Flanges shall be long-hub screwed tightly on pipe by machine at the foundry prior to facing and drilling.
 - c. Gaskets:
 - (1) Ring type of rubber with cloth insertion.
 - (2) Thickness of gaskets 12 inches in diameter and smaller: 1/16 inch.
 - (3) Thickness of gaskets larger than 12 inches in diameter: 3/32 inch.

- d. Fasteners:
 - (1) Make joints with bolt, stubs with a nut on each end, or one tapped flanged with a stud and nut.
 - (2) The number and size of bolts shall meet the requirements of the same American National Standard as the flanges.
 - (3) Nuts, bolts and studs shall be Grade B meeting the requirements of ASTM A307.
 - (4) After jointing, coat entire joint with bituminous material compatible with pipe coating.
- e. When applicable, provide and install flange clamps as shown on the Drawings.
- f. Uniflange type connection shall be positively restrained by use of threaded rods (2) or other approved restraint device.
- 3. Push-on and Mechanical Joint:
 - a. The plain ends of push-on pipes shall be factory machined to a true circle and chamfered to facilitate fitting the gasket.
 - b. Provide gaskets manufactured from a composition material suitable for exposure to the liquid to be contained within the pipe.
- 4. Grooved split ring couplings, sleeve couplings, flexible joints and couplings: As specified and shown on the Drawings.
- 5. Joint Restraint:
 - a. Provide both Mega-lug type joint restraint and thrust blocks as indicated on drawings details.
 - b. Types of joint restraint:
 - Mechanical joint ductile iron pipe shall have "Mega-lug Type" restrained ductile iron glands and thrust blocks of sufficient size in accordance with DIPRA and AWWA standards for thrust restraint.
 - (2) Pipe and fittings with approved lugs or hooks cast integrally for use with socket pipe clamps, tie rods, or bridles. Bridles and tie rods shall be a minimum of 3/4 inch diameter except where they replace flange bolts of a smaller size, in which case they shall be fitted with a nut on each side of the pair of flanges. The clamps, tie rods, and bridles shall be coated with an approved bituminous paint after assembly or, if necessary, prior to assembly.
 - (3) Other types of bracing as shown on the Drawings.

- C. Standard Fittings:
 - 1. All joints shall conform to the latest AWWA specification C-153.
 - 2. Class 350, Ductile Iron, Cement Lined except as shown on the Drawings or as specified.
 - 3. Joints the same as the pipe with which they are used or as shown on the Drawings.
 - 4. Provide fittings with standard bases where shown on the Drawings.
 - 5. Provide retainer glands on all fittings.
 - 6. Outside surface coated to specifications applicable to pipe.
- D. Non-Standard Fittings:
 - 1. Fittings having non-standard dimensions shall be subject to the Engineer's approval.
 - 2. Non-standard fittings shall have the same diameter and thickness as standard fittings and shall meet the specification requirements for standard fittings.
 - 3. The laying lengths and types of joints shall be determined by the particular piping to which they connect.
 - 4. Flanged fittings not meeting the requirements of ANSI A21.10 (i.e., laterals or reducing elbows) shall meet the requirements of ANSI B16.1 in Class 125.
- E. Polyethylene encasement shall be 8 mil thick.

PART 3 - EXECUTION

- 3.1 INSTALLATION
 - A. General:
 - 1. Install all pipe and fittings in strict accordance with the manufacturer's instructions and recommendations.
 - 2. Install all pipes and fittings in accordance with the lines and grades shown on the Drawings and as required for a complete installation.
 - 3. Install adapters, approved by the Engineer, when connecting pipes constructed from different materials.
 - B. Installation in Trenches:
 - 1. Firmly support the pipe and fittings on bedding material as shown on the Drawings and as specified in the appropriate Sections of these Specifications.
 - 2. Do not permanently support the pipe or fittings on saddles, blocking stones, or any material which does not provide firm and uniform bearing along the outside length of the pipe.
 - 3. Thoroughly compact the material under the pipe to obtain a substantial unyielding bed shaped to fully support the pipe.
 - 4. Excavate suitable holes for the joints so that only the barrel of the pipe receives bearing pressure from the supporting material after placement.
 - 5. Lay each pipe length so it forms a close joint with the adjoining length and bring the inverts up to the required grade.
 - 6. Set the pipe true to line and grade. Use a transit and level or a laser beam aligner as appropriate to the pipe application.

- 7. Do not drive the pipe down to grade by striking it with a shovel handle, timber, rammer, or any other unyielding object.
- 8. Make all pipe joints watertight with no visible leakage and no sand, silt, clay or soil of any description entering the pipeline at the joints.
- 9. Immediately after making a joint, fill the holes for the joints with bedding material and compact.
- 10. When each pipe length has been properly set, place and compact enough of the bedding material between the pipe and the sides of the trench to hold the pipe in correct alignment.
- 11. After filling the sides of the trench, place and lightly tamp bedding material to complete the bedding as shown on the Drawings.
- 12. Take all necessary precautions to prevent flotation of the pipe in the trench.
- 13. Where there is evidence of water or soil entering the pipeline, repair the defects.
- C. Temporary Plugs:
 - 1. When pipe installation work in trenches is not in progress, close the open ends of the pipe with temporary watertight plugs.
 - 2. If water is in the trench when work is resumed, do not remove plugs until all danger of water entering the pipe is eliminated.
 - 3. Do not use the pipelines as conductors for trench drainage during construction.
- D. Assembling Joints:
 - 1. Push-on Joints:
 - a. Insert the gasket into the groove of the bell.
 - b. Uniformly apply a thin film of special lubricant over the inner surface of the gasket that will contact the spigot end of the pipe.
 - c. Insert the chamfered end of the plain pipe into the gasket and push until it seats against the bottom of the socket.
 - d. Where electromagnetic type pipe locators are used or as directed, insert serrated brass wedges at all joints to assure continuity. Use two wedges per joint for 2" through 12" diameter pipe and four wedges for pipes greater than 12" diameter. Each wedge shall be driven into the opening between the plain end and the bell end. Wedges may be omitted with use of Field Lok 350 ™ gaskets.
 - 2. Bolted Joints:
 - a. Remove rust preventive coatings from machined surfaces prior to assembly.
 - b. Thoroughly clean and carefully smooth all burrs and other defects from pipe ends, sockets, sleeves, housings and gaskets.
 - 3. Flanged Joints:
 - a. Insert the nuts and bolts (or studs), finger tighten, and progressively tighten diametrically opposite bolts uniformly around the flange to the proper tension.
 - b. Execute care when tightening joints to prevent undue strain upon valves, pumps, and other equipment.

- 4. Mechanical Joints:
 - a. Thoroughly clean, with a wire brush, surfaces that will be in contact with the gaskets.
 - b. Lubricate the gasket, bell, and spigot.
 - c. Slip the gland and gasket, in that order, over the spigot and insert the spigot into the bell until properly seated.
 - d. Evenly seat the gasket in the bell at all points, center the spigot, and firmly press the gland against the gasket.
 - e. Insert the bolts, install the nuts finger tight, and progressively tighten diametrically opposite nuts uniformly around the joint to the proper tension with a torque wrench.
 - f. The correct range of torque (as indicated by a torque wrench) and the length of wrench (if not a torque wrench) shall not exceed:
 - (1) Range of Torque: 60-90 Ft.-lbs.
 - (2) Length of Wrench: 10 inches.
 - g. If effective joint sealing is not attained at the maximum torque specified above, disassemble, thoroughly clean, and reassemble the joint. Do not overstress the bolts to tighten a leaking joint.
- 5. Bell and Spigot Joints:
 - a. Thoroughly clean the bell and spigots and remove excess tar and other obstructions.
 - b. Apply a liberal coat of manufacturer supplied lubricant to both the gasket and the spigot end. Lubricant shall be appropriate for the pipe application.
 - c. Insert the spigot firmly into place and hold securely until the joint has been properly completed.
- E. Fabrication:
 - 1. Tapped Connections:
 - a. Make all tapped connections where shown on the Drawings or where directed by the Engineer.
 - b. Make all connections watertight and of adequate strength to prevent pullout.
 - c. Drill and tap normal to the longitudinal axis of the pipe.
 - d. The maximum sizes of taps in pipes and fittings without busses shall not exceed the sizes listed in the appendix of ANSI A21.51 based on 3 full threads for cast iron and 2 full threads for ductile iron.
 - 2. Cutting:
 - a. Perform all cutting with machines having rolling wheel cutters or knives designed to cut cast or ductile iron. Do not use a hammer and chisel to cut pipe.
 - b. After cutting, examine all cut ends for possible cracks.
 - c. Carefully chamfer all cut ends to be used with push-on joints to prevent damage to gaskets when pipe is installed.
- F. Polyethylene encasement shall be installed in agreement with ANSI/AWWA C105/A21.5 and per manufacturers recommendations. Tube end shall be overlapped

and secured with adhesive tape or plastic string. Repair any rips or deflects prior to backfilling.

- G. Pipe Deflection:
 - 1. Push-on and Mechanical Joints:
 - a. The maximum permissible deflection of alignment at joints, in inches for 18 foot lengths:

Size of Pipe	Push-On	Mechanical
6	19	27
8	19	20
10	19	20
12	11	20
14	11	13.5
16	11	13.5
18	11	11
20	11	11
24	11	9

- b. The maximum permissible deflection for other lengths shall be in proportion of such lengths to 18 feet.
- 2. Flexible Joints: The maximum deflection in any direction shall not exceed the manufacturer's instructions and recommendations.
- H. Testing to be performed in accordance with the appropriate section of Section 02610 Pipe and Pipe Fittings – General.

REINFORCED CONCRETE PIPE & FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install and test reinforced concrete pipe (RCP) of the size(s), type(s) and in the location(s) shown in the Drawings or specified herein.

1.2 QUALITY ASSURANCE

- A. Manufacturer shall have a minimum of five (5) years experience in the manufacture of RCP sewer pipe.
- B. The Engineer shall be granted the authority to visit the manufacturer and take core samples of the pipe.

1.3 SUBMITTALS TO THE ENGINEER

A. Submit manufacturer's literature, test reports and certificates of compliance in accordance with the General Conditions of the Construction Contract.

1.4 DELIVERY, STORAGE & HANDLING

- A. Deliver as job progress requires and store on a smooth bed to prevent point loading.
- B. Stack pipe in accordance with manufacturer's instructions.
- C. Pipes will be removed from the delivery vehicle by forklift or with a sling and lifting equipment. Any pipe dropped from the bed of the delivery vehicle will be immediately rejected and removed from the site.

1.5 INSPECTION

- A. Provide all labor necessary to assist the Engineer to inspect pipe, fittings, gaskets and other materials.
- B. Carefully inspect all materials at the time of delivery and just prior to installation.
- C. Carefully inspect all pipe and fittings for:
 - 1. Defects and damage.
 - 2. Deviations beyond allowable tolerances for joint dimensions.
 - 3. Removal of debris and foreign matter.
- D. Examine areas and structures to receive piping for:
 - 1. Defects, such as weak structural components, that adversely affect the execution and quality of work.
 - 2. Deviations beyond allowable tolerances for pipe clearances.
 - 3. Any pipe which has damage extending beyond the compressive area of the innermost rubber o-ring shall be rejected.
- E. All materials and methods not meeting the requirements of the Contract Documents will be rejected.
- F. Start work only when conditions are corrected to the satisfaction of the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Pipe and Fittings:
 - 1. Type shall conform to ASTM C-76, latest edition.
 - 2. Cement shall be Type II. The concrete shall have a 28-day compressive strength as listed in ASTM C-76 for the size and class noted on the Drawings.
 - 3. Class or strength: as designated on the Drawings.
 - 4. Furnish straight pipe in standard laying lengths.
 - 5. Furnish fittings of approved equal to the pipe with identical joint configuration.
 - 6. Reinforcing steel shall not be stressed.
 - 7. Absorption shall not exceed 6 percent of the dry weight as determined by ASTM Test C497.
 - 8. The date of pipe casting shall be marked on each pipe and the pipe shall not be shipped until 85 percent of the compressive strength has been reached, or 5 days, whichever is greater.
- B. Joints: Flexible, oil resistant compression rings of elastomeric material conforming to ASTM C-443.
- C. Service Connections:
 - 1. All service connections shall be the Kor-N-Tee style, with a minimum 6-inch PVC service connection or as shown on the Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with the manufacturer's written instructions and as shown on the Drawings.

3.2 <u>CLEANING AND TESTING</u>

A. Refer to section 02651 Final Pipe Testing.

PVC PIPE & FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish, install and test PVC pipe of the size(s), type(s) and in the location(s) shown on the Drawings and or specified herein.
- B. Related work Specified Elsewhere (When Applicable):
 - 1. Site work is specified in this Division.
 - 2. Concrete is specified in Division 3.

1.2 <u>QUALITY ASSURANCE</u>

A. Manufacturer shall have a minimum of five (5) years experience in the manufacture of PVC sewer pipe.

1.3 SUBMITTALS TO THE ENGINEER

A. Submit manufacturer's literature, test reports, and certificates in accordance with the General Conditions of the Construction Contract.

1.4 DELIVERY, STORAGE & HANDLING

- A. Deliver as job progress requires and store on a smooth bed to prevent point loading.
- B. Stack pipe in accordance with manufacturer's instructions.
- C. Exercise extra care when handling.

1.5 INSPECTION

- A. Provide all labor necessary to assist the Engineer to inspect pipe, fittings, gaskets, and other materials.
- B. Carefully inspect all materials at the time of delivery and just prior to installation.
- C. Carefully inspect all pipe and fittings for:
 - 1. Defects and damage.
 - 2. Deviations beyond allowable tolerances for joint dimensions.
 - 3. Removal of debris and foreign matter.
- D. Examine areas and structures to receive piping for:
 - 1. Defects, such as weak structural components, that adversely affect the execution and quality of work.
 - 2. Deviations beyond allowable tolerances for pipe clearances.
- E. All materials and methods not meeting the requirements of the Contract Documents will be rejected.
- F. Immediately remove all rejected materials from the project site.
- G. Start work only when conditions are corrected to the satisfaction of the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Pipe & Fittings:
 - 1. Type Polyvinylchloride (PVC) plastic pipe with integral bell and spigot joints. Polymer compounding and classification shall be in accordance with ASTM D1784 (Class 12454-B).
 - 2. Gravity Sewers:
 - a. 4" 15" nominal diameter sizes shall conform to ASTM D3034 and SDR=35.
 - b. 18" 36" nominal diameter sizes shall conform to ASTM F679 (wall thickness T-1).
 - c. $42^{\circ}-48^{\circ}$ nominal diameters shall conform to ASTM 794.
 - 3. Pressure Sewers shall conform to ASTM D2241 and D1784, Class 12454-B, with maximum SDR=26. A safety factor of 2.5 shall be used for pressure rating determination.
 - 4. Furnish straight pipe in standard laying lengths, 12.5 and 20 feet for 18" diameter and less, 12 and 19.5 feet for 21", 24" and 27" diameter.
 - 5. Furnish fittings of approved equal to the pipe and having bell and spigot configuration identical to that of the pipe.
- B. Joints:
 - 1. Type Flexible elastomeric seal conforming to ASTM D3212 with push-on bell and spigot.
 - 2. Gaskets shall conform to ASTM F477.
 - 3. Rubber rings for pressure sewer shall conform to ASTM D1869 and ASTM F477.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with the manufacturer's written instructions and as shown on the Drawings.
- B. Exercise extra care during winter construction as pipes impact strength is lower.
- C. Prior to backfilling, exercise extra care to maintain water level in open excavation below the pipe invert to avoid flotation of pipe already set to line and grade.

3.2 <u>CLEANING AND TESTING</u>

A. Clean and test PVC pipes: Refer to Final Sewer Testing section in these specifications.

COPPER SERVICE PIPE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install copper service pipe of the type and size and in the locations shown on the Drawings and as specified herein.

1.2 QUALITY ASSURANCE

A. Seamless copper water tube, ASTM B88.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Type K, soft annealed, 3/4" (minimum) through 1".
- B. Type K, hard tempered, 1-1/4 inches and larger.

PART 3 - EXECUTION

- A. Jointing:
 - 1. Compression Joints
 - a. Ream or file the pipe to remove burrs.
 - b. Slip compression nut over pipe and slide pipe into corporation.
 - c. Tighten compression nut.
 - d. Inspect for cracks, splits or other damages and replace if necessary.
 - 2. Adapters: Use as required to connect to existing services.

B. Bending Pipe:

1. Bend pipe with suitable tools and provide smooth bend free of any cracks or buckles.

COUPLINGS, CONNECTORS, CAPS & PLUGS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish and install couplings and connectors of the type(s) and size(s) in the location(s) shown on the Drawings and as specified herein.
- B. Related Work Specified Elsewhere: "Pipe & Pipe Fittings General" is specified in this Division.

1.2 QUALITY ASSURANCE

- A. Minimum pressure rating equal to that of the pipeline in which they are to be installed.
- B. Couplings and connectors, other than those specified herein, are subject to the Engineer's approval.
- C. Cap and plug shop drawing submissions must be accompanied by a manufacturer's written certification that the cap or plug will effectively and permanently seal the inactivated or abandoned utility.

PART 2 - PRODUCTS

- 2.1 MATERIALS
 - A. All couplings and Connectors:
 - 1. Gasket Materials: Composition suitable for exposure to the liquids to be contained within the pipes.
 - 2. Diameters to properly fit the specific types of pipes on which couplings and connectors are to be installed.
 - B. Sleeve Type Couplings (When Applicable):
 - 1. Exposed Couplings (When Applicable):
 - a. Steel middle ring,
 - b. Two steel follower rings,
 - c. Two wedge-section gaskets,
 - d. Sufficient steel bolts to properly compress the gaskets,
 - e. Acceptable Manufacturers:
 - (1) Dresser Manufacturing Co. Style 38,
 - (2) Smith-Blair Inc. Style 411,
 - (3) Or approved equal.
 - 2. Buried Couplings (When Applicable):
 - a. Cast or ductile iron middle rings with pipe stops removed,
 - b. Two malleable iron follower rings with ribbed construction,
 - c. Two wedge-section gaskets,
 - d. Sufficient galvanized steel bolts to properly compress the gaskets,
 - e. Acceptable Manufacturers:
 - (1) Dresser Manufacturing Co.

- (2) Smith-Blair Inc. Style 411,
- (3) Or approved equal.
- C. Split Type Couplings (When Applicable):
 - 1. Constructed from malleable or ductile iron.
 - 2. For use with grooved or shouldered end pipe with minimum wall thickness as required so as not to weaken pipe.
 - 3. Cast in two sections for 3/4 inch through 14 inch pipe sizes, four segments for 15 inch through 24 inch pipe sizes, and six segments for pipe sizes over 24 inch.
 - 4. Coating: Enamel.
 - 5. Bolts: Carbon steel.
 - 6. Acceptable Manufacturers:
 - a. Victaulic Company of America, Style 77,
 - b. Gustin-Bacon Co.,
 - c. Or approved equal.
- D. Flanged Adapters (When Applicable):
 - 1. For joining plain end or grooved end pipe to flanged pipes and fittings.
 - 2. Adapters shall conform in size and bolt hole placement to ANSI standards for steel and/or cast iron flanges 125 or 150 pound standard unless otherwise required for connections.
 - 3. Exposed Sleeve Type:
 - a. Constructed from steel.
 - b. Coating: Enamel.
 - c. Bolts: Carbon steel.
 - d. Acceptable Manufacturers:
 - (1) Dresser Manufacturing Co. Style 128 for cast iron, ductile iron and steel pipes with diameters of 2 inches through 96 inches.
 - (2) Or approved equal.
 - 4. Buried Sleeve Type:
 - a. Constructed from cast iron.
 - b. Bolts: Galvanized steel.
 - c. Acceptable Manufacturers:
 - (1) Dresser Manufacturing Co. Style 127 locking type for cast iron, ductile iron, asbestos cement and steel pipes with diameters of 3 inches through 12 inches.
 - (2) Or approved equal.
 - 5. Split Type:
 - a. Constructed from malleable or ductile iron.
 - b. For use with grooved or shouldered end pipe.
 - c. Coating: Enamel.
 - d. Acceptable Manufacturers:
 - (1) Victaulic Company of America Style 741 for pipe diameters of 2 inches through 12 inches,
 - (2) Victaulic Company of America Style 742 for pipe diameters of 14 inches through 16 inches,
 - (3) Or approved equal.

- E. Flexible Joints:
 - 1. Expansion Joints:
 - a. Materials shall be capable of withstanding the temperature, pressure and type of material in the pipeline.
 - b. Shall be the filled arch type that will prevent sediment build up for all sludge, sewage, and other lines with similar service.
 - c. Supplied with control rods to restrict elongation and compression.
 - d. Metal retaining rings shall be split and beveled galvanized steel for placement against the flange of the expansion joint.
 - 2. Deflection Joints:
 - a. Joints designed to permit a nominal maximum deflection of 15 degrees in all directions from the axis of the adjacent pipe length, will prevent pulling apart, and will remain watertight at any angle of deflection under 15 degrees.
 - b. Material to be manufactured from a composition material suitable for exposure to the liquid, pressure and temperature to be contained within the pipe.
 - c. Supplied with control rods as required.
- F. Caps and Plugs
 - 1. Cap and plug material shall be as indicated on the Drawings and shall be adaptable to the inactive or abandoned utility to be capped or plugged.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Sleeve Type Couplings (When Applicable):
 - 1. Thoroughly clean pipe ends for a distance of 8 inches from the ends prior to installing couplings, and use soapy water as a gasket lubricant.
 - 2. Slip a follower ring and gasket (in that order) over each pipe and place the middle ring centered over the joint.
 - 3. Insert the other pipe length into the middle ring the proper distance.
 - 4. Press the gaskets and followers evenly and firmly into the middle ring flares.
 - 5. Insert the bolts, finger tighten and progressively tighten diametrically opposite bolts uniformly around the flange to the torque recommended by the manufacturer.
- B. Split Type Flange Adapters (When Applicable): Install in the same manner as Split Type Couplings.
- C. Buried Couplings, Adapters and Connectors (When Applicable): Thoroughly coat all exterior surfaces, including nuts and bolts, after assembly and inspection by the Engineer with a heavy-bodied bituminous mastic as approved by the Engineer.
- D. Install thrust rods, supports and other provisions to properly support pipe weight and axial equipment loads.
- E. Install caps and plugs in accordance with manufacturer's recommendations to ensure a permanent seal of the inactive or abandoned utility.

RUBBER SEATED BUTTERFLY VALVES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install butterfly 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 butterfly valves of the same type, class and duty shall be by one manufacturer.
- B. Meet or exceed AWWA 504 Rubber Seated Butterfly Valves (latest revision).
- C. Acceptable Manufacturers:
 - 1. Henry Pratt Co.
 - 2. Kennedy Valve
 - 3. Or approved equal.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. AWWA Water Service:
 - 1. Use butterfly valves when pipe size is 16" or greater.
 - 2. Equal or exceed requirements of AWWA C-504, Class 150B.
 - 3. Suitable for direct burial when required.
 - 4. Bubble tight-shut off at rated pressure.
 - 5. Body: Cast of ductile iron.
 - 6. Disc: Bronze, cast iron, ductile iron, No-resist per manufacturer's standard and valve size.
 - 7. Valve Seat: Natural or synthetic rubber, or elastomer material.
 - 8. Valve shaft: Stainless steel.
 - 9. Acceptable valve connections:
 - a. Mechanical joint unless otherwise shown on the Drawings.
 - b. When directed by Engineer, flanged (250 lb. standard) wafer (20 inch valves and smaller) and grooved joints may be used as alternates when rigid connections are required.

10. 200 psi water working pressure and 400 psi test pressure unless otherwise shown on the Drawings.

- 11. Operator:
 - a. Direct Burial:
 - 1) 2-inch square operating nut, securely fastened to shaft, with no Gear drive.
 - b. Above Ground:

- 1) Lever activator with infinite lockable positioning capability standard on 6 inch and smaller valves.
- 2) Gear driven handwheel standard on 8 inch and larger valves and elsewhere when shown.
- 3) Gear driven chain wheel where shown.
- 12. Valves shall open RIGHT (clockwise).

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Buried Valves:
 - 1. Stem vertical.
 - 2. Box vertical and centered over operating nut.
 - 3. Thrust blocks installed as shown on the Drawings.
 - 4. Valve box supported during backfilling and maintained vertically.

RESILIENT-SEATED GATE VALVES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install gate 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 gate valves of the same type and style shall be manufactured by one manufacturer.
- B. Meet or exceed AWWA 509 Resilient-Seated Gate Valves for Water and Sewerage Systems or AWWA C515 Reduced Wall Resilient Seated Gate Valves for Water Supply Service.
- C. Acceptable Manufacturers shall be specified by the local authority in their standards. If local standards do not exist, the following manufacturers shall be acceptable:
 - 1. Mueller
 - 2. Dresser
 - 3. Darling
 - 4. Clow
 - 5. Smith
 - 6. Or Equivalent

1.3 VALVE LOCATION AND USE

- A. As shown on the Drawings.
- B. Accessories: As shown and required for proper operation.

PART 2 - PRODUCTS

- 2.1 MATERIALS
 - A. Waterworks type NRS valves (AWWA C509 or AWWA C515), with mechanical joints and all accessories including retainer gland.
 - 1. Iron body bronze mounted (IBBM), coated inside and out with fusion bonded epoxy (AWWA C550).
 - 2. Non rising stem (NRS).
 - 3. Resilient seat gate.
 - 4. End Connections: As shown on the Drawings and as required for pipe.
 - 5. Working pressure:
 - a. All sizes: 200 psi water.
 - b. Unless otherwise shown on the Drawings.
 - 6. Stem Sealing:
 - a. Rust-proofed bolting.
 - b. "O" ring design.
 - c. Capable of replacing under pressure with valve open.
 - 7. Buried Valves:

- a. Gate box required.
- b. Sufficient quantity of tee-handle valve wrenches for operating valves of various depths.
- c. 2 inch square operating nut, securely fastened to shaft.
- 8. Valve operation: Open by turning right-clockwise.
- 9. Arrow showing direction of opening plainly cast on valve bonnet.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Buried Valves:
 - 1. Stem vertical
 - 2. Box vertical and centered over operating nut.
 - 3. Thrust blocks installed as shown on the Drawings.
 - 4. Gate box supported during backfilling and maintained.
 - 5. Gate box shall not transmit shock load or stress to valve.

CORPORATION STOPS

PART 1 -- GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish and install corporation stops of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.
- B. Work Specified Elsewhere. This Section is not a stand-alone Section. Other requirements which relate to this Section are noted elsewhere in these documents. The Contractor and all Subcontractors are required to review this entire document along with the Drawings in an effort to identify all requirements.

1.2 <u>REFERENCE STANDARDS</u>

A. ANSI/AWWA C800.

1.3 SUBMITTALS

A. Submit manufacturer's literature, test reports, and certificates in accordance with the General Conditions and Section 01340 - Submittals.

1.4 DELIVERY, STORAGE & HANDLING

A. Store to prevent damage and in accordance with manufacturer's instructions.

PART 2 -- PRODUCTS

2.1 MATERIALS

- A. Ball valve-type corporation with 300 psi rating.
- B. Shall conform to ANSI/AWWA C800, latest revision.
- C. Constructed of brass. Brass alloys not listed in ANSI/AWWA C800 Paragraph 4.1.2 are not approved.
- D. Shall be "lead free" as defined in the Safe Drinking Water Act, amended January 4, 2011. Specifically, fittings shall contain not more than a weighted average of 0.25% lead when used with respect to their wetted surfaces.
- E. Outlet shall have a compression pack joint (CPPJ) for Copper Tubing Size (CTS) O.D.
- F. Stainless steel insert stiffeners shall be used where CTS plastic tubing is specified
- G. Inlet shall have AWWA (cc) Tapered Pipe Threads.
- H. Acceptable Manufacturers:
 - 1. Mueller
 - 2. A. Y. McDonald
 - 3. Or equivalent

2.2 <u>SUBSTITUTIONS</u>

A. Products of equal or better quality, function and performance may be proposed for substitution by following the procedures in Section 01630 – Substitution and Product Options.

PART 3 -- EXECUTION

3.1 <u>INSTALLATION</u>

- A. Install at locations shown on the Drawings and as specified in accordance with manufacturer's instructions.
- B. Service saddles shall be required as noted on the drawings, on all PVC and AC mains, as required below, and as specified by the pipe and saddle manufacturers.

Pipe <u>Size</u>	Class 50 Ductile Iron Pipe	Class 51 Ductile Iron Pipe	Class 52 Ductile Iron Pipe
6"	All Tang	All Tops	$T_{ans} > 2/4$ "
0,,,	All Taps	All Taps $T_{ana} > 2/4$?	Taps $> 3/4$ Taps $> 2/4$
8	All Taps	Taps $> 3/4$	Taps $> 3/4$
10"	Taps > $3/4''$	Taps $> 3/4$ "	Taps $> 1''$
12"	Taps > 3/4"	Taps > 1"	Taps > $1-1/4$ "
16"	Taps > $1 - 1/4$ "	Taps $> 1-1/2$ "	Taps > 2"

- C. Spiral-wrap completely the thread area with Teflon tape prior to insertion.
- D. Install corporation stops at the 2 and 10 o'clock positions on the pipe.
- E. A minimum of one and a maximum of three threads of the installed corporation stop must be showing outside the water main. Care shall be taken not to over-tighten the stops.
- F. Check and adjust all corporation stops for smooth operation.

3.2 <u>TESTING</u>

A. All corporation stops must be installed prior to leakage testing of the water main.

CURB STOPS ASSEMBLY

PART 1 - GENERAL

1.1 DESCRIPTION

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

1.2 **QUALITY ASSURANCE**

- A. All curb stops shall be manufactured by one manufacturer.
- B. All curb boxes shall be from one manufacturer.
- C. Qualifications of Manufacturer: Products shall have proven reliable in similar installations over a reasonable number of years.
- D. Meet or exceed ANSI/AWWA C800.
- E. Acceptable Curb Stop Manufacturers:
 - 1. A.Y. McDonald Mfg. Co.
 - 2. Mueller Co.
 - 3. or equivalent.

PART 2 - PRODUCTS

- A. Curb Stop
 - 1. Curb ball valve, quarter turn check.
 - 2. Construction shall be in accordance with AWWA C800 latest revision.
 - 3. Shall be "lead free" as defined in the Safe Drinking Water Act, amended January 4, 2011. Specifically, fittings shall contain not more than a weighted average of 0.25% lead when used with respect to their wetted surfaces.
 - 4. Inlet and outlet shall have compression type connections (CPPJ).
 - 5. Working pressure shall be 300 psi.
 - 6. Stainless steel insert stiffeners shall be used where plastic tubing (CTS) is specified.
 - 7. Inverted key and plug type curb stops are not acceptable.
- B. Service Boxes
 - 1. Erie style
 - 2. $5\frac{1}{2}$ $6\frac{1}{2}$ bury (unless shown otherwise)
 - 3. Plug cover with rope thread
 - 4. $36'' \times \frac{1}{2}''$ stainless steel Box Rod
 - 5. For services over 1", provide heavy duty foot piece.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install at locations shown on the Drawings and in accordance with manufacturer's instructions.
- B. Install 2" x 8" x 8" concrete tile under curb stop.

3.2 ADJUSTMENTS

- A. Check and adjust all curb stops for smooth operation.
- B. The curb box shall be adjusted to final grade.
 - 1. In paved areas or in sidewalks, the adjustment shall be approximately 1/8" below finish grade.
 - 2. In lawn or grass area, the adjustment shall be approximately $\frac{1}{2}$ " below finish grade or at such a level as not to interfere with lawn maintenance.

HYDRANT ASSEMBLIES

PART 1 - GENERAL

1.1. DESCRIPTION

- A. Work Included: Furnish and install hydrant assemblies of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.
- B. Fire Hydrant Assemblies consist of:
 - 1. Hydrant tee.
 - 2. 6 inch gate valve and valve box.
 - 3. 6 inch hydrant branch piping.
 - 4. Fire Hydrant.
 - 5. Thrust blocking and retainer glands.
- C. Flushing Hydrant consist of:
 - 1. Threaded DI cap.
 - 2. 2" copper branch tubing and fittings.
 - 3. 2' curb stop and box.
 - 4. Yard Hydrant.

1.2 QUALITY ASSURANCE

- A. Hydrants shall conform to AWWA C502 and all hydrants shall be from one manufacturer.
- B. Hydrants shall comply with Factory Mutual Research Corporation and Underwriters' Laboratories UL246 Standard.
- C. Gate valves shall conform to AWWA C500.
- D. Acceptable Manufacturer for Fire Hydrants:
 - 1. Kennedy Model K-81A or as approved by the City of Portsmouth Water Department.
- E. Acceptable Manufacturers for Flushing Hydrants:
 - 1. Mainguard #77 by the Kupferle Foundary Company

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fire Hydrants:

2.

- 1. Dry barrel type with a 5-1/4 inch minimum valve opening.
 - Two (2) 2-1/2 inch hose connections and one (1) 4-1/2 inch pumper connection.
 - a. 2-1/2 inch outlets: 60 degree V threads, 7-1/2 threads to the inch, external threads 3-1/16 inches, O.D. National Standard threads.
 - b. 4-1/2 inch outlet: 4 threads to the inch, external threads 5-3/4 inches, O.D. National Standard threads.
- 3. 200 pounds working pressure and 400 pounds hydrostatic test pressure.
- 4. Working parts shall be bronze and open RIGHT (clockwise). Operating nut shall open by turning to the RIGHT and be five-sided, 1 1/2 inch point to flat.

- 5. Designed with standpipe breaking ring or breakable sections.
- 6. Supply one (1) collision repair kit for every twenty-five (25) hydrants installed.
- 7. Caps shall be attached to hydrant body by chains.
- B. Flushing Hydrants:
 - 1. Barrel shall be 2" diameter and self-draining.
 - 2. Outlet shall be 2.5" NST thread with cap.
 - 3. All working parts shall be brass.
 - 4. Hydrant shall be operated by non-rising type stem and plunger.
 - 5. Slotted operating nut shall be provided with locked access cover.
 - 6. Inlet shall be 2" FIP thread.
 - 7. Barrel shall include traffic breakaway coupling.
- C. Gate Valves: As specified in Section 02646 Resilient Seated Gate Valves.
- D. Valve Boxes:
 - 1. Cast or ductile iron, with the word "WATER" cast in covers.
 - 2. Be of such length as required without full extensions. Minimum lap 12 inches.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install hydrants as shown in the details and using manufacturer's written instructions.
- B. No hydrant assembly shall be backfilled until approved by the Engineer.
- C. Provide thrust blocks as shown.
- D. Provide barrel extensions as required for hydrant to be installed at proper grade at no additional cost to the Owner.
- E. Plug all drain openings with brass plugs.
- F. Provide finish paint on all exposed surfaces. Color must meet Owner's requirements.

3.2. <u>CLEANING</u>

A. Clean all hydrants of concrete, etc. and repaint as necessary to the satisfaction of the Engineer and Owner.

VALVE BOXES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install valve boxes 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 valve boxes shall be manufactured by one manufacturer.
- B. Qualifications of Manufacturer: Products to have been proven reliable in similar installations over a reasonable number of years.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. For valves 10 inches and smaller the valve box shall be cast iron, slip type two-piece integral base, with a top flange, 5-1/4 inch shaft.
- B. For valves 12 inches and larger the valve box shall be cast iron, slip type, three piece (separate base), with a top flange, 5-1/4 inch shaft.
- C. Cast or ductile iron, with the word "WATER" cast in covers.
- D. Acceptable Manufacturers:
 - 1. Mueller Co.
 - 2. Central Foundry Co.
 - 3. Clow.
 - 4. Or equivalent.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation as shown on the Drawings and/or as specified herein:
 - 1. When installation is complete, no pressure shall be exerted by valve box on the water main or on the valve.
 - 2. Be of such length as required without full extension. Minimum lap 12 inches.
 - 3. Install so cover is exactly level to 1/4 inch lower than pavement.

SERVICE SADDLES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install service saddles 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 service saddles shall be manufactured by one manufacturer.
- B. Qualifications of Manufacturer: Products to have been proven reliable in similar installations over a reasonable number of years.

1.3 SUBMITTALS TO THE ENGINEER

A. Submit shop drawings in accordance with the General Conditions.

PART 2 - PRODUCTS

2.1 MATERIALS WATER

- A. For cast iron, ductile iron, and C900 PVC pipe
 - 1. Body -.
 - a. Ductile iron Fusion bonded epoxy coated (10 mils min.)
 - b. Stainless Steel wrap around.
 - 2. Gasket NBR compound.
 - 3. Bolts, Washers and nuts heavy hex constructed of type 304 (18-8) stainless steel.
 - 4. Threads-American Tapered Pipe Threads.
- B. Straps:
 - 1. 304 Stainless Steel single or double strap for 6" or smaller.
 - 2. 304 Stainless Steel double strap for 8" and larger.
- C. Acceptable Manufacturers:
 - 1. Smith-Blair
 - 2. Dresser
 - 3. Romac
 - 4. Or equivalent

2.2 MATERIALS SEWER

- A. For ductile iron, AC, VC, DR and SDR PVC pipe
 - 1. Body -. Ductile iron painted body
 - 2. Gasket SBR compound.
 - 3. Bolts, Washers and nuts heavy hex constructed of type 304 (18-8) stainless steel.
- B. Straps 304 Stainless Steel.
- C. Acceptable Manufacturers:
 - 1. Romac

2. Or equivalent

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Water
- 1. As shown on the Drawings and/or as specified herein.
- 2. Install at locations with 1 1/2 inch or larger services on ductile iron pipe, or at any size service on PVC or A.C. pipe, or as specified by the pipe and saddle manufacturers.
- 3. Check for leaks prior to backfilling as appropriate.
- 4. Tap pipe with tools and methods specifically furnished by pipe manufacturer.
- 5. For new main construction
- B. Sewer
 - 1. As shown on the Drawings and/or as specified herein.
 - 2. For new main construction, install only with the written approval of the Engineer. Saddle to be tested in accordance with Section 02651 Final Sewer Testing.

SECTION 02650 EXCAVATION DEWATERING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Design, furnish, install, operate, maintain and remove temporary dewatering systems as necessary to lower and control water levels below the excavated depth.
- B. Determination of need to pre-drain soils using a well point system shall be by concurrence of the Engineer and Superintendant in advance of the work based on the following:
 - 1. Observed water table >2' above the proposed invert of the pipe.
 - 2. Sufficient hydrostatic groundwater pressure to cause blowup of the trench bottom or sufficient to cause disturbance of the soil in the trench.
 - 3. Perched water table above the invert of the pipe that can be addressed by conventional trench dewatering methods, such as by sump or trench pumps will not require a well point system.

1.2 DESIGN AND PERFORMANCE RESPONSIBILITY

- A. The Contractor shall be solely responsible for the proper design and execution of methods for controlling surface water and pre-draining groundwater.
- B. Damage to properties, buildings or structures, sewers and other utility installations, pavements, sidewalks, and work resulting from the Contractor's dewatering operations will be the responsibility of the Contractor.
- C. Design review and field monitoring activities by the Engineer shall not relieve the Contractor from their responsibility for the Work.

1.3 <u>SUBMITTALS TO THE ENGINEER</u>

- A. Plan of proposed dewatering method including, the number, type, size, power supply and location of proposed dewatering units; schedule of operation; and method of disposal of water.
- B. Water level readings in observation wells, the well locations, well point tip elevation and elevation of water in the wells.
- C. Include provisions for the dewatering system in the Erosion and Sediment Control and Storm water Management Plan described in Section 02540 Temporary Erosion Control.

1.4 SUBSURFACE CONDITIONS

- A. When available, locations of test borings and pits are shown on the Drawings. The boring logs are included in the Appendix of these Specifications.
- B. Variations in subsurface conditions should be anticipated by the Contractor when planning and estimating the work. Water levels can be expected to vary with season, precipitation and stages of nearby brooks and, therefore, water levels encountered at the time of construction may differ from any that are shown on the boring and test pit logs.

PART 2 - PRODUCTS

(NOT PART OF THIS SECTION)

PART 3 - EXECUTION

3.1 <u>GENERAL</u>

- A. Control surface water and pre-drain groundwater such that excavation to final grade is made in-the-dry, maintain undisturbed bearing soils and insure that softening and/or disturbance due to the presence of seepage of water does not occur.
- B. Perform all construction and backfilling in-the-dry. Flotation of completed portions of the Work is prohibited.

3.2 SURFACE WATER CONTROL

A. Construct surface water control measures, including dikes, ditches, sumps and other methods to prevent, as necessary, flow of surface water into excavations.

3.3 EXCAVATION DEWATERING

- A. Construct all pipelines, concrete work, pipe bedding, and backfill in-the-dry. Excavate in-the-dry and not until the water level, as indicated by groundwater observation wells, is a minimum of six inches below the proposed bottom of final excavation within the trench limits.
- B. Provide and maintain, at all times during construction, proper equipment and facilities to promptly and adequately remove and dispose of all water entering excavations. Keep undisturbed subgrade foundation conditions until the fill, structure or pipes to be built thereon have been completed to such an extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations.
- C. Conduct dewatering, at all times, in such a manner to preserve the natural undisturbed capacity of the subgrade soils at the bottom of excavations.
- D. Evaluate the impact of the anticipated subsurface soil/water conditions on the proposed method of excavation and removal of water.
- E. Where groundwater level is above the bottom of the proposed excavation level, install and operate a pumped dewatering system, including well points or closely spaced wells. Pre-drain the soils prior to final excavation, and maintain the lowered groundwater level until construction has been completed to such an extent that the structure, pipeline or fill will not be floated or otherwise damaged. The type of system, spacing of dewatering units and other details of the work will vary depending on soil/water conditions at particular locations.
- F. At least two weeks prior to the start of construction in any areas of anticipated dewatering, submit a proposed initial plan for removal of water, method of excavation and support of the excavation to the Engineer for review. Do not proceed with construction in any of these areas until the initial plan has been reviewed and commented upon by the Engineer. Concurrence by the Engineer with the Contractor's initial plan shall be the Engineer's agreement that the plan is satisfactory for initial trial. It is expected that the initial plan may need modifications to suit the variable soil/water conditions to be encountered along the route.

- G. Dewater and excavate in a manner which does not cause loss of ground or disturbance to the pipe bearing soil or soil supporting overlying or adjacent structures.
- H. Surround well points and other dewatering units with suitable filter sand to prevent fines from being removed by pumping.
- I. Pump the dewatering system continuously until pipe or structure is adequately backfilled and provide stand-by pumps.
- J. Collect water entering the excavation from precipitation or surface runoff in shallow ditches around the perimeter of the excavation, drain to sump and pump from the excavation to maintain a bottom free from standing water.
- K. Dispose of drainage in an approved area so that backflow, pollution, or public nuisance will not occur.

3.4 TEMPORARY GROUNDWATER OBSERVATION WELLS

- A. Prior to commencing excavation and at locations designated by the Engineer, install temporary groundwater observation wells on the alignment of the pipe centerline.
- B. The required spacing of the wells will be determined by the Engineer based on the methods and sequence of excavation and dewatering and the soil and water conditions encountered. It is anticipated that temporary well spacing will generally vary within the range of 100 feet to 300 feet.
- C. Evaluate water level readings in the wells to confirm that the groundwater level has been lowered as specified such that excavation to final grade can be made in-the-dry.
- D. Make water level readings and submit to the Engineer, to confirm effectiveness of dewatering prior to final excavation. Permit the Engineer to make independent readings of water levels in wells.
- E. Temporary groundwater observation wells shall consist of a screened or slotted well point and riser pipe. The well point tip shall be placed at least two feet below the proposed bottom of excavation level.
- F. Leave temporary groundwater observation wells in place until immediately prior to final excavation at the well locations.

FINAL SEWER TESTING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. All sewers, manholes, and appurtenant work, in order to be eligible for approval by the Engineer, shall be subjected to tests that will determine the degree of watertightness and horizontal and vertical alignment.
 - 2. Final sewer testing work includes the performance of testing and inspecting each and every length of sewer pipe, pipe joints and each item of appurtenant construction.
 - 3. Perform testing at a time approved by the Engineer, which may be during the construction operations, after completion of a substantial and convenient section of the work, or after the completion of all pipe laying operations.
 - 4. Provide all labor, pumps, pipes, connections, gages, measuring devices and all other necessary apparatus to conduct tests.

PART 2 - PRODUCTS

(NOT PART OF THIS SECTION)

PART 3 - EXECUTION

3.1 PERFORMANCE

- A. General:
 - 1. Thoroughly clean all sewer lines to be tested, in a manner and to the extent acceptable to the Engineer, prior to initiating test procedures.
 - 2. Perform all tests and inspections only under the direct observation of the Engineer and the plumbing or building inspector and in accordance with the requirements of the local and State plumbing codes.
 - 3. Prior to construction, inform the Engineer of the planned sewer testing pattern.
 - 4. Remedial Work:
 - a. Perform all work necessary to correct deficiencies discovered as a result of testing and/or inspections.
 - b. Completely retest all portions of the original construction on which remedial work has been performed.
 - c. Perform all remedial work and retesting in a manner and at a time approved by the Engineer at no additional cost to the Owner.
- B. Line Acceptance Tests (Gravity sewers):
 - 1. Test all gravity sewer lines for leakage by conducting a low pressure air test conforming to ASTM F1417 or Uni-B-6. Conduct all tests after the tees or saddles and service connections have been installed to the limit indicated on

the Contract Drawings. Conduct all tests after backfilling the sewer line trenches and prior to any paving.

- 2. Equipment:
 - a. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected.
 - b. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
 - c. All air used shall pass through a single central panel.
 - d. Connect 3 individual hoses:
 - (1) From the control panel to the pneumatic plugs for inflation,
 - (2) From the control panel to the sealed sewer line for introducing the low pressure air.
 - (3) From the sealed sewer line to the control panel for continually monitoring the air pressure rise in the sealed line.
 - e. All bypass pumping equipment needed to maintain main line flows for the entire test procedure.
- 3. Groundwater Conditions:
 - a. In areas where groundwater exists, and at the time of installing the sewer line, install a 1/2 inch diameter capped pipe nipple, approximately 10 inches long, through the manhole wall on top of one of the sewer lines entering the manhole.
 - b. Immediately prior to performing the line acceptance test, determine the height of groundwater by removing the groundwater test pipe cap, blowing air through the pipe nipple into the ground to clear it, and then connecting a clear plastic tube to the nipple.
 - c. Hold the tube vertically and measure the height in feet. Divide this height by 2.3 to establish the pounds of groundwater pressure to be added to the air pressure test readings. (Example: Height of water is 11-1/2 feet, added groundwater pressure is 5 psig, minimum air pressure is 3.5 psig; therefore, the total minimum acceptable pressure is 8.5 psig.)
- 4. Testing Pneumatic Plugs:
 - a. Seal test all pneumatic plugs prior to using them in the actual test.
 - b. Lay one length of pipe on the ground and seal both ends with the pneumatic plugs to the tested.
 - c. Pressurize the sealed pipe to 5 psig.
 - d. The pneumatic plugs are acceptable if they remain in place without bracing.
- 5. Testing Sewer Pipeline:
 - a. After the sewer pipe has been cleaned and the pneumatic plugs checked, place the plugs in the sewer line at each manhole and inflate them.
 - b. Introduce low pressure air into the sealed sewer pipeline until the air pressure reaches 4 psig greater than the average groundwater pressure.
 - c. Allow a minimum of 2 minutes for the air pressure to stabilize to a minimum of 3.5 psig greater than the groundwater pressure.

- d. After the stabilization period, disconnect the air hose from the control panel to the air supply.
- e. The pipeline will be acceptable if the pressure decrease is not greater than 1/2 psig in the time stated in the following table.

TABLE 1

Minimum Time <u>(min)</u>	Length for Min. Time (feet)	Time for Longer Lengths* (sec)
1:53	597	.190L
2:50	398	.427L
3:47	298	.760L
4:43	239	1.187L
5:50	199	1.709L
7:05	156	2.671L
8:30	133	3.846L
9:55	114	5.235L
11:20	99	6.837L
12:45	88	8.653L
14:10	80	10.683L
15:35	72	12.926L
17:00	66	15.384L
	Minimum Time (min) 1:53 2:50 3:47 4:43 5:50 7:05 8:30 9:55 11:20 12:45 14:10 15:35 17:00	Minimum Time (min) Length for Min. Time $(feet)$ 1:535972:503983:472984:432395:501997:051568:301339:5511411:209912:458814:108015:357217:0066

*Applies to pipe runs greater than those listed in column 3. L = Actual length of pipe being tested.

- 6. Test Results:
 - a. If the installation fails the low pressure air test, determine the source of leakage.
 - b. Replace all defective materials and/or workmanship and repeat low pressure test at no additional cost to the Owner.
 - c. Repairs shall only be made with prior approval of the Engineer in accordance with a method acceptable to the Engineer.
- C. Alignment Tests (Gravity Sewers):
 - 1. Perform tests for the correctness of horizontal and vertical alignment on each and every length of gravity sewer pipeline between manholes.
 - 2. Beam a source of light, acceptable to the Engineer, through the pipe line and directly observe the light in the manhole at the opposite end of each test section.
- D. Deflection Tests:
 - 1. Deflection test all PVC pipe.
 - 2. Perform test by using a deflectometer.
 - 3. Maximum deflection: 5 percent.
 - 4. Testing limits and test gauge diameter for plastic pipe:

a. Acceptance limit for deflection tests of installed flexible sewer pipe, listed in Table 2 shall be 5% of average inside diameter. A test shall be conducted after a minimum of thirty days following installation.

TABLE 2 - PVC Materials

D 3034	Solid Wall	4" - 15"
F 679	Solid Wall	18" - 36"
F 794	Ribbed Wall	18" - 48"
F 949	Corrugated	4" - 8"

b. The deflection gauge diameter (G) for this test shall be determined by the following formula:

G = 0.95 D inches (nominal)

where D is the average inside diameter given in the applicable ASTM standard. In the cases where inside diameters are not given they shall be determined by the following formula:

D = D' - 2(1.06 t) inches

Where: t = the minimum solid wall thickness D' = the average outside diameter

- c. All PVC pipe is to be gauged and the results are to be recorded and the owner is to be provided written results.
- d. Limits of installed defelection for other flexible pipe materials shall not exceed the above for PVC.
- E. Force Main Test:
 - 1. Pressure Test:
 - a. Perform testing in accordance with Section 5 of AWWA Standard C600, latest edition, at a pressure equal to 150 psi of the design operating total dynamic head.
 - b. The section of pipe to be tested shall be filled with water of approved quality, and all air shall be expelled from the pipe. If blowoffs are not available at high points for releasing air the Contractor shall make the necessary excavations, backfilling and taps at such points and shall plug said holes after completion of the test.
 - c. The section under test shall be maintained full of water for a period of 24 hours prior to the combined pressure and leakage test being applied. Perform a pressure test for all other piping systems at 1-1/2 times maximum system pressure, or at the maximum working pressure of the piping system, or at a pressure indicated in the appropriate Sections of this Specification.
 - d. While maintaining this pressure, the Contractor shall make a leakage test by metering the flow of water into the pipe. If the average leakage

during a two-hour period on buried pipelines exceeds a rate of 10 gallons per inch of diameter per 24 hours per mile of pipeline the section shall be considered as having failed the test. All pipes within structures and chambers and all flanged joints shall be no visible leakage.

- e. 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.
- f. Tests shall be hydrostatic.
- 2. Connection to Work by Others
 - a. If work involves connection of pipe lines to pipes or structures provided by others, pressure test pipe lines prior to making the connection.
 - b. After successfully passing the pipe line pressure test, make the necessary connections to the work by others, and pressure test the connection.
 - c. The connection shall be pressurized to the pipe line test pressure, for a minimum of 4 hours. The connection shall have no visible leakage.
 - d. Correct any leakage at no cost to the Owner and retest until connection passes.
- 3. Cleaning: Perform all specialized cleaning as specified or required by system

Scope of Work

Furnish, install and test all concrete work and appurtenant work in complete accordance with the Drawings and Specifications.

Contractor's Duties

Except as specifically noted, provide and pay for all labor, materials, equipment, tools, machinery, water, heat, other facilities and services necessary for proper execution and completion of the work.

Contents of Division

Section No.	Section Title
03000	Concrete – General
03010	Concrete Testing
03100	Concrete Formwork
03200	Concrete Reinforcement
03300	Cast in Place Concrete & Flowable Fill
03305	Concrete Cradles, Arches, Encasements, etc.
03604	Non-Shrink Grout
03000 03010 03100 03200 03300 03305 03604	Concrete – General Concrete Testing Concrete Formwork Concrete Reinforcement Cast in Place Concrete & Flowable Fill Concrete Cradles, Arches, Encasements, etc Non-Shrink Grout

CONCRETE - GENERAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install all concrete work of the type(s) and size(s) and in the locations shown on the Drawings and as specified herein.

1.2 QUALITY ASSURANCE

A. Testing:

- 1. Have tests conducted as specified in the Concrete Testing Section of these specifications.
- 2. Perform all concrete work in accordance with the latest ACI Code and Manual.

1.3 SUBMITTALS TO THE ENGINEER

- A. Shop Drawings:
 - 1. Submit shop drawings in accordance with the General Conditions of the Construction Contract.
 - 2. Submit schedules and detailed setting diagrams for all reinforcing steel.
 - 3. Submit copies of test results on all aggregates and on all mix design proportions for concrete strengths specified in this Division.

B. Informational Data:

- 1. Have informational data available on the site at all times as a standard of reference when applicable.
- 2. Informational data shall consist of the latest edition of the P.C.A. Manual of Concrete Mix Design.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle materials to prevent damage of any nature.
- B. Store cement in undamaged condition with seals and labels intact as packaged by the manufacturer.
- C. Store cement in weathertight bins or buildings and keep cement dry at all times.
- D. Store aggregate in separate piles or bins and handle in a manner that will minimize segregation and prevent contamination.
- E. Protect anchors, ties, reinforcement and other hardware from the elements.

1.5 JOB CONDITIONS

- A. Wet Weather Protection:
 - 1. Do not place concrete during rain, sleet, or snow unless adequate protection is provided.
 - 2. Do not allow rain water or other weather conditions to damage the surface finish.
- B. Cold Weather Protection:

- 1. Do not place concrete in an ambient air temperature below 40 degrees F.
- 2. When Work must be performed in temperatures below 40 degrees F, make approved provisions for heating materials and the completed work in accordance with A.C.I. 306.
- 3. The minimum temperature of concrete as placed shall be 50 degrees F.
- C. Hot Weather Protection:
 - 1. During hot weather conditions, place concrete in accordance with A.C.I. 305.
 - 2. Place concrete at a temperature which will not cause difficulty from loss of slump, flash set, or cold joints, usually somewhat less than 90 degrees F.
- D. Metal Protection: Paint metal to be in contact with mortar, concrete or other masonry materials with alkali-resistant coatings, such as heavy bodied bituminous paint.

PART 2 - PRODUCTS

2.1 <u>MATERIALS</u>

A. Materials are specified in the appropriate sections of these Specifications.

PART 3 - EXECUTION

3.1 ACCEPTANCE OF STRUCTURE

- A. Work which meets all applicable requirements will be accepted without qualification.
- B. Work which fails to meet one or more requirements, but which has been repaired to bring it into compliance, will be accepted without qualification.
- C. Work which fails to meet one or more requirements and which cannot be brought into compliance may be accepted or rejected, as determined by the Engineer.
- D. Concrete failing to meet the strength requirements as stated in these Specifications may require additional curing as directed by the Engineer. Modifications may be required in the concrete mix design for the remaining concrete work, at no additional cost to the Owner.
- E. Formed surfaces larger or smaller than dimensional tolerances specified may be rejected. If the Engineer permits the Contractor to correct errors, such corrections shall be as directed and in such a manner as to maintain the strength, function and appearance of the structure.
- F. Concrete members cast in the wrong location may be rejected and shall be removed at no additional cost to the Owner.
- G. Inaccurately formed surfaces exposed to view may be rejected and shall be repaired or removed at no additional cost to the Owner.
- H. Finished flatwork exceeding specified tolerances may be repaired by grinding high spots or patching low spots with an approved epoxy grout.
- I. Concrete exposed to view with defects which adversely affect the appearance of the specified finish may be repaired, if possible. If, in the opinion of the Engineer, the defects cannot be repaired, the concrete shall be removed and replaced at no additional cost the Owner.
- J. The strength of the structures in place will be considered potentially defective if it fails to comply with any of the following requirements:
 - 1. Low concrete strength as evaluated by the requirements of these Specifications.

- 2. Reinforcing steel size, quantity, strength, position or arrangement at variance with the Drawings.
- 3. Concrete which differs from the required dimensions or locations in such a manner as to reduce the strength.

CONCRETE TESTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Perform all testing of concrete as specified herein and as directed by the Engineer.

1.2 QUALITY ASSURANCE

- A. Have all testing conducted by an independent testing laboratory approved in writing by the Engineer.
- B. ASTM Requirements:
 - 1. Curing Test Cylinders: ASTM C31/C31M 03.
 - 2. Slump Testing: ASTM C143/C143M 03.
 - 3. Air Content Testing: ASTM C231 03.
 - 4. Core Testing: ASTM C42/C42M 03.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete materials are specified in the appropriate Sections in these Specifications.

PART 3 - EXECUTION

3.1 <u>PERFORMANCE</u>

- A. Test Cylinders:
 - 1. Have 4 standard test cylinders made and cured for each 50 cubic yards, or fraction thereof, of each type of concrete placed in any one day.
 - 2. Have 2 cylinders tested after 7 days, and 2 cylinders tested after 28 days.
 - 3. The necessity of breaking cylinders at intermediate periods will be determined by the testing laboratory.
- B. Slump Tests:
 - 1. Have tests for slump made at the place of deposit.
 - 2. Have 1 slump test made for each 50 cubic yards of each type of concrete placed in any one day. Have at least 1 slump test made for each concrete pour.
 - 3. Have more frequent slump tests made if, in the opinion of the Engineer, the concrete delivered does not appear to be consistent.
- C. Air Content:
 - 1. Have 1 air content test made for each 50 cubic yards of each type of concrete placed in any one day. Have at least 1 air content test made for each concrete pour.

- D. Changes of Materials:
 - 1. Have the above specified tests made for each change of materials and mix proportions.
 - 2. Make test occasioned by changes of materials and mix proportions at no additional cost to the Owner.
- E. Disputes:
 - 1. Have additional tests necessary to resolve disputes made only by the designated independent testing laboratory.
 - 2. If the work or materials are found to be deficient, testing shall be at no additional cost to the Owner.
 - 3. If the work or materials are found to be satisfactory, testing will be paid by the Owner.

3.2 EVALUATION OF STRUCTURES

- A. Concrete Strength: The strength of the concrete shall be considered satisfactory if the average of any 5 consecutive strength tests of the laboratory cured specimens representing each strength of concrete is equal to or greater than the specified strength, and if not more than 10 percent of the strength tests have values less than the specified strength, and no single test has a value more than 500 psi below the specified strength.
- B. Additional Tests:
 - 1. Impact hammers, sonoscopes, or other non-destructive testing devices may be used, if approved by the Engineer, to determine relative strengths of various areas of the structure, and as an aid in evaluating concrete strength in place or in determining locations of areas to be cored. Test results, so obtained, shall be used as a basis for acceptance or rejection only if these results are properly calibrated and correlated with other test data.
 - 2. When required by the Engineer, have core tests conducted.
 - 3. Have cores tested saturated-surface-dry if the concrete they represent will be wet at any time during the use of the completed structure. Have cores tested air-dry if the concrete they represent will be dry at all times during the use of the completed structure. The laboratory report shall state whether the cores were tested saturated-surface-dry or air-dry.
 - 4. Have at least 3 cores taken from each potentially deficient area. Locations will be determined by the Engineer. Damaged cores may be replaced.
 - 5. The strength of the cores from the concrete from each member or area shall be considered satisfactory if their average is equal to or greater then 90 percent of the specified strength, and no single core is less than 80% of the specified strength.
 - 6. Plug holes solid with 2:1 grout.

CONCRETE FORMWORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and erect formwork to provide concrete of the size(s) and in the location(s) shown on the Drawings and specified herein.

1.2 QUALITY ASSURANCE

- A. Formwork Design:
 - 1. A.C.I. 347
 - 2. Wind loads: As specified by local building codes.
- B. Earth Cut Forms: Do not use earth cuts as forms for vertical surfaces.
- C. Allowable Tolerances:
 - 1. Construct forms so that the concrete surfaces conform to the tolerances stated in A.C.I. 347.
 - 2. The maximum deflection of facing materials reflected in concrete surfaces exposed to view shall be 1/240 of the span between structural members.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Form Accessories:
 - 1. Provide commercially manufactured types of form accessories to be partially or completely embedded in the concrete, such as ties and hangers. Non-fabricated wire is not acceptable. Furnish and install form ties with a water seal in walls which will withstand a hydrostatic head.
 - 2. The portion of accessories remaining within the concrete shall leave no metal within 1 inch of the surface when concrete is exposed to view.
 - 3. Spreader cones on ties shall not exceed 1 inch in diameter.
 - 4. Furnish and install removable thru-wall ties with suitable plugs tested to withstand a hydrostatic head of at least two times the hydrostatic head in the structure.

PART 3 - EXECUTION

3.1 FABRICATION

- A. Construct moldings or chamfer strips in the corners of column, beam, and wall forms where the concrete will be exposed to view.
- B. Construct temporary openings at the base of column forms, wall forms and at other points where necessary to facilitate cleaning and observation immediately before concrete is placed.

- C. Construct forms sufficiently tight to prevent leakage of grout or cement paste. Swell board forms having joints opened by shrinkage of wood by wetting before concrete is placed.
- D. Seal plywood, and other wood surfaces not subject to shrinkage against absorption of moisture from the concrete by one of the following methods:
 - 1. A suitable field applied oil or sealer.
 - 2. A suitable factory applied non-absorptive liner.
- E. Coating Forms (shall be compatible with potable water):
 - 1. Coat form prior to placing reinforcing steel.
 - 2. Do not allow coating material to stand in puddles in forms nor to come in.
 - 3. Where as-cast finishes are required, do not coat form surfaces with materials that will impart a stain to the concrete.
 - 4. Where painted finished surfaces are required, coat form surfaces with materials compatible with the type of paint to be used.
- F. Clean all form surfaces before reuse.

3.2 INSTALLATION

- A. Camber formwork to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete and construction loads.
- B. Provide positive means of adjustment (wedges or jacks) of shores and struts to take up settlement during concrete placing operation. Brace shores and struts securely against lateral deflections.
- C. Edge Forms and Intermediate Screed Strips:
 - 1. Set accurately to produce the designed elevations and contours.
 - 2. Sufficiently strong to support vibrating bridge screeds or roller pipe screeds if finish requires the use of such equipment.
 - 3. Align concrete surface to the contours of screed strips by use of strike-off templates or approved compacting type screeds.
 - 4. When the formwork is cambered, set the screeds to a like camber to maintain the proper concrete thickness.

3.3 <u>REMOVAL</u>

- A. Formwork for columns, walls, sides of beams, and other parts not supporting the weight of the concrete may be removed as soon as concrete has hardened sufficiently to resist damage from removal operations, but must remain a minimum of 3 days after the placement of the concrete, when ambient temperatures are below 50°F or 2 days after placement when ambient temperatures are above 50°F
- B. Leave formwork for beam soffits, slabs, and other parts that support the weight of the concrete in place until the concrete has reached 75 percent of the specified 28 day strength.
- C. Do not place live loads on slabs until the concrete has reached the specified 28 day strength, unless the slab is reshored.

3.4 <u>RESHORING</u>

- A. When required, plan reshoring in advance.
- B. Loads and Strength:
- 1. Perform reshoring so that at no time will large areas of new construction be required to support their own weight.
- 2. While reshoring is under way, do not permit live loads on the new construction.
- 3. Leave reshores in place until concrete has reached its specified 28 day strength.
- C. Reshore Supports:
 - 1. Reshore floors supporting shores under wet conditions or leave their original shores in place.
 - 2. The reshores shall have at least one-half the load capacity of the shores above and shall be distributed in approximately the same pattern as those above.
 - 3. Leave these reshores in place until the freshly-placed concrete has reached 75 percent of its specified 28 day strength.

3.5 <u>REMOVAL STRENGTH</u>

- A. When formwork removal or reshoring removal is based on the concrete reaching its 28 day strength (or a specified percentage thereof), the concrete shall be presumed to have reached this strength when any of the following conditions has been met:
 - 1. When test cylinders, field cured under the most unfavorable conditions prevailing for any portion of the concrete represented, have reached the required strength. Except for the field curing and age at test, the cylinders shall be molded and tested as specified in the Concrete Testing Section of these Specifications.
 - 2. When the concrete has been cured as specified for the same length of time as the age at test of laboratory-cured cylinders which reached the required strength. The length of time the concrete has been cured in the field shall be determined by the cumulative number of days or fractions thereof, not necessarily consecutive, during which the temperature of the air in contact with the concrete is above 50 degrees F. and the concrete has been damp or thoroughly sealed from evaporation and loss of moisture.
 - 3. When the concrete has reached a specified strength as determined by non-destructive tests.

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 <u>DESCRIPTION</u>

A. Work Included: Furnish and install reinforcement for concrete of the type(s) and size(s) and in the location(s) shown on the Drawings and specified herein.

1.2 QUALITY ASSURANCE

- A. Reinforcing Steel:
 - 1. Yield strength of 60 ksi as shown on the Drawings.
 - 2. ASTM A 615
 - 3. Allowable fabrication tolerances:
 - a. Sheared length: +/- 1 inch.
 - b. Depth of truss bars: to, 1/2 inch.
 - c. Stirrups, ties, and spirals: +/- 1/2 inch.
 - d. All other bends: +/- 1/2 inch.
- B. Welded Wire Fabric: ASTM A185.

1.3 SUBMITTALS TO THE ENGINEER

A. Submit shop drawings and schedules in accordance with the General Conditions of the Construction Contract.

1.4 DELIVERY AND STORAGE

A. Protect reinforcement from the elements to prevent corrosion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All reinforcement shall be free of corrosion.

PART 3 - EXECUTION

3.1 <u>PLACING</u>

- A. Allowable Placement Tolerances:
 - 1. Concrete cover to formed surfaces: +/- 1/4 inch.
 - 2. Minimum spacing between bars: +/- 1/4 inch.
 - 3. Top bars in slabs and beams:
 - a. Members 8-inches deep or less: +/- 1/4 inch.
 - b. Members more than 8-inches but not over 1 feet deep: +/- 1/2 inch.
 - Crosswise of Members: Spaced evenly within 2 inches.
 - 5. Lengthwise of members: +/- 2 inches.
- B. Interference:

4.

- 1. Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits, or embedded items.
- 2. If bars are moved more than one bar diameter, or enough to exceed the above specified placement tolerances, the resulting arrangement of bars shall be subject to the written approval of the Engineer.
- C. Supports:
 - 1. Support all reinforcing bars, wire together to prevent displacement by construction loads or the placing of concrete beyond the above specified placement tolerances.
 - 2. Use metal or plastic sand plate chairs on the ground at spacing called for on the drawings.
 - 3. Use concrete, metal, plastic, or other approved bar chairs and spacers over framework.
 - 4. Use galvanized or plastic accessories where concrete surface will be exposed to the weather in the finished structure, or where rust would impair architectural finishes.
- D. Load Carrying Welded Wire Fabric Reinforcement:
 - 1. Lap splice so that the overlap measured between outermost cross wires of each fabric sheet is not less than the spacing of the cross wires plus 2 inches.
 - 2. Support welded wire fabric as required for reinforcing bars.
- E. Non-Load Carrying Welded Wire Fabric Reinforcement:
 - 1. Lap splice so that the overlap measured between outermost cross wires of each fabric sheet is not less than 2 inches.
 - 2. Extend welded wire fabric across supporting beams and walls and to within 2 inches of concrete edges.
 - 3. Extend welded wire fabric through contraction joints and construction joints except keyed joints in slabs on ground.
 - 4. Position welded wire fabric during the placing of concrete to insure its proper position in the slab.
- F. Column Reinforcement:
 - 1. Offset vertical bars in columns at least one bar diameter.
 - 2. To insure proper placement, provide templates for all column dowels.
- G. Obtain the Engineer's written approval of all splices not shown on the Drawings.
- H. Do not bend reinforcement partially embedded in hardened concrete.
- I. Do not tack weld reinforcement.
- J. Splicing:

K.

- 1. Lapped splices will be used except where other methods are shown on the Drawings.
- 2. Minimum splices: 50 bar diameters.
- 3. Stagger splices by 50 bar diameters.
- 4. Spliced bars shall be in contact and wired together to maintain the bar alignment.
- 5. No splices will be permitted at points of high stress.
- Minimum concrete cover when not shown on the plans.
 - 1. Footings 3 inches.

- 2. Walls, beams, columns, and slabs exposed to liquid immersion, earth or weather: 2 inches.
- 3. Walls, beams, columns, and slabs not exposed to liquid immersion, earth or weather: 1-1/2 inches.

CAST-IN-PLACE CONCRETE & FLOWABLE FILL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish and install the following, when applicable and as shown on the Drawings and as specified herein.
 - 1. Cast-in-place concrete, including building foundations, walls, slabs, beams, columns, equipment bases, conduit envelopes, concrete stair fill, and other concrete Work shown on the Drawings.
 - 2. Do all cutting, patching and repairing of concrete which may be required for proper completion of the work.
 - 3. Place flowable fill into abandoned pipes/structures (minimum 85% of total void for pipes) where directed by the Owner or the Owner's Representative including narrative summarizing execution and verification of the work.

1.2 <u>REFERENCE SPECIFICATIONS</u>

- A. "Specifications for Structural Concrete for Buildings" by the American Concrete Institute (ACI-301), latest edition.
- B. "Building Code Requirements for Structural Concrete and Commentary" (ACI-318). latest edition.
- C. NHDOT Standard Specifications for Road and Bridge Construction (Latest Edition)

1.3 <u>SHOP DRAWINGS</u>

- A. Submit complete shop drawings as stated in the General Conditions of the Construction Contract.
- B. Provide shop drawings for fabricating and placing reinforcing steel. Show all required information for cutting, bending and placing reinforcing bars and show all accessories and support bars on placing drawings. Indicate suitable marks for placing bars.
- C. Fabrication of any material or performing of any Work prior to the final approval of the shop drawings will be entirely at the risk of the Contractor.
- **D.** For Flowable Fill: Provide narrative to Engineer prior to placement of flowable fill including the following:
 - 1. Sequence of placement including fill/pump points and vent locations.
 - 2. Method of verification that all voids (85% minimum for pipes) have been filled.

1.4 <u>RELATED TRADES</u>

- A. Notify all trades responsible for installing chases, inserts, sleeves, anchors, louvers, etc., when ready for such installation, and for final checking immediately before concrete is placed.
- B. Leave openings in walls for pipes, ducts and other items for mechanical and electrical work, as shown on the Drawings, or required by layout of mechanical and electrical systems.

PART 2 - PRODUCTS

2.1 MATERIALS FOR CONCRETE

- A. Cement: Portland cement ASTM Specification C-150, Type II.
- B. Aggregates:
 - 1. Coarse aggregate: Hard, durable, uncoated crushed stone or gravel conforming to ASTM, Specification C-33 and shall pass through sieves 1-1/2 inch.
 - 2. Fine aggregate: Sand, clean, hard, durable, uncoated grains, free from silt, loam, and clay, to meet ASTM Specification C-33.
- C. Water: Potable from the local municipal supply.
- D. Admixtures:
 - 1. High range water Reducing Agent, ASTM 494 Type F or G, (superplasticizer) by same manufacturer as air-entraining agent.
 - a. Daracem 100 by Grace Construction Products
 - b. Sikament by Sika Corporation
 - c. Or approved equal.
 - 2. Water Reducing Agent, ASTM 494 Type A, by same manufacturer as air-entraining agent.
 - a. WRDA with HYCOL by Grace Construction Products
 - b. Plastocrete 161 by Sika Corporation
 - c. Or approved equal.
 - 3. Air-Entraining Agent, ASTM C-260, to be used to obtain percent air-entrainment specified unless obtained by cement used.
 - a. "Daravair 1000" by Grace Construction Products
 - b. Sika AER by Sika Corporation
 - c. Or approved equal.
 - 4. Water Reducing, Retarding Admixture, ASTM 494 Type D.
 - a. Daratard 17 by Grace Construction Products
 - b. Plastiment 161 by Sika Corporation
 - c. Or approved equal.
 - 5. Non-Corrosive, Non-Chloride Set Accelerating Admixture, ASTM 494 Type C, by same manufacturer as air-entraining agent.
 - a. Polarset by Grace Construction Products
 - b. Sikaset NC by Sika Corporation
 - c. Or approved equal.

- 6. No other admixtures may be used without written approval by the Engineer.
- 7. Calcium chloride will not be permitted.
- E. Joint Sealer: Furnish and install as specified in these Specifications.
- F. Floor Hardener: Apply to concrete floors to remain exposed and not receiving floor cover.
 - 1. "Lapidolith" by Sonneborn Building Products,
 - 2. "Hornlith" by A.C. Horn Company,
 - 3. "Saniseal 5" by Master Builders Company,
 - 4. Or approved equal.
- G. Moisture Barrier:
 - 1. Black polyethylene film extruded onto both sides of high quality kraft paper and laminated with asphalt to rot and fungus resistant kraft paper. Kraft paper shall have crossed reinforcing fibers which are embedded in asphalt laminent for high resistance to puncturing and tearing during the application.
 - 2. Moistop, Grade 395.
 - 3. Or approved equal.
- H. Perimeter and Under Slab Insulation as specified in Division 7.
- I. Flowable Fill materials shall be in accordance with Section 520.2 of the NHDOT Standard Specifications for Road and Bridge Construction (latest edition).

2.2 STORAGE OF MATERIALS

- A. Store all materials to prevent damage from the elements and other causes.
- B. Store cement and aggregates in such a manner as to prevent deterioration or intrusion of foreign matter. Do not use any materials which have deteriorated, or which have been damaged, for concrete.
- C. Store reinforcing steel on wood skids to protect it from weather, oil, earth and damage from trucking or other construction operations. Reinforcement shall be free from loose mill scale, rust, from oil, concrete spatter and other extraneous coatings at the time it is embedded in the concrete.
- D. Store all forms in a neat manner and orderly fashion, protected from the weather and abuse.
- E. Do not store materials which, in the opinion of the Engineer, are not acceptable for the Work and immediately remove them from the site.

2.3 CONCRETE MIXTURES

A. Strength, cement, and water requirements:

Use	Min.Strength @28 day-psi	Max.Size Coarse Agg.	% Air (+/-1%)	MinMax Slump	Min Cem.Fac.	Max W/C
Concrete	4,000	3/4"	5	2"- 4"		0.40
Concrete	3,000	3/4"	5	2"- 4"		0.45
Concrete	2,000	3/4"	5	1"- 3"		0.55

- B. If a pumping process is utilized to convey concrete, established concrete mixtures may require increased proportion of cement and fine aggregate and a decreased proportion of coarse aggregate, but these mixtures may not be altered more than:
 - 1. Cement plus 20 lbs./cu.yd.
 - 2. Fine Aggregate plus 50 lbs./cu.yd.
 - 3. Coarse Aggregate minus 50 lbs./cu.yd.
- C. Concrete shall contain specified admixtures.
- D. Flowable fill shall be mixed using the approximate proportions described below (per cubic yard) to create a viscous cement product suitable to flow through pipes:

Type II Portland Cement	75 lb.
Ground Granulated Blas Furnace Slag	1,590 lb.
Water	100 gal.

a. Flowable fill shall have a minimum 28 day compressive strength of 100 psi.

2.4 CURB BARS

A. Wooster type 150, cast aluminum, or similar by National Guard, Granite State, or McKinley.

PART 3 - EXECUTION

3.1 MIXING PROCESS

A. Use ready-mix process, ACI 301-72 Par. 7.1.

3.2 <u>PLACING</u>

- A. Notify the Engineer at least 24 hours prior to each placement.
- B. Do not place concrete until soil bottoms, reinforcing steel, and inserts, sleeves and other work to be built into the concrete have been completed.
- C. Conveying: Handle concrete from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent separation or loss of ingredients and in a manner which will assure that the required quality of the concrete is retained.
- D. Depositing: Program the delivery and placement of concrete so that the time between batching and placement shall not exceed 1-1/2 hours. Do not allow concrete to free fall over 4 feet. Deposit concrete as nearly as practicable in its final position to avoid segregation due to rehandling or flowing.
- E. Deposit concrete continuously, in horizontal layers of such thickness (not deeper than 24 inches) that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. Carry out placing at such a rate that the concrete which is being integrated with fresh concrete is still plastic. Do not deposit concrete which has partially hardened or has

been contaminated by foreign materials. No horizontal construction joints will be allowed in foundation walls.

F. Vibrate concrete thoroughly to produce a dense, homogenous mass without voids or pockets. Place vibrators in concrete rapidly to penetrate approximately 3 inches to 4 inches into the preceding lift and blend the two layers. Vibrating techniques must assure that when the coarse aggregate reaches the form, it stops and the matrix fills the voids.

3.3 FLOOR AND OTHER FLATWORK FINISHES

- A. Use a "troweled finish" ACI 302, Sections 7.2.1 7.2.10, including tops of exposed walls, except where otherwise shown on the Drawings.
- B. Screed all floors to establish elevations, then steel trowel level, with allowable tolerance not exceeding 1/8 inch in any direction when tested with a 10 foot long straightedge. Where floors contain drains, pitch the floors to drain as shown on the Drawings.
- C. If either or both of the above requirements are not met, correct the conditions by grinding and filling, as directed by the Engineer, using materials and methods which will be compatible with all finish and surface materials to be installed on floors at no additional cost to the Owner.

3.4 MOISTURE BARRIER

- A. Apply specified moisture barriers under all interior and exterior slabs-on-grade, after insuring that gravel subbase or crushed stone base is level and well compacted.
- B. Apply moisture barrier parallel with the direction of the concrete pour. Lap and seal all joints to a minimum width of 6 inches with adhesive provided by the moisture barrier manufacturer. Insure that the moisture barrier lies flat against sides and bottom of wall footing trenches. Trim moisture barrier to fit neatly around column bases; seal to concrete footings for a minimum of 6 inches around base.
- C. Do not damage the moisture barrier at any time; repair any accidental punctures with a patch of the same material extending a minimum of 6 inches in all directions, and seal.

3.5 <u>SURFACE REPAIRS</u>

- A. Remove all honeycombed and other defective concrete down to sound concrete. Dampen area to be patched and area around it to prevent absorption of water from patching mortar. Fill areas concealed in the finished work with a trowel.
- B. Make a patching mixture of the same sand and cement as necessary to match color of existing concrete as determined by trial patches in exposed areas.
- C. Limit the amount of mixing water to that necessary for handling and placing. Mix mortar in advance, allow to stand with frequent manipulation with a trowel, without addition of water, until it has reached the stiffest consistency that will permit placing.
- D. After surface water has evaporated from the area to be patched, brush area with neat cement grout, let it set until the grout loses its sheen and apply the patching mortar. Pack the mortar thoroughly into place, strike off to leave the patch slightly higher

than surrounding surfaces to permit initial shrinkage. Keep patched area damp for 7 days. Finish exposed surfaces of patch to match adjacent surfaces.

E. After cleaning and thoroughly dampening, fill all tie holes with patch mortar. Finish off as above specified for all exposed areas.

3.6 <u>CUTTING OF HOLES</u>

- A. Cut holes required by all trades in any cast-in-place concrete which did not receive sleeves. Use a core drilling process or sawing process which produces clean sharp edges and the minimum hole size which accommodates the piping, conduit, or equipment requiring the opening.
- B. Obtain written approval from the Engineer before cutting any holes for any trades.

3.7 NON-SHRINK GROUT

A. Grout solid all bearing plates in accordance with manufacturer's recommendations and as specified. Grout mixture for Steel Sleeves to be in accordance with Section 02445.

3.8 INSULATION

- A. Under-Slab Insulation: Lay insulation under slabs directly on moisture barrier, tightly butting each sheet of insulation against adjacent piece, where shown on the Drawings.
- B. Perimeter Insulation: Install vertical perimeter insulation dry, against foundation walls in a continuous manner as the backfill is placed, or hold in place with styrofoam mastic #7 or #11, or an approved equal.

3.9 STRENGTH OF STRUCTURE

- A. The strength of the structure in place will be considered potentially deficient if it fails to comply with any requirements which control the strength of the structure, as outlined below:
 - 1. Low concrete strength, as evaluated by the requirements of this Section.
 - 2. Reinforcing steel size, quantity, strength, position, or arrangement at variance with the project drawings.
 - 3. Concrete which differed from the required dimensions or locations in such a manner as to reduce the strength.

3.10 CONCRETE CURING AND PROTECTION

- A. General:
 - 1. Prevent premature drying of freshly placed concrete, and protect from excessively cold or hot temperatures until concrete has cured.
 - 2. Provide curing of concrete by one of the methods listed and as appropriate to service conditions and type of applied finish in each case.
 - 3. Curing and protection shall be in accordance with ACI 301-12 and ACI 308
- B. Curing Period:
 - 1. Not less than 14 days for slabs.
 - 2. For elements other than slabs, not less than 7 days for standard cements and mixes.

- 3. For elements other than slabs, not less than 4 days for high early strength concrete using Type III cement.
- C. Formed Surfaces: Cure formed concrete surfaces by moist curing with forms in place for full curing period or until forms are removed.
 - 1. Keep wooden or metal forms moist when exposed to heat of the sun.
 - 2. If forms are removed prior to completion of curing process, continue curing by one of the applicable methods specified.
- D. Surfaces Not in Contact with Forms:
 - 1. Start initial curing as soon as free water has disappeared, but before the surface is dry.
 - 2. Keep concrete slabs continuously moist for not less than 7 days and all other concrete elements continuously moist for not less than 3 days by uninterrupted use of any of the following:
 - a. Water ponding.
 - b. Water-saturated sand.
 - c. Water-fog spray.
 - d. Saturated burlap: Provide 4-inch minimum overlap at joints.
 - 3. Begin final curing procedures following initial curing and before concrete has dried but not sooner than 1 day after.
 - 4. Acceptable final curing methods:
 - a. Water ponding.
 - b. Water-saturated sand.
 - c. Water-fog spray.
 - d. Saturated burlap: Provide 4-inch minimum overlap at joints.
 - e. Moisture-retaining sheet.
 - f. Moisture-retaining cover: Lap not less than 3 inches at edges and ends, and seal with waterproof tape or adhesive. Repair holes or tears during curing period with same tape or adhesive. Maintain covering intimate contact with concrete surface. Secure to avoid displacement.
 - 1. Extend covering past slab edges at least twice the thickness of slab.
 - g. Do not use plastic sheeting on surfaces which will be exposed to view when in service.
 - h. Curing compound: Apply at rate stated by manufacturer to conform with moisture-retention requirements specified, using second, immediate application at right angles to first, if necessary, and reapply if damaged by rain.
 - i. Liquid curing compounds.
 - 1. Use curing compounds only in locations permitted or required.
 - 2. Do not apply to surfaces to receive other finishes, coating, coverings unless documentation is provided that the curing compound is compatible with the finish, coating or covering.
 - 3. For curing compounds used in contact with potable water, provide documentation of NSF 61 approval.
 - 5. Continue final curing to end of curing period.

- E. Avoid rapid drying at end of curing period.
- F. During and following curing period, protect concrete from temperature changes of adjacent air in excess of 5 degrees F per hour and 50 degrees F per 24 hours. Progressively adjust protective measures to provide uniform temperature changes over entire concrete surface.

03305-1 CONCRETE CRADLES, ARCHES, ENCASEMENTS AND THRUST BLOCKS

SECTION 03305

CONCRETE CRADLES, ARCHES, ENCASEMENTS & THRUST BLOCKS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and construct cradles, arches, encasements and thrust blocks for pipes in the location(s) and of the dimension(s) and shapes shown on the Drawings, and as required to rigidly support pipes.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Construct cradles, arches, encasements and thrust blocks of 2000 psi concrete, as specified in Cast-in-Place Section in these Specifications, unless otherwise shown on the Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Construct cradles, arches, encasements and thrust blocks the full width of the trench and/or as shown on the Drawings.
- B. Secure pipe to prevent movement and flotation during the placement of the concrete.

NON-SHRINK GROUT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install non-shrink grout of the type and in the location(s) shown on the Drawings and specified herein.

1.2 DELIVERY, STORAGE & HANDLING

- A. Deliver, store and handle materials to prevent damage of any nature.
- B. Store all non-shrink grout materials in undamaged condition with seals and labels intact as packaged by the manufacturers.
- C. Store cement in weathertight bins or buildings and keep cement dry at all times.
- D. Store aggregate in separate piles or bins and handle in a manner that will minimize segregation and prevent contamination.

1.3 JOB CONDITIONS

- A. Wet Weather Conditions:
 - 1. Do not place grout during wet weather unless adequate protection is provided.
 - 2. Do not allow rain water to increase the amount of the mixing water.
- B. Cold Weather Conditions:
 - 1. Do not place grout in an ambient temperature below 40 degrees F., except when written permission is given by the Engineer.
 - 2. When work is permitted by the Engineer in temperatures below 40 degrees F., make approved provisions for heating materials, and the completed Work, to a temperature of between 50 degrees F. and 70 degrees F. for a period of not less then 3 days.
- C. Hot Weather Conditions: When grout placement is permitted by the Engineer in an ambient air temperature of more than 90 degrees F. with a relative humidity less than 50 percent, make arrangements for the installation of windbreaks, shading, fog spraying, or wet covering of a light color.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Non-Shrink Grout: Conform to the following requirements:
 - 1. Manufactured under rigid quality control specifically for grout used in transferring heavy loads.
 - 2. Contain metallic and nonmetallic aggregates especially graded to minimize bleeding.
 - 3. Contain metallic aggregate that is ductile and capable of withstanding impact without fracturing.
 - 4. Have an initial setting time of approximately 1 hour at 70 degrees F.

- 5. Produce no settlement or drying shrinkage at 3 days or thereafter.
- 6. Have higher strength at all ages than plain cement grout of the same flowability.
- 7. Resistant to attack by oil and water and have lower absorption than plain cement grout of the same flowability.
- B. Portland Cement:
 - 1. ASTM C150.
 - 2. Type I.
- C. Sand:
 - 1. ASTM C33
 - 2. Fine Aggregate.
- D. Water:
 - 1. Free from injurious amounts of oils, acids, alkalis, or organic matter.
 - 2. Clean, fresh and potable.
- E. Pea Gravel (for grout thickness greater than 1 inch):
 - 1. ASTM C33.
 - 2. Coarse aggregate graded so that at least 90 percent passes a 3/8 inch sieve and 90 percent is retained by a number 4 sieve.
- 2.2 <u>MIXES</u>
 - A. For less than 2-inch clearance, or where size or shape of space makes grouting difficult, grout mix shall consist of grout material and water.
 - B. For greater than 2 inch clearances where coarse aggregate will not obstruct free passage of the grout, extend grout by adding 50 pounds of pea gravel per 100 pounds of grout material.
 - C. Use the minimum amount of water necessary to produce a flowable grout without causing either segregation or bleeding.
 - D. Portland cement mortar for raked-out edges of non-shrink grout: 1-part Portland cement, 2 parts sand, and 1/2 part water by weight.

PART 3 - EXECUTION

3.1 <u>PREPARATION</u>

- A. Mixing:
 - 1. Mix non-shrink grouting materials and water in a mechanical mixer for no less than 3 minutes.
 - 2. Mix grout as close to the work area as possible and transport the mixture quickly and in a manner that does not permit segregation of materials.
 - 3. After the grout has been mixed, do not add more water for any reason.
- B. Formwork:
 - 1. Build leakproof forms that are strong and securely anchored and shored to withstand grout pressures.
 - 2. Provide enough clearance between the formwork and the area to be grouted to permit proper placement of grout.
- C. Surface Preparation:

- 1. Remove all defective concrete, laitance, dirt, oil, grease, and other foreign material from concrete surfaces by bush-hammering, chipping, or other similar means, until a sound, clean concrete surface is achieved.
- 2. Lightly roughen the concrete, but not enough to interfere with the proper placement of grout.
- 3. Cover the concrete areas with a waterproof membrane until ready to grout.
- 4. Remove foreign materials from all steel surfaces in contact with grout.
- 5. Align, level and maintain final positioning of all components to be grouted.
- 6. Immediately before grouting, remove waterproof membrane and clean all contaminated surfaces.
- 7. Saturate all concrete surfaces with clean water; remove excess water and leave none standing.

3.2 PLACING

- A. Place non-shrink grouting material quickly and continuously by the most practical means: pouring, pumping or under gravity pressure.
- B. Do not use either pneumatic pressure or dry packing methods without the written permission of the Engineer.
- C. Apply grout from only one side to avoid entrapping air.
- D. Thoroughly compact final installation free from air pockets.
- E. Do not vibrate the placed grout mixture or allow it to be placed if the area is being vibrated by nearby equipment.
- F. If applicable, do not remove leveling shims for at least 48 hours after grout has been placed.
- G. After shims have been removed, fill voids with plain cement-sand grout.
- H. After the non-shrink grout has reached initial set, rake out all exposed edges and paint with portland cement mortar.

3.3 <u>CURING</u>

- A. Cure grout for 3 days after placing.
- B. Keep grout wet and covered with curing paper or other methods approved by the Engineer.

Scope of Work

Furnish, install and test all masonry work and appurtenant work in complete accordance with the Drawings and Specifications.

Contractor's Duties

Except as specifically noted, provide and pay for all labor, materials, equipment, tools, machinery, water, heat, other facilities and services necessary for proper execution and completion of the work.

Contents of Division

Section No.	Section Title
04000	Masonry - General
04201	Manhole Brick Masonry (NH)

MASONRY - GENERAL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. Furnish and install concrete masonry units, block reinforcing, ties, anchors, inserts, nailing blocks and appurtenant Work as shown on the Drawings and as specified herein.
 - 2. Clean and remove surplus material and waste.
- B. Other Work Included (When Applicable):
 - 1. Furnish and install:
 - a. Receivers or reglets for flashings.
 - b. Door frames, window frames and lintels with anchors.
 - c. Electrical panel boxes, conduit, grounds and electric fixtures to be set in masonry.
 - d. Miscellaneous hardware including sleeves, anchors, vents, grills, access panels, etc. to be set in masonry.
 - e. Leveling plates, anchor bolts and similar items requiring building into the masonry work.

1.2 <u>REFERENCE STANDARDS</u>

- A. Comply with the following codes for all materials, methods, and workmanship, not otherwise specified.
 - 1. The National Concrete Masonry Association Standard "Specifications for the Design and Construction of Load Bearing Concrete Masonry".
 - 2. "Recommended Practices for Cold Weather Masonry Construction" by the International Masonry Industry All-Weather Council.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Mortar and Joint Materials:
 - 1. Cement An approved brand of domestic Portland cement, conforming to ASTM C150-02a, Type 1.
 - Sand Clean, washed, uniformly well-graded, conforming to ASTM C144-03, 100 percent passing a No. 8 sieve with not more than 35 percent passing a No. 50 sieve and with a fineness modulus maintained at 2.25 plus or minus 0.10. Sand shall be light in color and obtained from a single source.
- B. Mortar Mixes:
 - 1. General In proportioning volumetric mixes, one (1) 94 pound sack of Portland cement and one (1) 50 pound sack of hydrated lime each shall be assumed to

constitute a nominal one (1) cubic foot. For mortar below the exterior grade, reduce lime proportion of (1/4) 50 pound sack.

- 2. Lime Approved brand of plastic hydrated, such as New England 4X, conforming to ASTM Specification C207-91(1997), Type "S".
- 3. Mortar Colorant (for joints of face brick) SGS pigments, or approved equal, in color as approved by the Engineer.
- 4. Integral Waterproofing for All Exterior Mortar Rheomix Rheopel, as manufactured by Master Builders Inc., "Drycrete" as manufactured by C.G. Pardee Co., Inc., or approved equal.
- 5. Weepholes Clear plastic tubing, 3/8 inch o.d., by 4 inches long.
- 6. Compressible Filler Rigid glass fiber board, 6 pounds p.c.f. density, 25 percent thicker than joint width.
- 7. Waterstops for Control Joints Extruded rubber, Hohmann and Barnard standard type, or approved equal.
- C. Reinforcement Anchors, Ties and Dowels:
 - 1. Continuous Horizontal Reinforcement for All Exterior Cavity Type Masonry -Truss design, 9 gauge galvanized wire, with all cross members having a V drip over cavity locations of walls where same occurs, in overall width 1-5/8 inches less than the overall wall thickness. Provide preformed reinforcing section at intersections of masonry walls and partitions and whenever walls and partitions change direction. Reinforcement shall be Dur-O-Wal, Hohmann Tru-Mesh, or approved equal. Vertical reinforcement shall be deformed bars with size and spacing as shown on the Drawings.

2.2 DELIVERY, STORAGE & HANDLING

- A. Deliver, store and handle materials to prevent damage of any nature.
- B. Store material off the ground to prevent contamination by mud, dust or materials likely to cause staining or other defects.
- C. Cover and protect all materials from the elements.

2.3 EXECUTION

- A. Masonry work in general.
 - 1. Do not deliver cement, lime and similar perishable materials to the site until suitable storage is available. Store such materials in weatherproof structures, and ensure that materials are in perfectly fresh condition when ready for use.
 - 2. Perform all masonry work with skilled workmen under adequate supervision, and erect all masonry true to lines and levels with joints of uniform thicknesses, all surfaces true, and corners straight and plumb. Lay exposed-to-view masonry block units with an individual unit-to-unit level tolerance not exceeding 1/8 inch and an overall tolerance from true level not exceeding 1/4 inch in 10 feet in any direction. Lay no unit having chipped edges or face in exposed-to-view locations. Remove any such unit, if installed and replace with a new undamaged unit.
 - 3. Examine all Drawings for locations of masonry requiring patching and as required for the accommodation of work of other trades. Provide all required

recesses, chases, slots, cutouts, and built-in items, for the accommodation of heating and plumbing pipes, bearing plates, and set loose lintels. Place anchors, bolts, sleeves and other items occurring in the masonry work. Take precautions to minimize future cutting and patching.

- B. Cold Weather Protection:
 - 1. Do not construct masonry in an ambient air temperature below 40 degrees F.
 - 2. When work is permitted by the Engineer in temperatures below 40 degrees F., make approved provisions for heating and drying materials and protecting the completed work. Heat the materials and maintain a temperature above 50 degrees F. Maintain a minimum temperature of 50 degrees F. on both sides of masonry work for a period of 48 hours or more for type M or type S mortar and 72 hours or more for Type N or Type O mortar. Reduce time periods to 24 and 48 hours respectively, when using high-early-strength cement.
 - 3. Do not use any material which is frozen or covered with frost or snow.
- C. Hot Weather Protection: Protect masonry work from direct exposure to wind and sun when in an ambient air temperature of more than 90 Degrees F. with a relative humidity less than 50 percent.
- D. Wet Weather Protection:
 - 1. During construction, keep all walls, including partially completed walls not being worked on, dry by covering with a strong waterproof membrane at the end of each day or shutdown period. The membrane shall have a 2 foot minimum overhang on each side of each wall and shall be securely anchored.
 - 2. Do not allow rain water to increase the amount of the mixing water.
- E. Metal Protection: Metal in contact with mortar or other masonry materials should be painted with alkali-resistant coatings such as heavy bodied bituminous paint.
- F. Batching and Mixing:
 - 1. Proportions:
 - a. For bricks: Mix one part masonry cement 2-1/2 parts sand by volume.
 - b. For concrete masonry units: Mix one part portland cement with 0.25 (25%) part hydrated lime and three parts sand.
 - 2. Measurement:
 - a. Measure accurately by volume in boxes construction for this purpose. Do not measure by shovel.
 - b. Accurately and uniformly control the quantity of water.
 - 3. Method:
 - a. Machine mix mortar in a suitable mixer.
 - b. Mix five minutes or more; two minutes for mixing dry materials and three minutes after adding water.
 - 4. Consistency:
 - a. Add enough water to produce a consistency for satisfactory workability for the material being set in the mortar.
 - b. Mix batches that can be used within two hours after the initial mixing.
 - c. Do not retemper mortar in the mortar box.
 - d. Do not use mortar that has greatly stiffened or has started to set.
- G. Reinforcement and Anchorage:

- 1. Install specified continuous reinforcement in all masonry walls, partitions, and in chimney walls, spacing the reinforcing not more than 16 inches on centers, vertical dimension, commencing one course above supporting concrete. Install additional reinforcement over all exterior and interior openings in first joint above opening and extending 36 inches beyond each side of opening. Lap all reinforcement 6 inches minimum. Install preformed units at intersections of all masonry walls and partitions and wherever walls and partitions change directions.
- H. Construction:
 - 1. Assist the waterproofing subcontractor and the roofing and flashing subcontractor to install their flashings. Provide soft mortar bed above and below flashings which penetrate the masonry.
 - 2. Clean all receiving surfaces of masonry units free from any loose dry mortar, cement dust, oil and any other matter which might otherwise interfere with the bond of the insulation adhesive.
 - 3. Use same mortar mixture used for laying masonry units wherever cavity in exterior walls is indicated to be filled with mortar.

MANHOLE BRICK MASONRY (NH)

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish all materials and perform manhole masonry Work to construct manhole shelves, inverts and grade adjustments as shown on the Drawings and as specified herein.

1.2 **QUALITY ASSURANCE**

A. Perform brick masonry work in conformance with the New Hampshire Department of Environmental Services Standards of Design and Construction for Sewerage and Sewage or Waste Treatment Systems.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Brick:
 - 1. Sound, hard, uniformly burned, regular and uniform in shape and size and compact texture.
 - 2. ASTM Standard Specifications for Sewer Brick (made from clay or shale), Designation C32, for a Grade SS, hard brick.
 - 3. Immediately remove unsuitable brick from the work.

B. Mortar:

- 1. Composition (by volume):
 - a. 1 part Type II Portland Cement
 - b. 1/2 part hydrate lime.
 - c. 4.5 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:
 - 1. Type II Portland Cement.
 - 2. ASTM C-150, Standard Specifications for Portland Cement.
- D. Hydrated Lime:
 - 1. Type S.

2. ASTM Standard Specifications for Hydrated Lime for Masonry Purposes, Designation C207.

- E. Sand:
 - 1. Inert and natural.
 - 2. ASTM Standard Specifications for Concrete (Fine) aggregates, Designation C33 as follow:
 - Grading:

Sieve	Percent Passing
#3/8	100
4	95-100
8	80-100
16	50-85
50	10-30
100	2-10
Fineness Modulus 2.3	- 3.1

PART 3 - EXECUTION

3.1 PERFORMANCE

- A. Laying Brick:
 - 1. Use only clean bricks.
 - 2. Moisten all bricks by suitable means until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.
 - 3. Lay each brick in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling, and thoroughly bond.

B. Curing:

- 1. Protect brick masonry from drying too rapidly by using burlaps which are kept moist, or by other approved means.
- 2. Protect brick masonry from the weather and frost as required.

DIVISION 7 THERMAL AND MOISTURE PROTECTION

Scope of Work

Furnish, install and test all thermal and moisture protection work and appurtenant work in complete accordance with the Drawings and Specifications.

Contractor's Duties

Except as specifically noted, provide and pay for all labor, materials, equipment, tools, machinery, water, heat, other facilities and services necessary for proper execution and completion of the work.

Contents of Division

Section No.	Section Title
07114	Manhole Waterproofing (Sewer Manholes)

MANHOLE WATERPROOFING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and apply bituminous waterproofing on all outside surfaces of all manholes.

PART 2 - PRODUCTS

- A. Acceptable Products:
 - 1. Minwax Fibrous Brush Coat manufactured by Minwax Company, New York, New York.
 - 2. Tremco 121 Foundation Coating manufactured by the Tremco Manufacturing Company, Newark 5, New Jersey.
 - 3. Or approved equal.

PART 3 - EXECUTION

3.1 <u>APPLICATION</u>

- A. Apply waterproofing only after concrete and mortar have set.
- B. Apply 2 coats of waterproofing allowing time between coats to permit sufficient drying so the application of the second coat has no effect on the first.
- C. Apply waterproofing by brush or spray in accordance with the manufacturer's instructions.
- D. When precast manholes are delivered with a coating of bitumastic, field apply one additional coat of waterproofing.

DIVISION 13 SPECIAL CONSTRUCTION REQUIREMENTS

Scope of Work

Provide Health and Safety Documents and conduct environmental testing to safeguard workers at project site and dispose of contaminated soils and groundwater in accordance with NHDES guidelines.

Contractor's Duties

Except as specifically noted, provide and pay for all labor, materials, equipment, tools, machinery, water, heat, other facilities and services necessary for proper execution and completion of the work.

Contents of Division

Section No.	Section Title
13100	Contaminated Soils and Groundwater
13710	Health & Safety Plan Requirements

MANAGEMENT & DISPOSAL OF SOILS AND GROUNDWATER

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This work shall include the management, transport, treatment and/or disposal of soils and groundwater transported and disposed of at an offsite facility.
- B. This work shall also include documentation and tracking excavated materials (regulated and non-regulated) in accordance with applicable local, state and federal regulations. Documentation of material disposal shall be provided to the Owner upon request.

1.2 <u>REQUIREMENTS</u>

- A. Unless specified or indicated, monitoring, testing, treatment (or disposal) of regulated soils and groundwater, or other materials, including sampling protocols and testing shall conform to applicable regulations, including but not limited to:
 - 1. New Hampshire Hazardous Waste Rules He-P 1905
 - 2. RSA 146-A, RSA 146-C, and RSA 146-D, (Administered by the NHDES Water Supply and Pollution Control Division).
 - 3. RSA 147-A, and RSA 147-B, (Administered by the NHDES Waste Management Division).
 - 4. RSA 125-C (Administered by the NHDES Air Resources Division).
 - 5. US Laws 29 Code of General Regulations (CRF) 1910 OSHA (Hazardous Materials Training).

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Available information pertaining to groundwater and remediation sites is included in Appendix C.
- B. Contractor shall prepare and implement a Health and Safety Plan (HASP) for open excavations. (Section 13710)

<u>PART 3 – EXECUTION</u> SURPLUS MATERIAL -

- 3.1 CONSTRUCTION REQUIREMENTS
 - A. Notify Owner immediately upon encountering soils regulated for disposal (or soils that are suspected to be regulated for disposal).
 - B. Segregate regulated soils from non-regulated materials

- C. Incorporate all regulated soils into project backfill wherever possible, and as soon as possible.
- D. The Engineer and the Owner reserve the right (utilizing an environmental consultant) to field screen surplus excavated material and claim material to be incorporated into the project as backfill, whether regulated or un-regulated.
- E. Regulated soils that represent a threat to the environment or groundwater shall be appropriately secured and covered during stockpiling to prevent emissions or leaching of contaminates into groundwater. Covers shall be secured to prevent displacement or damage from wind, rain or other adverse weather conditions.

3.2 <u>REGULATED SOIL DISPOSAL</u>

A. The method of disposal of soils shall be approved by the Engineer and the Owner's representatives.

3.3 <u>REGULATED GROUNDWATER DISPOSAL</u>

- A. In order to facilitate the treatment of potential contaminated groundwater, the Contractor shall obtain a Temporary Ground Water Discharge Permit from NHDES or authorization to discharge groundwater to the Owner's sanitary sewer system. A Temporary Surface Water Discharge Permit will require obtaining a NPDES permit exclusion from the United States Environmental Protection Agency for this activity.
- B. Review trench dewatering methods and groundwater disposal with the Owner. Obtain owner approval for any special handling of groundwater.
- C. Health and Safety precautions shall conform to the approved Project Health and Safety Plan.

HEALTH AND SAFETY PLAN REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This work shall consist of preparing and implementing a Health and Safety Plan (HASP) to establish protocols necessary for protecting workers and the general public from potential hazards during excavation, backfill and pipe installations. Excavated soils encountered in urban development areas often include petroleum contaminants from leaking underground storage tanks (UST's), ash and VOC's as well as other naturally occurring or man-made compounds that may be regulated such as arsenic. The HASP is meant for all personnel associated with excavation, pipe laying, backfill and/or trenching operations and other personnel observing the work who could come in contact with regulated soils, compounds, materials and groundwater. The HASP shall be prepared in accordance with 29 CFR 1910.120.

1.2 <u>REQUIREMENTS</u>

- A. The Contractor shall develop a HASP using these requirements as a baseline and incorporating additional requirements where necessary. The HASP must establish in detail the protocols necessary for protecting workers and potential off-site receptors from any potential hazards encountered during construction.
- B. The HASP shall address the safe work practices and engineering safeguards to be employed for the work performed by the Contractor. These shall include but not be limited to the following:
 - 1. Descriptions of personal protective equipment and clothing used as part of the different levels of protection. Respiratory protection shall also be addressed. The Contractor shall maintain an air quality monitor (for VOC detection) and explosimeter, to aid in the quick detection of methane or other potentially explosive gasses.

1.3 <u>SUBMITTALS</u>

- A. The HASP shall be submitted to the Engineer a minimum of fourteen (14) days prior to earthwork.
- B. A Closeout Safety Report shall be submitted by the contractor to the Engineer on completion of the work. This report shall summarize the weekly safety reports and provide an overview of the contractor's performance with regard to the HASP requirements.
- C. Accident Reports.

1.4 <u>LEVELS OF PROTECTION</u>

A. The Contractor shall include in the HASP a list of tasks and specific levels of protection for each task. Levels of protection may be upgraded or downgraded

during site activities, based upon air monitoring results, meteorological conditions and the professional judgment of the SSHO.

1.5 PERSONAL SAFETY EQUIPMENT AND PROTECTIVE CLOTHING

A. The Contractor shall provide on-site personnel with appropriate safety equipment and protective clothing, when required by the HASP and shall ensure that all safety equipment and protective clothing is kept clean and well maintained. Specific levels of respiratory, and clothing protection shall be established in the HASP.

1.6 AIR MONITORING

- A. General Requirements
 - 1. The Contractor shall develop and implement an Air Monitoring Program to detect and quantify any volatilization of soil contaminants or release of soil particles associated with the work and the surrounding air. The program shall be consistent with the requirements of this section and submitted as part of HASP for review by the Engineer.
 - 2. Information gathered during the air-monitoring program shall be logged and included in the project records and safety and health record file.

PART 2 - PRODUCTS

(NOT PART OF THIS SECTION)

PART 3 - EXECUTION

(NOT PART OF THIS SECTION)

F. NHDOT STANDARD SPECIFICATIONS, AMENDMENTS & SPECIAL PROVISIONS

NHDOT TECHNICAL SPECIFICATIONS, AMENDMENTS & SPECIAL PROVISIONS

Work itemized with NHDOT item numbers shall be in accordance with current edition of the State of New Hampshire, Department of Transportation (NHDOT) Standard Specifications for Road and Bridge Construction, Amendments to Standard Specifications, Supplemental Specifications, Special Attentions and Special Provisions included herein. Although not included within the Project Manual, the Standard Specifications shall be considered part of the Contract Documents. The Contractor shall comply with these Specifications. In the case where two specifications for one installation provided the more stringent specifications apply.

A complete set of NHDOT Standard Specifications for Road and Bridge Construction may be purchased from: NHDOT, Records Section, 1 Hazen Drive, P.O. Box 483, Concord, NH 03302-0483, Phone No.: 603-271-3514, or viewed online at the NHDOT website.

AMENDMENTS TO NHDOT SPECIFICATIONS

- General and Sections 100 to 109
- Section 203 Excavation and Embankment
- Section 401 Plant Mix Pavements General
- Section 403 Hot Bituminous Pavement
- Section 603 Culverts & Storm Drains
- Section 604 Catch Basins, Drop Inlets, and Manholes
- Section 615 Traffic Signs
- Section 618 Uniformed Officers and Flaggers
- Section 619 Maintenance of Traffic
- Section 645 Erosion Control
- Section 646 Turf Establishment
- Section 692 Mobilization

SUPPLEMENTAL SPECIFICATIONS

Section 616 – Traffic Signals

SPECIAL PROVISIONS

- Item 607 Ornamental Fence
- Item 608 Sidewalks Item 614 – Street Lighting Phase 2
- Item 625 Bollard Light
- Item 650 Planting
- Item 661.1 Tree Gate
- Item 661.2 Tree Guard
- Item 661.3 Granite Planters
- Item 661.4 Structural Tree Root Cells
- Item 661.41 Planting Soil Mix
- Item 661.5 Bicycle Rack
- Item 661.6 Bench
- Item 661.7 Trash Receptacle
- Item 665 Street Lighting System

SPECIAL ATTENTIONS

Item 1010.15 – Fuel Adjustment Item 1010.2 – Asphalt Cement Adjustment

AMENDMENT TO DIVISION 100 – GENERAL PROVISIONS

The NHDOT specifications for the purposes of this project are hereby amended as follows:

General:

Reference made to the "<u>Department</u>" or "<u>Bureau</u>" or "<u>State</u>" or "<u>District Engineer</u>" shall mean "<u>City of Portsmouth, their Agents or Engineer</u>."

<u>Section 100 – General Provisions</u>

Delete the following sections in entirety:

- Section 102-Bidding Requirements and Conditions
- Section 103-Award and Execution of Contract

<u>Section 104 – Scope of Work</u>

Amend 104.03.B.1 – Replace the last sentence of the third paragraph with the following:

Additional work caused by the suspension, for reasons beyond the Contractor's control, in accordance with 619.5.4 will be paid for at Contract prices or as provided for in the General Conditions and Supplementary Conditions of these Contract Documents.

Replace 104.03.C with the following:

104.03.C Maintenance Directed by the Engineer. If the Engineer directs special maintenance for the benefit of the traveling public not otherwise included in the Contract, payment will be based on Contract unit prices or as provided in the General Conditions of these Contract Documents. The Engineer will determine the work to be classed as special maintenance.

Amend 104.04 – **Delete** the words "for loading by the Contractor onto State owned vehicles as directed" from the second sentence of the fifth paragraph.

- Amend 104.04 Replace the second sentence of the last paragraph with the following: "Compensation for such removal, if any, shall be determined in accordance with the General Conditions of this Contract."
- Amend 104.06 Delete the second sentence of the second paragraph.

<u>Section 105 – Control of the Work</u>

Amend 105.06 – **Replace** the last sentence of the last paragraph to read as follows:

"If the Contractor believes that he is entitled to compensation or a time extension based on the Engineer's determination or arrangements, then the Contractor shall proceed in accordance with the General Conditions of these Contract Documents."

Division 100 2 of 4 Islington Street Corridor Improvements Portsmouth, NH

Amend 105.10 – Replace the third sentence of the second paragraph to read as follows:

"Should the Work prove acceptable, the uncovering, removing, and the replacing of the covering or making good of the parts removed will be paid as provided for in the General Conditions of these Contract Documents."

<u>Section 106 – Control of the Material</u>

Amend 106.06 – **Replace** the second paragraph to read as follows:

"Materials shall be stored to facilitate prompt inspection and will be subject to inspection and retesting before incorporation in the Work."

Amend 106.10 – Delete the last two sentences from this section.

Section 107 – Legal Relations and Responsibility to Public

Amend 107.09.1 – **Replace** the last sentence of the first paragraph and the last sentence of the second paragraph with the following:

"Compensation and time extensions for this work shall be determined in accordance with the General Conditions and Supplementary General Conditions of these Contract Documents."

Amend 107.17 – Replace the second sentence of the last paragraph:

"Work required to dispose of these materials shall be performed under Contract item(s), or Supplemental Agreement; compensation and time adjustment shall be as provided for in General Conditions of these Contract Documents."

<u>Section 108 – Prosecution and Progress</u>

Amend 108.03 - Delete the fourth paragraph and replace with:

"Progress schedule submissions shall include a paper copy and an electronic copy in .pdf format."

Amend 108.03.A.1.1 – Delete the last sentence of the first paragraph and replace with:

"The Contractor is not entitled to a time extension or compensation for the delay except as may be explicitly allowed by the contract documents"

Amend 108.03.A.1.4 – Replace the first sentence with the following:

"Submit a schedule update to the Engineer bi-weekly or as requested by the owner based on the progression of work."

Add 108.03.A.1.6 – Insert new paragraph:

Division 100 3 of 4 Islington Street Corridor Improvements Portsmouth, NH **108.03. A.1.6** "The Contractor shall provide a two-week look-ahead at weekly job meetings, which identify future work, planning and progress of the Contract."

Amend 108.03.A.2 – Delete paragraph in its entirety and replace with:

108.03. A.2 "The Contractor shall develop a CPM schedule in a format that is acceptable to the Owner and shall perform all Work required to ensure that the schedule accurately reflects the planned schedule and progress."

Delete 108.03.A.2.1 in its entirety.

Amend 108.03.A.2.2 – **Delete** "Within 30 calendar days after providing the initial bar chart," from the 1^{st} sentence of the paragraph:

Amend 108.03.A.2.2.3 – Replace "monthly" with "bi-weekly" in the first sentence.

Amend 108.03.A.3.2 – Replace "monthly" with "weekly" in the second sentence.

Amend 108.03.C – Delete "flaggers and" from third sentence.

Delete the 4th sentence.

Amend 108.04 – Delete the second sentence of the second paragraph and replace with the following:

"Whenever a holiday is observed the Contractor shall cease operations and shall have left the site by noon (12pm) on the working day prior. For Monday holidays, operations shall cease, and the Contractor have left the site by noon (12pm) on the Friday prior."

Section 109 – Measurement and Payment

Amend 109.09 – **Delete** the section in its entirety and **replace** with:

Replace Section 109.09 with the following:

109.09 The Prime Contractor shall pay all Subcontractors for the work performed no later than 21 calendar days from the date the Prime Contractor received payment from the Owner for said work, including materials in the progress payments paid for in the progress payments. Subcontractors are required to pay their Subcontractors and/or material suppliers, within 21 calendar days from the date they receive payment for satisfactory work performed or supplies received. This Prompt Pay requirement shall be made part of all subcontracts and agreements.

If the Prime Contractor believes that any portion of the payment should be withheld from the Subcontractor, the Prime Contractor shall notify the Owner's Contract Administrator in writing, prior to the estimate being processed. The Owner may withhold payment for the portion of work in dispute pending resolution. This prompt payment provision is a requirement of 49 CFR 26.29 and does not confer third party beneficiary right or other direct right to a Subcontractor against the Owner. This provision applies to both DBE and non-DBE Subcontractors.

Satisfactory Work Performed: Satisfactory Work performed shall be defined for the purposes of this prompt payment provision as:

- 1. Upon review, the Engineer finds the work completed in accordance with the contract, plans and specifications, and;
- 2. Required paperwork, for Progress and Partial payments, including material certifications and payrolls, has been received.

The determination of whether work meets the standards set forth above is the responsibility of the Engineer. If the Subcontractor becomes insolvent after it satisfactorily performs work as defined above but before payment is due, the obligation to pay is not extinguished. (Payment may have to be made to the bankruptcy trustee or to an escrow account for the benefit of creditors.)

The Prime Contractor must include, in all subcontract agreements, notices to Subcontractors of their right to prompt payment, and of the Owner's policy prohibiting the Prime Contractor from holding retainage from Subcontractors under 49 CFR 26.29.

Failure of a Prime Contractor or a Subcontractor to comply with these prompt payment provisions may result in sanctions.

Non-Payment Claims: All notifications of failure to meet prompt payment provisions shall be referred by Subcontractors, in writing, to the Owner with a copy supplied to the respective Contract Administrator.

Payment Certifications: The Prime Contractor or any Subcontractor who receives payment for work and/or materials (specifically supplied to the project more than \$10,000) shall submit a "Monthly Prompt Pay Certification," OFC Form 18, to the Owner no later than the 10th calendar day of each month.

Note: Where two specifications may apply, Amendments to NHDOT specifications and Special Provisions will take precedent over NHDOT Standard Specifications. Where NHDOT specifications and Amendments are different from Details or Specifications specific to the project, the more stringent specifications shall apply.
Section 203 1 of 1 Islington Street Corridor Improvements Portsmouth, NH

AMENDMENT TO NHDOT SPECIFICATIONS

Section 203 – Excavation and Embankment

Classification of Material

Amend 2.2 to Read:

2.2 Rock excavation shall consist of all solid rock that cannot be removed without blasting, ripping or hammering with hoe ram. It shall also consist of boulders, masonry structures and concrete slabs when found to be greater than 6 inches in thickness <u>and</u> 2 cubic yards in volume.

Section 401 1 of 1 Islington Street Corridor Improvements Portsmouth, NH

AMENDMENT TO NHDOT SPECIFICATIONS

Section 401 - Plant Mix Pavements - General

Construction Requirements

Add the following sentence to 3.10.11 - Generals:

"The top of manholes and other castings shall be sprayed with kerosene or other product before the paver passed over the casting. The top of the casting shall be clean of asphalt at the completion of paving."

Amend 401.3.13.3 to Read:

3.13.3 Placing of the course shall be as continuous as possible, keeping the number of transverse joints at a minimum while still being able to make a hot longitudinal joint.

Section 403 1 of 3 Islington Street Corridor Improvements Portsmouth, NH

AMENDMENT TO NHDOT SPECIFICATIONS

Section 403 – Hot Bituminous Pavement

Description

Add the following to the end of the last sentence of part 1.1. "or temporary. Sidewalks and walkways shall be as specified in section 608"

Amend 1.1.1 to Read:

1.1.1 Hand method shall include only the paving of raised islands, slopes, cattle passes, areas between rails at railroad crossings, driveways, driveway aprons, curb patch between concrete barrier and pavement, and permanent trench patches. Amend 1.1.2 to Read:

1.1.2 Machine method shall include all paving operations not classified as hand method. Machine method shall also include those driveways and other areas completed with the use of a paver and specifically identified as machine method.

Add section 1.4

1.4 Prior to the start of any paving operations a mandatory pre-paving meeting will be conducted.

Materials

Amend section 2.2 to read as follows:

2.2 Temporary bituminous pavement shall conform to 401, Table 1. Thickness shall be 2" minimum or as ordered by the Engineer.

Add section 2.3

2.3 Job mix formula for bituminous pavement materials shall be as follows:

a. Temporary pavement material shall be 3/4" base course gradation as specified in NHDOT Standard Specifications, Section 401.

b. Permanent base course pavement material shall be 3/4" base course gradation as specified in NHDOT Standard Specifications, Section 401.

c. Permanent binder course pavement material, including driveways, shall be 3/4" binder course gradation as specified in NHDOT Standard Specifications, Section 401.

d. Permanent wearing course pavement material shall be 1/2" wearing course gradation as specified in NHDOT Standard Specifications, Section 401.

e. Bituminous driveway wearing course material shall be 3/8" wearing course gradation as specified in NHDOT Standard Specifications, Section 401.

Section 403 2 of 3 Islington Street Corridor Improvements Portsmouth, NH

f. Bituminous waterway material shall be 1/2" wearing course gradation as specified in NHDOT Standard Specifications, Section 401.

g. Temporary bituminous pavement material shall be 3/4" binder course gradation as specified in NHDOT Standard Specifications, Section 401

h. Permanent bituminous pavement (for trench patching) shall have a minimum total thickness of four inches (4"), or match existing thickness, whichever is greater or as shown on the Contract Drawings. Permanent bituminous pavement with a thickness of four inches (4") shall be installed with a base lift of 2.5" of 3/4" binder course and a top lift of 1.5" of 1/2" wearing course or as shown on the Contract Drawings.

Construction Requirements

Add section 3.5

3.5 Temporary bituminous pavement will not be required for all trenches and structures but shall only be installed when so directed by the Engineer.

Add section 3.6

3.6 Temporary pavement shall be repaired as necessary to maintain the surface of the pavement until replaced by the permanent pavement. If points of settlement or holes appear in the temporary pavement, the Contractor shall repair the same within 24 hours without any further compensation.

Add section 3.7

3.7 Permanent bituminous pavement shall be installed in multiple lifts of wearing, binder and base course mixes as indicated in the Contract Drawings or directed by the Engineer to achieve the total thickness of pavement as indicated in the Contract Drawings. Permanent bituminous pavement (for trench patching) with a total thickness of four inches (4") shall be installed with a base lift of 2.5" of 3/4" binder course and a top lift of 1.5" of 1/2" wearing course unless otherwise indicated on the Contract Drawings or directed.

Methods of Measurement

Add section 4.2

4.2 Temporary or permanent bituminous pavement shall be measured by the ton with the width of trench limited to that shown on the details shown on the Drawings.

Basis of Payment

Amend 5.4 to Read:

Section 403 3 of 3 Islington Street Corridor Improvements Portsmouth, NH 5.4 The accepted quantity of temporary or permanent bituminous pavement will be paid for at the contract unit price per square yard complete. Maintenance and repair of temporary pavement under 3.6 shall be subsidiary to the item.

Add section 5.5 as follows:

5.5 Pavement Joint Adhesive shall be considered included in the price for hot bituminous pavement and no additional compensation will be allowed.

Section 603 1 of 2 Islington Street Corridor Improvements Portsmouth, NH

AMENDMENT TO NHDOT SPECIFICATIONS

Section 603 – Culverts and Storm Drains

Add the following paragraphs:

Description

1.2 Work shall also include constructing 6" PE drain laterals to each property and provide a 6" PE riser or a cast iron downspout boot as shown on the drawings or where directed.

Materials

2.13 Cast Iron downspout boot for PE drain laterals shall be "A Series – Angular Downspout Boots" as manufactured by J.R. Hoe and Sons, Inc. or approved equal.

Construction Requirements

3.1.3.1 Refer to design drawings for installation. Where a conflict exists between Figure 1 and the design drawings the design drawings shall govern.

3.11 Cast Iron Downspout Boots for drain laterals

3.11.1 Cast iron downspout boots shall be secured to the foundation using stainless steel bolts and anchoring inserts sized as specified by the manufacturer.

3.11.2 Provide PE bends and fittings as required to connect 6" PE pipe at the required angle to the downspout boot with a flexible coupling.

Method of Measurement

Delete section 603.4.3 and replace with the following:

4.3 "Video inspection (where ordered) will be measured by the linear foot to the nearest foot based on the actual length."

Add the following paragraphs:

4.4 Cast iron downspout boots will be measured per each installed complete and in place where shown on the drawings or as directed.

4.5 PE drain lateral risers will be subsidiary to item 603.82206 and will not be measured for additional payment

Section 603 2 of 2 Islington Street Corridor Improvements Portsmouth, NH

Basis of Payment

5.9 Cast Iron downspouts will be paid for at the contract unit price per each installed and in place including common structure excavation to expose and prep the existing foundation, mounting hardware (stainless steel inserts and bolts), all fittings and couplings required to connect to 6" PE pipe as shown on the drawings, backfill, compaction, and any property restoration not paid for under separate items.

5.10 Management of surplus soils for use as trench backfill to replace brick and concrete removed from roadway excavations will be paid under Item 1.15B.

Amend section 603.5.1 by replacing "specified in 206.4.1" in the first sentence with "required to complete the installation as indicated on the plans."

Replace Section 5.1.3 with the following:

5.1.3 Granular backfill generated from the project or other locations designated by the Owner will be subsidiary to backfill operations.

Delete section 603.5.3 and replace with the following:

5.3 "Where deficient work has been determined through video inspection, the Contractor shall absorb all costs associated with video inspection. Where work has been determined to be acceptable costs for video shall be paid at the Contract unit price per linear foot and will include all required labor, equipment and materials."

Add section 603.5.3.1

5.3.1 Where an item does not exist for video inspection payment shall be in accordance with Section 109 based on Subcontractor invoicing or Contract labor hours and equipment rates.

Add section 603.5.3.2

5.3.2 Payment shall be considered full compensation for the work for video inspection whether or not the pipe is in service.

Amend section 603.5.8.1 by adding "No additional compensation shall be provided where additional suitable material is located within the project work area." after the last sentence.

Add the following pay items and units

603.31 Cast Iron Downspout Boots

Section 604 1 of 5 Islington Street Corridor Improvements Portsmouth, NH

AMENDMENT TO NHDOT SPECIFICATIONS

Section 604 – Catch Basins, Drop Inlets, and Manholes

Materials

Amend 604.2.4 to read as follows:

2.4 All brick used for casting adjustment and invert tables shall be clay brick conforming to AASHTO M32 Grade SS. Maximum water absorption shall be 3%-4% during the five-hour boil test. The use of concrete brick will not be permitted.

Add the following after paragraph 2.7:

2.7.1 All castings provided for City of Portsmouth shall be certified Made in the USA

Amend 604.2.9 to read as follows:

2.9 Prefabricated adjustment rings are not allowed.

Add Section 604.2.11

2.11 All catch basin frames (single and double) installed at granite curbing locations shall be 3-flanged. All catch basin frames (single and double) installed with no granite curbing shall be 4-flanged.

Delete paragraph 2.9 and **replace** with the following:

2.9 Prefabricated adjustment rings will only be permitted on existing structures to remain which require adjustment to proposed grades.

2.9.1 Adjustment of castings on new structures shall be by brick and mortar.

Add the following paragraphs after paragraph 2.10:

2.11 Drain manhole covers shall be hinged, Ergo XL and manufactured by East Jordan Iron Works.

2.11.1 All hinged manhole covers shall be provided with cam lock mechanisms.

2.12 CB hoods (oil and debris separators) shall be "Snout" as manufactured by Best Management Products, "The Eliminator" as manufactured by Ground Water Rescue, Inc, or approved equal.

2.13 Curb inlet style catch basin grate shall be model R-3303 by Neenah Foundry or approved equal.

2.14 Catch basin hoods (oil and debris separators) shall be "Snout" as manufactured by Best Management Products, "The Eliminator" as manufactured by Ground Water Rescue, Inc., or approved equal.

Construction Requirements

Amend 604.3.3 to Read:

3.3 When remodel/reconstruct or adjustment of existing structures is specified, the frames and grates or covers shall be removed and the walls reconstructed as required. Reconstruction of the walls shall mean replacing the top section, if necessary, adding riser sections, replacing riser sections, removing riser sections, or adding/removing rows of barrel block as required to meet the proposed grades. The frames and grates or covers shall be cleaned and reset at the required elevation. Non-serviceable and non-conforming castings shall be replaced as directed.

Amend 604.3.3.1 to Read:

3.3.1 The use of prefabricated adjustment rings will not be allowed.

Add the following sections after 604.3.9

3.10 New frame & grates or frame & cover and frame adjustments shall include new red clay brick (subsidiary). Existing frame shall be cleaned prior to reset. Where elevation adjustment is specified, the existing brick shall be inspected for serviceability. Unserviceable brick shall be replaced.

3.10.1 Each brick for casting setting or adjustment is to be thoroughly wet just before laying and is to be completely embedded in mortar under its bottom, its side and its end at one operation. Care is to be taken to have every joint full of mortar and the outside is to be fully filled and the inside pointed. No brick work is to be laid in water and no water is to be allowed to rise on the work until it has set at least 24 hours. Do not plaster or mortar over brickwork inside the manholes.

3.10.2 Frames for manhole covers shall be set 1/8" below or flush with finish grade. Frames for catch basins shall be set 1/2" to 1" below finish grade. The Contractor shall ensure that the frame is set at the same cross slope and profile of the road. New pavement courses shall be luted around the rim to provide a smoothly transitioned depression.

Section 604 3 of 5 Islington Street Corridor Improvements Portsmouth, NH

3.11 Total adjustment of castings to proposed grades on new structure shall not exceed 12"

3.12 Field cores shall be completed where directed using equipment as required to provide a round core so that a new pipe can be connected to an existing catch basin or drain manhole. Penetrations cut by pipe saws will not be acceptable.

3.12.1 Field cores shall be sized and aligned to accept proposed pipe diameter at line and grade as specified on the drawings

3.12.2 Upon insertion of pipe, construct brick masonry to fit neatly to neatly between pipe and structure. Solidly parge space between pipe and structure with non-shrink grout

3.12.3 Complete modification to inverts as required so that water flows smoothly and hydraulically un-inhibited through the invert, subsidiary

3.13 Annular space between boot connector and pipe shall be grouted with non-shrink mortar.

3.14 Construct brick inverts inside drain manholes and sewer manholes using brick specified in paragraph 2.4 above.

Method of Measurement

Delete paragraph 4.1 and replace with the following

4.1 Catch basins, drop inlets, or manholes will be measured per vertical foot to the nearest tenth of a foot.

4.1.1 Catch basins and drop inlets will be measured from the top of the frame set to binder course pavement grade to the bottom of the sump.

4.1.2 Drain manholes will be measured from the top of the frame set to binder course pavement to the invert of the lowest pipe.

Delete paragraph 4.4 and **replace** with the following:

4.4 Catch basin hoods shall be measured per each installed and in place as shown on the drawings or directed.

Add the following paragraph:

Section 604 4 of 5 Islington Street Corridor Improvements Portsmouth, NH

4.5 Replacement of existing catch basin frame and grate with either a manhole frame and cover <u>or</u> curb inlet assembly will be measured per each

4.6 Field cores completed of the type and size specified will be measured per each.

Basis of Payment

Delete paragraph 5.1 in its entirety and replace with the following:

5.1 The accepted quantities of catch basins, drop inlets, and drain manholes, which includes the necessary frames and grates or covers, of the type and diameter specified will be paid at the Contract unit price per **vertical foot** complete and in place, including sawed pavement, common structure excavation and setting to final grade to depth specified on the drawings, bedding if required, backfill, removal of existing structures within the limit of excavation, and systems installed to pre-drain soils not paid for under separate items.

5.1.1 All rock structure excavation, any common structure excavation below the depth specified on the drawings, and excavation of unsuitable material below the bottom of each catch basin, drop inlet, and manhole will be paid under the respective Items 6.1, 6.2A, 6.2B.

5.1.2 Payment will include adjustment of structures to binder and final grade as specified in 3.4 and 3.4.10 above. No extra allowance will be made for structures constructed in accordance with 3.4

5.1.3 Water repellant treatment for new drainage structures will be subsidiary

5.1.4 Construction of brick inverts in manholes (or removal and replacement of brick inverts) invert and replacement of the existing casting with new type including final adjustment of frames is subsidiary to manholes.

5.4 The accepted quantities of frames and grates or manhole covers will be paid for at the Contract unit complete in place, including setting to final grade and necessary brick adjustment (new or existing).

5.4.1 Removal and disposal of existing non-conforming or damaged units shall be subsidiary to this item.

Delete paragraph 5.5 and **replace** with the following:

5.5 Polyethylene liners installed in new catch basins and drop inlets will be subsidiary to those items. Polyethylene liners installed in existing structures, or where adjusting or modifying existing structures, will be paid at the contract unit price per each.

Section 604 5 of 5 Islington Street Corridor Improvements Portsmouth, NH

Add the following paragraph:

5.6 Accepted quantities for the replacement of existing catch basin frame and grates with new drain manhole frame and covers or curb inlet assemblies will be paid at the contract unit price per each complete and in place including common structure excavation to expose existing castings, removal and disposal of existing casting (or returning casting to the owner if requested), preparation of concrete for adjustment to grade as required, placement of new assemblies, and placement and compaction of suitable backfill (gravels if within the roadway cross section).

5.7 Accepted quantities of field cores of existing structures will be paid at the contract unit price per each field core complete and in place.

5.7.1 Any common structure excavation, rock structure excavation, and backfill (even if core is completed at a different time than pipe installation, will be subsidiary to respective pipe item for which the field core is intended.

Add the following pay items and units

604.0008	Catch basin hoods (12" to 18" diameter outlet pipe)	EA
604.184	Catch basin with curb inlet -4 ' diameter	VF
604.62	Remove CB Frame/Grate and replace with DMH Cover (24" opening)	EA
604.71	Remove CB Frame/Grate and replace with curb inlet assembly	EA
604.811	Field core existing manhole or catch basin (6" dia. to 18" dia. pipes)	
EA		
604.821	Field core existing pipe for insert-tee (6" to 10" dia. connection)	EA
604.822	Field core existing pipe for insert-tee (12" to 15" dia. connection)	EA
604.831	Field core AC existing pipe for insert-tee (6" to 10" dia. connection)	EA
604.832	Field core AC existing pipe for insert-tee (12" to 15" dia. connection)	EA

Page 1 of 17

ISLINGTON STREET CORRIDOR IMPROVEMENTS

Electrical Conduit

SECTION 614

PART I - GENERAL

1.01 IN GENERAL

Division 1, The General Conditions, and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein. Refer to Division 1.

A. Work of this section shall be accomplished by the Contractor.

1.02 SCOPE OF WORK

In general, the Contractor shall supply all labor, equipment, temporary protection, tools and appliances necessary for the proper completion of the work as required in the specifications and in accordance with good construction practice. Refer to the Contract Drawings for locations of work included in the contract.

- A. <u>Work Included</u> The work under this section generally includes the following:
 - 1. Added branch circuit(s) at existing Maplewood Street control panel.
 - 2. Feeders for street lighting, etc.
 - 3. Branch circuits for controls, etc...
 - 4. Electrical utility service and metering at Cabot Street
 - 5. Feeder to new traffic control panel at Cabot Street.
 - 6. New conduits crossing Islington Street, including pull boxes.
 - 7. Install larger pull box to replace existing at Bridge Street
 - 8. Obtain all permits and inspections
- B. <u>Related Work</u> Items of work in the following sections are related to work performed under this section:

1.03 <u>ALTERNATE BIDS</u>

A. This project is to be bid indicating a Base Bid and an Alternate Bid.

Base Bid: The Base Bid is to include all electrical materials, labor, etc. for installation of the new electric service at Cabot Street, provision of new metering and control enclosure, provision of new feeder to the new traffic signal enclosure adjacent to the new service and control enclosure, all conduit, wire, etc. for the new post lighting (fixtures 1 through 14 plus 16) and for the new bollards B-1 through B-6) in the abutting park, and to include associated in ground pull boxes, etc. to provide this portion of the project fully operational in accordance with the project requirements.

Alternate Bid: The Alternate Bid is to include all electrical materials, labor, etc. for the installation of the required modifications to the Owner's existing Maplewood Street meter and distribution/control panel, all conduit, wire, etc. for the new post lighting (fixtures 17 through 34 except not existing fixture 29 and fixtures 31 and 33 are not indicated on the Contract Documents), and to include all associated in ground pull boxes (including the change of the existing pull box at Bridge Street which appears not to be adequately sized per Code) to provide this portion of the project fully operational in accordance with the project requirements.

PART 2 - PRODUCTS

2.01 RACEWAYS AND FITTINGS

- A. Rigid Galvanized Steel Conduit: Hot-dip galvanized inside and outside, with factory-cut threads galvanized after cutting; all conduit coated with outer coating of zinc dichromate inside and outside; couplings and elbows galvanized, threaded and coated as for conduit; conduit and elbows shall conform to U.L. Standard No. 6 and shall be U.L. listed and labeled for intended use; each conduit length equipped with coupling on one (1) end and thread protector on other end; elbows equipped with thread protectors or both ends; equal to products manufactured by Triangle, Pittsburgh, Steelduct or Republic Steel.
- B. PVC, Schedule 40: PVC conduit conforming to UL standards and with UL listing and labeling for intended use, equal to products manufactured by Carlon, Cantex, or approved equal. Conduit shall conform to NEMA TC-Z and WC-1094 specifications and shall be rated for 90°C wiring. Schedule 40 PVC shall be installed below grade only.
- C. PVC, schedule 80: PVC conduit conforming to UL standards and with UL listing and labeling for intended use, equal to products manufactured by Carlon or approved equal. Conduit shall conform to NEMA TC-Z and WC-1094 specifications and shall be rated for 90°C wiring. Schedule 80 PVC may be utilized for underground installations and shall be used for any above grade installations.
- D. Liquid tight Flexible Metal Conduit: Spirally-wound galvanized steel strips, as for flexible metal conduit, with polyvinyl chloride cover extruded over the exterior to make conduit liquidtight; U.L. listed labeled for the intended use; equal to products manufactured by Anaconda "Sealtite" type E.F. Where subject to sunlight, product shall be rated for same.
- E. Couplings and Terminations for PVC Conduit Couplings at connections between rigid conduit sections.
- F. Couplings and Terminations for Liquidtight Flexible Metal Conduit: Appleton ST or STB adapters at connection between flexible and rigid conduit; nylon insulated throat, steel connectors at box cabinet terminators.

Page 3 of 17

ISLINGTON STREET CORRIDOR IMPROVEMENTS

- G. Couplings and Terminations for Rigid Conduit: Factory made threaded couplings of same materials as conduit; O Z Type A molded canvas bakelite insulation bushing at all boxes and cabinets, with locknuts inside and outside box or cabinets; O-Z Type BL bakelite insulated grounding bushing on all conduits where grounding bushings are required by code or systems specifications, with locknuts in and outside the enclosure involved.
- H. Wireways (if any): U.L. listed and labeled; enamel finished; sizes shown or required; screw oil hinged covers as required; complete with all fittings, couplings, hangers, barriers, end caps, closures and accessories; equal to products as manufactured by Square D, General Electric, or Await. Where installed outdoors, provide as NEMA 3R.
- I. Expansion Fittings: UL listed and labeled. Install all conduits rising at the exterior of any building or other structure, where crossing expansion joints and where required by any codes and/or ordinances.
- J. Concrete Encasement: PVC conduits installed underground shall be concrete encased where they are installed below streets, highways, or driveways only if required by Codes or Ordinances or by the electric utility where their lines are involved.
- 2.02 <u>BOXES</u>
 - A. Outlet Boxes: U.L. listed and labeled, sizes and types as required.
 - 1. Sheet Steel Boxes: Sheet steel not lighter than 14 gauge, galvanized after fabrication; equal to products as manufactured by Raco, Steel City or Appleton. (Interior of distribution enclosures only).
 - 2. Cast Metal Boxes: Cast iron or cast alloy with threaded hubs equal to products as manufactured by Crouse Hinds, Appleton. Exterior or interior installations.

2.03 <u>CONDUCTORS</u>

- A. Conductors (600 Volts and Under), shall be soft drawn, annealed copper, U.L. listed and labeled, rated at 600 volts, shall be continuous, without weld, splice or joint, uniform cross-section, free from flaws, scale and other imperfections; equal to products as manufactured by Okonite, Triangle, or Anaconda.
 - 1. No. 8 and longer, stranded; No. 10 and smaller solid.
 - 2. Branch Circuits within distribution equipment enclosures: Type XHHW-2 or THWN-2 insulation
 - 3. Feeders/ branch circuit wiring to light fixtures: Type XHHW-2, RHW-2, or THWN-2 insulation

- 4. Lighting and Fixture Conductors: Type and size approved by the National Electrical Code for the intended use. Note: Contract Drawings indicate conduit sizes based on type XHHW-2 or type THWN-2 insulation. The Contractor must adjust conduit sizes if alternative insulation types are proposed and approved by the Engineer and the Owner and such changes shall be at no added cost to the Owner.
- B. Service Entrance Conductors and Panelboard Feeders: Shall be copper with Type XHHW-2, RHW-2, or THWN-2 insulation.
- C. 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)
Phase A	Black
Phase B	Red
Phase C	
Neutral	White
Bond	Green

D. 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.

2.04 WIRING DEVICES, COVER PLATES AND FITTINGS

- A. Wiring Devices: Provide wiring devices of specification grade; ivory finish; conforming to the listing below. Catalogue numbers are Arrow-Hart, unless noted otherwise; equivalent devices manufactured by Hubbell, Pass and Seymour, or Bryant are acceptable.
 - 1. Wall Switches (if any):
 - a. For loads not exceeding 1800 watts at 120 volts., 20 ampere at 120/277 volts, with ivory handle such as Bryant 4901-I.
 - 2. Convenience Outlets:
 - a. Receptacle: 20 Ampere, 125 volt, 2 pole, 3 wire, ground fault circuit interrupter protected, Bryant GFR5FT.
 - 3. Cover Plates:

Provide cover plates for all wiring devices and other kindred devices.

- a. For Flush Mounted Devices: All cover plates shall be Arrow-Hart 71000 series nylon to match devices which they cover.
- b. For Surface Mounted Devices: Zinc-Coated sheet metal with rounded or beveled edges, of same size as boxes, for indoor use; cast alloy plates with gaskets for outdoor, with "extra duty" covers conforming to NEC Article 406.8(B) for "in use while not attended".
- 4. Oversized Conductors Wiring/Conductor sizes noted are based on limiting voltage drop at the various devices. This results in oversized conductors when loads are located remote from the distribution equipment. The Contractor shall utilize a wet location listed code acceptable means of reducing the conductor size to be accommodated by the device. This may be a mechanically crimped reducing connector if appropriate.

2.05 <u>PULLING CABLES</u>

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

2.06 **DISCONNECTS** (if any)

- A. Where shown on the Drawings, or when NEC required whether or not shown, install disconnect switches appropriate for the application. When serving motors, they shall be motor rated. Those for equipment (if any) outdoors shall be in rain-tight enclosures, or as otherwise indicated on Contract Drawings.
- B. Switches shall be heavy duty, quick make and break type. They may be non-fused by a solid copper bar, silver plated, heavy duty on motors over 2 hp. For small motors (1/8 hp and less), a toggle switch, motor rated, may be used; otherwise, they shall be similar to Square D Type HU. Manual starters with overload protection built in are approved when NEC acceptable.

2.07 OVERCURRENT PROTECTION DEVICES

A. 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.

2.08 <u>MOTORS</u>

A. Not applicable to this project.

Page 6 of 17

ISLINGTON STREET CORRIDOR IMPROVEMENTS

2.09 <u>SECONDARY SERVICE</u>

- A. A new underground 120/240 volt, single phase, 3 wire service is required at the Cabot Street electrical service metering and distribution enclosure.
- B. Service at the Maplewood Street metering and distribution enclosure is existing.

2.10 ELECTRICAL SERVICE AND DISTRIBUTION SYSTEMS

- A. The electric utility company shall provide the electrical service of the characteristics as shown on the drawings. The Subcontractor's work will begin where the utility company's work ends.
- B. The subcontractor shall furnish all labor, materials, etc. necessary for a complete approved electrical service as required by the structure, including inspection and approval by the utility and local inspection departments.
- C. The Subcontractor shall notify the utility company 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 each facility.

2.11 UNDERGROUND ELECTRICAL SERVICES

- A. Underground service shall comply with all the requirements of the National Electrical Code, National Electrical Safety Code, local utility company, and local enforcing authority.
- B. Furnish and install secondary lugs on transformer as/if required.
- C. Secondary service at Cabot Street shall be cable in rigid conduit to riser at utility pole. Transformer will be pole mounted by utility. Provide rigid galvanized conduit riser and expansion fitting at service meter and at base of pole unless utility requires PVC, in which it shall be schedule 80 at the pole. Riser construction at service poles shall conform to the serving utility's standards.
- D. It may be run in schedule 40 PVC plastic conduit where buried and subject to conforming to utility specifications. Conduit shall be 36" below grade and pitched to drain.

2.12 PRIMARY POWER SERVICE

A. Primary power is existing at both project locations. If primary power reconstruction by the utility is required at any location due to new service transformer installations, costs for such shall be excluded from the bid and will either be paid directly by the Owner or processed as Change Orders to the Contract if the Owner elects to have the Contractor coordinate this work. In either case, the physical work will be by the utility or by their Subcontractor, not the Electrical Contractor for this project.

2.13 <u>METERING</u>

- A. The Electrical Subcontractor shall furnish and install all equipment and meter trim for metering, in accordance the utility company requirements, except that the utility meter will be provided by the local utility. Any required meter transformer enclosure is to be provided by the Electrical Subcontractor, to local utility standards. Provide any utility required switches, to utility company requirements, to provide cold sequence metering. Provide any metering transformer enclosures required, to utility company specifications.
- B. Where the local utility does not provide the meter sockets, the electrical Subcontractor shall provide them to the local utility's specifications. Note that the Owner desired meter and control Milbank equipment is specified on Ironwood Drawing L3.0.
- C. Any utility charges for poles, service cable, meters, etc., in connection with the provision of the temporary and/or permanent power shall be paid in full by the Electrical Subcontractor under this Section. The cost of temporary power use by all trades shall be paid by the General Contractor.

2.14 PANELBOARDS

- A. Panelboards shall be provided with main lugs or main breakers and branch circuit breakers, according to the schedule on the Drawings.
- B. The general requirements for the panels are shown on the drawings including mounting and gutters. Mount the panels 6'-6" up to top of roughing cabinets. Gutters shall not be less than 5". Breaker frame size is shown on the drawings. Handle ties will <u>not</u> be permitted anywhere. Multi-pole breakers shall have common trip and <u>one</u> handle.
- C. All breakers shall be trip-free, suitable for switching, and thermal magnetic. All breakers shall be bolted to bus type secured in place by holding bolt. "Space" means provisions 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 of copper full silvered between all contact surfaces. All breakers shall have an interrupting capacity of not less than 22,000 amperes at 240 volts AC (symmetrical RMS amperes) for 120/240 volt panelboards. If the utility indicates the available fault current at a service exceeds the rating noted, the Contractor shall provide breakers with an interrupting capacity that exceeds the utility value at no added cost to the Owner. Provide written utility documentation of available fault current with shop drawing submission or panelboards will not be approved.
- D. Provide a typewritten tabulation indicating fixture outlets, devices, machines, or apparatus served by each breaker and their room location. This shall follow coding on the drawings with breakers numbered from top to bottom. Mount tabulation inside the door in a frame for the purpose, with a transparent plastic cover.
- E. Where required by the National Electrical Code, branch breakers shall be GFCI protected.

Page 8 of 17

ISLINGTON STREET CORRIDOR IMPROVEMENTS

- F. Panelboards shall have "door-in-door" covers.
- G. All panelboards shall be manufactured by Square D, or approved equal and provided as part of the specified meter and control/distribution panel assembly.

H. If added breakers are required in existing panelboards they shall be of the same manufacturer as the panelboard and shall have AIC ratings adequate for the available fault current of the panel they will be installed in.

2.15 BALANCING OF LOADS

- A. The Contractor shall balance all loads between phases in all panels, etc., around the neutral. Neutral conductors shall be the same size as phase conductors unless specifically noted otherwise. <u>No Common neutrals will be permitted</u>.
- B. All circuits shall be distributed among the phases so as to restrict any phase load imbalance to less than 10% at any panelboard.
- C. After completion of the installation, record under full load conditions the current flow in each phase feeder. Submit four copies to the Engineer giving name and location of each panel, etc.
- D. Circuit numbers assigned to home runs and devices on the Drawings are for purposes of indicating individual circuits and are intended to correspond with the circuit numbers in the panels. The panelboard directory shall designate each circuit and its associated load. If the numbers deviate from the Drawings, the as-built Drawings shall reflect this.

2.16 <u>LIGHTING FIXTURES</u>

- A. Wire directly to the service hand hole for each fixture. From hand hole to LED lamp driver provide wire sized and of the insulation type recommended by the fixture manufacturer.. Provide a bond wire to ground all fixtures. Provide in-line waterproof fusing in the hand hole for the conductor supplying the fixture on the pole. Fuse rating shall be per NEC for the fixtures installed.
- B. The lighting fixtures listed on the Drawings are those specifically required for the project and are manufactured to the Owner's specifications. No substitution of fixtures and/or poles will be considered for this project.
- C. Provide the Owner with ten (10) spare fuses of each rating installed on the project, with notation of which fixtures the ratings are provided for.
- D. Light fixtures and Bollards are provided under a separate specification section.

2.17 LAMPS, DRIVERS, AND ACCESSORIES

A. LED light fixtures shall be Reduction of Hazardous Substances (RoHS)

614

ISLINGTON STREET CORRIDOR IMPROVEMENTS

compliant and the LED drivers, modules, and housing shall be products of the same manufacturer. The fixtures poles, lamps, and drivers are provided under a separate specification section.

- B. LED drivers shall include the following features unless otherwise indicated:
 - a. Minimum efficiency: 85% at full load.
 - b. Minimum Operating Ambient Temperature: -20°C. (-4°F)
 - c. Input voltage: 120 277 V (+/-10%) at 60 Hz.
 - d. Integral short circuit, open circuit, and overload protection.
 - e. Power factor no less than 95%.
 - f. Total Harmonic Distortion: No greater than 20%.
 - g. Comply with FCC 47 CFR Part 15.
- C. 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 3500°K unless otherwise indicated in the Fixture Schedule.

c. Minimum Rated Life: 50,000 hours per IES L70.

2.18 <u>TELEPHONE SERVICE</u>

A. Not applicable to this project.

2.19 EMERGENCY LIGHTS

A Not part of the work under this project.

2.20 WIRING OF OTHER EQUIPMENT (if any)

A. The Electrical Subcontractor shall wire all power to, providing and installing local disconnects for, all equipment by other trades or provided by Owner or this section per contract Drawings, if any.

2.21 <u>FUSES</u>

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

Page 10 of 17

ISLINGTON STREET CORRIDOR IMPROVEMENTS

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.
- D. Provide fuses and in line fuse holders at each fixture as noted in 2.16, A and C above.

2.22 STREET LIGHTING AND BOLLARDS

- A. Street lighting and bollards are provided under another specification section.
- B. The Contractor shall install new light fixtures, complete with lamps and new poles and bases as indicated in the Contract Documents..
- C. The Contractor shall provide all conduit, wiring, junction boxes, etc. associated with the new pole and lighting installations and shall provide all other required materials and labor needed to have the installation function as designed.
- D. The lighting fixtures are as selected by the Owner. It has been indicated that the Engineer did not need to obtain any point-to-point lighting results from the fixture manufacturer.
- E. The contactor and switching controls for the street lighting is located within the distribution enclosures that are part of the metering and control enclosures that are provided by the Contractor as noted on the Contract Drawings and specifications..

2.23 TRANSFORMERS

A. Not applicable to this project.

2.24 <u>SURGE PROTECTION</u>

- A. Provide surge protection at the Cabot Street distribution enclosure, mounted in the enclosures..
- B. Surge Protection Devices shall be approved equal to Advanced Protection Technologies, NEMA 3R enclosed, 320kA/phase surge capacity L-N and N-G, for service on 240/120 Volt, single phase, 3 wire, 60 Hz. utility services. They shall have UL suppression voltage ratings of 330 L-N and N-g; 700 L-L; 150 MCOV. Units shall be UL1449 Fourth Edition Listed, 1283 Recognized, and for Type 2 installations. Each unit shall include a built-in surge counter.

2.25 <u>PULL BOXES – UNDERGROUND (if any)</u>

A. Provide pull boxes complete with covers and frames if required due to the degrees of bending on conduits between fixtures and to provide for splices for the bollard fixtures as indicated on Drawing E1.5. Box size and construction must be not less than Tier 15 rated, Quazite and sized per Code for the installations involved. Physical positions of any such boxes must be field coordinated by the Contractor with the Engineer, Owner, and all other utility systems installed in the vicinity. Pull box covers shall be set to not create any pedestrian tripping hazard and shall not extend above finished grade. Cover logo shall be "Power" or "Electric". Covers shall be secured with stainless steel, hex head bolt with washers.

2.26 <u>MAGNETIC CONTACTORS</u>

- A. Provide NEMA 1 enclosed, 30 ampere, multi-pole contactors for control of street lights and other loads as noted, if any. Traffic signal power circuits shall not be contactor controlled.
- B. Install in service and distribution equipment enclosures. Wire and connect all contactors.
- C. Contactors shall be Allen Bradley, Square D, or approved equal.

2.27 ELECTRIC SERVICE AND DISTRIBUTION ENCLOSURE

A. Provide Milbank meter and distribution control enclosure for Cabot Street, complete with concrete base. Hardware to secure enclosure to concrete base shall be stainless steel. Refer to Drawing L3.0 for model number.

2.28 IN GROUND ELECTRICAL PULL BOXES

A. Provide new in ground pull boxes for indicated crossings of Islington Street. Boxes shall be approved equal to Quazite by Hubbell. See detail and notes on Drawing E-1.0.

2.29 DELIVERY, STORAGE AND PROTECTION

A. The Subcontractor shall be responsible for the work and equipment until finally inspected, tested and accepted. Carefully store materials and equipment, which are not immediately installed after delivery to the site. Close open ends of work with temporary covers or plugs during construction to prevent entry of obstructing material.

B. Each Subcontractor shall protect work and material of other trades from damage that might be caused by that Subcontractor's work or workers and shall make good a damage thus caused.

PART 3 - EXECUTION

3.01 <u>UNDERGROUND CONDUIT</u>

Page 12 of 17

ISLINGTON STREET CORRIDOR IMPROVEMENTS

A. Install underground conductors in PVC schedule 40 conduit, unless noted or specified otherwise, or required otherwise by serving utility standards for service conduits. Where located under slabs, install at least 18 in. below bottom of finished slab. Where located outside of building line, install 30 in. below finished grade. Make joints with couplings and solvent cement taking care to maximize watertightness. Where conduit penetrates floor slabs or concrete pads, etc., change from plastic to wrapped galvanized steel. All ells shall be long radius type, and rigid galvanized steel with 'Scotchrap' coating.

3.02 BUILDING RACEWAYS

A. Not applicable to this project.

3.03 PULLBOXES AND JUNCTION BOXES

A. Size all pull boxes and junction boxes in accordance with Governing Codes, using larger sizes than required by code where so noted or where job conditions so require.

3.04 <u>OUTLET BOXES</u>

- A. Terminate conduits at a metal outlet box at each outlet of device of any character. All boxes shall conform to Governing Codes.
- B. Boxes in Enclosures: Sheet steel boxes.
 - 1. For Lighting Fixture Outlets: 4 in. octagonal.
 - 2. For Receptacles Use: 4 in. long type, one-piece; no sectional boxes permitted.
 - 3. Boxes Used Outdoors: Cast metal boxes with gasketed covers and threaded hubs. Note: Bell style boxes will not be accepted.

3.05 CONDUCTOR AND CABLE PULLING

- A. Pulling Devices in Empty Raceways: Provide in every empty raceway, not containing conductors to be installed under this Division 26, a suitable nylon pull line to facilitate future installation of wiring. Pull wires are not acceptable.
- B. Provide suitable installation equipment to prevent abrasion and cutting of raceways during the pulling of conductors. Use ropes of polyethylene, nylon or other suitable non-metallic materials to pull in feeders. Metallic ropes are prohibited.
- C. Attach pulling lines to conductors by means of insulated woven basket grips or by pulling eyes attached directly to conductors. Do not use rope hitches or bare steel basket grips. All conductors to be installed in a single conduit shall be pulled in simultaneously.

- D. Conductor and cable pulling tensions shall not exceed manufacturers recommended values.
- E. Use a lubricant for pulling conductors. Lubricant shall be listed by Underwriter's Laboratories, Inc. Only cable lubricants approved for the type of jacket material or insulation shall be used, and must be of such consistency that it will dry completely when exposed to air. Lubricant shall not leave an obstruction or tackiness that will prevent pulling out old conductors or pulling in new conductors or additional conductors, and after drying must leave a film of lubricating wax which will promote easy movement of the conductors.
- F. No soap flakes, vegetable oils, or ordinary lubricating oil or grease will be permitted in the conduit. Lubricant shall be Ideal "Yellow 77" or approved equal.

3.06 <u>CONDUCTORS AND CABLE</u>

- A. All conductors shall be installed in raceways unless specifically noted to the contrary.
- B. SIZES:
 - 1. No conductor shall be smaller than No. 12 except for signal or control circuits, and except for individual lighting fixture taps as permitted by Governing Codes.
 - 2. Receptacle Circuits: Minimum No. 12 conductors unless noted or scheduled otherwise.
- C. Pull no conductors into conduits until all work of a nature which may cause injury to conductors is completed.
- D. Install all conductors, for feeders and branch circuits their entire length in continuous pieces without joints or splices. Make joints in branch circuit only where circuits divide.
- E. Do not use gutters of panelboards as raceways, junction boxes or pull boxes for conductors not terminating in said panelboard.
- F. An equipment grounding conductor shall be installed in every conduit whether shown or not. The conduit system in no case shall be used as the equipment grounding network.
- G. Color Coding:
 - 1. Use standardized color coding of conductors throughout.
 - 2. Neutral Conductors: White or natural gray. Where conductors of two (2) different systems may be installed within the same enclosure, one (1) neutral shall be white or natural gray; the other neutral shall be white with a colored stripe other than green.

- 3. Grounding Conductors: Green, or green with one (1) or more yellow stripes.
- 4. Phase Conductors in various voltage systems shall be identified as noted in item 2.03, Conductors, this specification section.
- 5. Use other colors as necessary to identify other special circuits.
- 6. All color coding shall be continuous for the entire length of the conductors, and shall be permanent and readily distinguished after installation.
- 7. In cases where the specified colors of insulated wire and cable are unavailable, such conductors shall be color coded, as specified above, by means of Bradly, or equivalent, slip-on colored plastic sleeves at all pull boxes, support boxes, outlet boxes, panelboards, switchboards, and other terminal and splicing points. Sleeves shall be of proper sizes to fit conductor insulation snugly. Use of colored tape is unacceptable.
- H. Identifying Tags: Nylon band with marking pad, equivalent to T & B No. TY-53M. Markings shall be field applied utilizing a black pen having non-smearing, waterproof ink, and shall be written neatly and clearly. Securely fasten tags to all cables, feeders and power circuits in pull boxes, lighting, power and distribution panelboards.
- I. Bundling Conductors: Bundling Conductors: Bundle all conductors in panelboard, cabinets, control centers and the like, using marline twine lacing or nylon straps made for the purpose. Bundle conductors larger than No. 10 in individual circuits. Bundle smaller conductors in larger groups.

3.07 FOUNDATION, HANGERS AND SUPPORTS

A. Furnish and install all foundations, hangers and supports required by equipment and materials included in the various electrical sections of the Specifications.

B. Unless otherwise noted, concrete foundations shall be 6 in. high, of reinforced concrete, poured in forms of new dressed lumber with all corners neatly chamfered. Conductors shall enter enclosures by means of sheet metal steel pipe sleeves set in forms before concrete is poured. Locate bolts by template. After concrete is set-up, remove forms and hand rub with carborundum.

3.08 <u>GROUNDING</u>

A. The Conduit system and the neutral conductor of the wiring system shall be grounded. The ground connection between the Electrical system neutral and the conduit system shall be made at the main electrical service disconnect device. A bare copper conductor sized per NEC shall be installed in nonmetallic conduit from the disconnect enclosure to the entrance of the water service, to two 3/4 inch diameter by 10 foot long copperweld ground rode driven 10 feet apart outside the enclosure, to any project structural

steel framing, and to reinforcing steel in the foundation. 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 connection. Connection at driven ground rods shall be by exothermic connectors. NOTE: A new ground electrode system and wiring is part of the project at each new metering and distribution enclosure location.

B. If there are no water lines or if nonmetallic water lines are provided on the project, the ground electrode conductor shall be connected by a process approved equal to "Cadweld" (and exothermic connection) to copper ground rods sized as noted above. Provide certified test by a recognized testing agency of the ground resistance.

C. The conduit system and the neutral conductor of the wiring system shall be grounded. The ground connection between the electrical system neutral and the conduit system is existing.

D. Ground wires shall be grouped and bonded to panel boxes, not to system neutrals. The ground terminals or receptacles shall be bonded to outlet boxes with #12 AWG bare or green insulated wire, or other suitable means per the National Electric Code.

- E. Ground Bonding Conductors, sized per Code, shall be included for all feeder and distribution circuits.
- F. Where flexible metallic conduit is used, it shall be listed for grounding service.
- G. All electrical equipment shall be grounded.
- H. Conduit and/or raceway shall not be utilized as the bonding conductor.

3.09 EXPLOSION PROOF REQUIREMENTS

A. If encountered, equipment shall be as required for the environment involved.

3.10 PULLING CABLES

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

3.11 EXAMINATION AND APPROVAL WORK

A. No work shall be covered before examination and approval by the Project Engineer and by all inspectors and authorities having jurisdiction. Replace any imperfect or condemned work with work conforming to requirements and satisfactory to the Project

Page 16 of 17

ISLINGTON STREET CORRIDOR IMPROVEMENTS

Engineer, without extra cost to the Owner. If work is covered before due inspection and approval, the Contractor shall pay all costs of uncovering and reinstating work.

3.12 CLEAN UP AND REPAIR

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

3.13 <u>GUARANTEE</u>

- A. Attention is directed to provisions of the General Conditions regarding guarantees and warranties for work under this Contract.
- B. Manufacturer shall provide standard guarantees for work under this Section. However, such guarantees shall be in addition to and not in lieu of all other liabilities, which the manufacturer and Contractor may have by law or by other provisions of the Contract Documents.
- C .All materials, items or equipment and workmanship furnished under this Section shall carry the standard warranty against all defects in material and workmanship for a period of not less than one year from the date of final acceptance of the work. Any fault due to defective or improper material, equipment, workmanship or design which may develop within that period shall be made good, forthwith by and at the expense of the Contractor, including all other damage done to areas, materials and other systems resulting from this failure.
- D. This Contractor shall guarantee that all elements of the systems are of sufficient capacity to meet the specified performance requirements as are set forth herein or as indicated.
- E. Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the guarantee period, the affected part or parts shall be replaced by the Contractor.

PART 4 - METHOD OF MEASUREMENT

4.1 PVC Plastic Conduit of the size and schedule specified will be measured by the linear foot, complete in place, according to the Standard Specifications.

4.2 Light Pole Base shall be measured by each, complete in place, according to the Standard Specifications.

4.3 Light Pole and Fixture and Bollards will each be measured by the number of units installed, complete with all lights, lamps, wiring, accessories and incidentals.

F. The Contractor shall furnish, before the final payment is made, a written guarantee covering the above requirements.

Page 17 of 17

ISLINGTON STREET CORRIDOR IMPROVEMENTS

4.4 Lighting Control Cabinet and Wiring System will be measured by the number of units, complete in place including concrete foundation, panel boards, conductors, breakers, surge protection, meters, grounds, switches and incidentals. All wiring for the lighting system will be included in the unit price bid for this item.

PART 5 - BASIS OF PAYMENT

5.1 The accepted quantities of PVC Plastic Conduit will be paid for at the Contract unit price per linear foot of the type, size and number of ducts specified complete in place, including brackets/spacers, sawed and concrete pavement, common structure excavation to the depth specified in 206.4.1, bedding if required, and backfill, with the exceptions noted in the Standard Specifications.

5.2 The accepted quantities of light pole and bollard bases of the types required will each be paid for at the Contract unit price for each complete in place. There will be no separate payment for excavation and granular backfill.

5.3 The accepted quantities of Light Pole and Fixture and of bollards will each be paid for at the Contract unit price for each, complete in place with all lights, lamps, wiring, accessories and incidentals.

5.4 The accepted quantities of Lighting Control Cabinet and Wiring System will be paid for at the Contract unit price for each unit complete in place including concrete foundation, panel boards, conductors, breakers, surge protection, meters, grounds, switches and incidentals. All wiring for the lighting system connected to this panel will be included in the unit price bid for this item.

5.5 The accepted quantities of Modifications/additions to existing Lighting Control Cabinet and System Wiring will be paid for at the contract price for the complete in place modifications made to the existing installed panel. All wiring for the lighting system connected to this panel will be included in the unit price bid for this item.

Pay Items and Units

614.7114	1-In PVC Plastic Conduit, Schedule 40	Linear Foot
614.7214	2-In PVC Plastic Conduit, Schedule 40	Linear Foot
614.7218	2-In PVC Plastic Conduit, Schedule 80	Linear Foot
614.7314	3-In PVC Plastic Conduit, Schedule 40	Linear Foot
614.7318	3-In PVC Plastic Conduit, Schedule 80	Linear Foot
614.91	Lighting Control Cabinet	Unit
614.91A	Lighting System Wiring	Unit

END OF SECTION

Section 615 1 of 2 Islington Street Corridor Improvements Portsmouth, NH

AMENDMENT TO SECTION 615 – TRAFFIC SIGNS

Delete paragraphs 1.2.2 and 1.2.3 and **replace with the following:**

"1.2.2 Traffic Signs Type B and Type BB shall be flat sheet aluminum signs with retroreflective sheeting background and retro reflectorized cut-out copy or overlay film. Type B signs shall be furnished without posts or mounting hardware.

1.2.3 Traffic Signs Type C and Type CC shall be flat sheet aluminum signs with retroreflective sheeting background and non-embossed copy unless otherwise shown on plans. Type C signs shall be furnished without posts or mounting hardware."

Add the following:

"1.3 Mount all signs to new "U" posts to be furnished by the contractor.

Materials

Add the following paragraphs:

"2.5.3.1 All "U" post assemblies shall be provided with breakaway systems as specified in paragraph 2.8.6.

2.8.6. Breakaway mounts for new "U" posts shall be Lap Splice breakaway system as distributed by Tapco Safety (www.tapco.net)."

Measurement

Delete paragraph 4.2 and **replace** with the following:

"4.2 Traffic signs A, B, C will be measured by the square foot per each sign as identified in the sign schedule in accordance with 109.11 as shown on the plans, and mounting hardware will be measured under separate item."

Delete paragraph 4.6 and **replace** with the following:

"4.6 Relocating traffic sign Type A, B, C, AA, BB or CC will be measured by a unit. A unit will include removal and safe storage of existing sign, removing footings and post and erecting existing sing(s)_ on a new "U" post provided under item 615.5."

Section 615 2 of 2 Islington Street Corridor Improvements Portsmouth, NH

Add the following paragraph:

"4.7 New "U" posts shall be measured per each furnished and installed by the contractor.

Basis of Payment

Delete paragraph 5.2 and **replace** with the following:

5.2 Traffic signs type A, B, C, AA, BB or CC will be paid for at the Contract unit price per square foot of each sign complete in place in accordance with 109.11.

Add the following paragraph:

"5.3 "U" posts will be paid at the contract unit price for each installed as shown or directed by the owner or engineer."

Pay Items and Units:

Add the following unit items:

615.004	Relocate traffic sign (all types)	EA
615.5	Traffic signs – "U" post only	EA
615.61	Traffic sign Type B (sign only)	EA
615.62	Traffic sign Type BB (sign only)	EA
615.63	Traffic sign Type C (sign only)	EA
615.64	Traffic sign Type CC (sign only)	EA

Page 1 of 6

ISLINGTON STREET CORRIDOR IMPROVEMENTS

05/05/22

S UPPLEMENTAL SPECIFICATION

Item 616.191 – Traffic Signals

This special provision provides for the reconstruction of the existing traffic control signal at the intersection of Islington Street and Cabot Street in the City of Portsmouth, NH. Work shall include new traffic signal controller, controller cabinet, and ancillary equipment, power service, mast arms and poles, foundations, electrical and signal cable, LED vehicular and pedestrian indications, APS push buttons, emergency vehicle preemption, video vehicle detection and other items shown on the plan sheets and described in the List of Major Materials.

GENERAL:

All provisions of Section 616, except as modified or changed below, shall apply.

- 1. The Contractor shall be responsible for the traffic signal operation and maintenance once alterations to the existing signals, excavation or other work within 75 feet of the stop bar at any leg of the intersection has begun. The Contractor shall notify the City of Portsmouth Department of Public Works (603-427-1530) with the names and phone numbers of persons to be contacted in case of a malfunction. The Contact person(s) must be available 24 hours a day, seven days a week. The Contractor shall also keep a signal log in the cabinet to track all maintenance work the Contractor completes on the signal system. This log shall be placed within a plastic cover and shall at least include the description of the trouble call, corrective action taken, date, time and personnel who completed the work.
- 2. The traffic signal must be inspected and approved by the City of Portsmouth Department of Public Works (603-427-1530) prior to placing in flashing operation. The Contractor shall contact David Desfosses (603-766-1411) one week prior to turning the signals on flash. If the Contractor does not speak directly with David Desfosses they must leave a detailed message with the Administrative Assistant and expect a call back. Leaving a message does not constitute an approval.
- 3. The Contractor shall install a generator anchoring system to the new traffic controller cabinet's concrete foundation. The location of the anchoring system will be on the side of the cabinet that houses the controller's power supply and installed to the raised foundation (see location A on Attachment A Detail Plan). If the controller cabinet doesn't have a raised foundation to accommodate the anchoring

05/05/22

system then the Contractor shall install the anchoring system to the front access pad of the controller cabinet. The anchoring system shall be a ½-inch x 13 tpi galvanized wrought eyebolt with a thread length of 1 5/8-inch. The eyebolt shall be installed in a 5/8-inch diameter drilled hole into the concrete foundation or pad (the location of the drilled hole shall be placed in an area where it does not interfere with the existing controller cabinet anchor bolt system to the concrete foundation). The eyebolt shall be bonded into the concrete by an epoxy compound [Component "A: (105 resin) and Component "B" (205 hardener)], with the epoxy compound filling the drilled hole and covering the threads of the eyebolt. The epoxy compound shall be a product as included on the Department's Qualified Product List. [See Attachment A Detail Plan]

4. The electrical service modifications and new hook-up shall be paid for by the Contractor. The monthly power costs will continue to be paid for by the City of Portsmouth during the construction contract.

Add to 2:

2.1.3 List of Major Materials:

- Maintain existing traffic signal cabinet and controller during the duration of construction and remove and stack cabinet at the Portsmouth DPW following switch-over to the new control. All ancillary equipment shall be salvaged and delivered with the cabinet. Removal of all existing signal equipment including structures and foundations shall be incidental to item 616.191.
- 1 16-Phase programmable traffic actuated signal controller of current NEMA specifications (TS2 Type 1) with internal time-based coordination and internal fire preemption with associated MMU to be operated in conflict monitor mode. The controller and MMU/conflict monitor shall be of the same manufacturer Siemens model m60 NEMA controller or approved equal. The controller and MMU/conflict monitor, plus any additional hardware shall be capable of initiating the flashing yellow arrow sequence. The controller shall include an integrated Ethernet port.
- 1 –. The traffic signal equipment shall be housed in a P type cabinet that is on the NHDOT approved products list and assembled by the equipment manufacturer with a 12-inch extension base. The interior and the exterior of the cabinet shall be black, Federal color No. 27038. The cabinet shall be equipped with a pull-out keyboard tray, an interior light, heat control with heat source to control moisture, twin cooling fans. The cabinet shall be equipped with a newly installed ground

616

Page 3 of 6

ISLINGTON STREET CORRIDOR IMPROVEMENTS

05/05/22

rod array and lightning arresting connections on all external cable leads. The cabinet shall be provided with a Portland cement concrete foundation

- 1 30 Amp 125 V semi-flush Traffic Signal Generator Transfer switch with confirmation pilot light to indicate restored power mounted to the controller cabinet. Parallax Power Supply Model ATS-301 GenTran Corp (Model FS300130) or approved equal with a minimum 5 year warranty.
- $1 \frac{1}{2}$ inch x 13 tpi galvanized wrought eyebolt with minimum thread length of 4-inch.
- 1 Two-part epoxy bonding agent (105 resin and 205 hardener).
- 1 Electrical service connection complete.
- 1 The Signal Mast Arm Pole shall have a mast arm length of 45 feet and a 12-foot street light luminaire arm at a 40-foot mounting height. Galvanized steel black powder coated, mast arm signal pole and foundation. Signal mast arm pole shall be manufactured by Union Metal Manufacturing Company, Design 50914-Y26-P, Valmont Industries, Inc., or approved equivalent. The signal mast arm foundation shall follow NHDOT standard specifications and details.
- 3 8-foot pedestrian signal post with foundation, black powder coated: Alloy Castings Co., Inc. model ACTB-20-695 or approved equal.
- 8 One-way, three-section, 12-inch black polycarbonate signal housing with LED modules, type (Duralight Corp., G.E. Lighting (Gelcore) or Dialight/Trastar) mounted on mast arms with new Astro-Bracs, with 5-inch louvered backplates. The outside perimeter of the backplate shall be lined with a fluorescent-yellow 2-inch strip of Type IX of XI retroreflective sheeting.
- 8 Pelco brand style "Astro Bracs" or approved equal.
- 2 One-way, 16"x18" polycarbonate pedestrian signal housing, painted black, bracket-mounted, single unit with solid hand symbol, solid walking symbol countdown timer digits, Leotek, G.E. Lighting or Dialight/Trastar brand LED modules or approved equal.
- 6 One-way, 16"x18" polycarbonate pedestrian signal housing, painted black, pedestal-mounted, single unit with solid hand symbol, solid walking symbol countdown timer digits, Leotek, G.E. Lighting or Dialight/Trastar brand LED modules or approved equal.

616

Page 4 of 6

ISLINGTON STREET CORRIDOR IMPROVEMENTS

05/05/22

- 8 Pedestrian push button assemblies, mounted on traffic signal poles or posts. The push button assemblies shall provide Accessible Pedestrian signal (APS) capabilities; including vibratory warning and audio/audible warning. Push buttons shall be mounted perpendicular to the path of travel and detectable arrow parallel to the path of travel. Push button assemblies shall include a black housing, R10-3e sign, mounted with the push button, with arrow facing the corresponding crossing path.
- 2- Pedestrian push button 12" extension brackets painted, black to be used for mounting on proposed mast arm upright.
- 8 R10-3e (with left, right and/or double walking directional arrow), 9 inch by 15 inch, Count-Down pedestrian sign, Pelco model SF-1072-12 and SF-1072-12 or approved equal.
- 2- R10-11a sign, 30 inch by 36 inch, "No Right Turn on Red"
- 4 Optical Fire Preemptor receivers GTT Opticom Model 711 or approved equivalent with mounting hardware.
- 1 Optical Fire Preemptor Phase Selector, GTT Opticom Model 764 with a Model 760 Card Rack, or approved equivalent.
- 1 Confirmation Strobe Light, 120 VAC with red Lexan optic lens, Whelen Model IAC 12 RP, TOMAR Model 804-110 or approved equivalent.
- 1 –Video Detection Camera– Grid Smart omni-direction, Video Camera with manufacturer cables and rack cards, including hardware mounted on the mast arm or approved equal with integral counting capability.
- 1 Rack Mounted Video Detection Processor and Cable, GridSmart GS2 or approved equal. Detector rack power supply shall be Naztec Model TS1-RACK-PS only or approved equal.
- 1- Camera mount for luminaire arm or mast arm, galvanized steel, Pelco brand astrobrac or approved equal.
- 1-9" Color flat screen portable monitor or approved equal, compatible with installed video detection system, with capabilities to view video detection

616

Page 5 of 6

ISLINGTON STREET CORRIDOR IMPROVEMENTS

05/05/22

- GPS Technology Equipment, Model TR-3/TR-4 GPS Assembly (501661F), mounted inside the controller cabinet. Model RE-3/TR-4 GPS Receiver (501532), mounted on top of the controller cabinet. GPS Receiver Simulator Software (501638TR). PC Cable for Simulator Software (504567). RTC Manufacturing, Inc. or approved equal.
- 1 Pole Riser for Communication Cables with first 10 feet above ground and sweep being ridged steel
- 1 Pole Riser for power connection
Page 6 of 6

ISLINGTON STREET CORRIDOR IMPROVEMENTS

05/05/22

ATTACHMENT "A"



TRAFFIC CONTROLLER CABINET N.T.S. 616

Page 1 of 2

ISLINGTON STREET CORRIDOR IMPROVEMENTS

SPECIAL PROVISION

Item 625.9 – Bollard Light

Description

1.1 This work shall consist of furnishing and installing Bollard Lights as shown on the plans.

Materials

2.1 The contractor shall use all new materials of high quality. The contractor shall submit product specifications for approval.

2.2 Bollard Light

2.2.1

Light manufacturer: Stress Crete Group, 14503 Wallick Road Atchison, Kansas 66002 (913) 255-3112 1-800-837-1024 Fax: (913) 255-3124 Light model KLCS-T1AF-V-40(SSL)-4003-120:277-E11-DB-3K Stress Crete Silhouette with lights, or approved equal. Peter Beane, Regional Sales Representative, <u>peter@speclines.net</u>

- 2.2.2 Product: Bollard Light Material: Spun concrete Height: 42 inches above grade Diameter top: 8 inches Model Name: Silhouette Finish: Eclipse Etched Black S11 Optical System: Tower Array Frosted IES Class: Type V Wattage: 40 watts CCT Temperature: 3000k Line Voltage 120:277
- 2.2.3 Bollard Lights shall be installed according to the manufacturer's instructions using cast aluminum mounting plate on concrete footer or ground screw. Installed bollards shall be plumb, unyielding, free of condensation, leaks, warps, dents, juts, paint imperfections or other faults that are a result of poor workmanship and/or installation.

625

ISLINGTON STREET CORRIDOR IMPROVEMENTS

- **2.2.4** Installed bollard light shall meet all applicable electrical codes and sufficiently grounded to protect internal components and the public.
- **2.2.5** Controls. Bollard Light controllers shall be a high efficiency maximum power point tracking (MPPT) charge controller that is integrated into the bollard housing, designed to automatically manage lighting performance based on environmental conditions and lighting requirements.

Construction Requirements

- **3.1** Contractor shall perform all work to be in conformance with local and national code requirements.
- **3.2** Before installing any of the work, the Contractor shall see that it does not interfere with the existing or proposed underground utilities or other fixed elements. Work installed by the Contractor which interferes with or modifies the design as shown on the Contract Drawings shall be changed as directed by the City's Representative, and all costs incidental to such changes shall be paid by the Contractor.
- **3.3** In any and all cases of discrepancy in figures, plans or specifications the matter shall be immediately submitted to the City's Representative for decision.
- **3.4** Solar Bollard Lights shall be installed in accordance with the manufacturers' recommendation and the construction drawings.

Method of Measurement

4.1 Bollard Lights will be measured by the number of each unit installed.

Basis of Payment

5.1 Payment for the Bollard Light will be full compensation for all labor, equipment, tools, supervision, and materials necessary to complete the work associated with construction and installation of the Bollard Lights as shown on the Plans and specified herein. The work shall include, but not be limited to coordination with related works of other trades, shop drawings, procurement of material, delivery of material, excavation, backfilling, tree trimming, hardware, and all other work required to complete the installation not paid for under other items as specified herein.

Pay Item and Unit:

625.9

Bollard Light

EA

END OF SECTION

Section 645 1 of 2 Islington Street Corridor Improvements Portsmouth, NH

AMENDMENT TO NHDOT SPECIFICATIONS

Section 645 – Erosion Control

Add the following paragraphs:

1.2.4 Contractor shall provide copies of Storm Water Pollution Prevention Plan (SWPPP) to Engineer and Owner and submit Notice of Intent (NOI) to the EPA, with copies to Engineer and Owner, at least seven (7) days prior to the start of construction.Amend 645.3.1.1:

Delete "in accordance with 105.02" from the first sentence.

Amend 645.3.2.4:

Delete "in accordance with 105.02" from the first sentence.

Amend 645.3.9.1 by adding the following after the first sentence:

"Maintenance of erosion control measures shall be conducted at no additional cost to the Owner."

Delete 645.4.3 and **replace** with the following:

4.3 Grass seed is subsidiary and will not be measured for payment.

Amend 645.4.5 by adding the following after the last sentence:

"Regular silt fence maintenance for damaged or dilapidated sections shall not be measured for payment but be part of the unit item cost."

Add 645.4.9 the following paragraphs 4.10 and 4.10.1:

4.10 Silt booms will be measured by the number of silt booms installed, complete and in place, at locations shown or where directed.

4.10.1 Silt booms up to 20 feet in length will be measured as a single unit. Silt booms exceeding 20' in length will be measured by dividing the silt boom length by 20' feet.

Section 645 2 of 2 Islington Street Corridor Improvements Portsmouth, NH

Delete 645.5.2 and **replace** with the following:

5.2 Slope seed for permanent erosion control is included in Section 646 and will not be paid for under Section 645. Rye grass ordered for temporary erosion control will be subsidiary to the work and not paid for separately.

Amend 645.5.5 by adding the following to the end of the sentence:

"and removed upon completion of work and establishment of vegetation." Add the following Paragraph 645.5.11:

5.11 "The accepted quantity of silt booms will be paid for at the Contract Unit Price for each unit, complete and in place."

Pay Items and Units

Add the following items:

645.9 "Silt Booms Unit"

Section 646 1 of 1 Islington Street Corridor Improvements Portsmouth, NH

AMENDMENT TO NHDOT SPECIFICATIONS

<u>Section 646 – Turf Establishment</u>

Add Section 646.3.4:

3.4 In addition to liability requirements stated in 644.3.7. Protection from erosion shall be included in the unit item without further compensation. Erosion of loamed areas shall be repaired by the Contractor throughout the duration of the project and warranty period.

Add Section 646.4.3

4.3 All necessary materials referenced in sections of Part 2, Materials, are subsidiary to Turf Establishment and will not be measured for payment.

Add Section 646.5.4

5.4 All necessary materials referenced in sections of Part 2, Materials, are subsidiary to Turf Establishment.

650

ISLINGTON STREET CORRIDOR IMPROVEMENTS

SPECIAL PROVISION

ITEM 650.2 – Landscaping

Description

- **1.1** This special provision confirms that all trees will be measured and paid under the Lump Sum Item 650.2 Landscaping.
- **1.2** All of the relevant provisions under Section 650 Planting General shall apply, with additions and amendments as follows:

Materials

ADD to 2.1.1 Plants/ General:

2.1.1.6 All planting stock shall be specimen quality, free of defects, and disease or injury. The City of Portsmouth, NH reserves the right to refuse/reject any plant material or planting action that fails to meet the standards set forth in the ANSI A300 Part 6 Standard Practices for Planting and Transplanting and/or The City of Portsmouth, NH Planting Requirements.

ADD to 2.12 Loam Backfill:

- 2.12.6 Identified plantings shall be backfilled with soil from the site and amended with Organic Compost (Standard Planting Soil Mix).
- 2.1.2.9 Circumstances where Standard Planting Soil Mix should not be used include plantings within:

Tree Box Filters Structural Sub-Surface Root Zone Cells Structural Sub-Surface Root Zone Cell planting locations where excavation reveals that cells cannot be used due to buried utilities in the area

- 2.12.7 Standard Planting Soil Planting Mix
 - 2.1.2.7.1 The Contractor shall furnish a Standard Planting Soil Mix as defined in this Section to support the growth of perennials, shrubs, and trees where Structural Sub-Surface Root Zone Cells and Tree Box Filters are not used. The components that comprise the standard Planting Soil Mix shall meet all the pertinent requirements herein.

ISLINGTON STREET CORRIDOR IMPROVEMENTS

2.1.2.7.2 The Standard Planting Soil Mix shall be comprised of loam and compost mixed to the following proportion. The standard Planting Soil Mix shall have an acidity range between pH 6.0 and 7.0.

Material	% by Volume
Compost	10%
Loam*	90%

*The City of Portsmouth tree planting standard states, "All plantings shall be backfilled with soil from the site and amended no more than 20% with Organic Compost. The only exceptions are new construction where engineered soil is being used in conjunction with Structural Sub-Surface Root Zone Cells (Silva Cells) and where new planting beds are being created."

2.1.2.7.3 The standard Planting Mix shall have an acidity range between pH 6.0 and 7.0.

2.1.2.7.4 The quantity of mix necessary to sufficiently fill the required planting areas shall be determined by the Contractor taking into account the settlement.

2.1.2.8 Planting Mix for Tree Box Filters

See Tree Box Filter specifications for planting soil requirements.

2.1.2.9 CU-Structural Soil Planting Mix

2.1.2.9.1 The Contractor shall furnish the CU-Structural Soil planting mix as defined in this section, to support the growth of street Tree Plantings.

CU-Structural Soil planting mix shall be used when excavation identifies excessive utilities in the project area and Structural Sub-Surface Root Zone Cells cannot be installed due to limited space. The amount of soil and the locations where it may be needed is to be determined.

CU-Structural Soil is patented and licensed for sale by qualified producers; it is sold under the names of CU-Structural SoilTM and CU-SoilTM.

A source of CU-Structural Soil:

Read Custom Soils 158 Tihonet Road Wareham, MA 0257

ISLINGTON STREET CORRIDOR IMPROVEMENTS

https://readcustomsoils.com/

The quality parameters of the proprietary soil mix shall meet these specifications:

Soil used to create CU Structural Soil shall be a "loam" with a minimum clay content of 20% or a "clay loam" based on the "USDA classification system" as determined by mechanical analysis (ASTM D-422) and it shall be of uniform composition, without admixture of subsoil. It shall be free of stones, lumps, plants and their roots, debris and other extraneous matter. It shall not contain toxic substances harmful to plant growth. Clay loam shall contain not less than 2% or more than 6% organic matter as determined by the loss on ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 230 degrees F., plus or minus 9 degrees.

Textural Class	% of Total Weight
Gravel	less than 5%
Sand	20-50%
Silt	20-45%
Clay	20-40%

Mechanical analysis for the loam or clay loam shall be as follows:

2.1.2.9.2 Chemical analysis: Meet, or be amended to meet the following criteria:

- pH between 5.5 to 6.5 when using limestone, up to 7.2 when using granite or other non-limestone crushed stone.
- Percent organic matter 2% 6% by dry weight
- Adequate nutrient levels
- Soluble salt less than 1.0 mmho/cm
- Cation Exchange Capacity (CEC) greater than 10 milli-equivalents per 100 grams of soil
- Carbon/Nitrogen ratio less than 33:1
- 2.1.2.9.3 Loam or clay loam shall not come from USDA classified prime farmland.
- 2.1.2.10 Planting Mix for Structural Sub-Surface Root Zone Cells

See Special Provision for Planting Soil for Structural Sub-Surface Root Zone Cells specifications for planting soil requirements.

650

ISLINGTON STREET CORRIDOR IMPROVEMENTS

Construction Requirements

AMEND 3.5 Excavation as follows:

All planting holes shall be dug by hand- no machines. The only exceptions are new construction where new planting pits, planting beds with granite curbing, and planting sites with Structural Sub-Surface Root Zone Cells are being created. If a machine is used to dig in any of these situations and planting depth needs to be raised the material in the bottom of the planting hole MUST be tamped by machine to prevent sinking of the root ball.

ADD to 3.6.1.1:

The root ball of the tree shall be worked so that the root collar of the tree is visible and no girdling roots are present. The root collar of the tree shall be 2"-3" above grade of planting hole for finished depth. All plantings shall be backfilled in lifts and ALL lifts shall be watered so the planting will be set and free of air pockets- NO EXCEPTIONS.

An earth berm shall be placed around the perimeter of the planting hole except where curbed planting beds or pits are being used.

2"-3" of mulch shall be placed over the planting area.

ALL Wire and Burlap shall be removed from the root ball AND planting hole.

Method of Measurement

Landscaping will be measured as a unit. A unit will include furnishing and installing landscaping materials, including trees, all layout, fertilizing, planting soil mixes, soil conditioning, staking, guying, watering, excavating, weeding, herbicides, fungicides, pesticides, refertilizing as necessary, replanting as needed, and stake and guy removal after the establishment period, as shown on the plans or as ordered.

Basis of Payment

5.4.1 The following table is included to assist the Contractor in developing the required "Bill of Materials" for the proposed planting materials. If there are any differences between the quantities

ISLINGTON STREET CORRIDOR IMPROVEMENTS

shown in the below table and the planting materials shown on the plans, the plans shall govern unless directed otherwise by the Engineer.

The provided table is only an estimate of the plants identified in the landscape planting plan. The Contractor must refer to the plan for definitive plant identification and quantitation.

QTY.	SCIENTIFIC NAME	COMMON NAME
7	GYMNOCLADUS DIOISCUS 'ESPRESSO'	ESPRESSO KENTUCKY COFFEETREE
4	LIQUIDAMBAR STYRACIFLUA 'ROTYUNDILOBA'	ROUND-LEAFED SWEETGUM
5	NYSSA SYLVATICA 'WILDFIRE'	WILFIRE BLACK GUM
8	ZELKOVA SERRATA 'GREEN VASE	GREEN VASE ZELKOVA
24		

DECIDUOUS SHADE TREES

DECIDUOUS UNDERSTORY TREES

6		AMELANCHIER X GRANDIFLORA	AUTUMN BRILLIANCE
0	AGA	'AUTUMN BRILLIANCE'	SERVICEBERRY
4		CARPINUS BETULUS 'EMERALD	EMERALD AVENUE EUROPEAN
4	CB	AVENUE'	HORNBEAM
6	MAS	MAACKIA AMURENSIS 'STARBURST'	STARBURST AMUR MAACKIA
3	OV	OSTRYA VIRGINIANA	EASTERN HOPHORNMBEAM
6	PA	PRUNUS x ACCOLADE	ACCOLADE CHERRY
4	PSA	PRUNUS SUBHIRTELLA 'AUTUMNALLIS'	AUTUMN CHERRY
6	SR	SYRINGIA RETICULATA 'IVORY SILK'	JAPANESE TREE LILAC
35			

#8 ISLINGTON STREET

SHRUBS		
QTY.	SCIENTIFIC NAME	COMMON NAME
7	AZALEA 'ARNESON GEM'	ARNESON GEM AZALEA
5	FOTHERGILLA GARDENII	DWARF FOTHERGILLA
7	HYDRANGEA A. 'INVINCIBELLE WEE WHITE'	WEE WHITE HYDRANGEA
7	HYDRANGEA PANICULATA 'BOBO'	BOBO PANICLE HYDRANGEA
6	LEUCOTHOE FONTANESIANA 'SILVER RUN"	SILVER RUN LEUCOTHOE
9	RHODODENDRON CATAWBIENSE 'ALBUM'	WHITE CATAWBA RHODODENDRON
7	TAXUS MEDIA 'EVER LOW'	EVER LOW YEW
48		

GROUNDCOVERS / PERENNIALS

ISLINGTON STREET CORRIDOR IMPROVEMENTS

22	LIRIOPE SPICATA	CREAPINGF LILY TURF
22		

GOODWIN PARK

GROUNDCOVERS / PERENNIALS

1420	PACHYSANDRA TERMINALIS	JAPANESE SPURGE
1420		

Pay items and units:

ITEM 650.2

Landscaping

Unit

ISLINGTON STREET CORRIDOR IMPROVEMENTS

S P E C I A L P R O V I S I O N Amends Division 600 – Incidental Construction ITEM 661.1 - TREE GRATE ITEM 661.2 - TREE GUARD

Description

1.1 This work shall consist of furnishing and installing tree grates and tree guards as shown on the plans, as described below and as directed.

Materials

2.1 TREE GRATES

A. Tree grates shall be "Starburst Series 2" as manufactured by Ironsmith, Inc., 41-701 Corporate Way, Unit 3, Palm Desert, CA 92260 (800) 338-4766 (manufacturer's item #6054-2), or approved equal. Grates shall be rectangular, (36x60 inches; see plans Type II street tree planting) with 3/8" maximum slot openings to satisfy ADA requirements. Tree openings shall be 18".

In some cases, the plans call for Ironsmith Starburst series rectangular grates 30X60 inches (see plans Type III street tree planting).

Grates shall include matching steel angle frames and all setting hardware per the details and manufacturer's recommendations, as approved by the Engineer. Grates shall be supplied in unfinished natural state. The castings shall be of uniform pattern and quality, free from blowholes, hard spots, shrinkage, distortion or other defects. Castings shall be cleaned by shot blasting.

B. Grates shall be cast iron. Contractor shall provide all required hardware. All hardware shall be galvanized as per ASTM A153 latest requirements. Concrete shall conform to 520, Class B

2.2 TREE GUARDS

- A. Tree Guards shall be as supplied by Ironsmith, 41701 Corporate Way #3, Palm Desert, CA 922601, (800) 338-4766, or approved equal.
- B. Tree Guards shall be Model M3 Tree guard, welded steel construction, in halves for greater rigidity & quick labor-saving assembly, 60" in height (5 foot), grate attaching hardware. The plans identify 18 tree plantings needing 5-foot high tree guards.

661

ISLINGTON STREET CORRIDOR IMPROVEMENTS

In some instances, Tree Guards shall be 48" in height (4 foot), as shown on the plan; 48" tree guards may be a customized size from the Ironsmith manufacturer. The plans identify 23 tree plantings needing 4-foot high tree guards.

C. Finish: All Tree Guards shall be supplied with factory applied finish, flat black powder coat (standard) guards shall be furnished and installed around each tree with a grate according to plans.

Construction Requirements

3.1 TREE GRATES

- A. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.
- B. Install grates and frames where indicated on plans flush and leveled with surrounding pavement surface.
- C. Install steel angle frame
 - 1. flush and leveled with surrounding paving surface, maintain flush and leveled at all times. Frames MUST NOT slope in more than one direction.
 - 2. Use spreaders or stakes to keep frame from being distorted by concrete pressure.
 - 3. Install frames per details on plans and manufacturer's recommendations.
- D. Clean concrete and debris from frame prior to tree grate installation.
- E. If needed, grind pads on underside of tree grates to level and prevent rocking in frame.

3.2 TREE GUARDS

- A. Install materials and systems in proper relation with adjacent construction and with uniform appearance per manufacturers recommendation. Shim Guards as necessary so that they are 90 degrees from level. Coordinate with work of other sections.
- B. Install per manufacturer's instructions.

ISLINGTON STREET CORRIDOR IMPROVEMENTS

Method of Measurement

- **4.1** Tree Grates will be measured per each complete in place including frames, reinforced concrete beams (setting beds), and all mounting hardware.
- **4.2** Tree Guards will be measured per each complete in place including all mounting hardware.

Basis of Payment

- **5.1** The accepted quantity of Tree Grates will be paid at the Contract unit price per Each including frames, reinforced concrete beams (setting beds), and all mounting hardware.
- **5.2** The accepted quantity of Tree Guards will be paid at the Contract unit price per Each including all mounting hardware.

Pay Item	Description	<u>Units</u>
Item 661.1A	TREE GRATE (2.5' X 5')	Each
Item 661.1B	TREE GRATE (3' X 5')	Each
Item 661.24	TREE GUARD (4' TALL)	Each
Item 661.25	TREE GUARD (5' TALL)	Each

661

ISLINGTON STREET CORRIDOR IMPROVEMENTS

S P E C I A L P R O V I S I O N Amends Division 600 – Incidental Construction ITEM 661.3 – GRANITE PLANTER

Description

1.1 This work shall consist of constructing granite planters as shown on the plans, as described below and as directed.

Materials

2.1 General

- A. Granite used to form the planter boarders shall be NHDOT item 609.01 Straight Granite Curb, 6" width at the top, cut to the dimensions shown in the plans.
- B. Concrete beams for supporting the granite borders over Structural Sub-Surface Root Zone Cell shall conform to Section 520, Class B, including reinforcing.
- C. Air Tubes shall be perforated PVC and shall include elbows and Tee's.
- D. Geotextile shall be Class 3 (low strength) woven fabric suitable as a porous landscape barrier for use as a weed blacker under mulch, as approved by the engineer.
- E. Bark Mulch shall be hemlock and conform to the provisions of Item 645.15. A representative sample shall be approved by the Engineer prior to installation.
- F. Planting Soil shall be as per the Planting Soil for Structural Sub-Surface Root Zone Cell special provision in this Contract.

Construction Requirements

3.1 General

- A. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.
- B. Install curb and concrete beams after tree cell units are filled and complete. Curb reveal shall be uniform 6" height above the adjacent sidewalk around the entire boarder.

ISLINGTON STREET CORRIDOR IMPROVEMENTS

C. Install tree and planting soil as per instructions in the Structural Sub-Surface Root Zone Cell special provision and as directed.

Method of Measurement

4.1 Granite Planters will be measured per Each complete in place at the locations shown on the plans.

Basis of Payment

5.1 The accepted quantity of Granite Planters will be paid at the Contract unit price per Each including granite curb, reinforced concrete beams (setting beds), excavation, planting soil, air tubes, geotextile fabric, and bark mulch. Structural Sub-Surface Root Zone Cell and trees will be paid under separate items.

Pay Item	Description	<u>Units</u>
Item 661.3	GRANITE PLANTERS	Each

Page 1 of 19

ISLINGTON STREET CORRIDOR IMPROVEMENTS

SPECIAL PROVISION

Amends Division 600 – Incidental Construction

SECTION 661.4 - STRUCTURAL SUB-SURFACE TREE ROOT ZONE CELL

PART 1 - DESCRIPTION

1.01 SUMMARY

- A. Section Includes:
 - 1. Structural Sub-Surface Root Zone Cell for planting and paving.
 - 2. Other materials including, but not limited to, geotextile, geogrid, aggregate, subbase material, backfill, root barrier, and planting soil.

B. Related Requirements:

- 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- 2. Special Provision Section 608. Brick Sidewalk
- 3. Special Provision Section 608 Sidewalks
- 4. Special Provision Section 609 Granite Curb
- 5. Special Provision Section 650.2 Landscaping
- 6. Special Provision Section 650 Planting Soil for Sub-Surface Structural Tree Root Zone Cells

1.02 REFERENCES

- A. Definitions:
 - 1. AGGREGATE BASE COURSE: Aggregate material between the paving and the top of the Structural Sub-Surface Tree Root Cells deck below, designed to distribute loads across the top of the deck.
 - 2. AGGREGATE SETTING BED FOR PAVERS: Aggregate material (sand / cement) between the bituminous pavement base course and unit surface pavers, designed to act as a setting bed for the pavers.
 - 3. AGGREGATE SUBBASE: Aggregate material between the bottom of the and the compacted subgrade below, designed to distribute loads from the Structural Sub-Surface Tree Root Cells bases to the subgrade.
 - 4. BACKFILL: The earth used to replace or the act of replacing earth in an excavation beside the structural cell to the excavation extents.
 - 5. FINISH GRADE: Elevation of finished surface of planting soil or paving.

ISLINGTON STREET CORRIDOR IMPROVEMENTS

- 6. PLANTING SOIL: Planting Soil for Structural Sub-Surface Tree Root Cells, intended to fill the cell and other planting spaces.
- 7. Structural Sub-Surface Root Zone Cell:
 - a. Cell: One assembled unit made up of 1 base, 6 post assemblies, and 1 deck.
 - b. Structural Sub-Surface Tree Root Cells System: Two or more structural cells used in combination with each other and with required accessories.
- 8. SUBGRADE: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill.
- 9. WALK-THROUGH: A process for light compaction of soils by walking through the soil following placement.
- B. Reference Standards:
 - American Association of State Highway and Transportation Officials (AASHTO):
 a. AASHTO H-20
 - 2. ASTM International (ASTM):
 - a. ASTM D448-12, Standard Classification for Sizes of Aggregate for Road and Bridge Construction
 - b. ASTM D698-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ [600 kN-m/m³])
 - c. ASTM D1241-07, Standard Specification for Materials for Soil-Aggregate Subbase, Base, and Surface Courses
 - d. ASTM D3786/D3786M-13, Standard Test Method for Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method
 - e. ASTM D4491-99a(2014)e1, Standard Test Methods for Water Permeability of Geotextiles by Permittivity
 - f. ASTM D4533-D4533M-15, Standard Test Method for Trapezoid Tearing Strength of Geotextiles
 - g. ASTM D4632-D4632M-15, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
 - h. ASTM D4751-12, Standard Test Method for Determining Apparent Opening Size of a Geotextile
 - i. ASTM D4833/D4833M-07(2013)e1, Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
 - j. ASTM D5262-07(2012), Standard Test Method for Evaluating the Unconfined Tension Creep and Creep Rupture Behavior of Geosynthetics
 - k. ASTM D6241-14, Standard Test Method for Static Puncture Strength of Geotextile and Geotextile-Related Products Using a 50mm Probe
 - 1. ASTM D6637-11, Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method

Page 3 of 19

ISLINGTON STREET CORRIDOR IMPROVEMENTS

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Conference: Prior to installation of the Structural Sub-Surface Tree Root Cells and associated Work, meet with the Contractor, and their field supervisor, manufacturer's technical representative, the City Representative, and other entities concerned with the Structural cell system performance.
 - 1. Provide at least 72 hours advance notice to participants prior to convening preinstallation conference.
 - 2. Introduce and provide a roster of individuals in attendance with contact information.
 - 3. The preinstallation conference agenda will include, but is not limited to the review of:
 - a. Required submittals both completed and yet to be completed.
 - b. The sequence of installation and the construction schedule.
 - c. Coordination with other trades.
 - Details, materials and methods of installation.
 - 1) Review requirements for substrate conditions, special details, if any, installation procedures.
 - 2) Installation layout, procedures, means and methods.
 - e. Mock-up requirements.
- B. Sequencing and Scheduling:

d.

- 1. General: Prior to beginning Work of this Section, prepare a detailed schedule of the Work involved for coordination with other trades.
- 2. Schedule utility installations prior to beginning Work of this Section.
- 3. Where possible, schedule the installation of the structural cells after the area is no longer required for use by other trades and Work. Where necessary to prevent damage, protect installed system if Work must occur over or adjacent to the installed structural cells.

1.04 SUBMITTALS

- A. Action Submittals: Submit these to the City Representative (Engineer, Landscape Architect, City Employee) for review and acceptance not less than 45 days prior to start of installation of materials and products specified in this Section.
 - 1. Product Data: For each type of product, submit manufacturer's product literature with technical data sufficient to demonstrate that the product meets these specifications.
 - 2. Test and Evaluation Reports:

Page 4 of 19

ISLINGTON STREET CORRIDOR IMPROVEMENTS

- a. Submit results of compaction testing required by the Specifications for approval.
- b. Include analysis of bulk materials including soils and aggregates, by a recognized laboratory that demonstrates that the materials meet the Specification requirements.
- 3. Samples:
 - a. One full size sample of an assembled Structural Sub-Surface Tree Root Cell
 - b. One 6-inch (150-mm) square piece of geogrid.
 - c. One 6-inch (150-mm) square piece of geotextile.
 - d. Provide a one-gallon (3.79-liter) sample of each type of existing site soil prior to adding amendments with testing data that includes recommendations for compost volumes and chemical additives for the types of plants to be grown. Samples and test samples shall represent the composite mixing of the available soils.
- 4. Manufacturer's Report: Submit structural cell manufacturer's letter of review and approval of the Project, including Drawings and Specifications, Addenda, Clarifications and Modifications, and for compliance with product installation requirements.
- 5. Qualification Statements:
 - a. Manufacturer:
 - 1) Submit list of completed projects demonstrating durability and longevity of in-place systems.
 - a) Include project name, location, and date of completion.
 - b. Installer:
 - 1) Submit documentation of the qualifications of the structural cell installer and their field supervisor, sufficient to demonstrate that both meet the requirements specified in Article 1.05 QUALITY ASSURANCE.
 - 2) Submit list of completed projects of similar scope and scale demonstrating capabilities and experience.
- B. Closeout Submittals: Submit these to the City Representative at completion of installation.
 - 1. Warranty: Submit manufacturer's warranty, fully executed.

1.05 QUALITY ASSURANCE

A. Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction.

Page 5 of 19

ISLINGTON STREET CORRIDOR IMPROVEMENTS

- B. Manufacturer Qualifications:
 - 1. A manufacturer whose product is manufactured in an ISO/TS 16949 compliant and ISO 9001 2008 registered factory.
 - 2. A manufacturer with not less than 100 structural cell systems in-place, each system in use for not less than 7 years, confirming durability and longevity of the system.
 - 3. A manufacturer with an established and demonstrated utility service and repair process, including written procedure and photographs demonstrating work.
 - 4. A manufacturer with a published operating and maintenance manual
- C. Installer Qualifications: A qualified installer with not less than 5 years of successful experience installing structural cell systems or related products and materials, and whose work has resulted in successful installation of underground piping, chambers and vault structures, planting soils, and planter drainage systems of a similar scope and scale in dense urban areas.
- D. Installer's Field Supervisor: A full-time supervisor employed by the installer with not less than 5 years of successful experience similar to that of the installer and present at the Project site when Work is in progress. Utilize the same field supervisor throughout the Project, unless a substitution is submitted to and approved in writing by the City Representative.
- E. Mock-Up: Prior to the installation of the structural cell system, construct a mock-up of the complete installation at the Project site in the presence of the City Representative.
 - 1. Size and Extent: Minimum of 100 sq. ft. (9.29 sq. m.) in area and including the complete Structural cell system installation with subbase, aggregate subbase, drainage installation, Structural cell decks, posts, and bases, base course aggregate, geotextile, geogrid, backfill, planting soil, and necessary accessories.
 - 2. The mock-up area may remain as part of the installed Work at the end of the Project provided that it remains undamaged and meets the requirements of the Drawings and Specifications.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Structural Sub-Surface Tree Root Cell System: Protect Structural Sub-Surface Tree Root Cells system components from damage during delivery, storage and handling.
 - 1. Store components on smooth surfaces, free from dirt, mud and debris. Store under tarp to protect from sunlight when time from delivery to installation exceeds one week.
 - 2. Perform handling with equipment appropriate to the size (height) of Structural cells and site conditions; equipment may include, hand, handcart, forklifts, extension lifts, or small cranes, with care given to minimize damage to Structural cell bases, posts, decks and adjacent assembled Structural cells.

Page 6 of 19

ISLINGTON STREET CORRIDOR IMPROVEMENTS

- B. Packaged Materials: Deliver packaged materials in original, unopened containers indicating weight, certified analysis, name and address of manufacturer, and indication of conformance with State and Federal laws, if applicable. Protect materials from deterioration during delivery and while on the Project site.
- C. Bulk Materials:
 - 1. Do not deliver or place backfill, soils, or soil amendments in frozen, wet, or muddy conditions.
 - 2. Provide protection including tarps, plastic and/or matting between bulk materials and finished surfaces sufficient to protect the finish material.
 - 3. Bring planting soil to the site using equipment and methods that do not overly mix and further damage soil peds within the soil mix.
- D. Provide erosion-control measures to prevent erosion or displacement of bulk materials and discharge of soil-bearing water runoff or airborne dust to adjacent properties, water conveyance systems, and walkways. Provide additional sediment control to retain excavated material, backfill, soil amendments and planting mix within the Project limits as needed.

1.07 FIELD CONDITIONS

A. Existing Conditions: Do not proceed with Work when subgrades, soils and planting soils are in a wet, muddy or frozen condition.

1.08 WARRANTY

- A. The Contractor shall warrant the Structural Sub-Surface Tree Root Cells to be free of faults and defects in accordance with the General Conditions, except that the warranty shall be extended by manufacturer's written warranty against defects in materials and workmanship as follows:
 - 1. DeepRoot® warrants to the original purchaser of its Structural cell product that such product will be free from defects in materials and workmanship, and perform to DeepRoot's written specifications for the warranted product, when installed and used as specifically provided in the product's installation guidelines for a period of 20 years from the date of purchase. This warranty does not cover wear from normal use, or damage caused by abuse, mishandling, alterations, improper installation and/or assembly, accident, misuse, or lack of reasonable care of the product. This warranty does not apply to events and conditions beyond DeepRoot's control, such as ground subsidence or settlement, earthquakes and other natural events, acts of third parties, and/or Acts of God. If this warranty is breached, DeepRoot® will provide a replacement product. Incurred costs, such as labor for removal of the original product, installation of replacement product, and the cost of incidental or other materials or expenses are not covered under this warranty.

ISLINGTON STREET CORRIDOR IMPROVEMENTS

2. Deeproot® makes no other warranties, express or implied, and specifically disclaims the warranty of merchantability or fitness for a particular purpose. Deeproot® shall not be liable either in tort or in contract for any direct, incidental or consequential damages, lost profits, lost revenues, loss of use, or any breach of any express or implied warranty.

PART 2 - MATERIALS

2.01 MANUFACTURER

A. Acceptable Manufacturers:

DeepRoot Green Infrastructure, LLC 101 Montgomery Street, Suite 2850 San Francisco, CA, 94104

415.781.9700 800.458.7668 Fax 415.781.0191

www.deeproot.com

- B. Substitutions: Manufacturers seeking approval of their products are required to comply with the City's Instructions to Bidders, generally contained in the Project Manual. If such instructions are not included in Division 1, submit requests as specified herein.
 - 1. Submit proposed substitutions to the City Representative not less than 10 calendar days prior to the date for receipt of Bids.

2.02 DESCRIPTION

- A. The term Structural Sub-Surface Tree Root Cell shall be used to refer to a single cell.
- B. Structural cells shall be designed for the purpose of growing healthy trees and providing stormwater management (where designed for that purpose).
- C. Structural cells shall be modular, structural systems.
- D. Each Structural Sub-Surface Tree Root Cell shall be structurally independent from all adjacent cells for incorporating utilities and other site features as well as for future repairs.
- E. Cells shall be capable of supporting loads up to and including AASHTO H-20 (United States) or CSA-S6 87.5 kN (Canada) when used in conjunction with approved pavement profiles.
- F. Cells shall be open on all vertical faces and horizontal planes and shall have no interior walls or diaphragms.

Page 8 of 19

ISLINGTON STREET CORRIDOR IMPROVEMENTS

- G. Cells shall be capable of providing a large, contiguous, continuous volume of planting soil that does not inhibit or prevent the following:
 - 1. Placement of planting soil
 - 2. Walk through compaction
 - 3. Compaction testing of planting soil, once in place
 - 4. Movement and growth of roots
 - 5. Movement of water within the provided soil volume, including lateral capillary movement
 - 6. Installation and maintenance of utilities placed within, adjacent to, or below the Structural cell.
- H. Structural Sub-Surface Tree Root Cells shall be capable of being filled with a variety of soil types and soils that include peds 2 inches or larger in diameter as is appropriate for the application, location of the installation, and tree species.

2.03 STRUCTURAL CELL MATERIALS AND ACCESSORIES

A. Structural Sub-Surface Tree Root Cell Components: Each "Structural cell 2" soil cell module (hereafter Structural cell or "cell", and "Structural Sub-Surface Tree Root Cell") is composed of one base, 6 post assemblies, and one deck.

2x Structural cell 2 System:

- a. Components: One base, six 2x posts, and one deck.
- b. Assembled Dimensions (Each Cell): 47.2 inches long by 23.6 inches wide by 30.9 inches high (1200 mm long by 600 mm wide by 784 mm high).
- B. Structural cell Materials and Fabrication:
 - 1. Bases and Posts: Homopolymer polypropylene.
 - 2. Decks: Fiberglass reinforced, chemically-coupled, impact modified polypropylene.
- C. Manufacturer's Related Structural cell Installation Accessories:
 - 1. Strongbacks: An accessory designed to stabilize the Structural cell posts temporarily, during soil placement, and removed for reuse prior to placing decks.
 - 2. Anchoring Spikes: 10" landscape spike for securing assembled Structural cells to subbase.

2.04 RELATED PRODUCTS

A. Root Barrier: Recyclable, black, injection molded panels manufactured with a minimum 50 percent post-consumer recycled polypropylene plastic with UV inhibitors, and integrated zipper joining system which allows instant assembly by sliding one panel into another; for redirecting tree roots down and away from hardscapes.

Page 9 of 19

ISLINGTON STREET CORRIDOR IMPROVEMENTS

- 1. Panel Sizes:
 - a. No. UB12-2: 24 inches long by 12 inches deep by 0.080 inches thick (61 cm long by 30 cm deep by 2.03 mm thick); for use with 1x systems and for pavement profiles less than 12 inches (30 cm) deep.
 - b. No. UB18-2: 24 inches long by 18 inches deep by 0.080 inches thick (61 cm long by 46 cm deep by 2.03 mm thick); for use with 2x and 3x systems, and for pavement profiles 12 inches or more in depth.
- 2. Products meeting this specification:
 - a. DeepRoot Tree Root Barrier (DeepRoot Green Infrastructure, LLC)
- B. Geogrid: Net-shaped woven polyester fabric with PVC coating, uniaxial or biaxial geogrid, inert to biological degradation, resistant to naturally occurring chemicals, alkalis, and acids; used to provide a stabilizing force within soil structure as the fill interlocks with the grid.
 - 1. Tensile strength at ultimate (ASTM D6637): 1850 lbs/ft (27.0 kN/m) minimum
 - 2. Creep reduced strength (ASTM D5262): 1000 lbs/ft (14.6 kN/m) minimum
 - 3. Long term allowable design load (GRI GG-4): 950 lbs/ft (13.9 kN/m) minimum
 - 4. Grid aperture size (MD): 0.8 inch (20 mm) minimum
 - 5. Grid aperture size (CD): 1.28 inch (32 mm) maximum
 - 6. Roll size: 6-foot (1.8-m) width is preferred, up to 18-foot (5.4-m).
 - 7. Products meeting this specification:
 - a. Stratagrid SG 150; <u>http://www.geogrid.com</u>
 - b. Miragrid 2XT; <u>http://www.tencate.com</u>
 - c. Fortrac 35 Geogrid; (http://www.hueskerinc.com
 - d. SF 20 Biaxial Geogrid; <u>http://www.synteen.com</u>
- C. Geotextile: composed of high tenacity polypropylene yarns which are woven into a network such that the yarns retain their relative position and is inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids.

Tensile strength at ultimate (ASTM D4595):	5100 lbs/ft (74.4 KN/m) MD minimum
	5100 lbs/ft (74.4 KN/m) CD
	minimum
Tensile strength at 2% strain (ASTM D4595):	960 lbs/ft (14.0 KN/m) MD
	1560 lbs/ft (22 8 KN/m) CD
	minimum
Tensile strength at 5% strain (ASTM D4595)	2400 lbs/ft (350 KN/m) MD minimum
	Tensile strength at 2% strain (ASTM D4595): Tensile strength at 5% strain (ASTM D4595)

Page 10 of 19

ISLINGTON STREET CORRIDOR IMPROVEMENTS

		3600 lbs/ft (52.5 KN/m) CD minimum
4.	Tensile Strength at 10% (ASTM D4595):	5040 lbs/ft (73.5 KN/m) MD minimum
5.	Factory Seam Strength (ASTM 4884):	3000 lbs/ft (43.8 KN/m) minimum
6.	Flow rate (ASTM D4491):	30 gal/min/ft ² (2648 l/min/m ²) minimum
7.	Apparent opening size (ASTM D4751):	30 sieve (0.60 mm)
9.	UV Resistance (at 500 hours):	80 percent strength retained

- 10. Products meeting this specification:
 - a. Mirafi HP570; <u>http://www.tencate.com</u>
 - b. Geolon PP40; <u>http://www.tencate.com</u>
 - c. Nilex Woven 2044 (Nilex); http://www.nilex.com
- D. Plastic Cable Ties: A tensioning device or tool used to tie similar or different materials together with a specific degree of tension.

2.06 OTHER RELATED MATERIALS

- A. Wood Blocking: Nominal dimensioned untreated lumber used for spacing assembled Structural cells.
- B. Air Tubes:
 - 1. 1" Dia. Perforated PVC pipes, including elbows and tees per the plans.
- B. Aggregate Subbase (Below Structural cell Base):
 - 1. Aggregate meeting one of the following specifications:
 - a. Complying ASTM D1241, Type I, Gradation B; Type I mixtures shall consist of stone, gravel, or slag with natural or crushed sand and fine mineral particles passing a No. 200 sieve.

Sieve

Percent Passing

1-1/2 inches (37.5 mm) 100

ISLINGTON STREET CORRIDOR IMPROVEMENTS

1 inch (25 mm)	75 to 95
3/8 inch (9.5 mm)	40 to75
No 4 (4.75 mm)	30 to 60
No 10 (2 mm)	20 to 45
No 40 (425 µm)	15 to 30
No 200 (75 µm)	5 to 15

- b.Local Department of Transportation (DOT) virgin aggregate that most closely meets the gradation of ASTM D1241.
- c. Dense graded aggregates intended for use as granular base within the pavement structure, granular shouldering, and backfill.

Sieve	Percent Passing
26.5 mm	100 85 to 100
13.2 mm	65 to90
9.5 mm 4.75 mm	50 to73 35 to55
1.18 mm 300 um	15 to 40 5 to 22
75 μm	2 to 8

- D. Aggregate Base Course (Above Structural cell Deck):
 - 1. NHDOT Item 304.3 Crushed Gravel.
- E. Setting Bed for Unit Pavers (Above Structural cell Deck):
 - 1. NHDOT Item 304.2 50% Sand with 50% Portland Cement over:
 - 2. NHDOT Item 608.12 2" Bituminous Sidewalk
- G. Backfill Material (Adjacent to Structural cells): Clean, compactable, coarse grained fill soil free of organic material, trash and other debris, and free of toxic material injurious to plant growth.
- H. Planting Soil: Refer to Special Provision Planting Soil for Tree Root Cells.

PART 3 – CONSTRUCTION REQUIREMENTS

3.01 EXAMINATION

Page 12 of 19

ISLINGTON STREET CORRIDOR IMPROVEMENTS

- A. Examine the conditions under which the Structural cells are to be installed.
 - 1. Carefully check and verify dimensions, quantities, and grade elevations.
 - 2. Carefully examine the Drawings to become familiar with the existing underground conditions before digging. Verify the location of aboveground and underground utility lines, infrastructure, other improvements, and existing trees, shrubs, and plants to remain including their root system.
 - 3. Notify the City Representative in writing in the event of conflict between existing and new improvements, of discrepancies, and other conditions detrimental to proper and timely completion of the installation.
 - 4. Obtain written approval of changes to the Work prior to proceeding. Proceed with installation only after changes have been made and unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Take proper precautions as necessary to avoid damage to existing improvements and plantings.
- B. Prior to the start of Work, layout and stake the limits of excavation and horizontal and vertical control points sufficient to install the complete Structural cell system.
- C. Coordinate installation with other trades that may impact the completion of the Work.

3.03 TEMPORARY PROTECTION

- A. Protect open excavations and Structural cell system from access and damage both when Work is in progress and following completion, with highly visible construction tape, fencing, or other means until related construction is complete.
- B. Do not drive vehicles or operate equipment over the Structural cell system until the final surface material has been installed.

3.04 EXCAVATION

- A. General: Excavate to the depths and shapes indicated on the Drawings. Provide smooth and level excavation base free of lumps and debris.
- B. Confirm that the depth of the excavation is accurate and includes the full section of materials required to place the subbase aggregate, Structural cell, and pavement profile as indicated on the Drawings.
- C. Over-excavate beyond the perimeter of the Structural cell to allow for:
 - 1. The extension of aggregate subbase beyond the Structural cell layout as shown on the Drawings.
 - 2. Adequate space for proper compaction of backfill around the Structural cell system.
- D. If unsuitable subgrade soils are encountered, consult the City Representative for directions on how to proceed.

Page 13 of 19

ISLINGTON STREET CORRIDOR IMPROVEMENTS

E. If conflicts arise during excavation, notify the City Representative in writing and make recommendations for action. Proceed with Work only when action is approved in writing.

3.05 SUBGRADE COMPACTION

- A. Compact subgrade to a minimum of 95 percent of maximum dry density at optimum moisture content in accordance with ASTM D698, Standard Proctor Method, or as approved by the City's
- B. geotechnical representative.
- B. Do not exceed 10 percent slope for subgrade profile in any one direction. If the 10 percent slope is exceeded, contact manufacturer's representative for directions on how to proceed.

3.06 INSTALLATION OF GEOTEXTILE OVER SUBGRADE

- A. Install geotextile over compacted subgrade.
 - 1. Lay geotextile flat with no folds or creases.
 - 2. Install the geotextile with a minimum joint overlap of 18 inches (450 mm).

3.07 INSTALLATION OF AGGREGATE SUBBASE BELOW STRUCTURAL CELL BASES

- A. Install aggregate subbase to the depths indicated on the Drawings.
- B. Extend subbase aggregate a minimum of 6 inches (150 mm) beyond the base of the Structural cell layout.
- C. Compact aggregate subbase to a minimum of 95 percent of maximum dry density at optimum moisture content in accordance with ASTM D698, Standard Proctor Method.
- D. Do not exceed 10 percent slope on the surface of the subbase. Where proposed grades are greater than 10 percent, step the Structural cells to maintain proper relation to the finished grade.

3.08 INSTALLATION OF STRUCTURAL CELL BASE

- A. Install the Structural cell system in strict accordance with manufacturer's instructions and as specified herein; where requirements conflict or are contradictory, follow the more stringent requirements.
- B. Layout and Elevation Control:
 - 1. Provide layout and elevation control during installation of the Structural cell system to ensure that layout and elevations are in accordance with the Drawings.

Page 14 of 19

ISLINGTON STREET CORRIDOR IMPROVEMENTS

- C. Establish the location of the tree openings in accordance with the Drawings. Once the trees are located, mark the inside dimensions of the tree openings on the prepared subbase.
- D. Locate and mark other Project features located within the Structural cell layout (e.g. light pole bases, utility pipes). Apply marking to identify the extent of the Structural cell layout around these features. Follow the layout as shown on the Drawings to ensure proper spacing of the Structural cell bases. Refer to the Drawings for offsets between these features and the Structural cells.
- E. Check each Structural cell component for damage prior to placement. Reject cracked or chipped units.
- F. Place the Structural cell bases on the compacted aggregate subbase. Start at the tree opening and place Structural cell bases around the tree openings as shown on the Drawings.
- G. Working from tree opening to tree opening, place Structural cell bases to fill in the area between tree openings.
 - Maintain spacing no less than 1 inch (25 mm) and no more than 6 inches (150 mm) apart, assuming geotextile covering the decks meets the specifications in section 2.04 paragraph C.
- H. Follow the Structural cell layout plan as shown on the Drawings.
- I. Install Structural cell bases around, over, or under existing or proposed utility lines, as indicated on the Drawings.
- J. Level each Structural cell base as needed to provide full contact with subbase. Adjust subbase material, including larger pieces of aggregate, so each base sits solidly on the surface of the subbase. Structural cell bases that rock or bend over any stone or other obstruction protruding above the surface of the subbase material are not allowed. Structural cell bases which bend into dips in the subbase material are not allowed. The maximum tolerance for deviations in the plane of the subbase material under the bottom of the horizontal beams of each Structural cell base is 1/4 inch in 4 feet (6 mm in 1200 mm).
- K. Anchor Structural cell base with 2 spikes per base.
 - 1. For applications where Structural cells are installed over waterproofed structures, use wood blocking or similar spacing system consistent with requirements of the waterproofing system to maintain required spacing.

3.09 INSTALLATION OF STRUCTURAL CELL POSTS

- A. 2x Structural cell 2 System:
 - 1. Attach 2x posts to the installed Structural cell base. Each base will receive six 2x posts. Place the end of the post with tabs into the base. Rotate post clockwise to snap in place.]

Page 15 of 19

ISLINGTON STREET CORRIDOR IMPROVEMENTS

3.10 INSTALLATION OF STRONGBACKS, GEOGRID, BACKFILL AND PLANTING SOIL

- A. Install strongbacks on top of the Structural cell posts by snapping into place over installed posts prior to installing planting soil and backfill.
 - 1. Strongbacks are required only during the placement and compaction of the planting soil and backfill.
 - 2. Move strongbacks as the Work progresses across the installation.
 - 3. Remove strongbacks prior to the installation of the Structural cell decks.
- B. Install geogrid around the perimeter of the Structural cell system where the compacted backfill and planting soil interface.
 - 1. Do not place geogrid between the edge of the Structural cells and adjacent planting areas.
 - 2. Cut the geogrid to allow for a 6-inch (150-mm) overlap at the Structural cell base and a 12-inch (300-mm) overlap at the Structural cell deck.
 - 3. Provide a minimum 12-inch (300-mm) overlap between adjacent sheets of geogrid.
 - 4. Secure geogrid with cable ties below the top of the posts, along the post ridges.
- C. Place the first lift of backfill material loosely around the perimeter of the Structural cell system, between the geogrid and the sides of the excavation. Place backfill to approximately the midpoint of the Structural cell post. Do not compact.
- D. Place the first lift of planting soil in the Structural cell system to approximately the midpoint of the Structural cell post.
 - 1. Level the planting soil throughout the system.
 - 2. Walk-through the placed planting soil to remove air pockets and settle the soil. Do not compact greater than 80 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method.
- E. Compact the first lift of backfill material, previously spread, to 95 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method or in accordance with Project Specifications for hardscape areas, whichever is greater.
- F. Add and compact additional backfill material so that the final finished elevation is at approximately the same level of the placed planting soil within the Structural cells.
 - 1. Maintain the geogrid between the Structural cell system and the backfill material at all times.
- G. Place the second lift of backfill material loosely around the perimeter of the Structural cell system, between the geogrid and the sides of the excavation so that the material is 2 to 3 inches below the top of the posts. Do not compact.
- H. Place the second lift of planting soil inside of the Structural cell to the bottom of the strongbacks. Walk through.

Page 16 of 19

ISLINGTON STREET CORRIDOR IMPROVEMENTS

- I. Install air tubes as shown in the plans, wrapped with geotextile fabric, prior to backfilling with planting soil.
- J. Repeat process of alternately placing backfill and planting soil so that elevation of the compacted backfill and the walked-through planting soil are just below the level of the strongbacks.

3.11 INSTALLATION OF STRUCTURAL CELL DECK

- A. Obtain final approval by the City Representative of planting soil installation prior to installation of the Structural cell decks.
- B. Remove strongbacks, level out the planting soil, and immediately install decks over the posts below. Place deck over the top of the posts. Push decks down until the deck clips lock into the posts, snapping the deck into place.
- C. Fold the 12 inches (300 mm) of geogrid onto the top of the decks.

3.12 FINAL BACKFILL PLACEMENT AND COMPACTION

A. Place and compact final lift of backfill material to 95 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method, such that the backfill is flush with the top of the installed deck. Do not allow compacting equipment to come in contact with the decks.

3.13 INSTALLATION OF GEOTEXTILE AND AGGREGATE BASE COURSE OVER THE DECK

- A. Ensure geotextile meets the specifications in section 2.04 paragraph C.
- B. Place geotextile over the top of the deck and extend to the edge of the excavation. Overlap joints a minimum of 18 inches (450 mm). Leave enough slack in the geotextile for the aggregate base course to push the geotextile down in the gaps in between the decks.
- C. Install the aggregate base course (including aggregate setting bed if installing unit pavers) over the geotextile immediately after completing the installation of the fabrics. Work the aggregate from one side of the layout to the other so that the fabric and aggregate conform to the Structural cell deck contours.
- D. Maintain equipment used to place aggregate base course completely outside the limits of the Structural cell excavation area to prevent damage to the installed system.
- E. For large or confined areas, where aggregate cannot easily be placed from the edges of the excavated area, obtain approval for the installation procedure and types of equipment to be used in the installation from the Structural cell manufacturer.
- F. Compact aggregate base course(s) to 95 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method. Utilize a vibration or plate compactor with a maximum weight of 800 lbs (362.87 kg).
- G Do not drive vehicles or operate equipment over the completed aggregate base course.

Page 17 of 19

ISLINGTON STREET CORRIDOR IMPROVEMENTS

3.14 INSTALLATION OF CONCRETE CURBS AT TREE OPENINGS, AGGREGATE SUBBASE AND PAVEMENT ABOVE THE STRUCTURAL CELL SYSTEM

- A. Place reinforced concrete beams along planting areas and tree openings as shown on the Drawings to retain the aggregate base course from migrating into the planting soil and to support the tree grates.
- B. When staking concrete forms (e.g. curbs around the tree openings), prevent stakes from penetrating the Structural cell decks.
- C. Turn down edge of concrete paving to the Structural cell deck along the edges of tree openings or planting areas to retain the aggregate base course material.
- D. When paving type is a unit paver or other flexible material, provide a reinforced concrete beam curb under the paving at the edge of the Structural cell deck to retain the aggregate base course material at the tree opening.
- E. Place paving material over Structural cell system in accordance with the Drawings.
 - 1. The Structural cell system does not fully meet loading strength until the final paving is installed. Do not operate construction equipment on top of the Structural cell system until paving installation has been completed.
- F. Use care when placing paving or other backfill on top of Structural cell system to prevent damage to the Structural cell system or its components.

3.15 INSTALLATION OF ROOT BARRIERS

A. Install root barrier in accordance with manufacturer's installation instructions.

3.16 INSTALLATION OF PLANTING SOIL WITHIN THE TREE PLANTING AREA

- A. Remove rubble, debris, dust and silt from the top of the planting soil within the tree opening that may have accumulated after the initial installation of the planting soil within the Structural cells.
- B. Install additional planting soil within the tree openings, to the depths indicated on the Drawings.
 - 1. Use the same soil used within the Structural cells for planting soil within the tree openings.
- C. Compact planting soil under the tree root ball to between 85 and 90 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method, to prevent settlement of the root ball.
- D. Place trees in accordance with the Drawings and backfill with planting soil.

3.17 **PROTECTION**

Page 18 of 19

ISLINGTON STREET CORRIDOR IMPROVEMENTS

- A. Keep construction traffic away from the limits of the Structural Sub-Surface Tree Root Cells until the final pavement profile is in place. The Structural Sub-Surface Tree Root Cells does not fully meet loading strength until the final paving is installed.
 - 1. Do not operate equipment directly on top of the Structural Sub-Surface Tree Root Cell system until paving installation has been completed.
 - 2. Provide fencing and other barriers to prevent vehicles from entering into the Structural Sub-Surface Tree Root Cells area.
- B. When the Structural Sub-Surface Tree Root Cells installation is completed and the permanent pavement is in place, limit traffic and construction related activities to only loads less than the design loads.

3.18 CLEAN UP

- A. Perform clean up during installation and upon completion of the Work. Maintain the site free of soil, sediment, trash and debris. Remove excess soil materials, debris, and equipment from the site following completion of the Work of this Section.
- B. Repair damage to adjacent materials and surfaces resulting from installation of this Work using mechanics skilled in remedial work of the construction type and trades affected.

PART 4 – METHOD OF MEASUREMENT

4.01 Structural Sub-Surface Tree Root Cells will be measured as a Unit complete in place including excavation, compaction, backfill, one 2x Structural Sub-Surface Tree Root Cells 2 System as specified above, geotextile fabric, root barrier, PVC air tubes, anchor spikes and ties, geogrid wrap, crushed gravel subbase, and planting soil.

PART 5 – BASIS OF PAYMENT

5.01 The accepted quantities of Structural Sub-Surface Tree Root Cells will be paid for at the Contract unit price per Unit, complete in place, including excavation, compaction, backfill, one 2x Structural cell 2 System as specified above, geotextile fabric, root barrier, PVC air tubes, anchor spikes and ties, geogrid wrap, crushed gravel subbase, and planting soil.

Pay Items and Units

661

Page 19 of 19

ISLINGTON STREET CORRIDOR IMPROVEMENTS

Unit

Structural Tree Root Cell

END OF SECTION

661.4
1 of 9

Islington Street Corridor Improvements - Phase 2

SPECIAL PROVISION

Item 661.41- Planting Soil Mix for Structural Sub-Surface Root Zone Cell

PART 1 – GENERAL

1.01 SUMMARY

- A) Section includes:
 - 1. Labor, materials, tools, supplies, equipment, facilities, transportation and services necessary for, and incidental to performing all operations in connection with furnishing, and delivery of planting soil within the Structural Sub-Surface Root Zone Cells (Silva Cell) system and tree pits as shown on the Plans and as directed.
- B) The scope of Work in this Section includes, but is not limited to, the following:
 - 1. Locate, purchase, deliver and install imported planting soil and soil amendments.
- C) Related Requirements:
 - 1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division I Specifications, apply to Work of this Section.

1.02 REFERENCES

- A) Definitions:
 - 1. COMPACTION: The density of soil measured as oven dry weight divided by volume.
 - 2. EXISTING SOIL: Mineral soil existing at the locations of proposed planting of area designated for the installation of Silva Cells after the majority of the construction within and around the planting or Silva Cell site is completed and just prior to the start of Work to excavate the soil
 - 3. Engineer: The person or entity, employed by the Owner to represent their interest in the review of the Work.
 - 4. PED: Clump or clod of soil held together by a combination of clay, organic matter, and fungal hyphae, retaining the original structure of the harvested soil.

Islington Street Corridor Improvements - Phase 2

- 5. SCREENED SOIL: Soil that has been processed through a metal screen to remove or break apart soil peds (clumps /clods), roots, rocks and debris and remove larger physical items in the soil not permitted by the specification.
- 6. SILVA CELLS: Structural paving support system defined in Section 800.3.
- 7. SUBGRADE: Surface or elevation of subsoil remaining after completing excavation, or top surface of fill or backfill, before placing planting soil.
- B) Reference Standards:
 - 1. ASTM International (ASTM)
 - a. ASTM C33, Standard Specification for Concrete Aggregates- Fine Aggregates.
 - 2. The Soil Science Society of America.
 - a. Methods of Soil Analysis, most current edition,
 - United States Composting Council <u>www.compostingcouncil.org</u> and <u>http://compostingcouncil.org/admin/wp-</u> <u>content/plugins/wp- pdfupload/pdf/191/LandscapeArch</u> <u>Specs.pdf.</u>
 - 4. United States Department of Agriculture, Natural Resources Conservation Service.
 - a. National Soil Survey Handbook, title 430-VI.

http://www.nres.usda.gov/wps/portal/nrcs/detail/so ils/survey/?cid=nres142p2054242

1.03 SUBMITTALS

A) Action Submittals: Submit these to the Engineer for review and acceptance not less than 60 calendar days prior to start of installation of materials and products specified in this Section.

1. *Product Data:* For each type of product, submit manufacturer's product literature with technical data sufficient to demonstrate that the product meets these specifications.

- For each compost product submit the manufactures certification that the compost meets the requirements for US Compost Council STNTMECC criteria for "Compost as a Landscape Backfill Mix Component" and other requirements of the Specification.
- b. For coarse sand product submit the following analysis by a recognized laboratory:

3 of 9

Islington Street Corridor Improvements - Phase 2

- 1. pH
- 2. Manufactures Fines Modulus Index
- 3. Particle size distribution (percent passing the following sieve sizes):

3/8inch	(9.5 mm)
No 4	(4.75 mm)
No 8	(2.36 mm)
No 16	(1.18mm)
No 30	(0.60 mm)
No 50	(0.30 mm)
No 100	(0.15 mm)

- 2. Test and Evaluation Reports: (0.13 mm) No 200 (0.13 mm)
 - a. Include analysis of bulk materials including soils and aggregates, by a recognized laboratory that demonstrates that the materials meet the Specification requirements.
 - b. Submit required soil test analysis report for each sample of imported topsoil, existing site soil, and planting soil mixes from an approved soil-testing laboratory as follows:
 - 1. Do not submit planting soil mixes, for testing until all topsoil, compost, and coarse sand have been approved.
 - 2. If tests fail to meet the Specifications, obtain other sources of material, retest and resubmit until accepted by the Engineer.
 - 3. All testing shall be performed following the requirements of *Methods of Soil Analysis*, The Soil Science Society of America.
 - 4. Provide a particle size analysis (percent dry weight) and USDA soil texture analysis. Soil testing of planting soil mixes shall also include USDA gradation distribution of gravel, coarse sand, medium sand, and fine sand in addition to silt and clay. Reports of particle size distribution shall use USDA size nomenclature and analysis protocols.
 - 5. Provide the following other soil properties:
 - a. pH and buffer pH
 - b. Percent organic content by oven dry weight

c. Nutrient levels by part per million including: phosphorus, potassium, magnesium, manganese, iron, zinc, and calcium. Nutrient test shall include the testing laboratory recommendations for supplemental additions to the soil for optimum growth of the plantings specified. Soluble salt by electrical conductivity of a 1:2 soil water sample measured in Milliohm per cm.

- 3. Samples:
 - a. Each sample shall be double bagged packaged in two plastic zip lac style bags. Each bag shall be clearly marked with the project name,

Islington Street Corridor Improvements - Phase 2

date, contractors name and telephone number, and product name.

- b. Samples of all existing site soil, topsoil, coarse sand and, compost and planting soil mixes shall be submitted at the same time as the particle size and physical analysis of that material.
- c. Samples of the existing site soil that are under existing pavement to be removed may be submitted as soon as possible after the paving is removed.
- d. Samples will be reviewed for appearance only.
- e. Provide samples for the following products.
 - 1. One-gallon (3.79-liter) sample of each type of existing site soil prior to adding amendments.
 - 2. One-gallon (3.79-liter) sample of imported topsoil.
 - 3. One-gallon (3.79-liter) sample of bio-retention topsoil.
 - 4. One-gallon (3.79-liter) sample of compost.
 - 5. One-gallon (3.79-liter) sample of bio-retention compost.
 - 6. One-gallon (3.79-liter) sample of coarse sand.
 - 7. One-gallon (3.79-liter) sample of unscreened planting soil mix.
 - 8. One-gallon (3.79-liter) sample of screened planting soil mix.
 - 9. One-gallon (3.79-liter) sample of bio-retention soil mix.
- 4. Qualification Statements:
 - a. Soil supplier:

1. Submit documentation of the qualifications of the planting soil supplier and their field supervisor, sufficient to demonstrate that both meet the requirements specified in Article 1.04 QUALITY ASSURANCE.

2. Submit list of completed projects of similar scope and scale demonstrating capabilities and experience.

1.04 QUALITY ASSURANCE

- A. Weather: Do not mix or deliver soil when frozen or muddy.
- B. Protect soil and soil stockpiles, from wind, rain and washing that can erode soil or separate fines and coarse material, and contamination by chemicals, dust and debris that may be detrimental to plants or soil drainage. Confine delivered materials to neat piles in areas coordinated with the site supervisor. Cover stockpiles with plastic sheeting or fabric at the end of each Workday.

Islington Street Corridor Improvements - Phase 2

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Weather: Do not mix or deliver soil when frozen or muddy.
- B. Protect soil and soil stockpiles, from wild, rain, and washing that can erode soil or separate fines and coarse material, and contamination by chemicals, dust and debris that may be detrimental to plants or soil drainage. Confine delivered materials to neat piles in areas coordinated with the site supervisor. Cover stockpiles with plastic sheeting or fabric at the end of each Workday.
- C. All manufactured packaged products and material shall be delivered to the site in unopened containers and stored in a dry enclosed space suitable for the material and meeting all environmental regulations.

1. Biological and chemical additives shall be protected from extreme humidity, cold, or heat. All products shall be freshly manufactured and dated for the year in

which the products are to be used. Chemical amendments shall have original

labels intact and legible, stating the guaranteed chemical analysis.

PART 2 PRODUCTS

2.01 TOPSOIL

- A. Imported topsoil: Fertile, friable soil loam topsoil suitable for the germination of seeds and the support of vegetative growth meeting the following criteria:
 - 1. Soil texture: USDA loam, sandy clay loam or sandy loam with clay content between 15 and 35 percent; a combined clay/silt content of no more than 60 percent; and sand between 35 and 65 percent.
 - 2. Except where noted, imported topsoil shall NOT have been screened and shall retain soil peds (clumps/clods) larger than 2 inches (50 mm) in diameter throughout the stockpile after harvesting.
 - a) Light screening through a 2-inch (50 mm) square or larger opening will be permissible in soils with clay content of 20 percent or greater if required to break up large peds (clumps/clods) or remove coarse roots and stones.
 - b) Retained soil peds (clumps/clods) shall be the same color on the inside as is visible on the outside surface of the ped.
 - 3. Soil objects larger than 1/4 inch (6.24 mm) in diameter: Imported topsoil

6 of 9

Islington Street Corridor Improvements - Phase 2

shall contain less than 5 percent total volume of the combination of all objects 1 to 8 inch (25 mm to 200 mm) in their largest dimension including clumps/clods of heavy clay, sandy clay or silty clay subsoil, debris, refuse, roots, stones, sticks, brush, and or litter. The soil shall contain less than 8 percent by volume total of the above objects 1/4 inch to 1 inch (6.24 mm to 25 mm) in diameter. Remove all objects larger than 8 inch (200 mm) in its longest dimension.

a) Meet the above requirement by utilizing acceptable soils sources rather than soil screening.

- 4. Imported topsoil may be a harvested soil from fields or development sites or purchased from suppliers who collect and process soil. The organic content and particle size distribution shall be the result of natural soil formation. Manufactured soils where sand, composted organic material or other additives have been added to the soil to meet the requirements of imported topsoil shall not be acceptable.
- 5. pH value shall be between 5.0 and 7.0.
- 6. Percent Organic Matter (OM): 3 to 5 percent, by dry weight
- 7. Soluble Salt Level: Less than 2 mmho/cm.
- 8. Soil nutrient chemistry suitable for growing the plants specified or after modification.
- 9. Germinating seedlings from seeds in the soil shall be removed within one month of germination whether during the period the soil is being stored or after installation, including during the warranty period of the plants.
- B. Stockpiled existing topsoil at the site meeting the above criteria may be acceptable.
- C. Submittal Requirements: Provide a one-gallon(3.79-liter) sample from each imported topsoil source with required soil testing results. The sample shall be a mixture of the random samples taken around the source stockpile or field. The soil sample shall be delivered with soil peds (clumps/clods) intact that represent the size and quantity of expected peds(clumps/clods) in the final delivered soil. The sample shall represent the expected number of objects larger than1/4 inch(6. 24 mm).

2.02 COMPOST

7 of 9

Islington Street Corridor Improvements - Phase 2

A. Compost: Blended and ground leaf, wood and other plant-based material, composted for a minimum of 9 months and at temperatures sufficient to break down woody fibers, seeds and leaf structures, free of toxic material at levels that are harmful to plants or humans. Compost feed stock shall be yard waste trimmings, blended with other plant and or manure feed stock designed to produce compost high in fungal material.

1. Compost shall be commercially prepared compost and meet US Compost Council STA/TMECC criteria or as modified in this Section for "Compost as a Landscape Backfill Mix Component".

http://compostingcouncil.org/admin/wp-content/plugins/wppdfupload/pdf191/LandscapeArch_Specs.pdf

2. Submittal Requirements: Provide one-gallon(3.79-liter) sample with manufacturer's literature and material certification that the product meets the requirements.

2.03 COARSE SAND

A. Clean, washed, natural sand, free of toxic materials.

1. Coarse concrete sand, ASTM C33 Fine Aggregate, with a Fines Modulus Index of 2.8 and 3.2.

2. Coarse sand, free of limestone, shale and slate particles. Manufactured Sand shall not be permitted.

- 3. pH shall be lower than 7.0.
- 4. Provide coarse sand with the following particle size distribution:

Sieve	Percent	<u>passing</u>
3/8 inch(9. 5 r	nm)	100
No 4(4.75 mr	n)	95 to100
No 8(2.36 mr	n)	80 to100
No16(1.18 m	าฑ์)	50 to 85
No 30(0.60 m	nm)	25 to 60
No 50(0.30 m	nm)	10 to 30
No100(0.15	mḿ)	2 to10
No 200(0.75	mm)	2 to 5

B. Submittal Requirements: Provide a one-gallon sample with manufacturer's

Islington Street Corridor Improvements - Phase 2

literature and material certification that the product meets the requirements.

2.04 FERTILZIER

A. If noted by the soil test recommendations, add slow-release, organic fertilizer based on soil test and plant requirements.

B. Submittal Requirements: Provide manufacturer's literature that the product meets the requirements.

2.05 UNSCREENED PLANTING SOIL MIX

A. A mixture of imported topsoil, coarse sand, and compost as specified above shall be blended to make a new soil that meets the Project goals for use within the Structural Tree Root Cells (Silva Cells).

1. The approximate mix ratio of imported topsoil, coarse sand and compost shall be:

Mix component	Percent	by moist volume
Imported topsoil unscree	ened	50 to 60 percent
Coarse sand		30 to 40 percent
Compost		10 to 15 percent

2. Final Tested Soil Organic Matter (OM): 2.75 to 4 percent (by dry weight loss ash burn).

B. Mix the coarse sand and compost together first and then add to the topsoil. Mix with a loader bucket to loosely incorporate the topsoil into the coarse sand/compost Mix. DO NOT

OVER MIX. Do not mix with a soil-blending machine. Do not screen the soil. Peds (clumps/clods) of Soil, and loosely mixed Compost and coarse sand will be permitted in the overall mix.

C. At the time of soil installation, add fertilizer or biological amendments, if required, to the planting soil mix at rates recommended by the testing results for the plants to be grown.

D. Submittal Requirements: Provide a one-gallon sample with testing data that includes recommendations for chemical additives for the types of plants to be grown. Samples and testing data shall be submitted at the same time. The sample shall be a mixture of the random samples taken around the source stockpile or field. The sample shall be delivered with soil peds (clumps/clods) intact that represent the size and quantity of expected peds (clumps/clods) in the final delivered soil mix.

PART 3 – CONSTRUCTION REQUIREMENTS

9 of 9

Islington Street Corridor Improvements - Phase 2

3.01 INSTALLATION OF PLANTING SOIL IN STRUCTURAL SUB-SURFACE ROOT CELLS

A. Refer to the Special Provision for 600 – Incidental Construction, Section 661.4 Structural Sub-Surface Root Zone Cell for construction requirements.

PART 4 – METHOD OF MEASUREMENT

4.01 Planting Soil will not be measured separately, but will be included with the unit measure for Structural Sub-Surface Root Zone Cell.

PART 5 – BASIS OF PAYMENT

5.01 Planting Soil will not be paid for separately but will be included in the unit price bid for Structural Tree Root Cells.

END OF SECTION

ISLINGTON STREET CORRIDOR IMPROVEMENTS

S P E C I A L P R O V I S I O N Amends Division 600 – Incidental Construction ITEM 661.5 – BICYCLE RACK

Description

1.1 This work shall consist of furnishing and installing bicycle racks as shown on the plans, as described below and as directed.

Materials

2.1 GENERAL

- A. Bicycle racks shall be the ground mounted U/2 Inverted-U Rack Vintage Racks, "Plymouth" model, as manufactured by Cycle-Safe, Inc., 4630 Ada Drive, Suite B, Ada, MI 49301, (888)-950-6531, or approved equal. Finish shall be "Traffic Black" powder coated. Unit is a direct burial style rack.
- B. Concrete shall meet the requirements of Section 520, Class B and will be subsidiary to this item.

Construction Requirements

- 3.1 GENERAL
- 3.2
- A. The Contractor shall submit manufacturer's descriptive literature for materials specified and shop drawings showing procedures for installation of units.
- B. Material damaged due to the Contractor's negligence shall be replaced with new materials at the Contractor's expense.
- C. Concrete shall be placed in accordance with Section 520.

Method of Measurement

4.1 Bicycle Racks will be measured per each complete in place.

Basis of Payment

5.1 The accepted quantity of Bicycle Racks will be paid at the Contract Unit Price per each, complete in place including all materials, labor, equipment including mounting hardware and concrete where not mounted in existing or new concrete sidewalk.

Pay Item	Description	Units
Item 661.5	BICYCLE RACK	Each

ISLINGTON STREET CORRIDOR IMPROVEMENTS

S P E C I A L P R O V I S I O N Amends Division 600 – Incidental Construction ITEM 661.6 – BENCH

Description

1.1 This work shall consist of furnishing and installing benches as shown on the plans, as described below and as directed.

Materials

2.1 GENERAL

A. Benches shall be manufactured by Victor Stanley, Inc., or approved equal, Type: Model C-10, 6' long from the Classic Series to match typical City of Portsmouth bench standard. Slats shall be Ipe, Philippine mahogany. Color to match City of Portsmouth standard. Benches shall be fastened to concrete with minimum 3/8" stainless steel anchor stud with nut.

Manufacturer: Victor Stanley, Inc. P.O. Drawer 330 Dunkirk, MD 20754 USA Toll Free: (800) 368-2573 (USA & Canada) Tel: (301) 855-8300 Fax: (410) 257-7579 E-mail: sales@victorstanley.com Web site: http://www.victorstanley.com

B. Concrete shall meet the requirements of Section 520, Class B and will be subsidiary to this item.

Construction Requirements

3.1 GENERAL

3.2

- A. The Contractor shall submit manufacturer's descriptive literature for materials specified and shop drawings showing procedures for installation of units.
- B. Material damaged due to the Contractor's negligence shall be replaced with new materials at the Contractor's expense.

Method of Measurement

ISLINGTON STREET CORRIDOR IMPROVEMENTS

4.1 Benches will be measured per each complete in place.

Basis of Payment

5.1 The accepted quantity of Benches will be paid at the Contract Unit Price per each, complete in place including all materials, labor, equipment including mounting hardware and concrete foundation.

Pay Item Item 661.6 Description BENCH

<u>Units</u> Each

ISLINGTON STREET CORRIDOR IMPROVEMENTS

S P E C I A L P R O V I S I O N ITEM 661.7 – TRASH RECEPTACLE

Description

1.1 This work shall consist of furnishing and installing trash and recycling receptacles as shown on the plans, as described below and as directed.

Materials

2.1 TRASH AND RECYCLING RECEPTACLES

- A. Units shall be manufactured by Landscape Forms, Inc. 431 Lawndale Avenue, Kalamazoo, MI 49048, (800)-521-2546 also (269)-381-0396., or approved equal,
- B. Trash receptacle shall be Scarborough Series Model #12 93 23 single use, side opening.
- C. Recycling receptacle shall be Scarborough Series Model #12 93 23 dual use (aluminum cans & plastic), side opening.
- D. Units shall be fastened to concrete with 7/16" anchor stud with nut.
- E. Concrete, if receptacles are not mounted in existing or new sidewalk, shall meet the requirements of 608.25 and will be subsidiary to these items.

Construction Requirements

3.1 GENERAL

- A. The Contractor shall submit manufacturer's descriptive literature for materials specified and shop drawings showing procedures for installation of units.
- B. Material damaged due to the Contractor's negligence shall be replaced with new materials at the Contractor's expense.
- C. Concrete shall be placed in accordance with Section 608.25.

Method of Measurement

4.1 Tash and Recycling Receptacles will be measured per each complete in place.

661

ISLINGTON STREET CORRIDOR IMPROVEMENTS

Basis of Payment

5.1 The accepted quantity of Tash and Recycling Receptacles will be measured per each complete in place including all mounting hardware and concrete where not mounted in existing or new sidewalk.

Pay Item	Description	
Item 661.7	TRASH RECEPTACLE	Each

661

ISLINGTON STREET CORRIDOR IMPROVEMENTS

SPECIAL PROVISION

Item 661.62 – Granite Block Bench, 10 FT Long

This Special Provision provides for the supply and installation of benches made of granite blocks.

Description

- **1.1** This work shall consist of furnishing and installing 10 foot-long granite block benches in locations shown on the plans and fabricated from Kitledge gray granite with surface finishes as shown on plans.
- **1.2** Common excavation performed to the depth specified in the plans is included in this work.

Materials

- 2.1. Absorption of natural building stone: ASTM C97. Compressive strength of natural building stone: ASTM C170. Modulus of rupture of natural building stone: ASTM C99. Free from seams that impair its structural integrity and of smooth splitting character. Natural variations characteristic of the deposit will be permitted. "Caledonia" granite type. Shall comply with the requirements of the National Building Granite Quarries Association, Inc. for tolerances, color, and finished qualities. Refer to project drawings for size of all granite units. All granite shall have surface finishes of exposed sides as identified in the drawings, finish on all exposed sides.
- **2.2.** Reinforcing steel: New billet steel deformed bars shall conform to the requirements of ASTM A615, Grade 40, latest edition and deformations shall conform to ASTM A305, latest edition. All steel shall be epoxy-coated in conformance with ASTM A775, latest edition unless otherwise noted on the drawings. Steel accessories and hardware: All accessories, dowels and hardware shall be stainless steel conforming to AISI type 304 and ASTM A193 latest edition unless indicated differently on the approved drawings.
- **2.3.** Grout shall be non-shrinking, non-metallic, non-staining.

ISLINGTON STREET CORRIDOR IMPROVEMENTS

2.4. Clear masonry sealer shall be a mineral gum in volatile thinner liquid sealer containing approximately 7% solids.

Construction Requirements

- **3.1** Construct all site masonry items as shown on the drawings and in conformance with approved samples and approved shop drawings.
- **3.2** All masonry work shall be constructed by skilled workers with a minimum of five (5) years experience on similar projects and under adequate supervision, and shall be constructed true to lines and grades and plumb.
- **3.3** Contractor shall check dimensions shown on contract drawings at the site by accurate field measurements before final submittal of shop drawings and before final fabrication of masonry work. The Contractor shall coordinate installation tolerances to ensure proper fit of final masonry work.
- **3.4** The Contractor shall review installation procedures and sequence to ensure proper coordination with other subcontractors and suppliers whose work is affected by the delivery schedule and installation of masonry work.
- 3.5 The Construction tolerances for masonry work are as stated below. This will apply to exposed surfaces of work that is installed.
 3.5.1 Variation from plumb must not exceed one-eighth inch in ten feet.
 3.5.2 Variation from level must not exceed one-eighth inch for individual grades or one-eighth inch in ten feet for level line.
- **3.6** Bottoms of all pieces to be set in mortar shall be sawn. Maximum variation from dimensions shown on approved shop drawings that drawn shall not exceed one-half inch. Mortar contact surfaces shall be cleaned of all rust stains and iron particles.
- **3.7** The Contractor must clean stone before setting by scrubbing with fiber brushes followed by a thorough drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh fillers or abrasives.
- **3.8** The Contractor shall use anchors, supports, fasteners and other attachments shown, specified or necessary to secure work in place in accordance with the very best practices of the trades. The Contractor shall shim and adjust accessories as required for proper setting of stone, and completely fill holes, slots and other

ISLINGTON STREET CORRIDOR IMPROVEMENTS

sinkages for anchors, dowels, fasteners and supports with non-shrinking, non-staining mortar during setting.

- **3.9** The Contractor must protect masonry work against freezing when ambient temperature is 40°F and falling.
- **3.10** The Contractor must not build on frozen work; remove and replace masonry work damaged by frost or freezing.
- **3.11** The Contractor must clean masonry work not less than six days after completion of work, using clean water and stiff-bristle brushes. Do not use wire brushes, acid-type cleaning agents or other cleaning compounds with caustic or harsh fillers. Starting at the top, remove all dirt and excess mortar, stains or other blemishes. Clean all work in accordance with the manufacturer's instructions.

Method of Measurement

4.1 The granite block bench shall be measured as a unit, inclusive of all accessories, closing and connecting devices and appurtenances.

Basis of Payment

5.1 The accepted quantities of granite block benches will be paid for at the Contract unit price complete in place. This unit price shall include the cost of furnishing all labor, tools, and equipment to satisfactorily complete the work and shall include fabrication and placement.

5.1.1 Mortar setting bed, steel dowels and non-shrink grout shall be subsidiary.

- **5.2** Crushed Gravel (F) will be paid for under item 304.3.
- **5.3** Common Excavation will be paid for under item 203.1.
- 5.4 Concrete Class A will be paid under item 520.1.
- **5.5** Reinforcing steel will be paid under item 544.1.
- 5.6 Stone dust surfacing will be paid under item 304.754.

Pay Items and Units

Item 661.62 – Granite Block Bench, 10 FT Long

Page 4 of 4

ISLINGTON STREET CORRIDOR IMPROVEMENTS

END OF SPECIAL PROVISION

Page 1 of 3

ISLINGTON STREET CORRIDOR IMPROVEMENTS

SPECIAL PROVISION

Item 665.17 – Light Pole with Fixture

Description

1.1 This work shall consist of furnishing and installation of light poles with fixtures as shown on the plans.

Materials

2.1 The contractor shall use all new materials of high quality. The contractor shall submit product specifications for approval.

2.2 Light Pole

2.2.1 Manufacturer: Spring City Electrical Mfg. Co.

Spring City, PA 19475 Phone (610) 948-4000 www.Springcity.Com or approved equal.

Lamp Post Specifications

Style:	HANCOCK (INTERIOR ANCHOR BOLTS)
Height:	10'-2"
Base:	16" DIAMETER
Material:	PLEASE SEE QUANTITY
Finish:	PRIME PAINT THEN FINISH PAINT, SHERWIN WILLIAMS
	ACROLON CLASSIC - BLACK
Access Door:	LOCATED IN BASE SECURED WITH TAMPER PROOF
	HEX SOCKET SECURITY MACHINE SCREWS
Ground Provisions:	DRILL AND TAP INSIDE WALL OF BASE OPPOSITE ACCESS
	DOOR
	1/4"-20 TO ACCOMMODATE GROUND STUD (STUD BY
	OTHERS)
Anchor Bolts:	(4) 3/4" DIA. X 24" LONG + 3" HOOK (FULLY GALVANIZED
	WITH 1
	GALVANIZED NUT AND 1 OVERSIZED GALVANIZED
	WASHER PER BOLT)
Bolt Projection:	3" REQUIRED
Tenon:	2 7/8" DIA. X 3 1/2" HIGH
Catalog No	
Post:	DPSHNC-16-10.17-2.88/3.50-CB
Anchor Bolts	323/1NW-OW

ISLINGTON STREET CORRIDOR IMPROVEMENTS

2.2.2 Installed poles shall be free of leaks, warps, dents, juts, paint imperfections or other faults that are a result of poor workmanship in installation.

2.3 Light Fixture

2.3.1 Manufacturer:

Newstamp Lighting, Co. 227 Bay Road N. Easton, MA 02356

Or approved equal.

2.3.2 Product: Portsmouth Style solid copper fixture Catalog Number: #RS-TUR-177 (per City of Portsmouth specification used with 2 compact fluorescent lamps [lamps by others]) Height: 48" Finish: Satin black

2.3.3 Installed fixtures shall be free of leaks, warps, dents, juts, paint imperfections or other faults that are a result of poor workmanship in installation.

Construction Requirements

- **3.1** Contractor shall perform all work to be in conformance with local and national code requirements.
- **3.2** Before installing any of the work, the Contractor shall see that it does not interfere with the existing or proposed underground utilities or other fixed elements. Work installed by the Contractor which interferes with or modifies the design as shown on the Contract Drawings shall be changed as directed by the Owner's Representative, and all costs incidental to such changes shall be paid by the Contractor.
- **3.3** In any and all cases of discrepancy in figures, plans or specifications the matter shall be immediately submitted to the Owner's Representative for decision.
- **3.4** Bases, poles and luminaries shall be installed in accordance with the manufacturers' recommendation and the construction drawings.

Method of Measurement

4.1 Light pole will be measured by the number of each unit installed.

Page 3 of 3

ISLINGTON STREET CORRIDOR IMPROVEMENTS

Basis of Payment

5.1 Payment for the light poles will be full compensation for all labor, equipment, tools, supervision, and materials necessary to complete the work associated with construction and installation of the Light Poles and Fixtures as shown on the Plans and specified herein. The work shall include, but not be limited to coordination with related works of other trades, shop drawings, procurement of material, delivery of material, excavation, backfilling, tree trimming, hardware, and all other work required to complete the light pole installation not paid for under other items as specified herein.

Pay Item and Unit:

665.17 Light Pole with Fixture

EA

END OF SECTION

Section 692 1 of 2 Islington Street Corridor Improvements Portsmouth, NH

AMENDMENT TO NHDOT SPECIFICATIONS

Section 692 – Mobilization

Basis of Payment

Amend section 1.1 by adding the following to the end of the first paragraph:

"No separate payment will be allowed for mobilizing for night work. Any mobilization required for night work shall be included in the Bid price."

Add section 1.2:

1.2. This item shall also consist of development of a preconstruction video. Two (2) copies of the video, on a flash drive, which can be clearly viewed on a computer, must be submitted to the Owner prior to the start of construction. The video shall include roadways and adjoining properties, driveways, fences, landscaping, etc.' that may be impacted by construction in this contract. The intent of this video is to document the condition of the roadway and abutting properties prior to construction.

Delete and **Replace** Paragraph 5.1 with the following:

- **5.1** Partial payments for this item will be made as follows:
- (a) When 5% of the original contract is earned, the accumulated total to be paid will be 25% of the amount bid, or 1-1/4% of the original Contract amount, whichever is lesser.
- (b) When 10% of the original contract amount is earned, the accumulated total to be paid will be 50% of the amount bid, or 2-1/2% of the original Contract amount, whichever is the lesser.
- (c) When 25% of the original contract amount is earned, the accumulated total to be paid will be 70% of the amount bid, or 3-1/2% of the original Contract amount, whichever is the lesser.
- (d) When 50% of the original contract amount is earned, the accumulated total to be paid will be 100% of the amount bid, or 5% of the original Contract amount, whichever is the lesser.
- (e) When work is considered substantially complete, the accumulated total to be paid will be 100% of the amount bid, or 5 percent of the original Contract amount, whichever is the lesser.

Section 692 2 of 2 Islington Street Corridor Improvements Portsmouth, NH

Delete and **Replace** Paragraph 5.2 with the following:

5.2 Upon completion of all work, payment of any amount bid for this item more than **5** percent of the original Contract amount will be paid.

Basis of Payment

Replace pay items and units the following:

692A	Mobilization (Base Bid)	Unit
692B	Mobilization (Add Alternate #1)	Unit

June 27, 2022

SPECIAL ATTENTION

ASPHALT CEMENT ADJUSTMENT AND ASPHALT CEMENT ADJUSTMENT FOR EMULSION

Bid items involving asphalt concrete mixtures containing asphalt cement may be subject to a price adjustment. Only the asphalt portion of asphalt-rubber cement will be eligible for price adjustment. The adjustment will take effect when the monthly price for asphalt cement as furnished by the Department differs from the base price contained in the proposal. Affected Sections and formulas are detailed below.

The <u>base price</u>* of asphalt cement for this Contract is \$<u>800.00</u> per ton.

The **monthly price*** of asphalt cement used to determine the Asphalt Cement Adjustment will be furnished by the Department and will be posted on the following web site: www.nh.gov/dot/org/projectdevelopment/construction/documents/MonthlyFuelPricesImperial.pdf

***Source**: The monthly price, applicable for the entire month, is developed from information in the *Asphalt Weekly Monitor*, a publication from Poten and Partners, Inc. The monthly price will be the average of the price range for Southern Maine/New Hampshire PG 64-28 asphalt binder, as published in the *Asphalt Weekly Monitor* on the dates shown in the following table. The base price is the latest available monthly price at the time the contract documents are prepared.

2022						
Month	Publication Date	Month	Publication Date	Month	Publication Date	
January	December 27, 2021	May	April 25, 2022	September	August 22, 2022	
February	January 24, 2022	June	May 23, 2022	October	September 26, 2022	
March	February 21, 2022	July	June 27, 2022	November	October 24, 2022	
April	March 21, 2022	August	July 25, 2022	December	November 21, 2022	

The contract prices of bituminous materials will be paid under the respective items in the contract. The price adjustment, as provided herein, upwards or downwards, will be made concurrently as the work is accomplished as follows:

Item 403.__ - Pavement (except items 403.4, 403.16, & 403.26) and Item 411.__ - Hot Bituminous Concrete Leveling Course and Plant Mix Surface Treatment

The price adjustment will be based on the percent of virgin asphalt cement stated in the Approved Mix Design containing the maximum percentage of reclaimed asphalt pavement. In the event of breakdown or unforeseen circumstances other than weather, an Approved Virgin Mix Design may be used. The price adjustment will then be based on the total percent of virgin asphalt cement in that approved design.

A contract adjustment will be made under **Item 1010.2** based on; [monthly price minus the base price] X [Approved Mix Design percent of virgin asphalt cement] X [tons of pavement used].

SSD: 3/31/14, 7/30/75, 5/9/83, 12/5/84, 2/12/92, 10/19/93, 5/9/94, 1/26/95, 12/30/96, 02/24/97, 12/08/08, 4/15/09, 01/01/12, 04/16/12, 03/24/15, 01/15/16, 02/21/16, 07/28/16, 04/21/17 08/22/17, 12/24/18, 12/23/19, 04/08/20, 12/14/20

Item 410.72 - Chip Seal Surface Treatment Rubber Polymerized

A contract adjustment will be made under **Item 1010.2** based on; [monthly price minus the base price] X [asphalt factor] X [tons of AC used] where:

Assumptions:

- Asphalt factor equals 82%
- Tons of AC used equals the total number of gallons sprayed divided by 235

Item 419.1___ - Bonded Wearing Course

A contract adjustment will be made under **Item 1010.2** based on; [monthly price minus the base price] X [Total AC in the BWC process percent] X [tons of BWC paved] where:

Assumptions:

• Total AC in the BWC process equals 5%

Item 419.2___ – AR Bonded Wearing Course

A contract adjustment will be made under **Item 1010.2** based on; [monthly price minus the base price] X [Total AC in the AR BWC process percent] X [asphalt factor] X [tons of BWC paved] where:

Assumptions:

- Total AC in the BWC process equals 5%
- Asphalt factor equals 82%

Emulsified Asphalt Cement [For Items 306.33, 405.__, 410.__ (excluding 410.22, 410.72 & 410.75_), 418.11__ , 418.32, and 419.3]

A contract adjustment will be made under **Item 1010.21** based on; [monthly price minus the base price] X [percent of residual asphalt cement] X [Tons of Emulsion used].

Assumptions:

- Quantities are assumed to be measured at 60° F
- Volume reduction between typical delivery temperature $(+/-140^{\circ} \text{ F})$ and 60° F is 2%
- Adjustment payment assumes 62% Residual Asphalt for all grades
- 239 Gallons/Ton is the unit conversion at 60° F

Item 1010.2	Asphalt Cement Adjustment ¹	Dollar
Item 1010.21	Asphalt Cement Adjustment for Emulsion ¹	Dollar

When no item for Asphalt Cement Adjustment and/or Asphalt Cement Adjustment for Emulsion is included in the contract no adjustments will be made.

¹ Not a bid item

June 28, 2022

SPECIAL ATTENTION

FUEL ADJUSTMENT

- (a) The shortage of all products in relation to the national and worldwide energy situation has made future costs of fuel unpredictable. For this reason, a price adjustment clause is being inserted in this contract to provide for either additional compensation to the Contractor or payment to the State, depending upon an increase or decrease in the price of fuel.
- (b) The fuel usage factors, which will be applied to the several items of the Contract shall be those set forth in Table 1.
- (c) Price adjustment will be based upon the quantity of fuel incorporated in the work as determined by the factors in Table 1.
 - When the monthly sales price determined per paragraph (f) is more than 110% of the fixed base price set forth in paragraph (e), a contract adjustment will be made under Item 1010.15 based on: [monthly sales price less 110% of the fixed base price] multiplied by [item quantity eligible for payment during month] multiplied by [fuel factor].
 - When the monthly sales price determined per paragraph (f) is less than 90% of the fixed base price set forth in paragraph (e), a contract adjustment will be made under Item 1010.15 based on: [monthly sales price less 90% of the fixed base price] multiplied by [item quantity eligible for payment during month] multiplied by [fuel factor].
- (d) The Contractor warrants that its bid prices for this Contract include no allowances for any contingency to cover increased costs for which adjustment is provided herein.
- (e) The fixed base price of fuel will be $\frac{4.9410}{2}$ per gallon.
 - This price is used solely to compute price adjustments. The fuel price will be the lower bulk retail price of **ultra low sulfur diesel fuel** for Boston as published by OPIS (Oil Price Information Service) in the Oil Price Daily, formerly known as the Journal of Commerce, and will include current Federal and State taxes.

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Page 2 of 3

2022					
Month	Publication Date	Month	Publication Date	Month	Publication Date
January	December 27, 2021	May	April 25, 2022	September	August 22, 2022
February	January 24, 2022	June	May 23, 2022	October	September 26, 2022
March	February 21, 2022	July	June 27, 2022	November	October 24, 2022
April	March 21, 2022	August	July 25, 2022	December	November 21, 2022

(f) The <u>monthly sales price</u> of fuel will be determined by the Department based on the following schedule:

Monthly sales prices will be set in the same manner as indicated in paragraph (e).

- (g) When an adjustment is called for as provided in paragraph (c), the monthly sales price determined in paragraph (f) will be used for work accomplished in the following month.
- (h) No price adjustment will be allowed beyond the Project completion date unless there is a Department-approved extension of time. Price adjustments <u>will</u> be made on quantities adjusted as a result of the final audit.
- (i) The Department will not be responsible for computing or otherwise indicating price adjustments except to the prime contractor, which must make its own arrangements with its subcontractors.
- (j) When no item for Fuel Adjustment is included in the Contract no adjustments will be made.

Pay item and unit:

1010.15 Fuel Adjustment¹

\$

¹ Not a bid item.

APPENDIX A

GEOTECHNICAL ENGINEERING REPORT



May 12, 2017

Consulting Engineers and Scientists

Project 161.05003

Mr. Gregory L. Bakos, P.E. Vanasse, Hangen Brustlin, Inc. 2 Bedford Farms Drive, Suite 200 Bedford, New Hampshire 03110

RE: Geotechnical Engineering Report Islington Street Project Portsmouth, New Hampshire

Dear Mr. Bakos:

Ransom Consulting, Inc. (Ransom) is pleased to provide this geotechnical engineering report for Vanasse Hangen Brustlin, Inc. (VHB) in support of the Islington Street Improvements planned for Portsmouth, New Hampshire. This evaluation was performed in general accordance with our proposal for services (dated January 12, 2015 as amended, reference number P161.05003) for City of Portsmouth Request for Proposal (RFP) 14-15. Figure 1 of this report is a Site Location Map that illustrates the location of the project area on a 7.5-minute topographic quadrangle map.

The purpose of this geotechnical evaluation was to determine the geotechnical subsurface conditions along the proposed utility alignment, and provide recommendations for design and construction of the proposed utilities. Ransom is preparing an environmental evaluation of the soils that will be excavated during construction; the environmental report will be submitted under separate cover.

PROJECT DESCRIPTION

The overall project consists of installing new underground utilities along 5,400 linear feet of the Islington Street Corridor (Figure 1). The corridor begins at the Islington Street overpass over U.S. Route 1 Bypass (Station 100+00) to the intersection of Islington Street and Maplewood Avenue (Station 154+50). The new utility lines will consist of manholes and sanitary sewer lines, catch basins and stormwater lines, and new water lines. We have assumed that the underground utilities will be constructed using cut-and-cover methods.

In addition to the underground utility lines, new traffic signals are planned for the intersections of Islington Street with Bartlett Street and with Cabot Street. We have included the boring locations based on the project design sheets ("Utilities Plan & Profile, Islington Street, City of Portsmouth, Portsmouth, New Hampshire," dated 06/08/2016, as prepared by Underwood Engineers, Inc. of Portsmouth, New Hampshire).

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SUBSURFACE INVESTIGATION

Ransom performed the subsurface explorations for this geotechnical investigation between March 20 and 23, 2017. The subsurface exploration program consisted of 28 test borings drilled by Miller Engineering & Testing, Inc. of Manchester, New Hampshire using a truck-mounted Diedrich Model D-50 drill rig with a 2¼-inch, inside-diameter, hollow-stem auger. Split-barrel sampling with standard penetration testing (ASTM D 1586), using a safety drive hammer, was conducted nearly continuously from the ground surface to a depth of 6 feet below the ground surface (bgs) and at 5-foot intervals thereafter to the bottoms of the borings.

Underwood Engineers, Inc. of Portsmouth, New Hampshire (Underwood) surveyed the locations of the test borings for this geotechnical evaluation. We have estimated the elevations of the test borings based on the topography from Underwood's survey. The test borings were numbered sequentially from south to north and are further coded to project stations in Attachment A and Table 1.

A Ransom representative monitored subsurface explorations, prepared exploration logs, and measured the depth to groundwater. Soil samples were placed in sealed containers and returned to Ransom's office for further evaluation. Soil samples were visually classified in general accordance with visual manual procedures (ASTM D 2488) and described using modified Burmister Soil Classification System descriptors. Exploration logs are included as Attachment B.

SUBSURFACE CONDITIONS

Subsurface conditions at the Site were characterized by drilling into the unconsolidated, overburden soil formations at accessible locations along Islington Street. The general characteristics of the subsurface strata are described below; refer to the logs in Attachment B for more detailed soil descriptions at specific locations and depths.

Subsurface Soils

Test borings were advanced to depths ranging from approximately 3 to 20 feet below the existing grades. The subsurface explorations generally encountered surficial layers of asphalt pavement overlying the base course gravel fill materials for the pavements, a silt and clay deposit, glacial till soils, and bedrock. The general characteristics of the subsurface layers are described below in order of increasing depth encountered below the ground surface.

Surficial Layers

Asphalt pavements were penetrated at ground surface in each boring. The pavement consisted of asphalt concrete that was generally 4 to 6 inches thick (Attachment B). The pavement thickness ranged from 2 inches (in B-36) to 9 inches (B-28).

Fill Materials

The fill materials consisted of the base course gravel below the asphalt pavements. The fills consisted of brown sand and gravel with trace amounts of fines (silt and clay fractions combined). The fill materials generally ranged from approximately 6 inches (B-30) to 42 inches (3.5 feet) thick (in B-26). The existing fill materials were thicker at the intersection of Islington and Bartlett Streets, where borings B-13 and B-15 penetrated 5.5 feet of fill below the pavements. Standard penetration testing indicated that the fill materials were generally in a loose to medium dense condition.

Silt and Clay

Underlying the fill materials, a deposit of silt and clay was encountered in most of the test borings drilled for this project (Table 1). The silt and clay thickness ranged from approximately 2.5 to 12 feet, where encountered. Standard penetration testing in these soils indicated that the relative density was medium stiff to stiff. In boring B-13; however, a layer of very soft clay was encountered below the medium stiff silt and clay from depths of 13 to 15 feet below existing grades (approximate elevations 0 to -2 feet MSL) at the bottom of the boring.

Glacial Till

A glacial till deposit was encountered underlying the Fill Materials or the silt and clay soils in the explorations (Attachment B). The glacial till deposit consisted of dense to very dense, brown, silty fine to coarse sand with varying amounts of gravel and cobbles. Note that boulders were not encountered in our test borings; however, glacial till soils frequently contain boulders up to several feet in longest dimension and their presence cannot be ruled out along the project corridor.

Drilling Refusal/Bedrock Surface

Drilling refusal, the depth at which the drilling equipment was not able to penetrate the deeper geologic units, was encountered in 20 of the 28 Site test borings. The depths of refusal, where encountered, ranged from approximately 3 feet (in B-34) to 14.5 feet (in B-33) below existing grades (Table 1). The depths to refusal correspond to elevations of approximately 23 to 11 feet above mean sea level (MSL). It is our opinion that the drilling refusals were generally encountered at the top of competent bedrock, although confirmatory bedrock coring was not included in the project scope.

There was one exception: Boring B-34 (Sta. 146+00) encountered refusal at a depth of 3 feet below street level. We consider this shallow refusal likely on an obstruction, such as street cobblestones. Borings B-21 and B-22 encountered cobblestone street pavements that could not be penetrated by the hollow-stem auger. These borings were moved closer to the street edge, close to the curbing, and did not encounter obstructions. According to Mr. Reggie McQuate of Unitil, New Hampshire Gas Operations, cobblestone street paving could be encountered in excavations for the underground utilities for the stretch of Islington Street between Bartlett Street and Maplewood Avenue.

Inferred bedrock elevations were highest below the north end of the project Site, at approximate elevations 21 to 22 feet MSL close to Maplewood Avenue (B-37 and B-39). Bedrock elevations were lowest (at or below 3 feet MSL) beneath the area around the intersection of Islington and Bartlett Streets (B-12, B-13, and B-15).

Based on our test boring results, it appears that bedrock was encountered at or above design pipe invert elevations within the following intervals:

1. Sta. 109+00 to Sta. 117+00;

2. Sta. 120+00 to Sta. 126+50;

- 3. Sta. 129+00 to Sta. 137+00; and
- 4. Sta. 150+50 to Sta. 153+50.

Groundwater

Groundwater was encountered in only nine of the Site test borings (Table 1), at depths of approximately 4 feet (in B-15) to 14 feet (B-37) below ground surface (approximate elevations 22 to 11 feet above MSL). The water levels encountered in the test borings should be considered approximate, as the water levels did not equilibrate during the drilling program due to the dense and/or fine-grained nature of the soils. Qualitative observations of the water content of the soils from the borings are noted in the soil descriptions in the drilling logs (Attachment B).

Ransom also reviewed public information at the New Hampshire Department of Environmental Services (NH DES) OneStop on-line remediation and underground storage tank database in order to provide additional information on groundwater levels at NH DES-regulated sites along the Islington Street corridor. These data indicate that depths to groundwater in monitoring wells along Islington Street commonly range from 5 to 7 feet below the existing grades.

Groundwater levels at the Site will fluctuate due to seasonal effects, temperature, precipitation, nearby underground utilities, and construction activity. Therefore, water levels at other times may differ from the observations and measurements made during drilling.

Our test boring results indicate that groundwater was encountered at or above the design pipe invert elevations in the following intervals:

- 1. Sta. 113+50 to Sta. 119+00;
- 2. Sta. 126+50 to Sta. 129+50; and
- 3. Sta. 148+50 to Sta. 150+50

In these areas, excavations to the proposed invert elevations for the underground utilities could be below the groundwater table. Note that groundwater could also be encountered above design invert elevations at other locations along the alignment depending on groundwater conditions at the time of the project.

DESIGN RECOMMENDATIONS

Based on the subsurface explorations and our geotechnical evaluations, Ransom presents the following recommendations for the design of the Islington Street Improvements.

Bedrock Excavation

Our test boring results indicate that bedrock was encountered at or above design pipe invert elevations within the following project intervals:

- 1. Sta. 109+00 to Sta. 117+00;
- 2. Sta. 120+00 to Sta. 126+50;
- 3. Sta. 129+00 to Sta. 137+00; and
- 4. Sta. 150+50 to Sta. 153+50.

In these areas, it appears that the proposed invert elevations for the underground utilities will require excavations into bedrock. Note that bedrock and/or large boulders could also be encountered above design invert elevations at other locations along the alignment.

Where bedrock is encountered above design invert elevations, undercutting of the bedrock should be performed in accordance with the pipe manufacturer's recommendations and a minimum of 6 inches below the proposed pipe invert.

If bedrock/boulder removal requires blasting, the techniques and methods in the latest edition of the New Hampshire Department of Transportation *Standard Specifications for Road and Bridge Construction* should be followed. Blasting should also be performed in accordance with the City of Portsmouth blasting ordinance.

Excavation of one to two feet of bedrock could likely be accomplished using mechanical and/or hydraulic methods, such as hoe rams, without the need for blasting. Removal of grater bedrock thicknesses could require blasting.

Alternatively, the project civil engineer could reassess the design invert elevations to raise the pipe elevations where possible to avoid bedrock removal.

Traffic Signal Foundations

Two borings (B-15 and B-27) were drilled to provide subsurface information for design of the foundations for traffic signals; the results are summarized below.

Boring	Station	Depth to Refusal (feet)	Refusal Elevation (feet MSL)	Depth to Suitable Bearing Soils (feet)	Elevation of Suitable Bearing Soils (feet MSL)
B-15	120+40	9	3	6	6
B-27	136+28	7	16	3	20

Based on our test borings, the soil bearing pressure for traffic signal foundations at these two locations should be designed for 3,000 pounds per square foot when founded within the glacial till soils. The fill materials penetrated by these two borings are not considered to be suitable bearing soils for the traffic signals.

CONSTRUCTION RECOMMENDATIONS

Based on the subsurface explorations and our geotechnical evaluations, Ransom presents the following recommendations for the construction of the Islington Street Improvements.

Temporary Excavations

We have assumed that the utility excavations will be through cut-and-cover methods using trench boxes to provide temporary support to the deepest stretches of open trenches. It has been our experience that the ground surface around trench boxes could settle, leading to subsidence of adjacent roadways, sidewalks, and the ground without adequate engineering design. Lateral excavation support should be designed by a New Hampshire licensed Professional Engineer. The design should be submitted to Ransom as a shop drawing for review.

Excavations will encounter fill materials, silty clay, glacial till, and bedrock in areas. These materials should generally be suitable for backfills within the trenches, but will be unsuitable for pipe bedding. If crushed stone is used for backfilling, a geotextile separator fabric (Mirafi 140N, for example) should be placed between the crushed stone and the in-place soils.

All temporary excavations should be performed according to Occupational Safety and Health Administration (OSHA) Standards (29 CFR 1926 Subpart P). The contractor's competent person will be responsible for monitoring the height, slope, and depths of the excavations in accordance with these regulations.

Dewatering

Groundwater was encountered in the test borings at depths between approximate elevations 22 and 11 feet MSL (4 to 14 feet below grade) along the alignment. Construction dewatering should be provided where water is encountered so as to allow construction to be accomplished "in the dry."

It is our opinion that groundwater from these types of soils could potentially be controlled through pumping from open sumps. Should free-draining soils be encountered, pumping from sumps might not provide sufficient groundwater control.

Surface water runoff should be directed away from excavations to reduce dewatering efforts and to protect subgrades from becoming soft and unstable. The contractor should anticipate the need for controlling runoff during wet periods.

The contractor should be aware that the presence of groundwater can destabilize trench walls. This potential should be taken into account in determinations of the stability of the trenches, as well as the trench heights and lateral support methods.

Bedrock Excavation

Excavation of one to two feet of bedrock could likely be excavated using mechanical and/or hydraulic methods, such as a hoe ram, without the need for blasting. If bedrock/boulder removal requires blasting, the techniques and methods in the latest edition of the *Standard Specifications for Road and Bridge Construction* (New Hampshire Department of Transportation) should be followed. Blasting should also be performed in accordance with the City of Portsmouth blasting ordinance.

Backfilling

Excavation within the fills and naturally occurring soils should be accomplished using an excavator with smooth-edged bucket to minimize disturbance to the underlying subgrade soils; disturbance from toothed buckets could increase settlement of the backfilled soils after construction. Disturbed soils should be removed or compacted prior to placing pipe bedding materials. Boulders and loose bedrock should be removed prior to placing pipe bedding.

The soils that will be excavated from the utility trenches could require control of the moisture content before being approved for use as backfill. Where subgrades become saturated, unstable, and/or difficult to compact, crushed stone should be placed and compacted in lieu of structural fill. Crushed stone, when used, should be wrapped in a geotextile filter fabric, such as Mirafi 140N or equal.

All backfill soils should be placed in 12-inch maximum loose lifts and should be compacted to a minimum of 95 percent of the material's maximum dry density, as determined by ASTM D 1557 (modified Proctor test) and verified with field density testing (ASTM D 6938 or equivalent method). Lift thickness should be a maximum of 6-inch loose lifts when compacted with hand-guided equipment. Compaction to less than 95 percent could result in settlement of the backfills within the trench, which could damage the pavement.

Bedding placed below utilities should be in accordance with the utility and manufacturer requirements. In general, utilities may be supported directly on a minimum 6-inch-thick layer of compacted fill, crushed stone, or other suitable pipe bedding materials.

CLOSING COMMENTS

This report has been prepared to assist the Site civil engineers in the design and construction of the utilities related to the Islington Street Project in Portsmouth, New Hampshire. In the event that changes in the design or location of the proposed structures are planned, the conclusions and recommendations contained in this report should not be considered valid unless they have been reviewed and modified or verified in writing by Ransom. Ransom should be provided the opportunity to review the final design plans and project specifications in order to confirm that the recommendations made in this report were interpreted and implemented as intended.

Our recommendations are based in part upon data obtained from widely spaced test explorations. The nature and extent of variations between explorations will not become evident until construction. If significant variations then appear, it may be necessary to reevaluate and revise the recommendations of this report.

The findings, recommendations, specifications, and professional opinions contained within this project geotechnical report have been prepared in accordance with generally accepted professional geotechnical engineering practice. No other warranties are implied or expressed.

Thank you for this opportunity to be a member of VHB's design team on the Islington Street Project. Please contact us if you have questions or need additional information.

Sincerely,

RANSOM CONSULTING, INC.

Jay P. Johonnett, P.E. Project Engineer

Steven F. Rickerich, P.G. Vice President

JPJ/KWM/SFR:jar Attachments



MANANIA

Kenneth W. Milender, P.E., P.G. Senior Project Manager
TABLE 1: SUMMARY OF SUBSURFACE CONDITIONS Geotechnical Engineering Report Islington Street Project Portsmouth, New Hampshire

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Estimated Groundwater	Elevation (feet MSL)	1	1	I	I	I	I	13	11	1	4	8	I	I	1	12	11	1	I	I	I	I	I	1	11	I	17	22	1
Groundwater	Depth (feet)	Not Observed	თ	8	Not Observed	6	4	Not Observed	Not Observed	Not Observed	6	10	Not Observed	14	Not Observed	б	4	Not Observed											
Estimated Refusal	Elevation (feet MSL)	< 18	< 13	15	20	19	14	11	11	<3	<-2	3	6	11	9	<1	< 6	16	20	17	16	< 13	17	15	11	23	< 14	21	22
Refusal Depth	(feet)	>12	>15	13	8	8.5	10.5	11	8.5	>12	>15	6	9	8.5	11	>20	>15	8	9.5	7	7	>10	11	12	14.5	ъ	>12	5	4.5
s (feet)	Glacial Till			0	6	7	8.5	3.5	2.5			3	в	6.5	3	18	12	4	5.5	0	4	9	7	10.5	8.5		9	3.5	2.5
tratum Thicknes	Silt & Clay	8	12	9.5	0	0	0	5.5	4	10	6	0	0	0	9	0	0	2.5	2.5	3	0	2.5	3	0	4		4	0	0
Soil St	Road Base Gravel Fill	3.5	2.5	3	1.5	1.5	1.5	1.5	1.5	1.5	5.5	5.5	2.5	1.5	1.5	1.5	2.5	1	1.5	3.5	2.5	1	0.5	1	1.5	2.5	1.5	1	1.5
Asphalt	(inches)	7	2	9	5	5	6	8	7	9	7	9	9	9	9	4	7	3	4	7	3	6	3	4	4	4	2	5	5
Official	Oliser	Right	Right	Right	Right	Right	Center	Right	Center	Center	Left	Left	Left	Left	Left	Left	Left	Left	Left	Left	Left	Left	Left	Left	Left	Left	Left	Left	Left
Ground	(MSL)	30	28	28	28	27	24	22	19	15	13	12	15	19	20	21	21	24	29	24	23	23	28	27	25	26	26	26	26
Approximate	Station	103+90	105+80	108+50	109+85	110+85	112+80	113+70	116+20	117+80	118+65	120+40	121+70	123+10	124+60	127+00	128+30	130+25	133+40	135+60	136+28	138+20	140+80	143+40	144+90	146+00	148+80	150+15	153+75
Boring	Number	B-2	B-3	B-5	B-6	B-7	B-8	B-9	B-11	B-12	B-13	B-15 (TS)	B-16	B-17	B-18	B-20	B-21	B-22	B-24	B-26	B-27 (TS)	B-28	B-30	B-32	B-33	B-34	B-36	B-37	B-39

Notes:

TS = Traffic signal boring.
 MSL = Mean Sea Level.
 >2. MSL = Mean Sea Level.
 >2. Solo = Drilling refusal depth greater that the depth (in feet) shown.
 4. Groundwater depth based on measurementes made with an electronic water level indicator at the time of drilling.
 5. Missing boring numbers in Table 1 were deleted from the drilling program.



		BORING LOG	6:							B2	
	ANSOM	Reviewed by: 1PJ		Total De	epth:	12 F	Feet	Logged E	y:		BAB
Co	nculting Inc	Date Reviewed: 5/0	17	Boring D	Diameter:	2 1/4	nches	Date Drill	ed: 3/2	20/17 to	3/20/17
	nsulting, inc.	Surface Elevation (ft.):	30	Well Stic	ckup:	N	A	Driller:		Mi	ller
DЕРТН	DESCRIF Based on USCS Burmister Soil Class	PTION and modified sification System	SOIL F	PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
	7" ASPHALT. S1 (0-2') Brown, fine to medi medium gravel, trace silt, trac	um SAND, some fine lo ce asphall.	Road	d Base	~	S1	4-4-5	5 8	24/8	5	
	S2 (2-4') Loose, brown/gray, little silt, little fine to medium	fine to medium SAND, gravel, moist.				S2	2-3-3 3	- 6	24/12	1	
	S3 (4-6') 4" Brown/gray, fine sill, little fine to medium grave dense, dark gray/brown, fine fine to medium gravel, few re	to medium SAND, little el, over 12" medium SAND, some silt, trace d mottles, moist.	Silt of	ad Clay		S3	3-9-8 7	- 17	24/16	1	
	S4 (10-12') 21" Medium stiff, some clay, over 3" gray CLA' End of boring12'.	gray/brown SILT, Y and SILT, moist.	WELL LEGENI	D:		S4	3-4-3 4	7	24/24	1	
	Drilling End of Boring Da	ate:	Filter Sand Na	ative Fill	Bentonit	e Bentor	nite Gro	ut Concrete	PVC S	Screen P	UC Riser
NOTES 1. Soil b 2. Soil s by 140 3. NA=r	o: porings conducted using truck-mou sampling conducted by standard pe lb. safety hammer. not applicable; NE=not encountere	Inted drill rig with 4 ½" ID h enetration test with 2" split d; NM=not measured.	ollow-stem auge barrel sampler c	ers. Iriven	Vanass	e, Han	gan &	Bustlin, I	nc.		
				-	Portsm	n Stree outh, N	et IH	04 05000			

	ANCOM	BORING LOC	G:							B 3	
JIII (ARDUM	Reviewed by: .)	RS	Total De	pth:	15 F	eet	Logged E	By:		BAB
Co	insulting Inc	Date Reviewed: 5/	9/17	Boring D)iameter:	2 1/4 li	nches	Date Drill	ed: 3/	20/17 to	3/20/17
	nouting, inc.	Surface Elevation (ft.):	28	Well Stic	kup:	N	٩	Driller:		Mi	ller
DEPTH	DESCRIF Based on USCS Burmister Soil Class	PTION and modified sification System	SOIL F	PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	VELL CONSTRUCTION
	7" ASPHALT. S1 (0-2') Medium dense, brow SAND, some fine to medium asphalt. S2 (2-4') 5" Loose, brown, fin	wn, fine to medium gravel, trace silt, trace e to medium SAND,	Roa	d Base		S1	10-10 8	- 20	24/9	1	
	little silt, over 5" medium den SAND, little fine to medium g cobbles at 3.5'. S3 (4-6') Medium dense, broy	se, fine to medium ravel, trace silt, vn/grav, fine to				S2	4-3-12 16	2- 15	24/10	<1	
5	medium SAND, little to some mottles, moist.	silt, few red and gray	Silt a	nd Clay		S3	5-6-5- 6	11	24/12	<1	
	S4 (8-10') 14" Medium stiff, b and SILT, few gray and red m gray/brown SILT and CLAY, o Auger to 13'. S5 (13-15') Medium stiff, gray trace clay, moist. End of boring 15'.	rown/gray, fine SAND hottles, over 2" cobbles at 9', moist.	Silt an Silt an	nd Clay nd Clay		S4	3-4-64 12 2-4-3- 6	- 68 7	24/16 24/14	1	
During I NOTES 1. Soil I 2. Soil 5 by 140 3. NA=1	Drilling End of Boring Da NE S: borings conducted using truck-mou sampling conducted by standard pe Ib. safety hammer. not applicable; NE=not encountered	nted drill rig with 4 ¼" ID h enetration test with 2" split d; NM=not measured.	Filter Sand Na nollow-stem auge barrel sampler o	ers.	Bentonite CLIENT Vanasse SITE: Islington Portsmo	Benton : e, Hanç o Street puth, NI	gan & t H	E1 05003	PVC s	Screen P ¹	/C Riser

		BORING LOG	:							B5	
	AR SOM	Reviewed by:	1	Total Dep	oth:	13 F	eet	Logged B	y:		BAB
	neulting Inc	Date Reviewed: 5/9/	17.	Boring Dia	ameter:	2 1/4 Ir	nches	Date Drill	ed: 3/2	20/17 to	3/20/17
	nsulung, Inc.	Surface Elevation (ft.): 2	8	Well Stick	kup:	NA	4	Driller:		Mi	ler
DЕРТН	DESCRIF Based on USCS Burmister Soil Class	PTION and modified sification System	SOIL P	ROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
	5 1/2" ASPHALT. S1 (0-2') Dark brown, fine to fine to medium gravel and co	medium SAND, some bbles, trace silt.	Road	Base	8	S1	15-8-4	4 23	24/7	<1	
	S2 (2-4') Medium dense, brow SAND, little silt, cobbles at 2.	wn, fine to medium 5', moist.	Na	itive		S2	14-9-3 6	12	24/6	5	
 5	S3 (4-6') Brown to brown/gra silt, moist, few red and gray n	y, fine SAND, some nottles from 5-6'.	Silt ar	nd Clay		S3	4-6-9- 11	15	24/19	<1	
10 10 10 15	Auger to 8'. S4 (8-10') Very stiff, brown/gr sand, trace clay, cobbles at 9 Auger to refusal.	ray SILT, little fine 9.5', few red mottles. 13'.	Silt ar	nd Clay Irock		S4	9-6-11 14	- 17	24/18	6	
	R LEVELS:		WELL LEGEN	D:							
During I	Drilling End of Boring Da NE	ate:	Filter Sand Na	ative Fill	Bentonite	e Benton	III iite Grou	ut Concrete	PVC S	Screen P	VC Riser
NOTES 1. Soil 1 2. Soil 3 by 140 3. NA=1	S: borings conducted using truck-mou sampling conducted by standard po lo. safety hammer. not applicable; NE=not encountere	unted drill rig with 4 ¼" ID ho enetration test with 2" split b d; NM=not measured.	llow-stem auge arrel sampler d	ers. Iriven	CLIENT Vanass SITE: Islingtor Portsmo	r: e, Hang n Stree buth, N	gan & t H	Bustlin, I 61.05003	nc. Page	e:	1

		BORING LOG	6:					-		B6	
JIII.	ANDOM	Reviewed by:)PS		Total Dep	pth:	8 Fe	eet	Logged B	y:		BAB
Co	nculting Inc	Date Reviewed: 5/9	1.7	Boring Di	iameter:	2 1/4 Ir	nches	Date Drille	ed: 3/2	20/17 to	3/20/17
	nsulting, inc.	Surface Elevation (ft.):	28	Well Stic	kup:	NA	Ą	Driller:		Mi	ller
DEPTH	DESCRI Based on USCS Burmister Soil Clas	PTION and modified sification System	SOIL F	PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
	5" ASPHALT. S1 (0-2') Brown, fine to medi medium gravel, trace silt, tra	um SAND, some fine to ce asphalt.	Road	d Base	X	S1	7-10- 13	- 17	24/2	4	
	S2 (2-4') Loose, brown, fine to fine to medium gravel, little s	to medium SAND, little ilt, moist.	Glad	cial Till		S2	4-3-6 6	- 9	24/12	2	
5	S3 (4-6') Medium dense, bro SAND, little fine to medium g moist.	wn, fine to medium ravel, trace to little silt,				S3	3-6-7 12	- 13	24/12	1	
 -	Auger refusal, end of boring	8'.	Be	drock							
WATE During	R LEVELS: Drilling End of Boring D NE	ate:	WELL LEGEN	D: ative Fill	Bentonit	e Bentor	//// hite Gro	t Concrete	PVC :	Screen P	VC Riser
NOTE: 1. Soil 2. Soil by 140 3. NA=	S: borings conducted using truck-mor sampling conducted by standard p lb. safety hammer. not applicable; NE=not encountere	unted drill rig with 4 ¼" ID h enetration test with 2" split ed; NM=not measured.	nollow-stem aug barrel sampler o	ers. driven	CLIEN Vanass SITE: Islingto	r: e, Han n Stree	gan &	Bustlin, I	nc.		
				_	Portsm Project N	outh, N	H	161.05003	Pag	e:	1

		BORING LOG	;							B7	
	ANDOM	Reviewed by: JAS		Total De	epth:	8.5 F	eet	Logged E	iy:		BAB
Co	nculting Inc	Date Reviewed: 5/m/	17	Boring D	Diameter:	2 1/4 lr	nches	Date Drill	ed: 3/2	20/17 to	3/20/17
	nsulung, n.c.	Surface Elevation (ft.):	27	Well Stie	ckup:	NA	4	Driller:		Mi	ler
DEPTH	DESCRIF Based on USCS Burmister Soil Class	PTION and modified sification System	SOILI	PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
	5" ASPHALT. S1 (0-2') 5" COBBLES, over medium SAND, little fine to n moist.	5" dark brown, fine to nedium gravel, little silt,	Roa	d base	*	S1	49-7-5	5 56	24/10	<1	
	S2 (2-4') No recovery, split-s past cobbles to 4'.	poon refusal, auger	Gla	cial Till		S2	35/1"	NA	>50	NA	
5	S3 (4-6') No recovery, split-s past cobbles/chatter to 6.5'.	poon refusal, auger	Glae	cial Till		S3	50/1"	NA	NR	NA	
	S4 (6.5-8.5') 8" Very stiff, bro some silt, over 6" COBBLES/			8	S4	17-25- 80/5"	NA	17/14	<1		
	Auger refusal, end of boring &	3.5'	Be	drock	~~						
- 10											
—15— 									•		
WATE	R LEVELS:		WELL LEGEN	D:							
During I	Drilling End of Boring Da NE	Filter Sand N	ative Fill	Bentonite	Bentoni	/// ite Grou	t Concrete	PVC S	Creen P	/C Riser	
NOTES 1. Soil 2. Soil by 140 3. NA=	5: borings conducted using truck-mou sampling conducted by standard pe lb. safety hammer. not applicable; NE=not encountere	ollow-stem aug barrel sampler o	ers. driven	CLIENT Vanasso SITE:	: ə, Hanç	gan &	Bustlin, I	nc.			
					Islingtor Portsmo	outh, NI	t H				
					Project N	o ·	10	61 05003	Page		1

		BORING LO	G:							B 8	
	ANDOM	Reviewed by:	5	Total De	epth:	10.5	Feet	Logged I	Зу:		BAB
Co	neulting Inc	Date Reviewed: 5/	aliz	Boring D	Diameter:	2 1/4 I	nches	Date Dril	led: 3/2	20/17 to	3/20/17
	nsulung, inc.	Surface Elevation (ft.):	24	Well Stie	ckup:	N	A	Driller:		Mi	ller
DЕРТН	DESCRI Based on USCS Burmister Soil Clas	PTION and modified sification System	SOIL F	PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
	6" ASPHALT. S1 (0-1.5') 5" COBBLES and SAND, split-spoon refusal at	brown, fine to medium 2'.	Road	d Base	8	S1	5- 50/4"	, NA	16/5	1	
	S2 (2-4') Medium dense, bro SAND, little silt, trace fine to S3 (4-6') Gray/brown, fine SA clay, few red and gray mottle	wn, fine to medium medium gravel, moist. AND and SILT, trace s, moist.	Glad	sial Till sial Till		S2 S3	10-10 11-13 2-5-6- 7	21 - 11	24/10 24/14	2 <1	
	Auger to 8'. S4 (8-10') 6" Very stiff, brown trace fine sand, red and gray medium dense, brown, fine to silt, trace gravel, moist. Auger refusal, end of boring f	a/gray SILT, little clay, mottles, over 4" o medium SAND, little 10.5'.	Bec	frock		S4	4-13- 14-17	27	24/10	3	
WATEF	R LEVELS: Drilling End of Boring Da	ate:				I	77)		ا	L	
1	NE		Filter Sand Na	ative Fill	Bentonite	Benton	///) ite Grou	t Concrete	₽VC S	≡ Screen P\	/C Riser
NOTES 1. Soil t 2. Soil s by 140 3. NA=r	S: porings conducted using truck-mou sampling conducted by standard pe lb. safety hammer. not applicable; NE=not encountered	Inted drill rig with 4 ¼" ID enetration test with 2" split d; NM=not measured.	hollow-stem auge t barrel sampler d	ers. Iriven	CLIENT Vanasse SITE: Islington Portsmo	: e, Hang Street buth, N	gan & t H	Bustlin, I	nc.	,	1

		BORING LOO	G:					an a na an		B9	
	ANSOM	Reviewed by:		Total De	epth:	11 F	eet	Logged E	By:		BAB
Co	nculting Inc	Date Reviewed: 51	aliz.	Boring (Diameter:	2 1/4 li	nches	Date Drill	ed: 3/2	20/17 to	3/20/17
	nsulung, mc.	Surface Elevation (ft.):	22	Well Sti	ckup:	N	A	Driller:		Mi	ller
DEPTH	DESCRIF Based on USCS Burmister Soil Clas	PTION and modified sification System	SOIL	PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	NELL CONSTRUCTION
	8" ASPHALT. S1 (0-2') No recovery.		Roa	d Base		S1	6-4-5	10	NR	NA	70
	S2 (2-4') 1" COBBLES, over SILT, little fine sand, trace cla S3 (4-6') Stiff, gray/brown SIL little clay and red and gray m	12" loose, gray/brown ay, few red mottles. .T, little fine SAND, ottles, moist.	Silt a	nd Clay		S2	10-5-4	9	24/13	<1	
- 5	Auger to 8'.		N	ative		S3	7	10	24/12	1	
	S4 (8-10') Medium dense, bro medium SAND, little fine to m moist to wet. Auger refusal, end of boring f	own/gray, fine to hedium gravel, little silt, 11'.	Ber	Till drock		S4	7-11- 11-10	22	24/15	<1	
WATER During D	R LEVELS: Drilling End of Boring Da 9'	WELL LEGEN	D: ative Fill	Bentonite	Benton	/// ite Grou	t Concrete	PVC S	Gcreen P	 VC Riser	
NOTES 1. Soil b 2. Soil s by 140 I 3. NA=r	: orings conducted using truck-mou ampling conducted by standard pe b. safety hammer. ot applicable; NE=not encountered	hollow-stem aug t barrel sampler o	ers. Iriven	CLIENT Vanasso SITE: Islingtor Portsmo	: e, Hang n Street buth, N	gan & t H	Bustlin, I	nc.			
					Project N	lo.:	10	61.05003	Page	e:	1

		BORINGLOG	2.							B11	
	ANSOM	Boviewed by:	••	Total De	nth:	855	eet	Logged P	v:		BAB
3.		Date Reviewed:	la liz	Boring D	iameter:	2 1/4 1	nches	Date Drill	ed: 3/2	21/17 to	3/21/17
	onsulting, Inc.	Surface Elevation (ft.):	19	Well Stic	kup:	N	A	Driller:		Mi	ller
ОЕРТН	DESCRI Based on USCS Burmister Soil Clas	PTION and modified sification System	SOIL	. PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	VELL CONSTRUCTION
	7" ASPHALT. S1 (0-2') Brown, fine to medi medium gravel, some aspha S2 (2-4') Medium dense, gra and SILT, red and gray mottl	um SAND, some fine to It, trace silt. y/brown, fine SAND es, moist.	Roa	d Base/Fill		S1	52-31 12	- 83	24/10	1	
 5	S3 (4-6') 14" Medium dense, and SILT, red and gray mottl SILT, little fine sand, trace cl	gray/brown, fine SAND les, over 2" gray/brown ay, moist.	Silt	and Clay		S2 S3	4-7-9- 8	12	24/16 24/20	<1	
	Auger to 8'		GI	acial Till							
 - 10- 	S4 (8-8.5') Brown, fractured medium sand, wet. Refusal, end of boring 8.5'.	ROCK, little fine to	WELL LEGE	Bedrock		S4	4- 100/5	. 100+	11/3	48	
During	Drilling End of Boring D 8'	Pate:	Filter Sand	Native Fill	Bentoni	te Bento	nite Gro	t Concret	e PVC	Screen F	VC Riser
NOTE	S:			-	Vanass SITE:	se, Har	ngan &	Bustlin,	Inc.		
					Islingto Portsm	on Stree louth, N	et NH				
					Project	No.:	1	161.05003	Pag	e:	1

		BORING LOG	6:				.			B12	
	ARSOM	Reviewed by: JPJ		Total Dep	oth:	12 F	eet	Logged	By:		BAB
Con	culting Inc	Date Reviewed: 5-/c	4/17	Boring Di	ameter:	2 1/4	nches	Date Dri	lled: 3/	21/17 to	3/21/17
COL	sulting, Inc.	Surface Elevation (ft.):	15	Well Stick	kup:	N	A	Driller:		Mi	ller
DEPTH	DESCRIF Based on USCS Burmister Soil Class	TION and modified ification System	SOIL F	PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
	6" ASPHALT. S1 (0-2') 6" COBBLES, over (medium SAND, some fine to silt. S2 (2-4') 6" Loose, gray/brow trace clay, over 8" soft, gray/b moist. S3 (4-6') 6" Medium stiff, gray/b clay, red and gray mottles, ov SILT, little clay, red and gray to Auger to 8'. S4 (8-10') Medium stiff, gray/b moist. S5 (10-12') Stiff, brown/gray C End of boring 12'.	5" brown, fine to medium gravel, trace n SILT and fine SAND, prown SILT, some clay, //brown SILT, some er 14" stiff, gray/brown mottles, moist.	Cobbles/ Silt an Silt an	Road Base		6) Z S1 S2 S3 S4 S5	mag 11-11 6-2-2-2 2-3-6-6 6 3-3-5-5 6-7-6-10	- 4 - 9 - 8 - 13	24/6 24/14 24/20 24/22 24/22 24/24	7 11 12 24 6	
WATER LE During Drilli NE	EVELS: ing End of Boring Dat	e:	WELL LEGEND): Itive Fill	Bentonite	Benton	/// ite Grou	(≣ it Concrete	e PVC S	Gcreen P	 VC Riser
NOTES:				v s	CLIENT /anass BITE:	: e, Hang	gan & I	Bustlin,	Inc.		
				F	slingtor Portsmo	outh, N	t H				

	a de la companya de l	T						-		a de la casa de la cas		***********
		BORING LOO	G:								B13	
Ille		Reviewed by:	2	Total D	epth:		15 F	eet	Logged	By:		BAB
CC	onsulting Inc	Date Reviewed: 5	hit	Boring I	Diamet	ter:	2 1/4	nches	Date Dri	led: 3/2	21/17 to	3/21/17
		Surface Elevation (ft.):	13	Well Sti	ckup:	T	N	Α	Driller:		M	iller
DEPTH	DESCRI Based on USCS Burmister Soil Clas	PTION and modified sification System	SOIL	PROFILE		SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
	7" ASPHALT. S1 (0-2') Brown, fine to medi medium gravel, trace silt.	um SAND, some fine to	Road Ba	ase and F		8	S1	6-6-8	3 12	24/6	NM	
	S2 (2-4') Loose, brown, fine to some fine to medium gravel,	to medium SAND, trace silt.					S2	6-6-4 4	- 10	24/11	<1	
5	S3 (4-6') Brown, fine to medi medium gravel, trace silt, trac	um SAND, little fine to ce asphalt.			21222222		S3	4-4-2 1	- 6	24/10	<1	
 	Auger to 8'. S4 (8-10') 10" Medium stiff, g clay, red and gray mottles, ov CLAY, little silt, moist to wet.	Silt a	nd Clay			S4	3-3-2 2	- 5	24/24	<1		
	Auger to 13'.											
 - 15 	S5 (13-15') Very soft, gray Cl End of boring 15'.	LAY, wet.	Silt a	nd Clay	XXXXXXX		S5	WOH WOH WOH	- - - - 1	24/24	<1	
WATE	R LEVELS:		WELL LEGEN	D:		L		L		l		
During	Drilling End of Boring Da NE	Filter Sand	ative Fill	Bento	onite	Bentor	nite Gro	ut Concret	e PVC s	Screen P	VC Riser	
NOTES	5:			CLIE Vana	INT	: e, Han	gan &	Bustlin.	Inc.			
				ŀ	SITE							
				Isling	gtor smc	n Stree outh, N	t H					
					Proje	ct N	o.:	1	61.05003	Page	е:	1

		BORING LOG	:							B15	
	ANDOM	Reviewed by: JP)		Total Depth:	;	15 F	eet	Logged B	y:		BAB
Co	nculting Inc	Date Reviewed: 5-19/1	7	Boring Diam	eter:	2 1/4 li	nches	Date Drill	ed: 3/2	21/17 to	3/21/17
	nsulting, inc.	Surface Elevation (ft.): 12	2	Well Stickup):	N	4	Driller:		Mi	ller
ОЕРТН	DESCRIF Based on USCS Burmister Soil Class	PTION and modified sification System	SOIL F	ROFILE	SAMPLE	SAMPLE NUMBER	aLOWS per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	VELL
	6" ASPHALT. S1 (0-2') Brown, fine to medi medium gravel, trace silt. S2 (2-4') 5" Brown, fine to me	um SAND, some fine to	8	=ill		S1	ш <u></u> 10-12 6	- 22	24/11	<1	50
 5	tine to medium gravel, trace s to coarse SAND, trace silt, m S3 (4-6') Brown, fine to mediu medium gravel, trace silt, we	silt, over 3" brown, fine loist. um SAND, some fine to t at 6'.	Glac	fill ial Till		S2 S3	6-3-3- 1 2-1-2- 1	- 6 - 3	24/8 24/4	<1 1	
10 10 10 	S4 (8-8'8") No recovery. Auger refusal, end of boring S	9'.				NR	12- 50/2"		8/0		
WATEF During I	R LEVELS: Drilling End of Boring Da 4'	ate:	VELL LEGENI	o: tive Fill Ber CLL Var SIT Islin Por	ntonite IENT nasso E: ngtor tsmc	e Benton ∵ e, Hang n Street puth, Ni	gan &	Bustlin, I	PVC S	Screen P	VC Riser

		BORING LOG								B16	
	ANS(O)M	Reviewed by: 1P		Total Dept	th:	6 Fe	eet	Logged E	sy:		BAB
	populting Inc	Date Reviewed: 5/9/	17	Boring Dia	meter:	2 1/4 Ir	nches	Date Drill	ed: 3/2	21/17 to	3/21/17
	nsulung, inc.	Surface Elevation (ft.): 1	5	Well Stick	up:	NA	4	Driller:		Mi	ller
DEPTH	DESCRI Based on USCS Burmister Soil Clas	PTION and modified sification System	SOIL	PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
HE GUI 	COBBLES at 4.5', augered to boulder/rock. Auger refusal, end of boring to R LEVELS: Drilling End of Boring Da	and modified sification System um SAND, some fine to er of asphalt at 2 1/2'. fine to medium SAND, little silt, cobbles at 3', o 4.5-6' through 20" of 6'. 6'.	VELL LEGEN	d Base cial Till ative Fill E	Bentonite CLIENT anasse	S1 S2 S3 S3	SM (16 MOTE) 14-10 10-15- 37- 65/5" 65/3"	TENNILLAS	24/10 23/16 3/<1	Correen P	CONSTRUCT
				5							
				ls P	slington ortsmo	o Street	t H				
			P	roiect N	o.:	1	61.05003	Page	e:	1	

		Т								- 1	
		BORING LOG	:							B17	
Im	ANDUM	Reviewed by: JPS		Total Depth	:	8.5 F	Feet	Logged E	By:		BAB
Co	onsulting Inc.	Date Reviewed: 5/4	17	Boring Diam	neter:	2 1/4 1	nches	Date Dril	ed: 3/2	21/17 to	3/21/17
	, , , , , , , , , , , , , , , , , , ,	Surface Elevation (ft.): 1	9	Well Stickup	p:	N	A	Driller:		M	iller
DEPTH	DESCRIF Based on USCS Burmister Soil Class	PTION and modified sification System	SOIL F	ROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
	6" ASPHALT. S1 (0-2') 6" COBBLE, split-sp to 2'.	ooon refusal, augered	Cobbles/	Road Base		S1	NA	NA	NA	NA	
	S2 (2-4') Medium dense, brow some silt, little fine to medium few red mottles, moist.	wn/gray, fine SAND, n gravel, cobble at 3.5',				S2	3-6-11 42	- 17	24/16	<1	
— 5— — —	S3 (4-6') Medium dense, brown/gray, fine SAND, some silt, little fine to medium gravel, few red mottles.		Glacial Till				S3 8-13- 12-23	25	24/22	<1	
 	Auger to 8', chatter/cobbles 7 S4 (8-8.5') Split-spoon refusa Auger refusal 8.5', end of bor	'.5-8'. Il at 8. ing.	Bec	lrock		S4	60/0"	NA	NR	NA	
WATE During	R LEVELS: Drilling End of Boring Da NE S:	ite:	WELL LEGENI	o: Inive Fill Be	entonite IENT nasse	Benton	ite Grou gan &	t Concrete Bustlin, I	PVC s	Screen P	UC Riser
				SIT Isli Po	FE: ngtor rtsmc	n Stree buth, N	t H	61 05003	Page		1

		POPING	<u> </u>		·					D40	
A.	ANCOM	BORING LOO	ב:	1						R18	
The		Reviewed by:		Total Dep	pth:	11 F	-eet	Logged	By:		BAB
CC	onsulting, Inc.	Date Reviewed: 5/	9/17	Boring Di	iameter:	2 1/4	nches	Date Dri	lled: 3/	21/17 to	3/21/17
		Surface Elevation (ft.):	20	Well Stick	kup:	N	A T	Driller:	Þ	Mi	iller
DEPTH	DESCRIF Based on USCS Burmister Soil Clas	PTION and modified sification System	SOIL	PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATIO RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
	6" ASPHALT. S1 (0-2') 7" Brown, fine to me fine to medium gravel, over 2 gray, fine to medium SAND, s	edium SAND, some " ASPHALT, over 3" some silt.	Roa	d Base		S1	5-7-4	12	24/12	<1	
	S2 (2-4') Loose, gray/brown, moist.	fine SAND, some silt,	Fine Sa	nd and Silt		S2	3-4-6 9	10	24/8	<1	
	S3 (4-6') 22" Medium dense, fine sand, trace clay, few gra red/brown, fine to medium SA	gray/brown SILT, little y mottles, over 2" AND, moist.				S3	5-7-8- 13	15	24/24	<1	
	Auger to 8'. S4 (8-10') Medium dense, brown/gray, fine SAND, some silt, trace fine to medium gravel, trace red mottles, moist.					×					
 			Glac		S4	11-11- 13-13	24	24/18	<1		
	Auger refusal 11, end of borir	ng.	Bec	lrock							
WATEF	R LEVELS:		WELL LEGEND):							
During D	Drilling End of Boring Da NE	te:	Filter Sand Na	tive Fill	Bentonite	Benton	III ite Grou	t Concrete	PVC S	creen P	/C Riser
NOTES	:				CLIENT	່: ອ, Hanູ	gan & I	Bustlin,	nc.		
				15	slington	Street	t				
				Portsmouth, NH							
				P	Project N	o.:	16	61.05003	Page	:	1

		BORING LOC	G:	-						B20	
Illa		Reviewed by: Jf	2	Total Depth	:	20 F	eet	Logged I	Зу:		BAB
Co	onsulting Inc	Date Reviewed: 5	laliz	Boring Dian	neter:	2 1/4 I	nches	Date Dril	led: 3/	21/17 to	3/21/17
		Surface Elevation (ft.):	21	Well Stickup	o:	N	A	Driller:		М	iller
рертн	DESCRIF Based on USCS Burmister Soil Class	PTION and modified sification System	SOIL	PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
	4" ASPHALT. S1 (0-2') Brown, fine to mediu medium gravel, trace silt.	um SAND, some fine to	Road Base	/Cobblestone		S1	5-7-5	5 12	24/7	<1	
	S2 (2-4') Very loose, brown, trace fine to medium gravel, r	ine SAND and SILT, noist.				S2	3-2-1 2	- 3	24/8	<1	
— — — 5—	S3 (4-6') Medium dense, gray some silt, little fine to medium	//brown, fine SAND, a gravel, moist.	Glad	cial Till		S3	5-7-6 17	- 13	24/13	<1	
	Auger to 8'.										
	 S4 (8-10') Dense, brown/gray, fine to medium GRAVEL, some fine to medium sand, trace to little silt, red and dark gray weathered rock, moist to wet. 		Glacial Till			S4	41-20 19-15	39	24/12	<1	
	-10		Glac	ial Till	×	S5	7-8-13 12	- 21	24/14	<1	
 WATE	- S6 (18-20') Dense, gray/brown, fine to medium SAND, some fine to medium gravel, little silt, wet. - End of boring 20'. WATER LEVELS:		WELL LEGENI	Fill D:		S6	11-19- 16-17	35	24/14	<1	
During I	During Drilling End of Boring Date:			ative Fill Be	Fill Bentonite Bentonite Grout Concrete PVC Screen PVC Ri					 VC Riser	
NOTES 1. Soil 1 2. Soil 3 by 140 3. NA=	NOTES: 1. Soil borings conducted using truck-mounted drill rig with 4 ¼" ID 2. Soil sampling conducted by standard penetration test with 2" spl by 140 lb. safety hammer. 3. NA=not applicable; NE=not encountered; NM=not measured.			ers. Iriven Isli Po Pro	IENT nass rE: ngtor rtsmc	: e, Han n Stree puth, N	gan & t H	Bustlin, 1	nc. Page);	1

	ANGAM	BORING LOC	5:					r		B21	
The		Reviewed by: JPS		Total Depth	h:	15 F	eet	Logged E	By:		BAB
CC	onsulting Inc.	Date Reviewed: 5/6	17	Boring Diar	meter:	2 1/4 l	nches	Date Drill	ed: 3/2	22/17 to	3/22/17
	,	Surface Elevation (ft.):	21	Well Sticku	ib:	N	A	Driller:		M	iller
DEPTH	DESCRIF Based on USCS Burmister Soil Class	PTION and modified sification System	SOILF	PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
	7" ASPHALT. S1 (0-2') No recovery, auger fine to medium gravel.	cuttings consisted of	Road Base/	Cobblestone	es	S1	7-4-3	8 11	24/0	NA	
	S2 (2-4') Loose, brown/gray, little silt, trace fine to medium	fine to medium SAND, gravel, moist.		Fill		S2	6-4-4 3	- 8	24/10	<1	
- 5	S3 (4-6) Loose, brown/gray, little silt, trace fine to medium gray mottles, moist.	ine to medium SAND, gravel, few red and	Na	ative		S3	4-3-6- 9	9	24/15	<1	
	Augered to 8'. S4 (8-10') Medium dense, bro medium SAND, little sill, trace gravel, red/orange and dark of moist. Auger to 13'. S5 (13-15') Medium dense, gr little to some silt, little fine to r End of boring 15'.	own/gray, fine to a fine to medium gray, weathered rock, ray/brown, fine SAND, nedium gravel, wet.	Glad	sial Till Fill		S4	8-12- 12-21 10-13- 14-21	24	24/15 24/14	<1	
During I	Drilling End of Boring Da	ite:				Z	77)	[₹]			
	NE			ative Fill B	entonite	Benton	ite Grou	ut Concrete	E PVC S	≡ Screen P	I I VC Riser
NOTES 1. Soil 2. Soil by 140 3. NA=	NOTES: 1. Soil borings conducted using truck-mounted drill rig with 4 ¼" ID 2. Soil sampling conducted by standard penetration test with 2" split by 140 lb. safety hammer. 3. NA=not applicable; NE=not encountered; NM=not measured.		ollow-stem auge barrel sampler c	Iriven SI	LIENT anasso TE: lingtor ortsmc	: e, Hang n Stree buth, N	gan & t H	Bustlin, I	nc.		1

	BORING LOG: Reviewed by:									B22		
		Reviewed by: JPS		Total Dep	pth:	8 Fe	eet	Logged E	y:		BAB	
Co	nculting Inc	Date Reviewed: 5/4	liz	Boring Di	iameter:	2 1/4 li	nches	Date Drill	ed: 3/2	22/17 to	3/22/17	
	nsulung, inc.	Surface Elevation (ft.): 2	24	Well Stic	kup:	N	٩	Driller:		Mi	ller	
DEPTH	DESCRIF Based on USCS Burmister Soil Class	PTION and modified sification System	SOIL F	PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION	
	3" ASPHALT. S1 (0-2') Brown, fine to mediu medium gravel, trace silt, aug	um SAND, some fine to gered past cobble.	Road Ba	se/Cobble	s 🛞	S1	3-6- 11/4'	, 9	22/3	NM		
	S2 (2-4') Loose, gray/brown, few gray mottles, moist.	fine SAND, some silt,	Sand	and Silt		S2	3-2-3 4	- 5	24/8	<1		
5	S3 (4-6') Loose, brown/gray S little clay, trace weathered ro	SILT, little fine sand, ck, moist.	Glad	cial Till		S3	1-4-5 7	9	24/11	<1		
	Auger to 8'.											
	Auger refusal, end of boring 8	3'.										
—10—												
WATE	R LEVELS:		WELL LEGEN	D:			I			L		
During	Drilling End of Boring Da NE	ate:		•.0				=				
			Filter Sand N	lative Fill	Bentonil	e Bentor	nite Gro	ut Concret	e PVC	Screen F	VC Riser	
NOTES	NOTES: 1. Soil borings conducted using truck-mounted drill rig with 4 %" ID		ollow-stem aug	ers.	Vanass	i: se, Han	gan &	Bustlin,	Inc.			
2. Soil	 Soil sampling conducted using index-modified drining with 4 /4 1D Soil sampling conducted by standard penetration test with 2" spl by 140 lb, safety hammer 		parrel sampler	driven	SITE:							
3. NA=	 NA=not applicable; NE=not encountered; NM=not measured. 				lel'	- 01						
					Islington Street Portsmouth. NH							
				-	Project			161 05003	Pag	Page: 1		

			A foreign and a second s							The second s	
	ANGAM	BORING LOG):							B24	
"IIII"	ANDUM	Reviewed by: JPS)	Total De	epth:	9.5 F	Feet	Logged E	By:		BAB
Co	nsulting Inc	Date Reviewed: 5kg	iliz	Boring [Diameter:	2 1/4 I	nches	Date Drill	ed: 3/3	22/17 to	3/22/17
	nouting, me.	Surface Elevation (ft.):	29	Well Sti	ckup:	N	A	Driller:		М	iller
DEPTH	DESCRIF Based on USCS Burmister Soil Class	PTION and modified sification System	SOIL	PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
	4" ASPHALT. S1 (0-2') Medium dense, brow	wn, fine to medium			*	5					
	SAND, little fine to medium g S2 (2-4') 7" Loose, gray/brow over 8" medium dense, gray, little silt, trace fine to medium	ravel, trace silt. /n SAND and SILT, /brown, fine SAND, gravel, moist.	Sand	and Silt		S1 S2	8-6-2 1-1-7- 15	- 8	24/7 24/15	<1	
 5	S3 (4-6') Dense, gray/brown, fine SAND, little silt, trace fine to medium gravel, boulder at 5.5' to 6'.		Glad	cial Till		S3	13-13 24-30	37	24/12	<1	
	S4 (8-9') 2" Gray/brown, fine fine to medium gravel, over 7 ROCK and fine to medium GI medium sand, trace silt. Auger refusal, end of boring S	SAND, little silt, trace " brown, fractured RAVEL, little fine to 9.5'.	Glad	cial Till		S4	38- 75/6"	NA	12/9	<1	
WATEF During I	R LEVELS: Drilling End of Boring Da NE	ite:	WELL LEGENI	D: ative Fill	Bentonit	e Benton	ite Grou	t Concrete	PVC S	Screen P	UC Riser
1. Soil I 2. Soil s by 140 3. NA=i	NOTES: 1. Soil borings conducted using truck-mounted drill rig with 4 ¼" ID H 2. Soil sampling conducted by standard penetration test with 2" split by 140 lb. safety hammer. 3. NA=not applicable; NE=not encountered; NM=not measured.		ollow-stem auge parrel sampler o	ers. Iriven	Vanass SITE: Islingto Portsmo	n Stree outh, N	gan & t H	Bustlin, I	nc.		1

	and the second										
		BORING LOG):							B26	
"IIII		Reviewed by:	5	Total Depth	n:	7 Fe	eet	Logged B	y:		BAB
Co	onsulting Inc	Date Reviewed: 5	1/17	Boring Diar	meter:	2 1/4 Ir	nches	Date Drill	ed: 3/2	22/17 to	3/22/17
		Surface Elevation (ft.):	24	Well Sticku	ip:	NA	4	Driller:		Mi	ller
DEPTH	DESCRIF Based on USCS Burmister Soil Clas	PTION and modified sification System	SOIL	PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
	7" ASPHALT. S1 (0-2') Medium dense, gra medium SAND, some fine to silt. S2 (2-4') Loose, gray/brown, some fine to medium gravel,	y/brown, fine to medium gravel, trace fine to medium SAND, trace silt.		Fill		\$1 \$2	12-9-0 2-3-3	6 21 - 6	24/6	1	
5	S3 (4-6') Medium dense, gra and SILT, red and gray mottl	y/brown, fine SAND es.	Sand	and Silt		S3	2 2-6-9 19	- 15	24/12	<1	
 - 10 	Auger refusal, end of boring	7'.									
WATEI	R LEVELS: Drilling End of Boring Da NE	ate:	WELL LEGEN	D: ative Fill B	entonite	Benton	ite Grou	t Concrete	PVC S	Screen P	 VC Riser
NOTES: 1. Soil borings conducted using truck-mounted drill rig with 4 ¼" ID h 2. Soil sampling conducted by standard penetration test with 2" split by 140 lb. safety hammer. 3. NA=not applicable; NE=not encountered; NM=not measured.		ollow-stem aug barrel sampler o	ers. driven Isl Pc	LIENT anasse ITE: lington ortsmo	: e, Hang n Street outh, NI	gan & t H	Bustlin, I	nc.	ə:	1	

	BORING LOG:									B27	
		Reviewed by:	Ľ'	Total De	pth:	7 F	eet	Logged B	y:		BAB
Co	nculting Inc	Date Reviewed: 57	kili7	Boring D	iameter:	2 1/4 li	nches	Date Drill	ed: 3/2	22/17 to	3/22/17
	nouting, inc.	Surface Elevation (ft.):	23	Well Stic	kup:	N	٩	Driller:		Mi	ller
рертн	DESCRIF Based on USCS Burmister Soil Class	PTION and modified sification System	SOIL F	PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
	3" ASPHALT. S1 (0-2') Brown, fine to medi medium gravel, trace silt, mo	um SAND, some fine to ist.		Fill		S1	7-6-5	5 13	24/10	169	
	S2 (2-4') 3" Brown, fine to me fine to medium gravel, trace s SILT, little fine sand, little clay moist.	edium SAND, some silt, over 10" loose y, few red mottles,	Glad	cial Till		S2	9-3-1 2	- 4	24/13	6	
	S3 (4-6') Medium dense, gray and SILT, trace fine to mediu mottles, eveidence of dark gr rock. Augered to refusal with chatte	//brown, fine SAND m gravel, red and gray ay and red weathered er.				S3	5-6-9 9	- 15	24/20	13	
 	Auger refusal, end of boring 7	7'.									
WATE	R LEVELS:		WELL LEGENI	D:			777		I		
During	Drilling End of Boring Da NE	ate:	Filler Seed		Bentanit	e Borton					VC Piper
NOTES: 1. Soil borings conducted using truck-mounted drill rig with 4 ¼" ID I 2. Soil sampling conducted by standard penetration test with 2" split by 140 lb. safety hammer. 3. NA=not applicable; NE=not encountered; NM=not measured.		Filter Sand Na ollow-stem aug barrel sampler o	ative Fill ers. driven	Bentonit CLIEN Vanass SITE: Islingto Portsm	e Benton F: se, Hang n Stree outh, N	gan & t H	Bustlin, I	nc.	e:	VC Riser	

	BORING LOG: Reviewed by:									B28		
	ANDOM	Reviewed by:		Total Dept	th:	10 F	eet	Logged I	Зу:		BAB	
Co	insulting Inc	Date Reviewed: 5k	5/7	Boring Dia	meter:	2 1/4 li	nches	Date Dril	led: 3/2	22/17 to	3/22/17	
	nouting, inc.	Surface Elevation (ft.):	23	Well Sticku	up:	N	4	Driller:		Mi	ller	
DEPTH	DESCRIF Based on USCS Burmister Soil Class	PTION and modified sification System	SOIL F	ROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION	
	9" ASPHALT. S1 (0-2') Loose, fine to mediu some fine to medium gravel,	um SAND, some silt, trace silt.	F	Fill	*	S1	5-4-5	9	24/9	<1		
	S2 (2-4') Medium dense, gray trace fine to medium gravel, r	γ, fine SAND, little silt, noist.	Sand	and Silt		S2	4-5-6- 5	. 11	24/5	21		
 - 5 	S3 (4-6') 10" Medium dense, SAND, little silt, trace fine to r over 8" medium dense, gray/l SAND, trace fine to medium o moist.	" Medium dense, dark gray/black, fine silt, trace fine to medium gravel, moist, dium dense, gray/brown SILT and fine e fine to medium gravel, red mottles,		Native		S3	4-6-7- 5	13	24/18	4		
10 10 15 15 	Auger to 8'. S4 (8-10") 14" Gray/brown, fir trace clay, trace fine gravel, o SAND, some silt, little fine to 1 (weathered red and dark gray mottles, moist. End of boring 10'.	ne SAND and SILT, ver 6" brown/gray, fine medium gravel rrock), few red	Glac	al Till		S4	6-10- 11-11	21	24/20	13		
WATEF During [I	R LEVELS: Drilling End of Boring Da NE	le:	WELL LEGEND	tive Fill B		Bentoni	T te Grou	t Concrete	PVC S	creen P	/C Riser	
1. Soil £ 2. Soil £ by 140 3. NA=r	 borings conducted using truck-moun sampling conducted by standard pe lb. safety hammer. not applicable; NE≃not encountered	nted drill rig with 4 ¼" ID h netration test with 2" split I I; NM=not measured.	ollow-stern auge barrel sampler di	rs. Va iven SI Isl Pc	anasse ITE: lington ortsmo	Street	ian & I	Bustlin, I	nc.	:	1	

		r									
	ANGOM	BORING LOO	G:	- ,						B30	
In		Reviewed by:	2	Total De	epth:	11 F	Feet	Logged E	By:		BAB
Co	onsulting Inc.	Date Reviewed: 5/	4/17	Boring [Diameter	2 1/4 1	nches	Date Drill	ed: 3/2	23/17 to	3/23/17
	nie chemis, niec	Surface Elevation (ft.):	28	Well Sti	ckup:	N	A	Driller:		Mi	ller
DEPTH	DESCRIF Based on USCS Burmister Soil Class	PTION and modified sification System	SOIL	PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
	3" ASPHALT. S1 (0-2') 2" Red/brown, fract brown/gray, fine to medium 3 medium gravel, trace silt. Augered to 2'. S2 (2-4') Gray/brown, fine SA fine to medium gravel, moist. S3 (4-6') 7" Medium dense, b sand, over 15" dense, gray/b silt, little fine to medium grave mottles, moist. Auger to 7'. S4 (7-9') Medium dense, gray some silt, trace fine to medium S5 (9-11') Dense, gray/brown trace fine to medium gravel, r weathered rock, wet. S6 (11') Fractured ROCK, littl SAND, little silt, wet. Auger refusal, end of boring 1	ured ROCK, over 2" SAND, little fine to NND, some silt, little frown SILT, little fine rown, fine SAND, little el, few red and gray //brown, fine SAND, m gravel, moist to wet. h, fine SAND and SILT, red and dark gray, le fine to medium 11'.				S1 S2 S3 S4 S5 S6	75/5' 3-4-7 15 9-16- 24-22 14-11 12-12 9-19- 33-40 50/1"	- 11 40 23 52	11/4 24/12 24/22 24/20 1/1	NM 1 15 1	
During [R LEVELS: Drilling End of Boring Da	ite:	WELL LEGEN	D:	5.00	Z	777	(=··)	E	≣	11
	NE		Filter Sand N	ative Fill	Bentonit	e Benton	ite Grou	t Concrete			 VC Riser
NOTES 1. Soil I 2. Soil s by 140 3. NA=I	S: borings conducted using truck-mou sampling conducted by standard pe lb. safety hammer. not applicable; NE=not encountered	nted drill rig with 4 ¼" ID f enetration test with 2" split d; NM=not measured.	hollow-stem aug	ers. driven	CLIEN Vanass SITE: Islingto Portsm	n Stree outh, N	gan & t H	Bustlin, I 61.05003	nc.		1

	BORING LOG:									B32	
	MNIS(O)M	Reviewed by:	<u> </u>	Total D	epth:	12 F	eet	Logged B	y:		BAB
	poulting loc	Date Reviewed: 5/	aliz	Boring I	Diameter:	2 1/4 1	nches	Date Drill	ed: 3/2	23/17 to	3/23/17
	nsulung, inc.	Surface Elevation (ft.):	27	Well Sti	ckup:	N	A	Driller:		Mi	ller
DEPTH	DESCRIF Based on USCS Burmister Soil Class	PTION and modified sification System	SOIL F	PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
	3 1/2" ASPHALT. S1 (0-2') Brown, fine to mediu medium GRAVEL. S2 (2-4') 6" Loose, gray/brow	um SAND and fine to	Roa	d Base		S1	11-24 5	- 35	24/8		10
	sand, over 4" medium dense medium GRAVEL, some fine silt, moist.	, gray/brown, fine to to medium sand, trace	Glad	cial Till		S2	3-2-10 24)- 12	24/10	2	
— — — 5—	S3 (4-6') Dense, gray/brown, little fine to medium gravel, fe mottles.	fine SAND, little silt, w red and gray	Glacial Till			53	10-21 16-15	37	24/18	1	
	Augered to 8'. S4 (8-10') 16" Medium dense some silt, little fine to medium brown/gray, fine SAND, some medium gravel, slight petrole Augered to refusal at 12'. Auger refusal, end of boring 1	e, gray, fine SAND, n gravel, over 4" a silt, little fine to um odor. 12'.		Till		S4	8-11-8	¹⁻ 19	24/20	30	
Durina I	R LEVELS: Drilling End of Boring Da	ate:				P	777)	(= · · ·)	Ē		11
9	NE		Filter Sand N	ative Fill	Bentoni	le Bentor	//// hite Grou	ut Concrete	E PVC €	目 Screen P	 VC Riser
NOTES 1. Soil 2. Soil by 140 3. NA=	S: borings conducted using truck-mou sampling conducted by standard pe lb. safety hammer. not applicable; NE=not encountere	unted drill rig with 4 ¼" ID I enetration test with 2" split d; NM=not measured.	hollow-stem aug	ers. driven	CLIEN Vanass SITE: Islingto Portsm	T: Se, Han on Stree outh, N	gan & t	Bustlin, I	nc.		4

			0							DOO	
	ANGOM	BORING LO	G:							B33	
'III.		Reviewed by:	JPS Total Dept		oth:	14.5 Feet		Logged By:			BAB
Co	nsulting, Inc.	Date Reviewed:	5/0/17	a/i.7 Boring Diameter:		2 1/4 li	nches	Date Dri	led: 3/	/23/17 to 3/23/17	
	0,	Surface Elevation (ft.):	25	Well Stick	kup:	N	4 T	Driller:	>	M	iller
DEPTH	DESCRIF Based on USCS Burmister Soil Clas	PTION and modified sification System	SOIL	PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
	4" ASPHALT. S1 (0-0.5') GRAVEL, split-spoon refusal at 0.5'. Augered through cobbles from 0.5-2'.			obbles		S1	60/2'		6/2	4	
	S2 (2-4') Loose, gray SILT, s fine to medium gravel, moist S3 (4-6') Medium dense, gray trace clay, red and gray moth	ome fine sand, little y, fine SAND and SILT, les, moist.	Silt	and Clay acial Till		S2 S3	2-1-3 2 4-6-6 6	- 4 - 12	24/17 24/24	2	
 10	S4 (8-10') Medium dense, bro silt, little fine to medium grave	own, fine SAND, little el, moist.	Gla	acial Till		S4	17-15 13-16	28	24/22	2	
 - 15 	S5 (13-14.5') Dense, brown/g SAND, some silt, some fine to moist to wet, split-spoon refus Auger refusal, end of boring 1	gray, fine to medium o medium gravel, sal. 14.5'.	Gla	acial Till		S5	14-14 60/3"	NA	15/10	1	
WATEF	R LEVELS: Drilling End of Boring Da 14'	ate:	WELL LEGEN	ND: Native Fill	Bentonite	Bentoni	te Grou	E Concrete	PVC S	Green P	UC Riser
NOTES 1. Soil t 2. Soil s by 140 3. NA=r	: porings conducted using truck-mou sampling conducted by standard pe lb. safety hammer. not applicable; NE=not encountered	inted drill rig with 4 ¼" ID enetration test with 2" spl d; NM=not measured.	hollow-stem aug it barrel sampler	gers. driven s	CLIENT /anasse SITE: slington Portsmo	: e, Hang Street outh, Nł	gan &	Bustlin, I	nc.		1

		BORING LO	G:				×			B34	
	ANSOM	Reviewed by: 10	5	Total D	Depth:	3 F	eet	Logged E	Зу:		BAB
Conculting Inc		Date Reviewed: 5	19/17	Boring	Diameter: 2 1/4 Inches		Date Drilled: 3/23/17 to 3/		3/23/17		
	CONSULTINE, ITIC. Surface Elevation (ft.)			Well St	lickup:	N	A	Driller:		Miller	
DEPTH	DESCRIF Based on USCS Burmister Soil Clas	SOIL	PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION	
	4" ASPHALT. S1 (0-2') 6" Brown, fine to me fine to medium gravel, trace : S2 (2-2'2") Split-spoon refusa Auger refusal at cobbles, end	edium SAND, some silt, over 5" COBBLES. al. d of boring 3'.				S1 S2	2-18- 14 60/2'	39	24/11 2/2	1 NM	
WATEF During [R LEVELS: Drilling End of Boring Da NE	ite:	WELL LEGEN	D: D: ative Fill	Bentoni	te Benton	ite Grou	t Concrete	PVC S	Screen P	 /C Riser
NOTES 1. Soil 8 2. Soil 8 by 140 3. NA=r	5: borings conducted using truck-mou sampling conducted by standard pe lb. safety hammer. not applicable; NE=not encountered	nted drill rig with 4 ½" ID enetration test with 2" split d; NM=not measured.	hollow-stem aug barrel sampler o	ers. driven	CLIEN Vanass SITE: Islingto Portsm	T: se, Hang on Street louth, N	gan & t H	Bustlin, I	nc.		1

	a	DODINOLO								000	and the second
	ANGOM	BORING LOO	G:		В30						
n.	THIADAIAE	Reviewed by: UPS	/	Total De	epth: 12 Feet		Logged By:		BAB		
Cc	onsulting, Inc.	Date Reviewed: 5/9	17	Boring D	iameter:	2 1/4	nches	Date Drill	ed: 3/2	23/17 to	3/23/17
	0,	Surface Elevation (ft.):	26	Well Stic	kup:	N		Driller:	Ż	Mi	ller
DEPTH	DESCRIPTION Based on USCS and modified Burmister Soil Classification System			PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATIO RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
	2" ASPHALT. S1 (0-2') Brown, fine to medi medium gravel, little silt.	um SAND, little fine to		Fill		S1	2-8-7- 5	- 15	24/9	<1	
	S2 (2-4') Medium dense, gra some silt, little fine to medium gray SILT, little fine sand, mo S3 (4-6') Loose, dark gray SI	Medium dense, gray/brown, fine SAND, little fine to medium gravel, over 2" dark , little fine sand, moist. Loose, dark gray SILT, little clay, trace fine				S2	6-5-6 3	- 11	24/12	<1	
5			Glad	cial Till		S3	1-2-2· 4	4	24/22	<1	
	Auger to 8'. S4 (8-10') 6" Loose, gray, fin 9" medium dense, brown/red SAND, little fine to medium g to wet. S5 (10-12') 11" Medium dense SAND, trace fine to medium S medium gravel, little silt, wet. End of boring 12'.	e SAND, little silt, over , fine to medium ravel, trace silt, moist e, gray SILT, little fine gravel, over 13" dense, SAND, little fine to	Glad	ial Till		S4 S5	1-9-15 9 9-17- 15-10	32	24/15 24/24	<1	
VATER LEVELS: VI During Drilling End of Boring Date: NE Fill			Filter Sand Na	ative Fill	Bentonite Bentonite Grout Concrete PVC Screen PVC Rise						VC Riser
NOTES: 1. Soil borings conducted using truck-mounted drill rig with 4 ¼" ID hollow-stem a 2. Soil sampling conducted by standard penetration test with 2" split barrel sampl by 140 lb. safety hammer. 3. NA=not applicable; NE=not encountered; NM=not measured.				ers.	Vanasse, Hangan & Bustlin, Inc. SITE: Islington Street Portsmouth, NH Project No.: 161.05003 Page: 1				1		

		BORING LOG	1							B37	
	ARSOM	Reviewed by: iP\		Total De	pth:	5 Fe	eet	Logged By: BA		BAB	
	poulting Inc	Date Reviewed: 5/9	1/12	Boring D)iameter:	: 2 1/4 Inches		Date Drilled:		3/23/17 to 3/23/17	
CONSULTING, ITC. Surface Elevation (ft.):			26	Well Stic	kup:	NA	٩	Driller:		Mil	ler
ДЕРТН	DESCRIF Based on USCS Burmister Soil Class	PTION and modified sification System	SOIL	PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
	4 1/2" ASPHALT. S1 (0-2') Brown, fine to medi medium gravel, little silt, moi	um SAND, little fine to st.	Roa	d Base		S1	4-3-5	5 7	24/4	1	
	S2 (2-3.5') 5" Dense, brown, some fine to medium gravel, fractured ROCK, split-spoon Augered to 4'.	fine to medium SAND, trace silt, over 3" gray, refusal.	Gla	cial Till		S2	16-18 18- 55/2'	3- 36	20/8	1	
	S3 (4-5') Dark gray, fine to m fine to medium gravel, little s	edium SAND, some ilt, wet.	Be	drock	\otimes	S3	3- 50/2'	, NA	8/4	17	
	Auger refusal, end of boring	5.									
—10—											
—15—											
			•								
WATE	R LEVELS:		WELL LEGEN	ID:						· ·	
During	Drilling End of Boring D NE	bate:		.0		, , , , , , , , , , , , , , , , , , ,					
			Filter Sand	vative Fill	CLIEN	T:	ille Gro	out Concrete	PVC	Screen F	VU RISEI
NOTE 1. Soil	S: borings conducted using truck-mo	unted drill rig with 4 1/4" ID h	ollow-stem aug	gers.	Vanas	se, Han	gan 8	Bustlin,	nc.		
2. Soil sampling conducted by standard penetration test with 2" split by 140 lb. safety hammer.			Darrei sampier	unven	SITE:						
3. NA=not applicable; NE=not encountered; NM=not measured.					Islingto	on Stree	et				
					Portsm	nouth, N	IH		1		
					Project No.: 161.05003 Page: 1						

		BORING LOO	G:							B39	
	ARSOM	Reviewed by:	5	Total De	Depth: 4.5 Feet			Logged By: BAB			
Co	nculting Inc	Date Reviewed: 5	19/17	Boring Diameter:		2 1/4 Inches		Date Drilled: 3/??/17 to		3/??/17	
	Surface Elevation (ft.): 26			Well Sti	ckup:	NA	4	Driller:		Mi	ller
рертн	DESCRIF Based on USCS Burmister Soil Class	PTION and modified sification System	SOIL F	PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
	4 1/2" ASPHALT. S1 (0-2') Brown, fine to medium SAND, some fine to medium gravel. S2 (2-4') 2" brown, fine to medium sand, some fractured rock, little silt, wet, over, 10" gray, fractured ROCK.			d Base cial Till		S1 S2	4-3-2 28-15 28-47	7	24/10 24/12	2	
	Auger refusal, end of boring 4	4.5'.	WELL LEGEN	D:							
NOTES 1. Soil I 2. Soil s by 140 3. NA=	Drilling End of Boring Da NE S: porings conducted using truck-mou sampling conducted by standard pe Ib. safety hammer. not applicable; NE=not encountered	ate: Inted drill rig with 4 ¼" ID I enetration test with 2" split d; NM=not measured.	Filter Sand Na hollow-stem auge barrel sampler o	ative Fill ers. Iriven	Bentonite CLIENT Vanasse SITE:	Bentoni : e, Hang	te Grou	t Concrete Bustlin, I	PVC S	Screen P	VC Riser
				-	Islington Street Portsmouth, NH					1	



Grain Size							
Material	Fraction	Sieve Size					
Boulders		12" +					
Cobbles		3"–12"					
Gravel	coarse	3⁄4"–3"					
	fine	No. 4 to ¾"					
Sand	coarse	No. 10 to No. 4					
	medium	No. 40 to No. 10					
	fine	No. 200 to No. 40					
Fines		Passing No. 200					
(Silt & Clay)							

Soil Classification Terms

Coarse and Fine Grained Soils							
Descriptive Adjective	*Percentage Requirement						
Trace	1–10%						
Little	10–20%						
Some	20–35%						
And	35–50%						

When sampling gravely soils with a standard split spoon, the true percentage of gravel is often not recovered due to the relatively small sampler diameter.

*Percentage measured by weight.

Identification of soil type Is made on the basis of an estimate of particle sizes, and in the case of fine-grained soils, also on basis of plasticity.

Standard Penetration	Value (N) &	Undrained Shear	[•] Strength (S _u) v.	Relative Density	& Consistency
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GRANULAR SOILS							
N	Relative Density (%)						
0–4	Very Loose (0-15)						
4–10	Loose (15-35)						
10–30	Medium Dense (35-65)						
30–50	Dense (65-85)						
>50 Very Dense (>85)							

COHESIVE SOILS							
S _u (psf)	N	Consistency					
<250	<2	Very Soft					
250 to 500	2–4	Soft					
500 to 1,000	4–8	Medium					
1,000 to 2,000	8–15	Stiff					
2,000 to 4,000	15–30	Very Stiff					
>4,000	>30	Hard					

Consistency of cohesive soils is based upon undrained shear strength determined from field vane shear, pocket penetrometer, torvane, or laboratory tests. Consistency of cohesive soils is based upon the N-value when no other data is available.



Rock Classification Terms

Weathering Classification						
Grade	Symbol	Diagnostic Features				
Fresh	F	No visible sign of decomposition or discoloration. Rings under hammer impact.				
Slightly Weathered	WS	light discoloration inwards from open fracture, otherwise similar to F.				
Moderately Weathered	WM	Discoloration throughout. Weaker mineral such as feldspar decomposed. Strength somewhat less than fresh rock but cores can not be broken by hand or scraped by knife.				
Highly Weathered	WH	Most minerals somewhat decomposed. Specimens can be broken by hand with effort or shaved with knife. Core stones present in rock mass. Texture becoming distinct but fabric.				
Completely Weathered	wc	Minerals decomposed to soil but fabric and structure preserved (Saprolite). Specimens easily crumbled or penetrated.				
Residual Soil	RS	Advanced state of decomposition resulting in Plastic soils. Rock fabric and structure completely destroyed. Large volume change.				

Rock Descriptors							
Term		Meaning					
Hardness	Soft	Scratched by finge	rnail				
	Medium Hard	Scratched easily by	y penknife				
Hard Scratched with difficulty by							
	Very Hard Cannot be scratched by penknif						
Jointing/	Slight	2 to 6 ft. spacing					
Fractures	Moderate	erate 8in. to 2 ft.					
	High	2 in. to 8 in.					
	Intense	< 2in.					
Bedding	Laminated	(< 1")	Natural Break				
	Thin Bedded	(1"-4")	in Rock				
	Bedded	(4" - 12")	Layers				
	Thick Bedded	(12" - 36")					
	Massive	(> 36")					

Table 1 - FUEL FACTORS				
Item of Work	Item No.		Units	Fuel
Excavation:				
Earth	203.14		gal/c.y.	0.26
	203.50,.5	1		
	203.6 .7			
	206.1			
	207.1			
	504.1			
Rock	203.2_		gal/c.y.	0.34
	206.2			
	207.2			
	504.2_			
Other	203.3		gal/c.y.	0.31
	206.3_			
	207.3_			
	583			
	585			
	586			
	587			
Bases:				
Unprocessed	209		gal/c.y.	0.46
	304.1_,.2_			
Processed ⁴	304.3_		gal/c.y.	0.82
	304.4_,.5_	,.6_		
	508			
Bituminous Concre	te			
Pavement ²	403		gal/ton	1.90
	411			
All Other Items:			gal/\$1,000 of work	13.0
Excluded Items: ³				()
210	510.41_	550.2_	565.7_	<u>692.</u>
211.	510.61	560	568	693
306.31_	510.65_	561	592	697
306.32	521.2_	563.1_	603.0001	698
306.33_	528	563.2	618	699
410	544	563.3	619	8·_
419.5	548	563.7	624.	10
510.31_	550.1_	565.2_	645./_	

² Item 403.4, 403.16, & 403.26 shall be calculated using the "All Other Items" category rate.
³ Also excluded are all supplementary agreements, extra work and per specification items.
⁴ Item 304.32 shall be calculated using the "All Other Items" category rate.

NONDISCRIMINATION CLAUSE

NONDISCRIMINATION IN CITY CONTRACTS: Any entity that enters into a contract for goods or services with the City of Portsmouth or any of its boards, agencies, and departments and any recipient of city funds shall:

Implement an employment nondiscrimination policy prohibiting discrimination in hiring, discharging, promoting or demoting, matters of compensation, or any other employment-related decision or benefit on account of actual or perceived race, ethnicity, color, religion, national origin, gender, disability, age, military status, sexual orientation, gender identity, gender expression, or marital or familial status.

Not discriminate in the performance of the contract on account of actual or perceived race, ethnicity, color, religion, national origin, gender, disability, age, military status, sexual orientation, gender identity, gender expression, or marital or familial status.