CONTRACT DOCUMENTS AND SPECIFICATIONS

for

Chestnut Street Streetscape Project

Bid # 61-17

City of Portsmouth

State of New Hampshire

John P. Bohenko, City Manager

Prepared by:

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133 Court Street
Portsmouth, NH 03801

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Department of Public Works

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INVITATION TO BID

Sealed bid proposals, **plainly marked, Chestnut Street Streetscape Project**, Bid Proposal #61-17 **on the outside of the mailing envelope as well as the sealed bid envelope,** addressed to the Finance/Purchasing Department, City Hall, 1 Junkins Avenue, Portsmouth, New Hampshire, 03801, will be accepted until July 31, 2017 at 1:00 p.m.; at which time all bids will be publicly opened and read aloud. **A pre-bid meeting will be held on Thursday July 20th at 10:00 a.m. at the Department of Public Works, 680 Peverly Hill Road.**

This project consists of the installation of water mains and services, drainage pipe & structures, sewer pipe, structures and services, roadway reconstruction with the installation of new concrete paver walks and roadway, granite curbing, granite landscape features and landscaping in the section of Chestnut Street from Congress Street to Porter Street including portions of both Porter and Congress.

Work may begin at any time on or after September 4, 2017. All utility work and binder pavement must be installed by November 10th, 2017. Final Completion of the project must occur by June 8, 2018. **Liquidated damages shall be assessed at $200.00 per day. Hours of work will be 7AM to 5 PM weekdays.**

The Contractor will be required to keep a sidewalk passable for the public to the maximum degree possible**. Chestnut Street may be closed for vehicular traffic during entire construction period. Porter Street may be closed during the work day when work is progressing in that street. Congress Street shall remain open with at least one lane of travel at all times.**

The General Contractor for this project must be Pre-qualified with NHDOT for Road Construction.

Bidders must determine the quantities of work required and the conditions under which the work will be performed.

Specifications may be obtained at the City's website: http://www.cityofportsmouth.com/finance/purchasing.htm
Addenda to this project, if any, including written answers to questions, will not be provided directly to vendors, but will be posted by **July 24, 2017** on the City of Portsmouth Website under the project heading.

Electronic copies of the plans and specifications may be obtained from the City's webpage. Documents are not available for pickup.

The City reserves the right, after bid opening and prior to award of the contract, to modify the amount of the work in the event that bids exceed budgeted amounts. The City of Portsmouth further reserves the right to reject any or all bids, to waive technical or legal deficiencies, to re-bid, and to accept any bid that it may deem to be in the best interest of the City. Also, the City reserves the right to approve or deny subcontractors for this project. An award of this project is contingent upon additional process and funding.

Each Bidder shall furnish a bid security in the amount of ten percent (10%) of the bid. The Bid Security may be in the form of a certified check or a bid bond executed by a surety company authorized to do business in the State of New Hampshire, made payable to the City of Portsmouth, N.H.

INSTRUCTIONS TO BIDDERS

BIDDING REQUIREMENTS AND CONDITIONS

1. Special Notice to Bidders

Appended to these instructions is a complete set of bidding and general contract forms. These forms may be detached and executed for the submittal of bids. The plans, specifications, and other documents designated in the proposal form will be considered as part of the proposal, whether attached or not.

The bidders must submit a statement of bidder's qualifications, if requested, subsequent to bid opening but prior to award.

Addenda to this bid document, if any, including written answers to questions, will be posted by July 24, 2017 on the City of Portsmouth website at http://www.cityofportsmouth.com/finance/purchasing.htm under the project heading. Addenda and updates will NOT be sent directly to firms. Contractors submitting a bid should check the web site daily for addenda and updates after the release date. Firms should print out, sign and return addenda with the proposal. Failure to do so may result in disqualification.

2. Interpretation of Quantities in Bid Schedules

The quantities appearing in the bid schedule are approximate only and are prepared for the comparison of bids. Payment to the contractor will be made only for actual work performed and accepted in accordance with the contract. Any scheduled item of work to be done and materials to be furnished may be increased, decreased or omitted as hereinafter provided, and no claim for loss, anticipated profits or costs incurred in anticipation of work not ultimately performed will be allowed due to such increase or decrease.

3. Examination of Plans, Specifications and Site Work

The bidder is expected to examine carefully the site of the proposed work, the plans, standard specifications, supplemental specifications, special provisions and contract forms before submitting a proposal. The submission of a bid shall be considered conclusive evidence that the bidder has made such examination and is satisfied as to the conditions to be encountered in performing the work and as to the requirements of the contract. It will be conclusive evidence that the bidder has also investigated and is satisfied with the sources of supply for all materials.

Plans, surveys, measurements, dimensions, calculations, estimates and statements as to the condition under which the work is to be performed are believed to be correct, but the contractors must examine for themselves, as no allowance will be made for any errors or inaccuracies that maybe found therein.

4. Familiarity with Laws

The bidder is assumed to have made himself or herself familiar with all federal and state laws and all local by-laws, ordinances and regulations which in any manner affect those engaged or employed on the work or affect the materials or equipment used in the work or affect the conduct of the work, and the bidder, if awarded the contract, shall be obligated to perform the work in conformity with said laws, by-laws, ordinances and regulations notwithstanding its ignorance thereof. If the bidder shall discover any provision in the plans or specifications which is in conflict with any such law, by-law, ordinance or regulation the bidder shall forthwith report it to the engineer in writing.

5. Preparation of Proposal

a) The bidder shall submit its proposal upon the forms furnished by the Owner. The bidder shall specify a lump sum price in figures, for each pay item for which a quantity is given and shall also show the products of the respective prices and quantities written in figures in the column provided for that purpose and the total amount of the proposal obtained by adding the amount of the several items. All words and figures shall be in ink or typed.

If a unit price or a lump sum bid already entered by the bidder on the proposal form is to be altered it should be crossed out with ink, the new unit price or lump sum bid entered above or below it and initialed by the bidder, also with ink.

b) The bidder's proposal must be signed with ink by the individual, by one or more general partners of a partnership, by one or more members or officers of each firm representing a joint venture; by one or more officers of a corporation, by one or more members (if member-managed) or managers (if manager-managed) of a limited liability company, or by an agent of the contractor legally qualified and acceptable to the owner. If the proposal is made by an individual, his or her name and post office address must be shown, by a partnership the name and post office address of each general and limited partner must be shown; as a joint venture, the name and post office address of each venturer must be shown; by a corporation, the name of the corporation and its business address must be shown, together with the name of the state in which it is incorporated, and the names, titles and business addresses of the president, secretary and treasurer.

6. Nonconforming Proposals

Proposals will be considered nonconforming and may be rejected in the Owner's sole discretion for any of the following reasons:

If the proposal is on a form other than that furnished by the Owner, or if the form is altered or any portion thereof is detached;

If there are unauthorized additions, conditional or altered bids, or irregularities of any kind which may tend to make the proposal or any portion thereof incomplete, indefinite or ambiguous as to its meaning;

If the bidder adds any provisions reserving the right to accept or reject an award, or to enter into a contract pursuant to an award; or

If the proposal does not contain a unit price for each pay item listed except in the case of authorized alter pay items.

7. Proposal Guaranty

No proposal will be considered unless accompanied by a bid bond, surety, or similar guaranty of the types and in an amount not less than the amount indicated in the Invitation to Bid. All sureties shall be made payable to the "City of Portsmouth". If a bid bond is used by the bidder it shall be:

In a form satisfactory to the Owner;

With a surety company licensed, authorized to do business in, and subject to the jurisdiction of the courts of the State of New Hampshire; and

Conditioned upon the faithful performance by the principal of the agreements contained in the sub-bid or the general bid.

In the event any irregularities are contained in the proposal guaranty, the bidder will have four business days (not counting the day of opening) to correct any irregularities. The corrected guaranty must be received by 4:00 p.m. If irregularities are not corrected to the satisfaction of the Owner, the Owner, in its sole discretion, may rejected the bid.

8. Delivery of Proposals

When sent by mail, the sealed proposal shall be addressed to the Owner at the address and in the care of the official in whose office the bids are to be received. All proposals shall be filed prior to the time and at the place specified in the invitation for bids. Proposals received after the time for opening of the bids will be returned to the bidder, unopened.

9. Withdrawal of Proposals

A bidder will be permitted to withdraw his or her proposal unopened after it has been submitted if the Owner receives a request for withdrawal in writing prior to the time specified for opening the proposals.

10. Public Opening of Proposals

Proposals will be opened and read publicly at the time and place indicated in the invitation for bids. Bidders, their authorized agents, and other interested parties are invited to be present.

11. Disqualification of Bidders

Any or all of the following reasons may be deemed by Owner in its sole discretion as being sufficient for the disqualification of a bidder and the rejection of his proposal:

More than one proposal for the same work from an individual, firm, or corporation under the same or different name;

Evidence of collusion among bidders;

Failure to submit all required information requested in the bid specifications;

If the Contractor is not listed with the New Hampshire Department of Transportation as a pre-qualified contractor under the classification of Road Construction;

Lack of competency or of adequate machinery, plant or other equipment, as revealed by the statement of bidder's qualification or otherwise;

Uncompleted work which, in the judgment of the owner, might hinder or prevent the prompt completion of additional work if awarded;

Failure to pay, or satisfactorily settle, all bills due for labor and materials on former contracts;

Default or unsatisfactory performance on previous contracts; or

Such disqualification would be in the best interests of the Owner.

12. Material Guaranty and Samples

Before any contract is awarded, the bidder may be required to furnish a complete statement of the origin, composition and manufacture of any or all materials to be used in the construction of the work, and the Owner may, in its sole discretion, reject the bid based on the contents of the statement or as a result of the failure of the bidder to submit the statement.

AWARD AND EXECUTION OF CONTRACT

1. Consideration of Proposals

After the proposals are opened and read, they will be compared on the basis of the total price for all sections of work and any such additional considerations as may be identified in the bid documents. The results of such comparisons will be immediately available to the public. In case of a discrepancy between the prices written in words and those written figures, the prices written in words shall govern. In case of a discrepancy between the total shown in the proposal and that obtained by adding the products of the quantities of items and unit bid prices, the latter shall govern.

2. Award of Contract

Within 30 calendar days after the opening of proposals, if a contract is to be awarded, the award will be made to the lowest responsible and qualified bidder whose proposal complies with all the requirements prescribed. The successful bidder will be notified, in writing, mailed to the address on his or her proposal, that his or her bid has been accepted and that the bidder has been awarded the contract.

3. Reservation of Rights

The Owner reserves the right to reject any or all proposals, to waive technicalities or to advertise for new proposals, if, in the sole discretion of the Owner, the best interest of the City of Portsmouth will be promoted thereby. The Owner further reserves the right to conduct such investigations of the contractor's history, financial resources, and other qualifications as it deems necessary to determine whether bidder is qualified to do the work. Bidder may be asked to execute releases. Failure to execute a release upon request may result in disqualification.

The Owner reserves the right to cancel the award of any contract at any time before the execution of such contract by all parties without any liability of the Owner.

The City reserves the right, after bid opening and prior to award of the contract, to modify the amount of the work in the event that bids exceed budgeted amounts. An award of this project is contingent upon additional process and funding.

4. Return of Proposal Guaranty

All proposal guaranties, except those of the three lowest bidders, will be returned upon request following the opening and checking of the proposals. The proposal guaranties of the three lowest bidders will be returned within ten days following the award of the contract if requested.

5. Contract Bonds

At the time of the execution of the contract, the successful bidder shall furnish:

A performance bond in the amount of 100 percent of the contract amount.
Labor and materials payment bond in the sum equal to 100 percent of the contract amount.

At the time of project completion, the Owner may, in its sole discretion, permit the Contractor to substitute a maintenance bond in lieu of holding retainage for the entire guaranty period. If a bond is furnished it shall meet the following criteria:

The bond shall be in an amount equal to 20 percent of the contract amount. Such bond shall guarantee the repair of all damage due to faulty materials or workmanship provided or done by the contractor. The guarantee shall remain in effect for a period of one year after the date of final acceptance of the job by the Owner.

Each bond shall be: (1) in a form satisfactory to the Owner; (2) with a surety company licensed and authorized to do business and with a resident agent designated for services of process in the State of New Hampshire; and (3) conditioned upon the faithful performance by the principal of the agreements contained in the original bid. All premiums for the contract bonds are to be paid by the contractor.

6. Execution and Approval of Contract

The successful bidder is required to present all contract bonds, to provide proof of insurance, and to execute the contract within 10 days following receipt of the City's notification of acceptance of the bid. No contract shall be considered as in effect until it has been fully executed by all parties.

7. Failure to Execute Contract

Failure to execute the contract and to provide acceptable bonds and proof of insurance within 10 days after notification of acceptance of bid shall be just cause for the cancellation of the award and the forfeiture of the proposal guarantee which shall become the property of the Owner, not as a penalty, but in liquidation of damages sustained. Award may then be made to the next lowest responsible bidder, or the City may exercise its reserved rights including the rejection of all bids or re-advertisement.

PROPOSAL FORM

Chestnut Street Streetscape Project

CITY OF PORTSMOUTH, N.H.

To the City of Portsmouth, New Hampshire, herein called the Owner.

The undersigned, as Bidder, herein referred to as singular and masculine declares as follows:

1. All interested in the Bid as Principals are named herein.

2. This bid is not made jointly, or in conjunction, cooperation or collusion with any other person, firm, corporation, or other legal entity;

3. No officer, agent or employee of the Owner is directly or indirectly interested in this Bid.

4. The bidder has carefully examined the sites of the proposed work and fully informed and satisfied himself as to the conditions there existing, the character and requirements of the proposed work, the difficulties attendant upon its execution and the accuracy of all estimated quantities stated in this Bid, and the bidder has carefully read and examined the Drawings, Agreement, Specifications and other Contract Documents therein referred to and knows and understands the terms and provisions thereof;

5. The bidder understands that the quantities of work calculated in the Bid or indicated on the Drawings or in the Specifications or other Contract Documents are approximate and are subject to increase or decrease or deletion as deemed necessary by the Director of Public Works. Any such changes will not result in or be justification for any penalty or increase in contract prices; and agrees that, if the Bid is accepted the bidder will contract with the Owner, as provided in the Contract Documents, this Bid Form being part of said Contract Documents, and that the bidder will supply or perform all labor, services, plant, machinery, apparatus, appliances, tools, supplies and all other activities required by the Contract Documents in the manner and within the time therein set forth, and that the bidder will take in full payment therefore the following item prices, to wit:

ITEM #	EST. QTY	UNITS	ITEM DESCRIPTION AND UNIT PRICE IN WORDS	UNIT PRICE IN FIGURES	ITEM TOTAL IN FIGURES
201.3	5	EA	Removal of Shrubs and Stumps	$_____	$_____
202.41	50	LF	Removal of Existing Pipe 0 to 24" Diameter (outside limits of new trenches)	$_____	$_____
202.45	2	EA	Removal of Fire Hydrant and Associated Piping	$_____	$_____

ITEM #	EST. QTY	UNITS	ITEM DESCRIPTION AND UNIT PRICE IN WORDS	UNIT PRICE IN FIGURES	ITEM TOTAL IN FIGURES
202.5	3	EA	Removal of Catch Basins, Drop Inlets, and Manholes	$_____	$_____
202.6	70	LF	Removal of Granite Curb for Salvage	$_____	$_____
202.65	75	SY	Removal of Existing Sidewalks	$_____	$_____
202.8	2	EA	Removal and Storage of Ornamental Lights and Poles	$_____	$_____
203.1	700	CY	Common Excavation	$_____	$_____
203.2	50	CY	Rock Excavation	$_____	$_____
206.19	16	HR	Common Structure Excavation – Exploratory, Including Backfill	$_____	$_____
206.2	75	CY	Rock Structure Excavation	$_____	$_____
209.1	150	CY	Granular Backfill	$_____	$_____
214	950	SY	Fine Grading	$_____	$_____
304.1C	20	CY	3:1 Sand / Cement Mix	$_____	$_____

ITEM #	EST. QTY	UNITS	ITEM DESCRIPTION AND UNIT PRICE IN WORDS	UNIT PRICE IN FIGURES	ITEM TOTAL IN FIGURES
304.2	115	CY	Gravel in Place (Roadway Base)	$_____	$_____
304.3	400	CY	Crushed Gravel in Place (Roadway, Pavers and Curb)	$_____	$_____
403.11A	210	TN	Machine Method, Binder ¾ in (19 mm), 50 GY	$_____	$_____
403.11B	30	TN	Machine Method, Wearing 3/8 in (9.5 mm), 75 GYR	$_____	$_____
403.12	12	TN	Hand Method, Wearing (for sidewalks, patching) 3/8 in (9.5 mm), 75 GYR	$_____	$_____
603.2006D	7	EA	Decorative Downspout Boots to 6" PVC Pipe, J.R. Hoe, O-Series, powder coated black Installed	$_____	$_____
603.8126	65	LF	6" PVC, SDR 21 Sewer Lateral Pipe Including All Fittings	$_____	$_____
603.8128A	234	LF	8" PVC, SDR 21 Sewer Pipe	$_____	$_____
603.82208	43	LF	8" Dia. HDPE Drain Pipe	$_____	$_____

ITEM #	EST. QTY	UNITS	ITEM DESCRIPTION AND UNIT PRICE IN WORDS	UNIT PRICE IN FIGURES	ITEM TOTAL IN FIGURES
603.82212	250	LF	12" Dia. HDPE Drain Pipe	$_____	$_____
603.8226	120	LF	6" Dia. HDPE Drain Pipe Including All Fittings (downspout laterals)	$_____	$_____
604.0007	7	EA	Poly Liner for CB	$_____	$_____
604.124	6	EA	Catch Basin, 4-foot diameter, including oil/debris stop hood.	$_____	$_____
604.314	3	EA	Sewer Manhole, 4-foot diameter	$_____	$_____
604.322	1	EA	Drain Manhole, 2-foot diameter	$_____	$_____
604.324	2	EA	Drain Manhole, 4-foot diameter	$_____	$_____
604.52	1	EA	Reconstruct Existing CB w/ New Slab Top, Adjust / Reset Existing CB Grate, (CB 3843)	$_____	$_____
604.61	3	EA	Install Sewer Manhole Frame & Cover Provided by City	$_____	$_____
604.62	2	EA	Provide and Install DMH Frame & Cover	$_____	$_____

ITEM #	EST. QTY	UNITS	ITEM DESCRIPTION AND UNIT PRICE IN WORDS	UNIT PRICE IN FIGURES	ITEM TOTAL IN FIGURES
604.72	4	EA	Provide and Install CB Frame and Grate	$_____	$_____
604.72A	2	EA	Provide and Install CB Frame and Grate – ADA Grate	$_____	$_____
608.26	1	SY	6 inch Concrete Sidewalk	$_____	$_____
608.5	75	SY	Portsmouth Standard Red Brick Sidewalk	$_____	$_____
608.52	30	SF	Furnish and Install ADA Detectable Warning Tiles, Cast Iron	$_____	$_____
609.015	20	LF	Straight Granite Curb, New 6” x 18”	$_____	$_____
609.018	95	LF	Straight Granite Curb, 8” x 17”	$_____	$_____
609.025	50	LF	Curved Granite Curb, 6” x 18”	$_____	$_____
611.2008	3	EA	8” Gate Valve Assembly including valve box	$_____	$_____
611.2018	205	LF	8” Ductile Iron Water Pipe, including poly wrap and wedges, tees and fittings, installed and tested.	$_____	$_____

ITEM #	EST. QTY	UNITS	ITEM DESCRIPTION AND UNIT PRICE IN WORDS	UNIT PRICE IN FIGURES	ITEM TOTAL IN FIGURES
611.5002	2	EA	2" Copper Corporation and Curb Stop	$_____	$_____
611.5012	110	LF	2" Copper Water Service Pipe	$_____	$_____
611.8	1	EA	New Hydrant Assembly Complete (Incl. tapping saddle & valve & 6" DI lateral pipe)	$_____	$_____
611.9	3	EA	Fire Service Connections to Existing Buildings (Incl. tapping saddle, valve & 6" DI lateral pipe)	$_____	$_____
612.1	4870	SF	Uni-lock Series 3000 Concrete Paver Color: Mocha Brown	$_____	$_____
612.2	550	SF	Uni-lock Series 3000 Concrete Paver Color: Crystalline Basalt	$_____	$_____
614.715118	125	LF	1.5" PVC Schedule 80 Electric / Communications Conduit	$_____	$_____
614.72118	90	LF	2" PVC Schedule 80 Electric / Communications Conduit	$_____	$_____
614.73118	190	LF	3" PVC Schedule 80 Electric / Communications Conduit	$_____	$_____

ITEM #	EST. QTY	UNITS	ITEM DESCRIPTION AND UNIT PRICE IN WORDS	UNIT PRICE IN FIGURES	ITEM TOTAL IN FIGURES
615.01	3	SF	Traffic Sign, Type A, mounted on light pole	$_____	$_____
615.012	6.25	SF	Traffic Sign, Type A, Breakaway Mount	$_____	$_____
615.012A	5.25	SF	Traffic Sign, Type A, Bollard Mount	$_____	$_____
618.7	960	HR	Flaggers (Flaggers get billed at cost)	$ 20.00	$ 19,200.00
618.6	50	HR	Portsmouth Police Officers – Traffic Detail (Police get billed at cost and will be used if directed)	$ 54.00	$ 2,700.00
619.1	1	U	Maintenance of Traffic, Vehicular and Pedestrian	$_____	$_____
619.11	1,500	LB	Calcium Chloride for Dust Control	$_____	$_____
619.253	12	WK	Portable Message Boards	$_____	$_____
625.1	2	EA	Concrete Light Pole Bases	$_____	$_____
626	2	EA	Install Salvaged Ornamental Lights and Poles	$_____	$_____

ITEM #	EST. QTY	UNITS	ITEM DESCRIPTION AND UNIT PRICE IN WORDS	UNIT PRICE IN FIGURES	ITEM TOTAL IN FIGURES
628.2	240	LF	Sawed Bituminous Pavement	$_____	$_____
632.3112	96	LF	12" Thermoplastic Crosswalk Markings	$_____	$_____
645	6	EA	Catch Basin Silt Sack	$_____	$_____
647.1	23	CY	Planting Soil Medium (16" deep: 8 parts loam:1 part aged compost)	$_____	$_____
650	1	LS	Planting - General	$_____	$_____
660.2	2	EA	Core Existing Drain Manhole(s)	$_____	$_____
670.01	4	EA..	Stone Cylinders: Stone Set #6. 2'-9" tall x 2'-6" wide installed	$_____	$_____
670.02	2	EA.	Stone Cylinders: Stone Set #7. 6-0" tall x 2'-6" wide. (includes rock face cap)	$_____	$_____
670.11	1	EA.	Stone Set #1Installed	$_____	$_____
670.12	1	EA.	Stone Set #2 Installed	$_____	$_____

ITEM #	EST. QTY	UNITS	ITEM DESCRIPTION AND UNIT PRICE IN WORDS	UNIT PRICE IN FIGURES	ITEM TOTAL IN FIGURES
670.13	1	EA.	Stone Set #3Installed	$_____	$_____
670.14	1	EA.	Stone Set #4Installed	$_____	$_____
670.15	1	EA.	Stone Set #5 Installed	$_____	$_____
672.06	3	EA	Furnish and Install 6" Dia. Concrete Filled Steel Bollard Including Footing and Plastic Sleeve	$_____	$_____
675.01	1	LS	Foundations for Music Hall Archway Including Excavation, Base Material and Backfill	$_____	$_____
675.02	1	LS	Coordination for Installation of Music Hall Archway, Archway Structure Provided and Installed by Others	$_____	$_____
680.1	1	LS	Coordinate Work with Electric Utility and provide all electrical work for project	$_____	$_____
680.2	1	LS	Coordinate Work with Telecommunications Utility Provider	$_____	$_____
680.3	1	LS	Coordinate Work with Gas Utility Provider	$_____	$_____

ITEM #	EST. QTY	UNITS	ITEM DESCRIPTION AND UNIT PRICE IN WORDS	UNIT PRICE IN FIGURES	ITEM TOTAL IN FIGURES
680.4	1	LS	Construct Brick Veneer to Cover Exposed Foundation of 82-86 Congress Street	$_____	$_____
692	1	U	Mobilization	$_____	$_____

It is the intent of this bid that the items listed above include the major cost items of the project as described in the bid documents. Any items not specifically listed above but required by the other documents shall be considered subsidiary and incidental to the finished product. The intent is that the cost listed below is for a finished and complete project.

TOTAL FOR PROJECT:

In Figures $_____

In Words $_____

To Bidder:

The City reserves the right, after bid opening and prior to award of the contract, to modify the amount of the work in the event that bids exceed budgeted amounts and/or easements and agreements from one or more impacted property owners are not received.

It is the intention of this contract that the items listed above describe completely and thoroughly the entirety of the work as shown on the plans and as described in the specifications. All other items required to accomplish the above items are considered to be subsidiary work, unless shown as a pay item.

The undersigned agrees that for extra work, if any, performed in accordance with the terms and provisions of the Contract Documents, the bidder will accept compensation as stipulated therein.

Date:

_____ By:_____
Company Signature

_____ Title:_____
Business Address

_____
City, State, Zip Code Telephone:_____

We certify that the Company is currently pre-qualified with the State of New Hampshire for Road Construction.

By: _____ _____
Signature & Title Date

The Bidder has received and acknowledged Addenda No._____through _____.

All Bids are to be submitted on this form and in a sealed envelope, plainly marked on the outside with the Bidder's name and address and the Project name as it appears at the top of the Proposal Form.

In order to follow the City's sustainability practices, future bid invitations/specifications may be sent electronically. Please provide an email address as to where I could email future bid invitations/specifications of this type. Thank you in advance for your cooperation.

Email
Address:_____

BID SECURITY BOND

(This format provided for convenience, actual Bid Bond is acceptable in lieu of, if compatible.)

KNOW ALL MEN BY THESE PRESENTS, that we the undersigned

_____, as Principal, and

_____, as Surety, are hereby

held and firmly bound unto _____

IN THE SUM OF _____

as liquidated damages for payment of which, well and truly to be made we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of this obligation is such that whereas the Principal has submitted to the
_____ _____
A CERTAIN Bid attached hereto and hereby made a part hereof to enter into a contract in writing, hereinafter referred to as the "AGREEMENT" and or "CONTRACT", for
_____
_____
_____

NOW THEREFORE,

(a) If said Bid shall be rejected or withdrawn as provided in the INFORMATION FOR BIDDERS attached hereto or, in the alternative,

(b) If said Bid shall be accepted and the Principal shall duly execute and deliver the form of AGREEMENT attached hereto and shall furnish the specified bonds for the faithful performance of the AGREEMENT and/or CONTRACT and for the payment for labor and materials furnished for the performance of the AGREEMENT and or CONTRACT,

then this obligation shall be void, otherwise it shall remain in full force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder in no event shall exceed the amount of this obligation.

CHESTNUT STREET STREETSCAPE PROJECT
Bid proposal # 61-17

The Surety, for value received, hereby agrees that the obligation of said surety and its bond shall be in no way impaired or affected by any extensions of the time within such BID may be accepted, and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the parties hereto have duly executed

this bond on the _____ day of _____, 20__.

_____L.S.
(Name of Principal)

(SEAL)

BY _____

_____
(Name of Surety)

BY _____

STATEMENT OF BIDDER'S QUALIFICATIONS

Supply with Bid

All questions must be answered and the data given must be clear and comprehensive. This statement must be notarized. Add separate sheets if necessary

1. Name of Bidder

2. Permanent Main Office Address

3. Form of Entity

4. When Organized

5. Where Organized

6. How many years have you been engaged in the contracting business under your 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 to you? _____(no)____(yes). If so, where and why?

10. Have you ever defaulted on a contract?
_____(no)_____(yes). If so, where and why?

11. Have you ever failed to complete a project in the time allotment according to the Contract Documents?
_____(no)_____(yes). If so, where and why?

12. List the most 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 foremen available for this contract.

15. List subcontractors for the following categories whom you will use for the following (unless this work is to be done by your own organization, in which case please state).

    a. Concrete Foundation work _____

    b. Curbing _____

    c. Asphalt Paving _____

    d. Paint Striping _____

    e. Granite Landscape features_____

    f. Concrete/Brick Pavers _____

    g. Underground utility installations_____

STATEMENT OF BIDDERS QUALIFICATIONS (continued)

The City reserves the right to disallow <u>any</u> subcontractor including work proposed to be completed by the General Contractor.

16. With what banks do you do business?

a. Do you grant the Owner permission to contact this/these institutions?
____(yes) ___(no).

b. Latest Financial Statements, certified audited if available, prepared by an independent certified public accountant, may be requested by Owner. If requested, such statements must be provided within five (5) business days or the bid proposal will be rejected. Certified Audited Statements are preferred. Internal statements may be attached only if independent statements were not prepared.

Dated at _____ this _____ day of _____, 20___.

_____
Name of Bidder

BY_____

TITLE_____

State of_____

County of_____

_____being duly sworn, deposes and

says that the bidder is _____of_____
(Name of Organization)

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

Sworn to before me this ____day of _____, 20__.

_____
Notary of Public
My Commission expires_____

CONTRACT AGREEMENT

Chestnut Street Streetscape Project

THIS AGREEMENT made as of the _____ day of _____ in the year **2017,** by and between the City of Portsmouth, New Hampshire (hereinafter call the Owner) and _____. (hereinafter called the Contractor),

WITNESSETH; that the Owner and Contractor, in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE I- Work - The Contractor shall perform all work as specified or indicated in the Contract Documents for the completion of the Project. The Contractor shall provide, at his expense, all labor, materials, equipment and incidentals as may be necessary for the expeditious and proper execution of the Project.

ARTICLE II - ENGINEER - The Director of Public Works or his authorized representative will act as engineer in connection with completion of the Project in accordance with the Contract Documents.

ARTICLE III - CONTRACT TIME - The work will commence in accordance with the Notice to Proceed. **All work shall be substantially completed for winter no later than November 10, 2017. Final Completion of the project must occur by June 8, 2018.**

ARTICLE IV - CONTRACT PRICE - Owner shall pay Contractor for performance of the work in accordance with the Contract Documents as shown under item prices in the base bid

ARTICLE V - PAYMENT - Partial payments will be made in accordance with the Contract Documents. Upon final acceptance of the work and settlement of all claims, Owner shall pay the Contractor the unpaid balance of the Contract Price, subject to additions and deductions provided for in the Contract Documents.

ARTICLE VI - RETAINAGE – To insure the proper performance of this Contract, the Owner shall retain **ten percent** of the Contract Price as specified in the Contract Documents.

ARTICLE VII - LIQUIDATED DAMAGES - In event the Contractor fails to successfully execute the work within the specified contract time the Owner shall assess the Contractor liquidated damages in the amount of **two hundred dollars ($200)** for each calendar day beyond the specified completion date for each section of work. Liquidated damages shall be deducted from the Contract Price prior to final payment of the Contractor.

CONTRACT AGREEMENT (continued)

ARTICLE VIII – CONTRACT DOCUMENTS – The Contract Documents which comprise the contract between Owner and Contractor are attached hereto and made a part hereof and consist of the following:

8.1 This Agreement
8.2 Contractor's Bid and Bonds
8.3 Notice of Award, Notice to Proceed
8.4 Instruction to Bidders
General Requirements, Control of Work, Temporary Facilities, Measurement and Payment, Standard Specifications
8.5 Insurance Requirements
8.6 Special Conditions
8.7 Standard and Technical Specifications
8.8 Drawings
8.9 Special Provisions
8.10 Any modifications, including change orders, duly delivered after execution of this Agreement.

ARTICLE IX – TERMINATION FOR DEFAULT – Should contractor at any time refuse, neglect, or otherwise fail to supply a sufficient number or amount of properly skilled workers, materials, or equipment, or fail in any respect to prosecute the work with promptness and diligence, or fail to perform any of its obligations set forth in the Contract, Owner may, at its election, terminate the employment of Contractor, giving notice to Contractor in writing of such election, and enter on the premises and take possession, for the purpose of completing the work included under this Agreement, of all the materials, tools and appliances belonging to Contractor, and to employ any other persons to finish the work and to provide the materials therefore at the expense of the Contractor.

ARTICLE X – INDEMNIFICATION OF OWNER – Contractor will indemnify Owner against all suits, claims, judgments, awards, loss, cost or expense (including without limitation attorneys' fees) arising in any way out of the Contractor's negligent performance of its obligations under this Contract. Contractor will defend all such actions with counsel satisfactory to Owner at its own expense, including attorney's fees, and will satisfy any judgment rendered against Owner in such action.

ARTICLE XI – PERMITS –The Contractor will secure at its own expense, all other permits and consents required by law as necessary to perform the work and will give all notices and pay all fees and otherwise comply with all applicable City, State, and Federal laws, ordinances, rules and regulations.

ARTICLE XII – INSURANCE – The Contractor shall secure and maintain, until acceptance of the work, insurance with limits not less than those specified in the Contract.

ARTICLE XIII – MISCELLANEOUS –

A. Neither Owner nor Contractor shall, without the prior written consent of the other, assign, sublet or delegate, in whole or in part, any of its rights or obligations under any of the Contract Documents; and, specifically not assign any monies due, or to become due, without the prior written consent of Owner.

B. Owner and Contractor each binds himself, his partners, successors, assigns and legal representatives, to the other party hereto in respect to all covenants, agreements and obligations contained in the Contract Documents.

C. The Contract Documents constitute the entire Agreement between Owner and Contractor and may only be altered amended or repealed by a duly executed written instrument.

D. The laws of the State of New Hampshire shall govern this Contract without reference to the conflict of law principles thereof.

E. Venue for any dispute shall be the Rockingham County Superior Court unless the parties otherwise agree.

IN WITNESS WHEREOF, the parties hereunto executed this

AGREEMENT the day and year first above written.

BIDDER:

BY:_____

TITLE:_____

CITY OF PORTSMOUTH, N.H.

BY:_____
John P. Bohenko

TITLE: City Manager

NOTICE OF INTENT TO AWARD

Date:

TO:

IN AS MUCH as you were the low responsible bidder for work entitled:

Chestnut Street Streetscape Improvements
Bid #

You are hereby notified that the City intends to award the aforesaid project to you.

Immediately take the necessary steps to execute the Contract and to provide required bonds and proof of insurance within ten (10) calendar days from the date of this Notice.

The City reserves the right to revoke this Notice if you fail to take the necessary steps to execute this Contract.

City of Portsmouth
Portsmouth, New Hampshire

Judie Belanger,
Finance Director

NOTICE TO PROCEED

DATE:

Chestnut Street Streetscape Improvements
Bid #61-17

TO: .

YOU ARE HEREBY NOTIFIED TO COMMENCE WORK IN ACCORDANCE

WITH THE AGREEMENT DATED XXXXXXXXXXX AND ALL

WORK SHALL BE COMPLETED BY November 30, 2017.

CITY OF PORTSMOUTH, N.H.

_____
BY: Peter H. Rice, PE

TITLE: Public Works Director

ACCEPTANCE OF NOTICE

RECEIPT OF THE ABOVE NOTICE TO
PROCEED IS HEREBY ACKNOWLEDGED BY

_____

This the _____ day of _____ 2017

By:_____
(Print Name)

Title:_____

CHESTNUT STREET STREETSCAPE PROJECT
Bid proposal # 61-17

CHANGE ORDER

Change Order Number Date of Issuance

Owner: CITY OF PORTSMOUTH, N.H

Contractor:

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

Description:

Purpose of Change Order:

Attachments:

CHANGE IN CONTRACT PRICE	CHANGE IN CONTRACT TIME
Original Contract Price:	Original Completion Date:
Contract Price prior to this Change Order: $	Contract date prior to this Change Order:
Net Increase or Decrease of this Change Order: $	Net Increase or Decrease of this Change Order:
Contract Price with all approved Change Orders: $	Contract Due date with all approved Change Orders:

RECOMMENDED:	APPROVED:		APPROVED:
by_____	by_____	by_____	by_____
PW Director	City Finance	City Manager	Contractor

CHESTNUT STREET STREETSCAPE PROJECT
Bid proposal # 61-17

PERFORMANCE BOND

(This format provided for convenience, actual Performance
Bond is acceptable in lieu, if compatible)

Bond Number _____

KNOW ALL MEN BY THESE PRESENTS

that _____as Principal, hereinafter called Contractor, and _____ (Surety Company) a corporation organized and existing under the laws of the State of_____ and authorized to do business in the State of New Hampshire as surety, hereinafter called Surety, are held and firmly bound unto the City of Portsmouth, N.H. Obligee, hereinafter called Owner, in the amount of _____ Dollars ($_____), for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents. WHEREAS, Contractor has by written agreement dated _____ entered into a contract with Owner for _____in accordance with drawings and specifications prepared by the Public Works Department, 680 Peverly Hill Road, Portsmouth, N.H. 03801, which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the Contractor shall well and faithfully do and perform the things agreed by him to be done and performed, according to the terms of said Contract and such alterations as may be made in said Contract during progress work, and shall further indemnify and save harmless the said Owner in accordance with the Contract and shall remedy without cost to the Owner any defect which may develop within one year from the time of completion and acceptance of the work.

The Surety hereby waives notice of any alteration in work or extension of time made by the Owner or any of its agents or representatives.

Whenever Contractor shall be, and declared by Owner to be, in default under the Contract, the Owner having performed Owner's obligations thereunder, the Surety may promptly remedy the default, or shall promptly:

(1) Complete the Contract in accordance with its terms and conditions, or

PERFORMANCE BOND (continued)

(2) Obtain a bid or bids for submission to the Owner for completing the Contract in accordance with its terms and conditions, and upon determination by Owner and Surety of the lowest responsible bidder, arrange for a contract between such bidder and Owner and make available as work progresses (even though there should be a default or a succession of defaults under the contract of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the contract price", as used in this paragraph, shall mean the total amount payable by the Owner to Contractor under the Contract and any amendments thereto, less the amount paid by Owner to Contractor.

Any suit under this bond must be instituted before the expiration of (2) years from the date on which final payment under the contract falls due.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the heirs, executors, administrators or successors of Owner.

Signed and sealed this _____ day of _____

A.D., 20___ .

In the presence of:

_____ BY: _____
(Witness) (Principal) (Seal)

_____
(Surety Company)

_____ BY: _____
(Witness) (Title) (Seal)

Note:
If the Principal (Contractor) is a partnership, the Bond should be signed by each of the partners.

If the Principal (Contractor) is a corporation, the Bond should be signed in its correct corporate name by its duly authorized Officer or Officers.

If this bond is signed on behalf of the Surety by an attorney-in-fact, there should be attached to it a duly certified copy of his Power of Attorney showing his authority to sign such Bonds.

There should be executed an appropriate number of counterparts of the bond corresponding to the number of counterparts of the Agreement.

CHESTNUT STREET STREETSCAPE PROJECT
Bid proposal # 61-17

LABOR AND MATERIAL PAYMENT BOND

(This format provided for convenience, actual Labor and Material Bond is acceptable in lieu, if compatible)

Bond Number _____

KNOW ALL MEN BY THESE PRESENTS:

that _____

as Principal, hereinafter called Contractor, and _____ (Surety Company) a corporation organized and existing under the laws of the State of

_____ and authorized to do business in the State of New Hampshire hereinafter called Surety, are held and firmly bound unto the City of Portsmouth, N.H. Obligee, hereinafter called Owner, for the use and benefit of claimants as herein below defined, in the

amount of _____ Dollars ($_____), for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has by written agreement dated _____ entered into a

contract with Owner for _____ in accordance with drawings and specifications prepared by the Public Works Department, 680 Peverly Hill Road, Portsmouth, N.H. 03801, which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that the Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract and for the hire of all equipment, tools, and all other things contracted for or used in connection therewith, then this obligation shall be void, otherwise it shall remain in full force and effect, subject however, to the following conditions:

(1) A claimant is defined as one having a direct contract with the Principal or, with a subcontractor of the Principal for labor, material, equipment, or other things used or reasonably required for use in the performance of the Contract. "Labor and material" shall include but not be limited to that part of water, gas, power, light, heat, oil and gasoline, telephone service or rental of equipment applicable to the Contract.

(2) The above named Principal and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such a claimant, may sue on this bond for the use of such claimant, prosecute the suit by final judgment for such sum or sums as may be

LABOR AND MATERIAL PAYMENT BOND (continued)

justly due claimant, and have execution thereon. The Owner shall not be liable for the payment of any such suit or any costs or expenses of any such suit, and principal and surety shall jointly and severally indemnify, defend and hold the Owner harmless for any such suit, costs or expenses.

(3) 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 notice to all the following:

The Principal, the Owner and the Surety above named, within six (6) calendar months 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, and Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the State of New Hampshire 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 all work on said contract, it being understood , however, that if any limitation embodied in this 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.

(c) Other than in a State court of competent jurisdiction in and for the county or other political subdivision of the State in which the project, or any part thereof, is situated, or in the United States District Court for the district in which the project, or any part thereof, is situated, and not elsewhere. (4) The amount of this bond may be reduced by and to the extent of any payment of payments made in good faith hereunder, inclusive of the payment by Surety of mechanics' liens which may be filed on record against said improvement, whether or not claim for the amount of such lien by presented under and against this bond.

Signed and sealed this _____ day of _____, 20____. In the presence of:

_____ BY: _____
(Witness) (Principal) (Seal)

_____
(Surety Company)

_____ BY: _____
(Witness) (Title) (Seal)

LABOR AND MATERIAL PAYMENT BOND (continued)

Note:
If the Principal (Contractor) is a partnership, the Bond should be signed by each of the partners.

If the Principal (Contractor) is a corporation, the Bond should be signed in its correct corporate name by its duly authorized Officer or Officers.

If this bond is signed on behalf of the Surety by an attorney-in-fact, there should be attached to it a duly certified copy of his Power of Attorney showing his authority to sign such Bonds.

There should be executed an appropriate number of counterparts of the bond corresponding to the number of counterparts of the Agreement.

MAINTENANCE BOND

At the Owner's election, a maintenance bond may be substituted for retainage at the completion of the project. If the Owner permits a maintenance bond, it shall be in the amount of **Twenty Percent (20%)** of the contract price with a corporate surety approved by the Owner. Such bond shall be provided at the time of Contract completion and shall guarantee the repair of all damage due to faulty materials or workmanship provided or done by the Contractor. This guarantee shall remain in effect for a period of one year after the date of final acceptance of the job by the Owner.

CONTRACTOR'S AFFIDAVIT

STATE OF _____:

COUNTY OF _____:

Before me, the undersigned, a _____
(Notary Public, Justice of the Peace)

in and for said County and State personally appeared, _____
(Individual, Partner, or duly authorized representative of Corporate)

who, being duly sworn, according to law deposes and says that the cost of labor, material, and equipment and outstanding claims and indebtedness of whatever nature arising out of the performance of the Contract between

CITY OF PORTSMOUTH, NEW HAMPSHIRE

and _____
(Contractor)

of _____

Dated: _____

has been paid in full for Construction of: **Chestnut Street Streetscape Project**

_____
(Individual, Partner, or duly authorized representative of Corporate Contractor)

Sworn to and subscribed
before me this _____day
of _____ 20____

_____

CONTRACTOR'S RELEASE

KNOW ALL MEN BY THESE PRESENTS that _____

(Contractor) of _____, County of _____and State of

_____ does hereby acknowledge

that_____(Contractor)

has on this day had, and received from the CITY OF PORTSMOUTH NEW HAMPSHIRE, final and completed

payment for the Construction of:

Chestnut Street Streetscape Project

NOW THEREFORE, the said _____

(Contractor)

for myself, my heirs, executors, and administrators) (for itself, its successors and assigns) do/does by these presents remise, release, quit-claim and forever discharge the City of Portsmouth, New Hampshire, its successors and assigns, of and from all claims and demands arising from or in connection with the said Contract dated _____, and of and from all, and all manners of action and actions, cause and causes of action and actions, suits, debts, dues, duties, sum and sums of money, accounts, reckonings, bonds, bills, specifications, covenants, contracts, agreements, promises, variances, damages, judgments, extents, executions, claims and demand, whatsoever in law of equity, or otherwise, against the City of Portsmouth, New Hampshire, its successors and assigns, which (I, my heirs, executors, or administrators) (it, its successors and assigns) ever had, now have or which (I, my heirs, executors, or administrators) (it, its successors and assigns) hereafter can shall or may have, for, upon or by reason of any matter, cause, or thing whatsoever; from the beginning of record time to the date of these presents.

IN WITNESS WHEREOF,

Contractor:

_____ By:_____

print name of witness:_____ Its Duly Authorized _____

Dated: _____

GENERAL REQUIREMENTS

SCOPE OF WORK

1. INTENT OF CONTRACT

The intent of the Contract is to provide for the construction and completion in every detail of the work described. The Contractor shall furnish all labor, materials, equipment, tools, transportation and supplies required to complete the work in accordance with the terms of the Contract. The Contractor shall be required to conform to the intent of the plans and specifications. No extra claims shall be allowed for portions of the work not specifically addressed in the plans and specifications but required to produce a whole and complete project, such work will be considered subsidiary to the bid items.

2. INCIDENTAL WORK

Incidental work items for which separate payment is not measured includes, but is not limited to, the following items:

a. Clearing, grubbing and stripping (unless otherwise paid for)
b. Clean up
c. Plugging existing sewers and manholes
d. Signs
e. Mobilization/Demobilization (unless otherwise paid for)
f. Restoration of property
g. Cooperation with other contractors, abutters and utilities.
h. Utility crossings, (unless otherwise paid for)
i. Minor items - such as replacement of bollards, brick sidewalks, etc.
j. Steel and/or wood sheeting as required.
k. Accessories and fasteners or components required to make items paid for under unit prices or lump sum items complete and functional.

3. ALTERATION OF PLANS OR OF CHARACTER OF WORK

The Owner reserves the right, without notice to Surety, to make such alterations of the plans or of the character of the work as may be necessary or desirable to complete fully and acceptably the proposed construction; provided that such alterations do not increase or decrease the contract cost. Within these cost limits, the alterations authorized in writing by the Owner shall not impair or affect any provisions of the Contract or bond and such increases or decreases of the quantities as a result from these alterations or deletions of certain items, shall not be the basis of claim for loss or for anticipated profits by the contractor. The contractor shall perform the work as altered at the contract unit price or prices.

4. EXTRA WORK ITEMS

Extra work shall be performed by the Contractor in accordance with the specifications and as directed, and will be paid for at a price as provided in the Contract documents or if such pay items are not applicable than at a price negotiated between the contractor and the Owner or at the unit bid price. If the Owner determines that extra work is to be performed, a change order will be issued.

5. CHANGE ORDERS

The Owner reserves the right to issue a formal change order for any increase, decrease, deletion, or addition of work or any increase in contract time or price. The contractor shall be required to sign the change order and it shall be considered as part of the Contract documents.

6. FINAL CLEANING UP

Before acceptance of the work, the contractor shall remove from the site all machinery, equipment, surplus materials, rubbish, temporary buildings, barricades and signs. All parts of the work shall be left in a neat and presentable condition. On all areas used or occupied by the contractor, regardless of the contract limits, the bidder shall clean-up all sites and storage grounds.

The items prescribed herein will not be paid for separately, but shall be paid for as part of the total contract price.

7. ERRORS AND INCONSISTENCY IN CONTRACT DOCUMENTS

Any provisions in any of the Contract Documents that may be in conflict with the paragraphs in these General Requirements shall be subject to the following order of precedence for interpretation.

1. Standard Specifications for Road & Bridge Construction will govern General Requirements.
2. Technical Specifications will govern Standard Specifications.
3. Plans will govern Technical Specifications, and General Requirements.
4. Special Provisions written for this contract will govern the plans.

CONTROL OF WORK

1. AUTHORITY OF ENGINEER

(a) All work shall be done under supervision of the Engineer and to his satisfaction. The Engineer will decide all questions which may arise as to the quality and acceptability of materials furnished and work performed and as to the rate of progress of the work; all questions that may arise as to the interpretation of the plans and specifications; and all questions as to the acceptable fulfillment of the Contract by the Contractor.

(b) The Engineer will have the authority to suspend the work wholly or in part for such periods as he may deem necessary due to the failure of the Contractor to correct conditions unsafe for workers or the general public; for failure to carry out provisions of the Contract; for failure to carry out orders; for conditions considered unsuitable for the prosecution of the work, including unfit weather; or for any other condition or reason deemed to be in the public interest. The Contractor shall not be entitled any additional payments arising out of any such suspensions.

(c) The Owner reserves the right to demand a certificate of compliance for a material or product used on the project. When the certificate of compliance is determined to be unacceptable to the Engineer the Contractor may be required to provide engineering and testing services to guarantee that the material or product is suitable for use in the project, at its expense (see Sample of Certificate of Compliance).

2. PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPES

(a) The Contractor shall use every precaution to prevent injury or damage to wires, poles, or other property of public utilities; trees, shrubbery, crops, and fences along and adjacent to the right-of-way, all underground structures such as pipes and conduits, within or outside of the right-of-way; and the Contractor shall protect and carefully preserve all property marks until an authorized agent has witnessed or otherwise referenced their location.

(b) The Contractor shall be responsible for all damage or injury to property of any character, during the prosecution of the work, resulting from any act, omission, neglect, or misconduct in his manner or method of executing the work, or at any time due to defective work or materials, and said responsibility will not be released until the project shall have been completed and accepted.

(c) When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, or as a result of the failure to perform work by the Contractor, the Contractor shall restore, at its own expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing rebuilding, or otherwise restoring as may be directed, or the Contractor shall make good such damage or injury in an acceptable manner.

(d) The Contractor shall paint with tree paint all scars made on fruit or ornamental trees by equipment, construction operations, or the removal of limbs larger than one inch in diameter. Damaged trees must be replaced if so determined by the City Arborist, in his or her sole discretion.

(e) If the Contractor fails to repair, rebuild or otherwise restore such property as may be deemed necessary, the Owner, after 48-hours notice, may proceed to do so, and the cost thereof may be deducted from any money due or which may become due the Contractor under the contract.

(f) It is the intent of the Parties that the Contractor preserve, to as great an extent as possible, the natural features of the site.

3. MAINTENANCE DURING CONSTRUCTION

The Contractor shall maintain the work during construction and until the project is accepted. This maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and workers to ensure that the structure is kept in satisfactory conditions at all times.

4. SAFETY PRECAUTIONS

Upon commencement of work, the Contractor shall be responsible for initiating, maintaining and supervising all safety precautions necessary to ensure the safety of employees on the site, other persons who may be affected thereby, including the public, and other property at the site or adjacent thereto.

5. PERMITS

It will be the responsibility of the Contractor to obtain all permits required for the operation of equipment in, or on, all city streets and public ways.

6. BARRICADES, WARNING SIGNS AND TRAFFIC OFFICERS

(a) The Contractor shall provide, erect and maintain all necessary barricades, suitable and sufficient lights, danger signals, signs and other traffic control devices, and shall take all necessary precautions for the protection of the work and safety of the public. Roadway closed to traffic shall be protected by effective barricades. Obstructions shall be illuminated during hours of darkness. Suitable warning signs shall be provided to control and direct traffic in a proper manner, as approved by the engineer.

(b) The Contractor will be held responsible for all damage to the work from traffic, pedestrians, animals or any other cause due to lack of adequate controlling devices.

(c) The Contractor shall provide such police officers or flaggers as the Engineer deems necessary for the direction and control of traffic within the site of project.

The work prescribed herein will not be paid for separately but will be paid for as part of the Contract Price unless specifically appearing as a bid item.

TEMPORARY FACILITIES

1. STORAGE FACILITIES

(a) The Contractor shall not store materials or equipment in a public right-of-way beyond the needs of one working day. Equipment and materials shall be stored in an approved location.

(b) The Contractor shall protect all stored materials from damage by weather or accident and shall insure adequate drainage at and about the storage location.

(c) Prior to final acceptance of the work all temporary storage facilities and surplus stored materials shall be removed from the site.

2. SANITARY FACILITIES

(a) The Contractor shall provide for toilet facilities for the use of the workers employed on the work.

(b) Temporary toilet facilities may be installed provided that the installation and maintenance conform with all State and local laws, codes, regulations and ordinances governing such work. They shall be properly lit and ventilated, and shall be kept clean at all times.

(c) Prior to final acceptance of the work all temporary toilet facilities shall be removed from the site.

3. TEMPORARY WATER

The Contractor shall make all arrangements with the local water department for obtaining water connections to provide the water necessary for construction operations and shall pay all costs.

4. TEMPORARY ELECTRICITY

The Contractor shall make all arrangements with Eversource for obtaining electrical connections to provide the electrical power necessary for construction operations and security lighting and shall pay all electrical connection and power costs.

The Contractor shall be responsible with obtaining an electrical permit from the City Electrical Inspector.

INSURANCE REQUIREMENTS

Insurance shall be in such form as will protect the Contractor from all claims and liabilities for damages for bodily injury, including accidental death, and for property damage, which may arise from operations under this contract whether such operation by himself or by anyone directly or indirectly employed by him.

AMOUNT OF INSURANCE

A) Comprehensive General Liability:
Bodily injury or Property Damage - $2,000,000
Per occurrence and general aggregate

B) Automobile and Truck Liability:
Bodily Injury or Property Damage - $2,000,000
Per occurrence and general aggregate

Coverage amounts may be met with excess policies

Additionally, the Contractor shall purchase and maintain the following types of insurance:

A) Full Workers Comprehensive Insurance coverage for all people employed by the Contractor to perform work on this project. This insurance shall at a minimum meet the requirements of the most current laws of the State of New Hampshire.

B) Contractual Liability Insurance coverage in the amounts specified above under Comprehensive General Liability.

C) Product and Completed Operations coverage to be included in the amounts specified above under Comprehensive General Liability.

ADDITIONAL INSURED

All liability policies (including any excess policies used to meet coverage requirements) shall include the City of Portsmouth, New Hampshire as named Additional Insureds.

1) The contractor's insurance shall be primary in the event of a loss.
2) City of Portsmouth shall be listed as a Certificate Holder. The City shall be identified as follows:

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

MEASUREMENT AND PAYMENT

1. MEASUREMENT OF QUANTITIES

(a) All work completed under the contract will be measured according to the United States standard measure.

(b) The method of measurement and computations to be used in determination of quantities of material furnished and of work performed under the contract will be those methods generally recognized as conforming to good engineering practice. Unless otherwise stated all quantities measured for payment shall be computed or adjusted for "in place" conditions.

(c) Unless otherwise specified, longitudinal measurements for area computations will be made horizontally, and no deductions will be made for individual fixtures having an area of 9 square feet or less. Unless otherwise specified, transverse measurements for area computations will be the dimensions shown on the plans or ordered in writing.

(d) Structures will be measured according to lines shown on the plans or as ordered unless otherwise provided for elsewhere in the specifications.

(e) In computing volumes of excavation, embankment, and borrow, the average end area method will be used. Where it is impracticable to measure by the cross-section method, acceptable methods involving three-dimensional measurement may be used. When measurement of borrow in vehicles is permitted, the quantity will be determined as 80 percent of the loose volume.

(f) In computing volumes of concrete, stone and masonry, the prismoidal method will be used. The term "ton" will mean the short ton consisting of 2,000 pounds avoirdupois.

(g) Except as specified below, all materials that are measured or proportioned by weight shall be weighed on scales which the Contractor has had sealed by the State or by a repairman registered by the Commissioner of Agriculture. All weighing shall be performed in a manner prescribed under the Rules and Regulations of the Bureau of Weights and Measures of the New Hampshire Department of Agriculture.

(h) Weighing of materials on scales located outside New Hampshire will be permitted for materials produced or stored outside the state, when requested by the Contractor and approved. Out-of-state weighing in order to be approved, must be performed by a licensed public weigh master or a person of equal authority in the state concerned on scales accepted in the concerned state.

(i) Each truck used to haul material being paid for by weight shall bear a plainly legible identification mark, and if required, shall be weighed empty daily at such times as directed.

(j) When material is weighed, the individual weight slips, which shall be furnished by the Contractor, for trucks, trailers, or distributors, shall show the following information: the date; the project; the material or commodity; the dealer or vendor; the Contractor or Subcontractor; the location of the scales; the vehicle registration number or other approved legible identification mark; the tare and net weights, with gross weights when applicable; and the weigher's signature or his signed initials.

(k) The right is reserved to weight any truck, trailer, or distributor, at locations designated, before and after making deliveries to the project.

(l) Bituminous materials will be measured by the gallon or ton.

(m) When material is specified to be measured by the cubic yard but measurement by weight is approved, such material may be weighed and the weight converted to cubic yards for payment purposes. Necessary conversion factors will be determined by the Owner.

(n) The term "lump sum" when used as an item of payment will mean complete payment for the work described in the item.

(o) When a complete structure or structural unit (in effect, "lump sum" work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories, so as to provide the item complete and functional. Except as may be otherwise provided, partial payments for lump sum items will be made approximately in proportion to the amount of the work completed on those items.

(p) Material wasted without authority will not be included in the final estimate.

2. SCOPE OF PAYMENT

(a) The Contractor shall receive and accept compensation provided for in the contract as full payment for furnishing all materials and for performing all work under the contract in a complete and acceptable manner and for all risk, loss, damage or expense of whatever character arising out of the nature of the work or the prosecution thereof.

(b) The Contractor shall be liable to the Owner for failure to repair, correct, renew or replace, at his own expense, all damage due or attributable to defects or imperfections in the construction which defects or imperfections may be discovered before or at the time of the final inspection and acceptance of the work.

(c) No monies, payable under the contract or any part thereof, except the first estimate, shall become due or payable if the Owner so elects, until the Contractor shall satisfy the Owner that the Contractor has fully settled or paid all labor performed or furnished for all equipment hired, including trucks, for all materials used, and for fuels, lubricants, power tools, hardware and supplies purchased by the Contractor and used in carrying out said contract and for labor and parts furnished upon the order of said Contractor for the repair of equipment used in carrying out said contract; and the Owner, if he so elects, may pay any and all such bills, in whole or in part, and deduct the amount of amounts so paid from any partial or final estimate, excepting the first estimate.

MEASUREMENT AND PAYMENT (continued)

3. COMPENSATION FOR ALTERED QUANTITIES

(a) Except as provided for under the particular contract item, when the accepted quantities of work vary from the quantities in the bid schedule the Contractor shall accept as payment in full, so far as contract items are concerned, at the original contract unit prices for the accepted quantities of work done. No allowance will be made for any increased expense, loss of expected reimbursement, or loss of anticipated profits suffered or claimed by the Contractor resulting either directly from such alterations or indirectly from unbalanced allocation among the contract items of overhead expense on the part of the Bidder and subsequent loss of expected reimbursements therefore or from any other cause.

(b) Extra work performed will be paid for at the contract bid prices or at the price negotiated between the Owner and the Contractor if the item was not bid upon. If no agreement can be negotiated, the Contractor will accept as payment for extra work, cost plus 15% (overhead and profit). Costs shall be substantiated by invoices and certified payroll.

4. PARTIAL PAYMENTS

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 whole will be deducted and retained by the Owner until such time as the work receives final acceptance.

5. FINAL ACCEPTANCE

Upon due notice from the Contractor of presumptive completion of the entire project, the Engineer will make an inspection. If all construction provided for and contemplated by the contract is found complete to his satisfaction, this inspection shall constitute the final inspection and the Engineer will make the final acceptance and notify the Contractor in writing of this acceptance as of the date of the final inspection.

If, however, the inspection discloses any work in whole or in part, as being unsatisfactory, the Engineer will give the Contractor the necessary instructions for correction of such work, and the Contractor shall immediately comply with and execute such instructions. Upon correction of the work, another inspection will be made which shall constitute the final inspection provided the work has been satisfactorily completed. In such event, the Engineer will make the final acceptance and notify the Contractor in writing of this acceptance as of the date of final inspection.

MEASUREMENT AND PAYMENT (continued)

6. ACCEPTANCE AND FINAL PAYMENT

(a) When the project has been accepted and upon submission by the Contractor of all required reports, completed forms and certifications, the Owner will review the final estimate of the quantities of the various classes of work performed. The Contractor may be required to certify that all bills for labor and material used under this contract have been paid.

(b) The Contractor shall file with the Owner any claim that the Contractor may have regarding the final estimate at the same time the Contractor submits the final estimate. Failure to do so shall be a waiver of all such claims and shall be considered as acceptance of the final estimate. From the total amount ascertained as payable, an amount equal to ten percent (10%) of the whole will be deducted and retained by the Owner for the guaranty period. This retainage may be waived, at the discretion of the City, provided the required Maintenance Bond has been posted. After approval of the final estimate by the Owner, the Contractor will be paid the entire sum found to be due after deducting all previous payments and all amounts to be retained or deducted under the provisions of the contract.

(c) All prior partial estimates and payments shall be subject to correction in the final estimate and payment.

7. GENERAL GUARANTY AND WARRANTY OF TITLE

(a) Neither the final certification of payment nor any provision in the contract nor partial or entire use of the improvements embraced in this Contract by the Owner or the public shall constitute an acceptance of work not done in accordance with the Contract or relieve the Contractor of liability in respect to any express or implied warranties or responsibility for faulty materials or workmanship. The Contractor shall promptly remedy any defects in the work and pay for any damage to other work resulting therefrom which shall appear within a period of twelve (12) months from the date of final acceptance of the work. The Owner will give notice of defective materials and work with reasonable promptness.

(b) No material, supplies or equipment to be installed or furnished under this Contract shall be purchased subject to any chattel mortgage or under a conditional sale, lease purchase or other agreement by which an interest therein or in any part thereof is retained by the Seller or supplier. The Contractor shall warrant good title to all materials, supplies and equipment installed or incorporated in the work and upon completion of all work, shall deliver the same together with all improvements and appurtenances constructed or placed thereon by him to the Owner free from any claims, liens or charges. Neither the Contractor nor any person, firm or corporation furnishing any material or labor for any work covered by this Contract shall have the right to a lien upon any improvements or appurtenances thereon.

Nothing contained in this paragraph, however, shall defeat or impair the right of persons furnishing materials or labor to recover under any bond given by the Contractor for their protection or any rights under any law permitting such persons to look to funds due the Contractor in the hands of the Owner. The provisions of this paragraph shall be inserted in all subcontractors and material contracts and notice of its provisions shall be given to all persons furnishing materials for the work when no formal contract is entered into for such materials.

MEASUREMENT AND PAYMENT (continued)

8. NO WAIVER OF LEGAL RIGHTS

(a) Upon completion of the work, the Owner will expeditiously make final inspection and notify the Contractor of acceptance. Such final acceptance, however, shall not preclude or stop the Owner from correcting any measurement, estimate, or certificate made before or after completion of the work, nor shall the Owner be precluded or be stopped from recovering from the Contractor or his Surety, or both, such overpayment as it may sustain by failure on the part of the Contractor to fulfill his obligations under the contract. A waiver on the part of the Owner of any breach of any part of the contract shall not be held to be a waiver of any other or subsequent breach.

(b) The Contractor, without prejudice to the Contract shall be liable to the terms of the Contract, shall be liable to the Owner for latent defects, fraud or such gross mistakes as may amount to fraud, and as regards the Owner's right under any warranty or guaranty.

9. TERMINATION OF CONTRACTOR'S RESPONSIBILITY

Whenever the improvement provided for by the Contract shall have been completely performed on the part of the Contractor and all parts of the work have been released from further obligations except as set forth in his bond and as provided in Section 8 above.

SHOP DRAWINGS

Shop Drawings for this project shall be submitted under the following conditions:

1. The Contractor shall submit working and detail drawings, well in advance of the work, to the City Engineer for review.
2. The Contractor's drawings shall consist of shop detail, erection and other working plans showing dimensions, sizes and quality of material, details and other information necessary for the complete fabrication and erection of the pertinent work.
3. The Contractor shall submit two (2) sets of drawings to the City Engineer.
4. Prior to the approval of the drawings, any work done or materials ordered for the work involved shall be at the Contractor's risk.
5. One (1) set of the drawings will be returned to the Contractor approved or marked with corrections to be made. After approval has been given, the Contractor shall supply the City Engineer with two sets of the revised detail working drawings.
6. The City Engineer's approval of the Contractor's working drawings will not relieve the Contractor from responsibility for errors in dimensions or for incorrect fabrication processes, or from responsibility to complete the contract work.

STANDARD SPECIFICATIONS

The Standard Specifications for Road and Bridge Construction of the State of New Hampshire Department of Transportation and any Addenda shall apply but without regard to Section 100 "General Conditions" of those Standard Specifications and without regard to any of those NHDOT provisions that allow for an adjustment for changing fuel and asphalt prices.

In addition, any specifications specifically attached in this contract shall supersede any State specifications relating to that item.

Special Provision

SPECIAL CONDITIONS&

CRITICAL TIMELINES

REQUIRED DEADLINES AND SPECIAL EVENTS

A very important part of this project will be meeting goals by certain dates. The following dates are crucial to the success of this project.

Utility work for the project may begin on Monday, September 4, 2017 and utility and binder pavement work must be complete by November 10, 2017. The deadline for utility and binder pavement work completion of November 10th is to accommodate the installation of exterior improvements to The Music Hall building at 28 Chestnut Street, including a new Music Hall sign on 28 Chestnut Street. The installation of the sign structure (by contractors working for The Music Hall) will be completed by the week of November 27th.

Work for the streetscape will be able to begin at the start of the 2018 construction season and the entire project must be complete by June 8th 2018 which is the Friday before Portsmouth's annual Market Square Day celebration.

This project, while municipally-owned and managed, is a partnership with The Music Hall. Without regard for the Partnership aspects of this project, The Music Hall is also a prominent project abutter with extensive public programming. Coordination with The Music Hall and other project abutters will be elaborated on as part of the construction mitigation plans elsewhere in this document.

The work schedule will need to be adjusted to accommodate the following:

- No work on Friday the 15th of September as the Telluride by the Sea Film Festival is September 15 through 17th.
- On October 3, there is a school day show from 9:00 a.m. to 1:00 p.m. with drop offs on Porter Street. Porter St must be open to bus traffic and there needs to be safe access to the front door of the Music Hall.
- On October 11, there is a school day show from 9:00 a.m. to 1:00 p.m. with drop offs on Porter Street. Porter St must be open to bus traffic and there needs to be safe access to the front door of the Music Hall.
- The New Hampshire Film Festival is a big event requiring reduced or no work on Thursday Oct. 12 and Friday Oct. 13.
- On March 20, 2018, there is a school day show from 9:00 a.m. to 1:00 p.m. with drop offs on Porter Street. Porter St must be open to bus traffic and there needs to be safe access to the front door of the Music Hall.
- On April 3, 2018, there is a school day show from 9:00 a.m. to 1:00 p.m. with drop offs on Porter Street. Porter St must be open to bus traffic and there needs to be safe access to the front door of the Music Hall.
- On May 8, 2018, there is a school day show from 9:00 a.m. to 1:00 p.m. with drop offs on Porter Street. Porter St must be open to bus traffic and there needs to be safe access to the front door of the Music Hall.
- On May 15, 2018 there is a school day show from 9:00 a.m. to 1:00 p.m. with drop offs on Porter Street. Porter St must be open to bus traffic and there needs to be safe access to the front door of the Music Hall.

Work will commence no earlier than 7am and will stop no later than 5 pm daily unless allowed by the Engineer.

DIVISION 1

GENERAL REQUIREMENTS

Contents of Division

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 SCHEDULE OF REFERENCES

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

PART 1 -- AIA American Institute of Architects

AISC American Institute of Steel Construction
AISI American Iron and Steel Institute
AITC American Institute of Timber Construction
AMCA Air 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
CLFMI Chain Link Fence Manufacturers Institute
CRSI Concrete Reinforcing Steel Institute
DHI Door and Hardware Institute
EJCDC Engineers' Joint Contract Documents Committee
EJMA Expansion Joint Manufacturers Association
FGMA Flat Glass Marketing Association
FM Factory Mutual System
FS Federal Specification
GA Gypsum Association
ICBO International Conference of Building Officials

PART 2 -- 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	**National Electrical Manufacturer's Association**
NFPA	**National Fire Protection Association**
NFPA	**National Forest Products Association**
NSWMA	**National Solid Wastes Management Association**
NTMA	**National 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**

PART 3 -- 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)

END OF 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)

END OF 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.

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 Community Access Channel and/or 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.

PART 2 - PRODUCTS

(NOT PART OF THIS SECTION)

PART 3 - EXECUTION

(NOT PART OF THIS SECTION)

END OF SECTION

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.
   3. Provide electronic copies of updated schedules upon request.

C. Content of Schedules:
   1. Provide complete sequence of construction by activity. Include sequencing of utilities as identified in the Prosecution of Work (POW) Item 3, Temporary Water Systems and/or other utilities will be dependent on the Contractor's sequencing for work that is in the Owner's best interest, as determined by the Engineer. Other items requiring special consideration, to be identified in schedules include:
      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.
   4. Include:
      a. Major changes in scope.
      b. Activities modified since previous updating.
      c. Revised projections due to changes.
      d. Other identifiable changes.
   5. Provide narrative report, including:
      a. Discussion of problem areas, including current and anticipated delay factors.
      b. Corrective action taken, or proposed.
      c. Description of revisions that may affect schedules.

1.2 SUBMITTALS

A. Submit 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)

END OF SECTION

SECTION 01515

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 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. 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.
2. Provide temporary services.
3. Make all necessary arrangements for power.
4. Furnish, install, maintain and remove bypass piping, appurtenances and temporary connections to water users, where necessary.
5. Excavate and backfill for connection to service pipes or branches at streets which are not otherwise served.
6. Provide forty-eight (48) hour notices to all users regarding any disruption of service.
7. Disinfect the temporary piping in accordance with Section 02160, Part 3.3.
8. 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.
9. 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 RELATED SECTIONS
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 SUBMITTALS

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 PERFORMANCE

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.

layout requirements

A. General Requirements:

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

END OF SECTION

SECTION 01518

BYPASS PUMPING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Provide and pay for all temporary systems to assure the uninterrupted flow of Sanitary Sewage or Drainage 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 or fuel.

1.2 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.

B. Contractor is to provide plans detailing by-pass pumping piping and operations. Plans shall include, at a minimum, pump sizes, locations, backup pump provisions, backup power provisions for unattended pumps, piping, flow diversion options or other means of directing flows around the work area.

C. If By-Pass Pumping is proposed for non-work hours, provide plans and details for operation including automatic dial out for pump failure, automatic operation of backup equipment and an emergency response plan for the Contractor's personnel. Under no circumstances will the Contractor rely on City personnel to operate or maintain operation of the By-Pass Pumping system.

PART 2 - PRODUCTS

2.1 MATERIALS

A. 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.

B. Adequate discharge piping, free of leaks, to carry the effluent from source to an adequate sanitary discharge point.

C. Provide adequate plugs to insure that no effluent flows into the work area.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Provide power supply from a secure source.

B. Maintain and operate the system to assure uninterrupted sewage flow around the work area as long as work requires replacement of active sewers.

C. Protect the discharge piping from damage caused by vehicular traffic or other outside influences.

D. Maintain all system elements in a sanitary working order free of leaks.

E. All work shall be performed in a manner to insure the health and welfare of the general public from accidental or intentional discharge of into other than a sanitary sewer system.

END OF SECTION

SECTION 01520

MAINTENANCE OF SEWER FLOWS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Provide and pay for all temporary systems to assure the uninterrupted flow of Sanitary Sewage or Drainage 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.

1.2 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.

B. Contractor is to provide plans detailing by-pass piping and pumping operations. Plans shall include, at a minimum, pipe and pump sizes, locations, backup pump provisions, backup power provisions for unattended pumps, flow diversion options or other means of directing flows around the work area.

C. If By-Pass Pumping is proposed for non-work hours, provide plans and details for operation including automatic dial out for pump failure, automatic operation of backup equipment and an emergency response plan for the Contractor's personnel. Under no circumstances will the Contractor rely on City personnel to operate or maintain operation of the By-Pass Pumping system.

PART 2 - PRODUCTS

2.1 PUMPS

A. 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.

B. Adequate discharge piping, free of leaks, to carry the effluent from source to an adequate sanitary discharge point.

C. Provide adequate plugs to insure that no effluent flows into the work area.

2.2 PIPING

A. Piping shall be sufficiently sized to carry combined storm flows (or match existing pipe sizes).

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Provide power supply from a secure source.

B. Maintain and operate the system to assure uninterrupted sewage flow around the work area as long as work requires replacement of active sewers.

C. Protect the discharge piping from damage caused by vehicular traffic or other outside influences.

D. Maintain all system elements in a sanitary working order free of leaks.

E. All work shall be performed in a manner to insure the health and welfare of the general public from accidental or intentional discharge of into other than a sanitary sewer system.

3.2 EXISTING FLOWS

A. Combined sewer flow will vary on storm events. Contractor should size piping and pump equipment for pipes flowing full. Anticipated storm flows as follows (based on a slope of 0.01 ft/ft and a Mannings n value of 0.012):

Pipe Size	**Peak Capacity** (gpm)
12”	1,750
15”	3,150
18”	5,150
24”	11,000
30”	19,950
36”	32,450
48”	69,850

END OF SECTION

SECTION 01546

USE OF EXPLOSIVES

PART 1 - GENERAL

1.1 DESCRIPTION

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.

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 Ordinance in Appendix E).
B. See Supplemental General Conditions for additional requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 PERFORMANCE

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.

END OF SECTION

SECTION 01548

VIBRATION MONITORING

PART 1 - GENERAL

1.1 DESCRIPTION

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. 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. Contractor shall be responsible for any and all damage resulting from construction activity vibrations.

PART 2 - PRODUCTS

2.1 MATERIALS

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 on the site identified in the Vibration Monitoring Plan including but not limited to 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.
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.

END OF SECTION

SECTION 01562

DUST CONTROL

PART 1 - GENERAL

1.1 DESCRIPTIONS

A. This project is in an urban and 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 at all times.

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 APPLICATION

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.

END OF SECTION

SECTION 01570

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 of Portsmouth DPW 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.

1.2 SCHEDULING WORK

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 Manual on Uniform Traffic Control Devices for Streets and Highways (latest edition) as published by U.S. Department of Transportation.

PART 3 - EXECUTION

3.1 DETOURS

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

3.2 INCONVENIENCE TO RESIDENTS OF VICINITY

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

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.

END OF SECTION

SECTION 01611

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.
   2. Load and transport to a location specified by the Owner all reclaimed asphalt product removed to meet existing road plan and section.
   3. Deliver all material claimed by the Owner to a location designated by the Owner.

B. Related Work Specified Elsewhere:
   1. See Division 2.

C. Schedule of Materials claimed by Owner:
   1. Reclaimed Asphalt Material (surplus).
   2. Manhole and Catch Basin frames, covers and grates.
   3. Granite curb removed and not reset.

PART 2 - PRODUCTS

(NOT PART OF THIS SECTION)

PART 3 - EXECUTION

(NOT PART OF THIS SECTION)

END OF SECTION

SECTION 01630

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 CRITERIA

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 RESULTING CHANGES

A. If proposed substitutions are judged as being acceptable, make all changes to structures, buildings, piping, electrical, and other items necessary to accommodate 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.

END OF SECTION

PROJECT CLOSE-OUT PROCEDURES

PART 1 - GENERAL

1.1 INTRODUCTION

A. Contractor's requirements of the Contract to close out 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. Submission of warrantees

PART 2 - PRODUCTS

(NOT PART OF THIS SECTION)

PART 3 - EXECUTION

(NOT PART OF THIS SECTION)

END OF SECTION

SECTION 01710

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 PERFORMANCE

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 and/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.

END OF SECTION

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Keep accurate Record Documents of all additions, substitutions of material, variations in work, and any other additions or revisions to the Contract.

PART 2 - PRODUCTS

2.1 DOCUMENTS

A. Maintain at the job site, one copy each of:
   1. Contract Drawings.
   2. Specifications.
   3. Addenda.
   4. Reviewed Shop Drawings.
   5. Change Orders.
   6. Any other modifications to the Contract.
   7. Field Test Reports.

PART 3 – EXECUTION

3.1 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.

3.2 RECORDING

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.
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 house 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.
      b. Prior to substantial completion, the Contractor shall provide tie forms for all water and sewer service connections.
   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, and 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.

3.3 SUBMITTALS

A. At the completion of the project, deliver Record Documents to the Engineer.

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 enactment of the liquidated damages as specified.

END OF SECTION

DIVISION 2

SITEWORK

PART 1 - GENERAL

1.1 All work included shall be done in conformity with the Specifications included herein these Contract Documents and with the applicable provisions of the State of New Hampshire Department of Transportation "Standard Specifications for Highways and Bridges", latest revision, including all the addenda and supplements, but without regard to Section 100 "General Conditions" and without regard to any of those NHDOT provisions that allow for an adjustment for changing fuel and asphalt prices.

1.2 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.

Contents of Division

Section No.	Section Title
206.19	Common Structure Excavation –Exploratory
608.24 & .26	Concrete and Brick Sidewalk Construction
608.52	ADA Detectable Warning Tiles
618	Uniformed Officers and Flaggers
619	Maintenance of Traffic
02223	Trench Excavation - Earth
02224	Trench Excavation - Ledge
02229	Backfill and Compaction
02275	Construction Fabrics
02369	Sheeting
02402	Site Dewatering
02431	Catch Basins, Frames & Grates (NH)
02540	Temporary Erosion Control
02551	Bituminous Pavement
02557	Pavement Reclamation
02560	Granite Curbing (NHDOT)
02601	Manholes, Covers and Frames (NH)
02610	Pipe & Pipe Fittings – General
02611	Ductile Iron Pipe and Fittings
02622	PVC Pipe & Fittings
02624	Corrugated Polyethylene Drainage Tubing (CPDT)
02625	Corrugated Polyethylene (CPE) Pipe and Fittings
02626	Copper Service Pipe
02630	Couplings, Connectors, Caps & Plugs
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
02930	Plantings

END OF SECTION

SECTION 206.19
COMMON STRUCTURE EXCAVATION - EXPLORATORY

Amend NHDOT Section 206 to include:

Method of Measure
Amend 4.1: Structure Excavation - Exploratory will be measured, by the Hour to the nearest 0.25 hour.

Basis of Payment
Amend 5.1: Structure Excavation – Exploratory will be measured and paid for by the Contract unit price, by the Hour.

END OF SECTION

SPECIAL PROVISION

To Section 608 (NHDOT Standard Specifications) Sidewalks

SECTION 608.24 & 608.26
CONCRETE SIDEWALK CONSTRUCTION

Amend sections of section 608 to read:

Materials:

2.2 Portland cement concrete shall be Class AA 4000 psi conforming to 520.

2.3.1 Handicapped ramps (at street intersections) shall be 6" deep, class AA 4000 psi.

2.3.2 4" Sidewalks shall be reinforced with synthetic fibers.

Construction Requirements:
3.2.6 Joints: Construct crack control joints at 5' intervals. Construct expansion joints at 25' intervals.

Sealant: All concrete shall be sealed with siloxane prior to acceptance of work. This coating is subsidiary.

Methods of Measurement:
4.1 This work shall be measured by the square yard of concrete sidewalk successfully & completely installed and approved by the Engineer.

Basis of Payment:
5.1 This work shall be paid for at the Contract Unit Price as listed in Item #608.24 & 608.26 in the Bid.

Pay Items and units:

608.24 4" Concrete sidewalk	Square yard
608.26 6" Concrete sidewalk (HC Ramps)	Square yard

This price shall include all equipment, material and labor incidental hereto.

END OF SECTION

SPECIAL PROVISION
To Section 608 (NHDOT Standard Specifications) Sidewalks
(not a NHDOT Standard Specification)
Amend Section 608 to read:
SECTION 608.5
Brick Sidewalk (Herringbone or Running Bond)

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included
   1. The work shall consist of constructing brick sidewalks as directed in the field by the Engineer.

1.02 METHODS OF CONSTRUCTION

A. All labor and materials shall conform to the State of New Hampshire Standard Specifications for Road and Bridge Construction, Section 608.

B. New bricks shall conform to the requirements of ASTM Standard Specifications for Building Bricks Designation C902 SX for Grade SW. The bricks shall be No. 1, wire cut type for paving, with a compressive strength of not less than 6,000 pounds per square inch. The bricks shall not be cored or have frogs and shall be of a standard size (2.25" x 3.625" x 7.625") (or modular for the herringbone style). The Engineer will have 5 working days to approve the brick submittals before they are installed. It is the responsibility of the Contractor to provide suitable brick samples for approval.

C. Excavation for sidewalks shall be at a depth of 13 inches below finish grade. In areas not butting curbing or buildings, the excavation shall be 6 inches wider than the finished sidewalk width. At all drive crossings, the depth of excavation shall be increased accordingly. The Contractor's price shall include neat and square cutting of existing asphalt road surface as needed. All unsuitable material shall be removed and disposed of off-site at the Contractor's own expense.

D. The base material for sidewalks shall consist of 8” of type 304.3 crushed gravel.

E. The Contractor shall lay the bricks so that approximately 5 bricks shall cover one square foot (tight joints).

F. The sidewalk shall pitch 1/4 inch per foot towards the street or as directed.

G. In areas where the edge of the brick sidewalk is not adjacent to granite curbing, the Contractor shall install edging to hold the bricks in place. Such edging shall be installed per the manufacturer's recommendations.

H. In areas with a closed drainage system, the contractor shall provide “silt sacks” to prevent brick dust from entering the collection system. Also, the area will be swept daily to keep dust levels as low as possible.

I. All half bricks needed for running bond work will be snapped if possible and all efforts will be made to keep brick dust to a minimum. All cuts not made by snapping will be wet cut.

J. Prior to placing the brick, the sidewalks will be paved parallel to grade with 3/8” bituminous asphalt hot mix paving 2” compacted thickness. Paving for this will be paid for under item 403.12. 1” of 1:3 portland cement / course sand mix will then be placed on the asphalt base and the pavers will be dry laid on the mixture.

END OF SECTION

ADA DETECTABLE WARNING TILES

Description

1.1 This work shall consist of furnishing and installing a detectable warning surface and accessories on sidewalk ramps at locations shown on the plans, as specified herein, or as ordered including any and all required surface preparation. Detectable warnings shall be installed at sidewalk ramps where a sidewalk crosses a vehicular way, excluding unsignalized driveway crossings. The edge nearest the curbline shall be located 6 to 8 in from the face of curbline. The panel(s) shall be centered on the ramp and extend the entire width of the ramp to the nearest whole panel dimension.

Materials

2.1 Material. The detectable warning surface shall consist of units from Neenah Foundry, East Jordan Iron Works, or approved equal. The units shall be cast into Portland cement or other owner approved material, as recommended by the manufacturer. The paver units shall be of cast iron.

2.2 Color. The color of the tile used shall be natural rust, and will be installed in a concrete ramp as described in 608.26.

2.3 Paver Dimensions. Nominal paver dimensions shall be 2' deep x 2' wide. The panels shall be combined to span the width of the walk to the nearest whole panel dimension.

2.4 Detectable Warning Truncated Dome Geometry:

- **2.4.1** Detectable warnings shall be in full compliance with ADAAG guidelines (Title 49 DFR Transportation, Part 37.9 Standard for Accessible Transportation Facilities, Appendix A, Section 4.29.2- Detectable Warning on Walking Surfaces).
- **2.4.2** Size and spacing for truncated domes shall be as follows: base diameter of nominal 0.9 inch, top diameter of nominal 0.4 inch, height of nominal 0.2 inch, with a center to center spacing of nominal 2.35 inches.
- **2.4.3** The truncated dome pattern shall align properly from paver to paver if more than 1 paver is required.

Construction Requirements

3.1 The Contractor shall submit manufacturer's installation instructions and descriptive literature for materials specified herein.

3.2 Pavers shall be set into fresh concrete before it sets. Concrete pad for setting bed to be 6" in both directions larger than the tactile panel so that no more than 3" of concrete is showing around the panels. See manufacturer instructions.

3.3 Transport, storage, and handling of products shall be in accordance with manufacturer's instructions. All sealants/adhesives shall be protected from freezing conditions.

3.4 The air and surface temperatures during construction shall be in accordance with manufacturer's recommendations.

3.5 Concrete foundation shall be installed in accordance with the specifications included within Section 608 to depths indicated in the section shown on the plans.

3.6 Install detectable warning pavers in accordance with manufacturer's instructions directly in the setting bed and the allowing the top surface of the paver units to be at or just below the required finish grade.

3.7 Care shall be taken to ensure the safety of pedestrians when sidewalks must remain in service during construction.

Method of Measurement

4.1 ADA Detectable warning tiles will be measured by the square foot installed.

Basis of Payment

5.1 ADA Detectable warning tiles will be paid for at the Contract unit price per each panel installed.

END OF SECTION

SECTION 618
UNIFORMED OFFICERS AND FLAGGERS

Amend NHDOT Section 618 to include:

Description

Add 1.2: Daily traffic control personnel will be required to facilitate traffic through the work zone quickly and safely. The use of, type of, and number of personnel will be reviewed and approved with the Engineer.

Method of Measurement

Amend 4.1: Uniformed Officers and Flaggers shall be measured by the actual hour worked in the field.

Basis of Payment

Amend 5.1: Uniformed Officers and Flaggers will be paid for at the Contract unit price, by the actual hour worked. The City will reimburse the exact cost for this item, no cost markup is allowed. The item cost on the bid form is reflective of the cost of these items to the City at the time of the bid and will be adjusted as necessary as costs increase.

END OF SECTION

SECTION 619
MAINTENANCE OF TRAFFIC

Amend NHDOT Section 619 to include:

Construction Requirements

Add 3.4: All work shall be prosecuted so pedestrian and traffic flow can be maintained. No travel lane or sidewalk closures will be allowed without prior approval from the Engineer. If lane closures are required, a traffic flagging and/or detour plan will be generated and will need to be approved by the Department prior to its implementation. It should be expected that detours will not be typically allowed for day to day work except for non-preventable road closures caused by the installation of certain structures or systems that would make one-way reversible traffic impossible or unsafe. No material (earth or otherwise) will be left on site during non-working hours.

Add 3.5: The Contractor will develop a construction staging plan for the project. The plan shall be submitted to be approved by the Engineer.

Add 3.6: Access shall be maintained to the abutting driveways and entrances at all times during construction. Open lanes of the road shall be graded safely for traffic at all times. A 24 hour contact will be required in case of emergency or safety concerns or in case the road surface needs attention.

Add 3.7: Dust control may be ordered by the Engineer. The Contractor shall have methods of dust control readily available for use at all times.

Add 3.8: Portable Message Boards shall be 54" x 92" (+/-) and readily available within 48 hours.

Basis of Payment

Amend 5.1.3: The material cost of calcium chloride will be paid for by the LB.

Amend 5.1.4: The material cost of permanent construction signs is subsidiary to the Pay Item.

Add 5.1.10: The following items are subsidiary to the 619.1 Pay Item: Traffic control, construction signs (permanent and temporary), temporary message boards, temporary traffic loops, traffic control plans, traffic cones and barrels and other methods of dust control as ordered by the Engineer.

END OF SECTION

SECTION 02223
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 bank-run 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 in Section 01611 – Owner’s Right to Material.
2. Disposal of surplus and unsuitable material is the Contractor’s responsibility.
3. 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 PERFORMANCE

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.

END OF SECTION

SECTION 02224
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 PERFORMANCE

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.

END OF SECTION

SECTION 02229
BACKFILL AND COMPACTION

GENERAL

DESCRIPTION

Work Included:

Work includes backfilling trenches and/or excavation around structures with suitable material removed in the course of excavating and other suitable materials.

1. Testing soils**.**

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.

REFERENCE STANDARDS

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

QUALITY ASSURANCE

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.

The Contractor shall make necessary arrangements to allow compaction testing to be performed at a time, place and elevation determined by the Engineer.

Pre-placement testing.

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.

Subgrade Material: Proctor density tests shall be performed on the existing subgrade in accordance with the following schedule and in accordance with ASTM D1557:

At the bottom of excavations where structures or slabs will be placed.
One after every 500 cubic yards has been relocated on the site.
Whenever the material has changed in the opinion of the Engineer.

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:

Before any materials are brought to the site.
One after every 500 cubic yards has been brought to the site.
Whenever the source changes.

The result shall be submitted to the Engineer for approval prior to placement.

The Contractor shall obtain representative samples for ongoing trench backfill operations.

Samples may be obtained in-situ at time of testing provided they are, in the Engineers opinion, representative of ongoing operations.

Samples may be obtained from stockpiles provide the stockpiled material is thoroughly mixed to represent ongoing operations.

Samples shall also be obtained for select materials such as reclaimed asphalt or gravels previously excavated from the trench.

Post-placement testing:

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.

Determine in-place density in accordance with ASTM D2922 or by other methods as approved by the Engineer.

Compaction tests shall be made in accordance with the following table:

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

1. *The Contractor shall propose a method for backfill on the first day of work. This proposed method will be tested and modified as required to meet the compaction requirements noted in the above table. The first day of testing shall include testing of a minimum of 4 lifts. This compaction method shall be used until the soil characteristics have changed in the opinion of the Engineer. 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.*

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.

3.2 Submittals

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. The Contractor shall submit sieve and proctor curves to the Engineer for approval 7 days before any material is brought to the site. The Contractor shall submit compaction test result sheets to the Engineer no later than 7 days after the test were performed.

B. PRODUCTS

MATERIALS

Excavated Material Suitable for Reuse:

Material shall be friable natural material comprised of gravels, sand, silts, or clayey gravel and sands.
Material shall be free from peat, muck, other organic matter, frozen material, ice, and/or snow.
Material shall be free from stones, ledge/rock fragments, and asphalt over 8" in the largest dimension.
The material shall not have a moisture content over 2% of its optimum moisture content.

Select and Borrow Materials:

Crushed Stone (Bedding Material):

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.
Clean, hard, and durable particles or fragments.
Sieve Analysis:

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

Sand (Sand Blanket or Bedding):

Clean, hard and durable particles or fragments.
Sieve Analysis:

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

Crushed Gravel or Structural Fill (Crushed Gravel Base Course):

Well graded granular crushed gravel material for use as a crushed gravel base.
Material shall be hard and durable, free from frost, organic material, loam, debris and other unsuitable material.
At least 50% of material retained on the 1 inch sieve shall have a fractured face.
Sieve Analysis:

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

Bank Run Gravel or Granular Gravel Borrow (Gravel Subbase Course):

Well graded granular bank-run gravel material for use as gravel subbase.
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.

Sieve Analysis:

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

A.

Common Borrow (i.e. Sand):

Consist of earth suitable for embankment construction; free from frozen material, perishable rubbish, peat and other unsuitable material.

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.

The optimum moisture content shall be determined in accordance with AASHTO T 180, Method C or D.

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

Gravel Borrow (i.e. Gravel):

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.

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

PART 4 -- EXECUTION

PERFORMANCE

General:

Provide and place all necessary backfill material.

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.

Place material in a manner that will prevent stones and lumps from becoming nested.

Completely fill all voids between stones with fine material.

Do not place backfill on or against new concrete until it has attained sufficient strength to support loads without distortion, cracking, and other damage.

Deposit backfill material evenly on all sides of structures to avoid unequal soil pressures.

Place backfill material evenly in the trench in an effort to maximize compaction.

Do not backfill with, or on, frozen materials.

Remove, or otherwise treat as necessary, previously placed material that has frozen prior to placing backfill.

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.

Material made unsuitable by the Contractor's construction methods shall be replace with Gravel Borrow at no additional cost to the Owner.

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.

Do not continue backfilling until the previously placed and/or new materials have dried sufficiently to permit proper compaction.

When original excavated material is, in the opinion of the Engineer, unsuitable, use only approved gravel borrow for backfilling.

Backfill excavation/trench as early as possible to allow for the maximum time for natural settlement.

Slope grade away from structures at a minimum slope of 1.5%.

The Contractor shall remove excess fill material from the site.

Sheeting:

Leave sheeting in place when damage is likely to result from its withdrawal. This shall only be allowed with written approval of the Engineer.

Completely fill with suitable material and thoroughly compact all voids left by the removal of sheeting.

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.

See Section 02369 – Sheeting.

Backfilling Around Trench Obstacles

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.

The Contractor shall provide adequate excavation supports to allow for a safe work environment in which to properly compact the excavation/trench.

The Contractor shall use methods that compensate for the space limitations in the immediate area around these obstacles.

Backfilling in Paved Areas:

Backfill trenches in streets and other paved areas by maintaining a moisture content within 2% of optimum.

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.

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.

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.

Backfilling Trenches in Nonpaved Areas:

Grade the ground to a reasonable uniformity.

Leave the mounding over the trenches in a uniform and neat condition, satisfactory to the Engineer.

Bedding & Backfilling of Pipelines:

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.

Deposit and thoroughly compact the remainder of the backfill as noted herein.

Placing and Compacting Backfill:

Water Jetting: Shall not be allowed without the approval of the Engineer.

Puddling: Shall not be allowed without the approval of the Engineer.

Tamping:

Deposit and spread the backfill material in uniform parallel layers not exceeding the lift thicknesses noted herein.

Tamp each layer as required to obtain a thoroughly compacted mass.

If necessary, furnish and use an adequate number of power driven tampers, each weighing at least 150 lbs.

Rolling:

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.

Deposit and spread the backfill material in uniform parallel layers not exceeding the lift thicknesses noted herein.

Roll each layer as required to obtain a thoroughly compacted mass.

Other placing and compacting methods may be employed only when approved by the Engineer.

Improper Backfill

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.

Refill and compact the excavation or trench with suitable material and restore the surface to the required grade and condition.

Excavation, backfilling, compacting work and testing performed to correct improper backfilling shall be performed at no additional cost to the Owner.

END OF SECTION

SECTION 02275

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 (at low strain)	20,000 lb/ft at 0.5% strain	ASTM D 6637-01

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	

E. Acceptable manufacturers:

1. Amoco

2. Mirafi
3. or equivalent

2.4 SEDIMENT CONTROL

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.

END OF SECTION

SECTION 02369
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.

END OF SECTION

SECTION 02402
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. AASHTO Highway Drainage Guidelines, Volume III, Guidelines for Erosion and Sediment Control in Highway Construction, American Association of State Highway and Transportation Officials, Inc., 444 North Capital St. N.W., Suite 249, Washington, D.C. 20001.

B. Stormwater Management and Erosion and Sediment Control Handbook for Urban and Developing Areas in New Hampshire, New Hampshire Department of Environmental Services, Public Information Office, P.O. Box 95, 6 Hazen Drive, Concord, New Hampshire.

C. Storm Water Phase II Compliance Assistance Guide, Section 5 Small Construction Activity, 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 REMOVAL OF WATER

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 drainage way.

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 REMOVAL OF TEMPORARY WORKS

A. After the temporary works have served their purpose, the Contractor shall remove them or level and grade them to the extent required to present a sightly appearance and to prevent any obstruction of the flow of water or any other interference with the operation of or access to the permanent works.

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.

END OF SECTION

SECTION 02431
CATCH BASINS, FRAMES & GRATES, (NH)

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. Construct catch basins in conformance with the dimensions, elevations, and locations shown on the Drawings, as specified herein, and/or as directed by the Engineer.
   2. Construct all catch basins throughout the entire project from the same materials.
   3. Furnish and install cast iron catch basin frames and grates on all catch basins unless otherwise shown on the Drawings.

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
   1. New Hampshire Department of Transportation Standard Specifications, latest edition.

1.3 SUBMITTALS TO THE ENGINEER

A. Submit Shop Drawings and manufacturer's literature in conformance with the standard General Conditions of the construction contract.

PART 2 - PRODUCTS

2.1 RISERS, TOPS, FRAMES, GRATES AND MASONRY

A. Sides of catch basins shall be made of precast concrete barrel sections (except proposed square structures) or cast-in-place concrete. **Pipe connections will be made with rubber boot connections.**
B. Catch basin bases shall be precast or cast-in-place concrete.
C. Precast concrete sections shall conform to the N.H.D.O.T. Standard details.
D. Concrete masonry units shall conform to the requirements of ASTM C139 with a minimum compressive strength of 3000 pounds per square inch when tested by the method in ASTM C116
E. Cement mortar shall conform to Section 569 of the N.H.D.O.T. Standard Specifications.
F. **All Catch Basins shall be provided with polyethylene liners**
G. Castings shall be gray iron, Class 30, conforming to AASHTO M105, unless otherwise specified.
H. Catch basin grates shall be N.H.D.O.T. Standard detail type B in pavement areas and Type C in non-pavement areas unless otherwise shown on the Drawings.
I. Acceptable manufacturers:
   1. LeBaron
   2. Neenah
   3. East Jordan

2.2 COMPOSITE HOOD DEVICES

A. Molded High Density Polyethylene (HDPE).
B. Anti-syphon opening
C. Multiple piece construction not allowed.
D. Mounting hardware as needed or provided by manufacturer
E. Acceptable manufacturer:
   1. Kleanstream

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Precast Risers and Tops:
   1. Install risers and tops level and plumb.
   2. Construct full mortar joints not more than 1/2" wide, with all exposed joints neatly finished.
   3. Construct masonry to fit neatly and tightly around the pipe.
   4. Set metal frames as directed.
   5. Do not permit water to rise over newly made joints until after inspection by the Engineer.

6. **Solidly fill annular spaces around pipes entering the catch basin with non-shrink grout.**
7. When necessary, cut openings carefully to prevent damage to risers and tops. Replace all damaged risers and tops at no additional expense to the Owner.

B. Adjustment to Grade:
1. If necessary, adjust the tops of catch basins to grade with brick masonry.
2. Unreinforced Concrete rings are not acceptable for adjusting to grade.
3. Temporarily set structures within the limits of pavement at the elevation of the bottom of the binder course or as directed. Prior to final paving, set the structures at their final grade.

C. Frames and Grates:
1. Set all frames on polyliner using caulk per manufacturer, true to grade and concentric with the catch basin openings.
2. Completely fill all voids beneath the bottom flange to make a watertight fit.
3. Clean the frame seats before setting the grates in place.

D. Composite Hood Devices
1. Install Composite Hood Device in structures in accordance with manufacturer's instructions. Use manufacturer supplied hardware and supplement as needed to make a complete installation. Only install hoods as directed by Engineer.

E. Clean up:
1. Upon completion, clean all structures of silt, debris, and other matter.
2. Keep all catch basins clean until final acceptance of the work.

END OF SECTION

SECTION 02540
TEMPORARY EROSION CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Description of Work:

1. Comply with all Federal, State and local regulations pertaining to erosion and sediment control and stormwater management.
2. Provide all labor, equipment, materials and maintain temporary erosion control devices as described in the Plan.
3. Provide such erosion control measures as may be necessary to correct conditions that develop prior to the completion of permanent erosion control devices and/or as required to control erosion that occurs during normal construction operations.
4. Provide such sediment control measures as may be necessary to address conditions created by construction dewatering methods and/or stormwater runoff.
5. After award of the Contract, prior to commencement of construction activities, meet with the Engineer to discuss the Plan and develop a mutual understanding relative to.
6. Conduct all construction in a manner and sequence that causes the least practical disturbance of the physical environment.
7. Stabilize disturbed earth surfaces in the shortest practical time and employ such temporary erosion control devices as may be necessary until such time as adequate soil stabilization has been achieved.

PART 5 -- **RECOMMENDED GUIDES:**

1. AASHTO Highway Drainage Guidelines, Volume III, Guidelines for Erosion and Sediment Control in Highway Construction, American Association of State Highway and Transportation Officials, Inc., 444 North Capital St. N.W., Suite 249, Washington, D.C. 20001.
2. Stormwater Management and Erosion and Sediment Control Handbook for Urban and Developing Areas in New Hampshire, New Hampshire Department of Environmental Services, Public Information Office, P.O. Box 95, 6 Hazen Drive, Concord, New Hampshire.
3. Storm Water Phase II Compliance Assistance Guide, Section 5 Small Construction Activity, United State Environmental Protection Agency, Publication No. 833-R-00-003.

PART 2 - PRODUCTS

2.1 Plan

A. Prior to the start of construction submit the Plan in accordance with the Shop Drawing review process in Section 01340 – Submittal.

B. Prior to the start of construction submit a Notice of Intent for Storm Water Discharges Associated with CONSTRUCTION ACTIVITY Under a NPDES General Permit (Copy attached).

C. To assist in Plan preparation, the Engineer will supply the following as available:

1. Specific Reproducible plan sheet and if available, cross sections of the project.
2. Drainage calculations as available.
3. Permits obtained for the project.
4. Geotechnical reports.

2.2 ACCEPTABLE MATERIALS

A. Baled Hay: At least 14" x 18" x 30" securely tied and staked twice per bale.

B. Stone Check Dams: Washed ¾ inch crushed septic system stone free of sand and silts.

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

D. Mulches:

1. Asphalt emulsion, gravel, crushed stone, loose hay, straw, peat moss, pine straw or needles, sawdust, wood chips, wood excelsior, or wood fiber cellulose.
2. Type and use shall be suitable for the Work.

E. Mats and Netting:

1. Twisted craft paper, yarn, jute, excelsior, wood fiber mats, glass fiber, and plastic film.
2. Type and use shall be suitable for the Work.

F. Seed:

1. Standard conservation mix of 100% annual rye grass or field broomgrass.

2. Equivalent seed mixture may be used, as approved by the Engineer, based on its suitability for use is controlling erosion of the various soil types and slopes.

G. Sod:
1. Grown from seed of adapted varieties to produce high quality sod, free of any serious thatch, weeds, insects, diseases and other pest problems.
2. At least one year old and not older than three years. Cut with 1/2" to 1" layer of soil.

H. Drains:
1. Flexible drains consisting of collapsible neoprene pipe, minimum of 8" in diameter, or an approved equal.
2. Corrugated metal pipe and inlet of a gauge consistent with the loading conditions. A minimum size of 12 inches in diameter or approved equal.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. Temporary Stone Checks:
1. Construct temporary erosion checks in ditches and other locations as needed.
2. Baled hay and/or sand bags may be used in an arrangement to fit local conditions designated by the Engineer.
3. Terrace side slopes to retard runoff velocities.

B. Temporary Berms (When Applicable):
1. Construct temporary barriers along the toe of embankments.
2. Construct temporary side drains in intervals as needed.

C. Temporary Slope Drains: Shall be collapsible pipe with corrugated metal pipe inlet with a crescent shaped barrier placed at each slope drain.

D. Debris Basin:
1. A barrier or dam constructed across waterway or other suitable location to form a silt or sediment basin.
2. Capacity shall be equal to the volume of sediment expected to be trapped at the site during the planned use for life of the structure or, if the periodic removal of debris would be practical, the capacity shall be proportionally reduced.

3.2 PERFORMANCE

A. Install erosion control devices as described in the Plan.
1. Apply seed for temporary cover at a rate of 40 lbs. per acre.
2. Apply hay or straw at a rate of 2 tons per acre.
3. Hydroseed all temporarily seeded areas.

B. Protection:
1. Protect streams and channels from fuel, lubricants and other pollutants.
2. Locate storage of materials in shop yards where erosion and sediment hazards are slight.

3.3 REMOVAL AND DISPOSAL

A. General: When permanent soil stabilization has been achieved, remove all temporary materials and devices that are unsightly.

B. Reuse: Materials and devices of suitable type and conditions may be reused at other onsite locations. Materials and devices, determined by the Engineer to be unsuitable for reuse, shall become the Contractor's property and shall be disposed of in a manner and location approved by the Owner.

C. Onsite Disposal when Applicable: The locations and methods of onsite disposal are subject to the Owner's approval. Onsite disposal that results in unsightly conditions, precludes proper maintenance and is detrimental to the physical environment will not be permitted.

END OF SECTION

SECTION 02551
BITUMINOUS CONCRETE PAVING (NH)

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install bituminous concrete pavement courses in accordance with Sections 401 of the NHDOT Standard Specifications for Road and Bridge Construction (latest edition) and as specified in this section.

B. All reference to NHDOT, NHDOT personnel or the Department may be construed as the Engineer, the City of Portsmouth, their agents and their representatives.

1.2 QUALITY ASSURANCE

A. Work shall conform to NHDOT Section 401, Tier 2 except as noted herein:

1. Ride Smoothness: Section 401.3.17.3.4.1 shall apply except variations exceeding **3/8** inch in profile or cross slope shall be eliminated.
2. Ride Smoothness: Section 401.3.17.3.4.4 shall apply except high points **0.5** inches in 25 feet shall corrected.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials shall conform to NHDOT Section 401 except the following:

1. **The maximum amount of Total Reused Binder (TRB) in the pavement mix design shall be .5% and the mix shall meet all volumetric mix design criteria.**
2. Asphalt Cement shall not contain any form of used, recycled or refined oil. Suppliers of PG Binder shall certify that the PG Binder does not contain any used, recycled or refined oil.
3. All 3/4" inch (19mm) and 1 inch (25mm) pavement mixes shall be designed using the 50 gyration N design, unless specified otherwise.
4. Liquid asphalt cement binder shall have a Performance Grade (PG) of PG 64-28 for all standard bituminous and PG 64-E for all high strength bituminous pavements.
5. All high strength asphalt, when specified, shall be 50 gyration unless otherwise directed.

2.2 PAVEMENT MIX DESIGNS

Pavement mix designs shall meet NHDOT Section 401.2.5.1 except the following:

A. Minimum asphalt binder content shall be as follows:

Minimum Asphalt Binder Content		
Mix Type	50 Gyration	75 Gyration*****
3/8-in (9.5 mm)	6.3	5.9
1/2-inch (12.5 mm)	5.9	*
3/4-inch (19 mm)	5.3%	*

The required minimum asphalt content is based on the use of aggregate with a specific gravity of 2.65 to 2.70. The minimum asphalt content requirement may be adjusted when aggregate with a higher specific gravity is used, or the minimum may be adjusted at the Engineer's discretion if it is believed to be in the best interest of the Owner**.** All mix designs shall be submitted to the Engineer for verification and approval.
*****75 Gyration mix not allowed without express written permission of the engineer.

B. Method Requirements NHDOT Section 401.2.6 shall apply including the following:

1. Coarse Aggregate: Stockpiled coarse aggregate shall meet the requirements of 2.6.1, Table 2.
2. Tolerances: All mixtures shall conform within the range of tolerances provided in NHDOT Section 401.2.6.2
3. When Non-Compliant test result, it shall be the Contractor's responsibility to correct non-compliant pavement. The Contractor may be required to remove non-compliant material that is poorly graded or material exhibiting cracks, open joints or other imperfections **(no payment will be made for this material or its removal).**

PART 3 - EXECUTION

3.1 INSTALLATION

A. Construction requirements shall be in accordance with Sections 401 of the NHDOT Standard Specifications for Road and Bridge Construction (latest edition) **and** as specified in this section.

1. Prior to placing any mix, a mix design shall be submitted for approval and pre-paving conference shall be held with the Owner, Contractor, and Engineer to discuss the proposed paving schedule, source of mix, type and

amount of equipment to be used, sequence of paving pattern, rate of mix supply, traffic control, and general continuity of the operation. Special attention shall be made to the paving pattern sequence to minimize cold joints.

2. The Contractor shall notify the Engineer one week in advance of paving operations to allow sufficient time for scheduling personnel.
3. Any pavement course four inches (compacted depth) or greater shall be placed and compacted in two lifts.
4. Sweeping. Existing pavement or previously laid courses shall be thoroughly dry and free from all dust, dirt, and loose material. Sweeping with a power broom, supplemented by hand brooming, may be necessary.
5. Tack coat. Surfaces of any pavement course shall have a tack coat of emulsified asphalt applied in accordance with NHDOT Specifications. Application of emulsified asphalt shall be between 0.03 and 0.05 gal/$yd^{2.}$
6. **Joint adhesive shall be used for all transverse and lateral seams when placing more than 100 tons of asphalt or more. This item is subsidiary unless a separate pay item is provided.**
6. Utility covers, frames and grates, valves and other castings shall be set and raised. Contact surfaces of the drainage and utility castings shall be painted with a thin coating of suitable bituminous material. Surface pavement shall be removed from covers and castings immediately following pavement operations.
7. Method requirements NHDOT Section 401.3.1.2 shall apply.
8. In addition to 3.1.A.7 above, the following performance requirements shall apply:
   a). Tier 2 QA/QC performance requirements shall apply.
   b). Ride Smoothness: NHDOT Section 401.3.17.3.4.1 shall apply except variations exceeding **3/8** inch in profile or cross slope shall be eliminated.
   c). Ride Smoothness: Section 401.3.17.3.4.4 shall apply except high points 0.5 inches in 25 feet shall corrected.

END OF SECTION

SECTION 02557
PAVEMENT RECLAMATION (NH)

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. Lower existing utility structures to a depth below the material to be scarified.
   2. Prepare road surface in accordance with reclaimer manufacturer recommendations.
   3. Reclaim roadway to specifications listed below.
   4. Regrade stabilized base according to typical section.
   5. Provide additional material or remove excess material to achieve the required profile and cross-section.
   6. Raise existing utility structures as specified.

C. Work Not Included:
   1. Reclamation of pavement beyond the limit of work for the convenience of the Contractor. Strict attention shall be made to minimize damage to pavement outside the limit of work.

D. Requirements of Regulatory Agencies
   1. The work performed shall conform to the requirements of NHDOT Standard Specifications Division 300 Base Course Section 306, Reclaimed Stabilized Base latest edition.
   2. NHDOT "Method of Payment" and "Basis of Payment", Sections 306.4 and 306.5 shall not apply.

1.2 QUALITY ASSURANCE

A. Equipment:
   1. Use only a self-propelled or towed reclaiming machine specifically designed to process the existing asphalt surface and a specified amount of subsurface gravel to the tolerances specified herein.
   2. Rock Crushing Equipment, Road Planers or Cold-Milling machines shall not be considered adequate.
   3. Equipment Needed: Hammer Mill, Bomag type reclaimer or other approved equivalent, grader, water truck, vibratory roller, towing unit for reclaiming unit if not self-propelled.

B. Testing:
   1. If required by the engineer, Contractor shall take samples of the existing pavement and base gravel to determine the need for additional gravel and bituminous asphalt. Samples shall be taken at an interval of not less than one every 200 linear feet of roadway to be reclaimed.
   2. Testing shall be performed at an NHDOT approved laboratory in accordance with AASHTO T 164.

C. Gravel:
   1. Gravel shall be furnished from a supplier whose gravel has been approved for use by the NHDOT.

D. Additional Asphalt:
   1. Additional asphalt may be required to obtain 1.5 percent bitumen content.
   2. Additional asphalt shall be from a NHDOT approved supplier.
   3. Asphalt shall be added by a liquid distributor at a rate determined by the asphalt testing to provide 1.5 percent bitumen content.
   4. Asphalt shall be blended with the stabilized base using an approved mixing method.
   5. No asphalt shall be applied if rain is threatening, during rain or when the air temperature is below 50° F.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Additional crushed gravel shall meet the requirements of crushed gravel or crushed stone base course (fine gradation) Section 304 -2.9 or 2.10 of the NHDOT Standard specification latest edition.

B. Stabilized Base:
   1. May be required to contain a minimum bitumen content of 1.5 percent of the portion that passes a ¾" sieve, measured according to AASHTO T-164. The crushed material shall meet the following gradation:

Sieve Designation	Percentage by Passing Weight
3"	100

1/2"	80 - 100
3/4"	55 - 90
#4	40 - 70

PART 3 - EXECUTION

3.1 INSTALLATION

A. Road Preparation:
   1. All utility structures shall be lowered to prevent damage by the processing.
   2. Where applicable, cut pavement according to Section 02555 of the Specifications.
   3. The road surface and an approximately equal thickness of gravel base shall be reclaimed.

B. Reclaiming:
   1. Apply water to insure optimum water content.
   2. The reclaimer shall process the material to the specified gradation.
   3. The process shall be repeated until the "Stabilized Base" meets the required specification.

C. Placement of the Stabilized Base:
   1. Where specified remove the stabilized base and perform the necessary regrading of the underlying roadbed in accordance with the plans and profiles, typical specifications or as directed by the Engineer.
   2. The stabilized base shall be compacted in accordance with NHDOT Section 304, "Aggregate Base Course", current edition.
   3. The finish grade shall not vary more than plus or minus a quarter inch (+/- 1/4") from a ten foot (10') straight line applied parallel to or perpendicular to the centerline.
   4. Excess material becomes the property of the contractor unless otherwise specified on the contract drawings or in Section 01611 - Owner's Right to Materials, of this document.

D. Contractor shall sawcut existing drives in accordance with the standard details on the plans.

END OF SECTION

SECTION 02560
GRANITE CURBING (NHDOT)

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included:

1. Work shall consist of constructing new or resetting existing curbing as shown on the Drawings or as ordered.

1.2 DELIVERY, STORAGE AND HANDLINGS

A. The Contractor shall inspect curbing upon delivery. Any damaged, chipped or defective curbing shall not be accepted.

B. The Contractor shall exercise care during storage and handling of curbing. Broken curb not meeting the dimensions shown on the Drawings shall not be considered for payment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Curb shall be new granite, hard, durable, reasonably uniform in appearance and free of seams. Solid quartz or feldspar veins will not be cause for rejection.

B. Surfaces of granite shall meet the following requirements:

Type	Surface	Minimum Requirements
Straight or Curved	Top	5",6",7"or 8" wide as appropriate or as otherwise shown, sawn true plane. Front and back arris lines pitched straight and parallel.
	Front Face (Exposed)	Right angle to top, approximately true plane. No drill holes showing in top 10".
	Back Face (Not Exposed)	Plane parallel with front face. Straight split to 1 1/2" below exposed surface. No larger than 1/4" segment of drill holes showing in arris lines.
	Bottom	Approximately parallel to top. Minimum width: 3".
	Ends (Exposed portion)	Square with planes of top and face.
	Joints (Exposed)	Optimum width: 1".
	Joints (Concealed)	To break back no more than 4". Lengths of stones 3' to 10' with 50% of sections to be 5' or greater, or as indicated.
	Length of Stones	3' to 10' with 50% of sections to be 5' or greater, or as indicated

PART 3 - EXECUTION

3.1 INSTALLATION

A. Construction requirements shall be in accordance with Division 600, Section 609 (Curbs) of N.H.D.O.T. Standard Specifications for Road and Bridge Construction, latest edition.

B. Excavation for curbing shall be made to the required depth and the base upon which the curb will be set shall be compacted to a firm even surface.

C. The front top arris line shall conform to the line and grade specified.

D. Joints shall be pointed with mortar and finished with a jointer.

E. Curbing to be salvaged and reset shall be carefully removed and stored. The Contractor shall replace any curbing damaged or lost as a result of his failure to remove or store curbing correctly.

F. The Contractor shall backfill curbing immediately after the curb is set.

END OF SECTION

SECTION 02601
MANHOLES, COVERS AND FRAMES (NH)

PART 6 -- 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 for sewer manholes shall be provided by the Department of Public Works.** The manholes have the City's seal on them and are hinged type similar to those made by Pamrex.
- 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 drain manhole covers shall be 30 inches in diameter unless shown otherwise on the Drawings and have the letter "D" or the word "DRAIN" in 3-inch letters cast into the top surface.
9. 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.
10. Contact surfaces of covers and frame seats shall be machined at the foundry before shipment to prevent rocking of covers in any orientation.
11 All castings shall be thoroughly cleaned and subject to a careful hammer inspection.
12. Prior to being shipped from the foundry, castings shall be sandblasted.
13. Repair all coatings that have been damaged in transit or handling to the satisfaction of the Engineer.

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. Standard Units:
1. **Shall be Hinged**
2. Constructed to support an HS-20 wheel loading.

6. Dimensions and Style shall conform to the Drawings; Standard castings differing in non-essential details are subject to approval by the Engineer:
   a. Covers - solid 3-inch letters diamond pattern.
   b. Frame - 30-inch diameter clear opening, with flange bracing ribs.
7. Minimum weight of frame and cover shall be 430 lbs.
8. Hinged Drain Manhole Covers shall be manufactured by EJ type Ergo XL 41421043L01or approved equal.
9. **Frames and covers for sewer manholes shall be provided by the Department of Public Works. The costs for these covers will be passed thru the contract at cost.**

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. 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.

J. Place a thick ring of mortar extending to the outer edge of the masonry all around and on the top of the bottom flange.

K. Finish the mortar so that it will be smooth and have a slight slope to shed water away from the frame.

L. 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. 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
1. 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.
4. 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.

END OF SECTION

SECTION 02610
PIPE & PIPE FITTINGS - GENERAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install, support and test pipe and pipe fittings of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.

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 and fittings.
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.
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. 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 three (3) inches wide Terra Tape Sentry Line 1350 (Detachable) by Reef Industries, Houston, TX, or approved equal.
B. 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 “For Use with Potable Water”.

PART 3 - EXECUTION

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 Contractor’s 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 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 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 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 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.

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 CLEANING AND TESTING

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:
   1. Pressure Test:
      a. Perform testing in accordance with Section 5 of AWWA Standard C600.
      b. Pressure and leakage tests are required.
   2. Chlorination of Pipelines:
      a. Chlorinate all new potable water lines in accordance with the procedure outlined in AWWA C600, latest revision.
      b. Locate chlorination and sampling points as approved by the Engineer.
      c. Use a dosage which will produce not less than 10.0 ppm chlorine residual after a contact period of not less than 24 hours.
      d. During the chlorination period, exercise care to prevent the contamination of water in existing water mains.
      e. After chlorination, flush the piping with clean potable water until there is only background chlorine residual.
      f. 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 at no additional cost to the Owner. The Contractor shall coordinate all testing with the City. Bacteriological testing services of new water mains will be completed by the City of Portsmouth Water Department and reimbursed by the Contractor. The Contractor shall be responsible for coordination and sampling in advance.
      b. The length of pipe to be tested and the time of the test shall be as approved by the Engineer.
      c. The Engineer will observe the taking of samples.
      d. Have all samples tested by a laboratory approved by the State and submit test results to the Engineer.
      e. Any segment of a potable water line shall be considered unsuitable for service if a Coliform bacteria count is obtained from that sample.
      f. Re-disinfect all segments of piping considered unsuitable and retest. Continue to disinfect and test until no Coliform bacteria are present.
      g. Place piping into service when it has been successfully tested for pressure, leakage and total Coliform bacteria.
   4. Services:

a. After a new main has been energized and the new service has been completed, it shall be the responsibility of the Contractor to confirm with the property owner that all water systems in the building are working properly. This will include removing any air from the water service and confirmation with the property owner that interior plumbing is functioning properly.

C. Building Interior Water Lines (When Applicable):
1. Clean and test in accordance with the "Plumbing General" Section in these Specifications.

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. Building Interior Sewer System: Clean and test in accordance with the "Plumbing General" Section in these Specifications.

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.

END OF SECTION

SECTION 02611
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. All rubber joints between pipes shall be supplied with 3 brass wedges per connection in order to provide continuity.
3. 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:

(1) 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 is required and 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. After bagging pipe with plastic, 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 3 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.

END OF SECTION

SECTION 02622
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 QUALITY ASSURANCE

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" – 48" 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 CLEANING AND TESTING
A. Clean and test PVC pipes: Refer to Final Sewer Testing section in these specifications.

END OF SECTION

SECTION 02624
CORRUGATED POLYETHYLENE DRAINAGE TUBING (CPDT)
Drain Services and Underdrain

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install, anchor, support and test pipe and pipe fittings of the types and sizes in the locations shown on the Drawings and/or as directed by the Engineer.

1.2 QUALITY ASSURANCE

A. Pipe shall be high density polyethylene (PE) conforming to the following standard referenced specifications:
   1. AASHTO: M252, Corrugated Polyethylene Drainage tubing.

B. Pipe and fittings shall be provided by a single manufacturer. The Contractor shall submit a certificate of compliance to the Engineer for approval.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Resin
   1. Resin used in the manufacturing of pipe and fittings shall meet the requirements of cell class 324420C as defined in ASTM 3350.
   2. Carbon black content shall not exceed 5%.

B. Pipe

   Pipe shall be heavy duty corrugated polyethylene (PE) tubing, soil tight with Class 2 perforations for underdrains. The water inlet area shall be a minimum of 2.0 square inch per linear foot. Drainage service pipe to have no perforations.

C. Fittings

   Only fittings and couplings supplied and recommended by the manufacturer of the pipe shall be used. The fitting and couplings shall not reduce or impair the overall integrity of the pipe.

D. Acceptable Manufacturers:
   1. Hancor, Inc. Findlay, Ohio
   2. Advanced Drainage Systems, Inc. Columbus, Ohio

PART 3 - EXECUTION

3.1 TRANSPORTING, HANDLING AND STORING PIPE

A. Transporting
   1. Care shall be taken during the transportation of the pipe in trucks and trailers so that it is not damaged from cuts and kinks.

B. Handling
   1. The handling and lifting of pipe lengths and fittings shall be such as to avoid damage and shall be done by means of ropes, fabric or rubber protected slings and straps.
   2. The pipe shall not be lifted by means of metal slings, chains, cables or hooks inserted into the pipe ends. Slings shall be positioned to prevent excessive flexing of the pipe lengths to avoid kinking or damage to the pipe.
   3. The pipe lengths shall not be dragged from the transportation media or allowed to fall onto un-prepared or rocky ground.
   4. The handling of the joined pipe line shall be done in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects.
   5. Sections of the pipes where cuts and gouges of the pipe wall are apparent shall be removed and the ends of the pipeline rejoined.

C. Storing

1. The stacking of the polyethylene pipe shall be limited to such a height as to not cause excessive deformation of the bottom layers of pipes under anticipated temperature conditions.
2. The surface where the pipe shall be stored shall be level and free of foreign objects which could damage the pipe.
3. Where necessary due to ground conditions, the pipe shall be stored on wooden sleepers of sufficient bearing and spacing.
4. Pipe coils shall be laid flat on their flat side and not stacked.

3.2 INSTALLING PIPES AND FITTINGS

A. Install in accordance with the manufacturer's written instructions and as shown on the Drawings.
B. The polyethylene pipe shall be lifted and lowered into the trench with proper equipment and in such a manner to ensure that the pipe is not damaged or twisted.
C. The pipe and fittings shall be laid with the perforations face down on the trench bottom or as directed.
D. Pipe shall be laid true to line and grade.

END OF SECTION

SECTION 02625

CORRUGATED POLYETHYLENE (CPE) PIPE & FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install, anchor, support and test pipe and pipe fittings of the types and sizes in the locations shown on the Drawings and/or as directed by the Engineer.

1.2 QUALITY ASSURANCE

A. Pipe shall be high density polyethylene (HDPE) conforming to the following standard referenced specifications:
   1. AASHTO M294
   2. ASTM: D1248 Polyethylene Molding & Extrusion materials.
   3. ASTM D3350 Polyethylene Plastic Pipes and Fittings.

B. Pipe and fittings shall be provided by a single manufacturer, and a certificate of compliance will be submitted to the Engineer for approval.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General
   1. The prescribed sizes of pipes are nominal inside diameters. Pipes shall be of the size and length shown on the plans.

B. Smooth Interior Corrugated Polyethylene Pipe
   1. The product supplied under this specification shall be high density polyethylene corrugated exterior/smooth interior pipe. Twelve - to 36 - inch diameters shall conform to AASHTO M294 Type S. Forty-two and 48 - inch diameters shall have minimum pipe stiffness of 20 and 17 psi, respectively, at 5% deflection; and shall meet all other requirements of AASHTO M294.
   2. Material shall meet ASTM D1248 Type III, Category 4, Grade P33, Class C; or ASTM D3350 Cell Classification 324420C.

C. Coupling Bands and Fittings
   1. Coupling bands shall cover at least one full corrugation on each section of pipe. When gasketed coupling bands are required, the gasket shall be made of closed-cell synthetic expanded rubber meeting the requirements of ASTM D1056, Type 2. Gaskets shall be installed on the coupling band by the pipe manufacturer. All coupling bands shall meet or exceed the soil-tightness requirement of the AASHTO Standard Specification for Highway Bridges, section 23, paragraph 23.3.1.5.4(e).
   2. Furnish fittings of approved equal to the pipe and having connection configurations identical to that of the pipe.
   3. Pipe fittings shall conform to AASHTO M294.

D. Acceptable Manufacturers:
   1. Hancor, Inc., Findlay Ohio
   2. Advanced Drainage Systems, Columbus Ohio
   3. Or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with manufacturer's recommendations and as shown on the drawings.
B. 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.
C. Flared end sections shall be fully supported.
D. Stones larger than 3 inches in diameter shall not contact the pipe, fittings or appurtenances.
E. Pipe shall be laid true to line and grade.

3.2 INSPECTION AND CLEANING

A. Inspect all drain pipes in the presence of the Owner and the Engineer. All pipes not demonstrating uniform slope and alignment shall be replaced at no additional cost to the Owner.

END OF SECTION

SECTION 02626
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.

END OF SECTION

SECTION 02630
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.

END OF SECTION

SECTION 02641
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.

END OF SECTION

SECTION 02642
CORPORATION STOPS

PART 1 -- GENERAL

1.1 DESCRIPTION

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

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 Reference standards

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 Substitutions

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 INSTALLATION

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.

C.

Pipe Size	Class 50 Ductile Iron Pipe	Class 51 Ductile Iron Pipe	Class 52 Ductile Iron Pipe
6”	All Taps	All Taps	Taps > 3/4”
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”

D.

E. Spiral-wrap completely the thread area with Teflon tape prior to insertion.

F. Install corporation stops at the 2 and 10 o’clock positions on the pipe.

G. 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.

H. Check and adjust all corporation stops for smooth operation.

3.2 Testing

A. All corporation stops must be installed prior to leakage testing of the water main.

END OF SECTION

SECTION 02643
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.
   1. Mueller Co.
   2. 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. 5½' - 6½' bury (unless shown otherwise)
   3. Plug cover with rope thread
   4. 36" x ½" 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 ½" below finish grade or at such a level as not to interfere with lawn maintenance.

END OF SECTION

SECTION 02644
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. Hydrant Assemblies consist of:

1. Hydrant tee.
2. 6 inch gate valve and valve box.
3. 6 inch hydrant branch piping.
4. Hydrant.
5. Thrust blocking and retainer glands.

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:

1. Kennedy Model K-81A or as approved by the City of Portsmouth Water Department.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fire Hydrants:

1. Dry barrel type with a 5-1/4 inch minimum valve opening.
2. 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. Gate Valves: Waterworks type non-rising stem AWWA valve as specified in Section 02646-Gate Valves.

C. 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. CLEANING
A. Clean all hydrants of concrete, etc. and repaint as necessary to the satisfaction of the Engineer and Owner.

END OF SECTION

SECTION 02646
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.

END OF SECTION

SECTION 02649
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
A. For cast iron, ductile iron, and C900 PVC pipe
   1. Body - ductile iron.
      a. Fusion bonded epoxy coated (10 mils min.)
   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. Or equivalent

PART 3 - EXECUTION

3.1 INSTALLATION
A. Installation as shown on the Drawings and/or as specified herein:
   1. Install at locations with 1 1/2 inch or larger services on ductile iron pipe, or at any size service on A.C. pipe, or as specified by the pipe and saddle manufacturers.
   2. Check for leaks prior to backfilling as appropriate.
   3. Tap pipe with tools and methods specifically furnished by pipe manufacturer.

END OF SECTION

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 Superintendent 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 SUBMITTALS TO THE ENGINEER

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 GENERAL

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.

END OF SECTION

SECTION 02651
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

Pipe Diameter (inches)	Minimum Time (min)	Length for Min. Time (feet)	Time for Longer Lengths* (sec)
4	1:53	597	.190L
6	2:50	398	.427L
8	3:47	298	.760L
10	4:43	239	1.187L
12	5:50	199	1.709L
15	7:05	156	2.671L
18	8:30	133	3.846L
21	9:55	114	5.235L
24	11:20	99	6.837L
27	12:45	88	8.653L
30	14:10	80	10.683L
33	15:35	72	12.926L
36	17:00	66	15.384L

*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:

$$G = 0.95\ D \text{ inches (nominal)}$$

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:

$$D = D' - 2(1.06\ t) \text{ inches}$$

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

END OF SECTION

SECTION 02930
PLANTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Planting items including but not limited to:
   1. Plants
   2. Planting soils
   3. Tree stabilization

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ANSI-Z60.1 - American Standard for Nursery Stock. As published by the American Association of Nurserymen; Washington, DC. 2004.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Engage the services of a reputable nursery in the area to furnish and plant such trees and shrubs as recommended by the nursery and as approved by the Landscape Architect.

B. Pre-installation Meeting: Convene a pre-installation meeting at least 1 month before starting work of this Section; require attendance by all relevant installers. Pre-Installation Meetings shall not be scheduled until which time the submittal and shop drawing process has been 100% completed and approved.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: For each type of product indicated, including soils.
   1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
   2. Plant Photographs: Include color photographs in [digital] format of each specimen tree to be furnished to the Project. Take photographs from an angle depicting true size and condition of the tree to be furnished. Include a scale rod or other measuring device in each photograph.

C. Qualification Data: For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

D. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
   1. Manufacturer's certified analysis of standard products.
   2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

E. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before start of required maintenance periods

F. Warranty: Sample of special warranty.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of plants.

B. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.

C. Experience: [Five] years' experience in landscape installation in addition to requirements in Division 01 Section "Quality Requirements."

D. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

E. Personnel Certifications: Installer's [field supervisor] shall have certification in [one of] the following categories from the Professional Landcare Network:

1. Certified Landscape Technician - Exterior, with [installation] specialty area(s), designated CLT-Exterior.

2. Certified Ornamental Landscape Professional, designated COLP.

F. Soil-Testing Laboratory Qualifications: An independent or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

G. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; [sodium absorption ratio;]deleterious material; pH; and mineral and plant-nutrient content of the soil.

1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.

H. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.

1. Selection of plants purchased under allowances will be made by Landscape Architect, who will tag plants at their place of growth before they are prepared for transplanting

I. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.

1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches (150 mm) above the root flare for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above the root flare for larger sizes.

2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

J. Plant Material Observation: Landscape Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Landscape Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Architect of sources of planting materials [seven] days in advance of delivery to site.

K. Preinstallation Conference: Conduct conference at [Project site].

1.07 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.

2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

3. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees

or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

D. Handle planting stock by root ball.

E. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.

2. Do not remove container-grown stock from containers before time of planting.

3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.

1.08 PROJECT CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Notify Construction Manager no fewer than two days in advance of proposed interruption of each service or utility.

1. Do not proceed with interruption of services or utilities without Construction Manager's written permission.

C. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting: <April 1st-June 15th>.

2. Fall Planting: <August 25th-October 15th>.

D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

E. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.

1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.09 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.

b. Structural failures including plantings falling or blowing over.

c. Faulty performance of [tree stabilization] [edgings].

d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Periods from Date of [Substantial Completion].

a. Trees, Shrubs, Vines, and Ornamental Grasses: [12] months.

b. Ground Covers, Biennials, Perennials, and Other Plants: [12] months.

B. Include the following remedial actions as a minimum:

1. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.

2. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.

3. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.

4. Provide extended warranty for period equal to original warranty period, for replaced plant material.

1.10 MAINTENANCE SERVICE

A. Initial Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.

1. Maintenance Period: [12] months from date of [Substantial Completion].

B. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 PRODUCTS

2.01 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch (19 mm) in diameter; or with stem girdling roots will be rejected.

2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

D. Labeling: Label [at least one] plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant as shown on Drawings.

E. If formal arrangements or consecutive order of plants is shown on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

2.02 INORGANIC SOIL AMENDMENTS

A. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

2.03 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through [1/2-inch (13-mm)] sieve; soluble salt content of [5 to 10] decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: [50 to 60] percent of dry weight.

2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

B. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.

1. In lieu of decomposed wood derivatives, mix partially decomposed wood derivatives with ammonium nitrate at a minimum rate of [0.15 lb/cu. ft. (2.4 kg/cu. m)] of loose sawdust or ground bark, or with ammonium sulfate at a minimum rate of [0.25 lb/cu. ft. (4 kg/cu. m)] of loose sawdust or ground bark.

C. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.04 FERTILIZERS

A. Bone meal: Commercial, raw or steamed, finely ground; a minimum of [1] [4] percent nitrogen and [10] [20] percent phosphoric acid.

B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.

C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.

2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition.

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

E. Planting Tablets: Tightly compressed chip type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.

1. Size: [10-gram] tablets.

2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

F. Chelated Iron: Commercial-grade FeEDDHA for dicots and woody plants, and commercial-grade FeDTPA for ornamental grasses and monocots.

2.05 PLANTING SOILS

A. Planting Soil <6 parts loam, 4 parts med-course sand, 1 part aged compost >: ASTM D 5268 topsoil, with pH range of 5.5 to 7, a minimum of [6] percent organic material content; free of stones 1 inch (25 mm) or larger in any dimension and other extraneous materials harmful to plant growth.

1. Additional Properties of Imported Topsoil or Manufactured Topsoil: Screened and free of stones 1 inch (25 mm) or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants including quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and

bromegrass; not infested with nematodes; grubs; or other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration. Continuous, air-filled pore space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis.

2.06 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of the following:
   1. Type: [Ground or shredded bark].
   2. Size Range: [3 inches (76 mm) maximum, 1/2 inch (13 mm) minimum].
   3. Color: Natural.

2.07 TREE STABILIZATION MATERIALS

A. Stakes and Guys:

1. Upright and Guy Stakes: Rough-sawn, sound, new [hardwood] [softwood with specified wood pressure-preservative treatment], free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal (38-by-38-mm actual) by length indicated, pointed at one end.

2. Wood Deadmen: Timbers measuring 8 inches (200 mm) in diameter and 48 inches (1200 mm) long, treated with specified wood pressure-preservative treatment

3. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes.

4. Guys and Tie Wires: ASTM A 641/A 641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch (2.7 mm) in diameter.

5. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.

6. Guy Cables: Five-strand, 3/16-inch- (4.8-mm-) diameter, galvanized-steel cable, with zinc-coated [turnbuckles], a minimum of 3 inches (75 mm) long, with two 3/8-inch (10-mm) galvanized eyebolts.

7. Flags: Standard surveyor's plastic flagging tape, white, 6 inches (150 mm) long.

8. Proprietary Staking-and-Guying Devices: Proprietary stake and adjustable tie systems to secure each new planting by plant stem; sized as indicated and per manufacturer's written recommendations.

2.08 MISCELLANEOUS PRODUCTS

A. Wood Pressure-Preservative Treatment: AWPA C2, with waterborne preservative for soil and freshwater use, acceptable to authorities having jurisdiction, and containing no arsenic; including ammoniacal copper arsenate, ammoniacal copper zinc arsenate, and chromated copper arsenate.

B. Root Barrier: Black, molded, modular panels manufactured with 50 percent recycled polyethylene plastic with ultraviolet inhibitors, 85 mils (2.2 mm) thick, with vertical root deflecting ribs protruding 3/4 inch (19 mm) out from panel, and each panel [24 inches (610 mm)] wide.

C. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

D. Burlap: Non-synthetic, biodegradable.

E. Planter Drainage Gravel: Washed, sound crushed stone or gravel complying with [ASTM D 448 for Size No. 8].

F. Planter Filter Fabric: [Woven] geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.

G. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb (0.45 kg) of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb (0.45 kg) of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.

2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.

3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.

4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.02 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Landscape Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

D. Lay out plants at locations directed by Landscape Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings

E. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

F. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

3.03 PLANTING AREA ESTABLISHMENT

A. Loosen subgrade of planting areas to a minimum depth of [8 inches (200 mm)]. Remove stones larger than [1 inch (25 mm)] in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

B. Spread planting soil to a depth of [12 inches (300 mm)] but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

1. Spread approximately one-half the thickness of planting soil over loosened subgrade. Mix thoroughly into top [4 inches (100 mm)] of subgrade. Spread remainder of planting soil.

C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

D. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

E. Application of Mycorrhizal Fungi: At time directed by Architect, broadcast dry product uniformly over prepared soil at [application rate indicated on Drawings].

3.04 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.

1. Excavate approximately three times as wide as ball diameter for [balled and burlapped] [balled and potted] [container-grown] [fabric bag-grown] stock.

2. Excavate at least 12 inches (300 mm) wider than root spread and deep enough to accommodate vertical roots for bare-root stock.

3. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.

4. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.

5. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.

6. Maintain supervision of excavations during working hours.

7. Keep excavations covered or otherwise protected [after working hours].

8. If drain tile is shown on Drawings or required under planting areas, excavate to top of porous backfill over tile.

B. Subsoil and topsoil removed from excavations [may not] be used as planting soil.

C. Obstructions: Notify Landscape Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Drill 6-inch- (150-mm-) diameter holes, 24 inches (600 mm) apart, into free-draining strata or to a depth of 10 feet (3 m), whichever is less, and backfill with free-draining material.

D. Drainage: Notify Landscape Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.05 TREE, SHRUB, AND VINE PLANTING

A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Set [balled and burlapped stock] and [fabric bag-grown stock] plumb and in center of planting pit or trench with root flare [2 inches (50 mm) above] adjacent finish grades.

1. Use planting soil <6 parts loam, 4 parts med-course sand, 1 part aged compost > for backfill.

2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.

3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.

4. Continue backfilling process. Water again after placing and tamping final layer of soil.

D. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.06 TREE STABILIZATION

A. Install trunk stabilization as follows unless otherwise indicated:

1. Upright Staking and Tying: Stake trees of 2- through 5-inch (50- through 125-mm) caliper. Stake trees of less than 2-inch (50-mm) caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches (450 mm) below bottom of backfilled excavation and to

extend[one-third of trunk height] above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.

2. Use two stakes for trees up to 12 feet (3.6 m) high and 2-1/2 inches (63 mm) or less in caliper; three stakes for trees less than 14 feet (4.2 m) high and up to 4 inches (100 mm) in caliper. Space stakes equally around trees.

3. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

4. Support trees with two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

B. Staking and Guying: Stake and guy trees more than 14 feet (4.2 m) in height and more than 3 inches (75 mm) in caliper unless otherwise indicated. Securely attach no fewer than three guys to stakes 30 inches (760 mm) long, driven to grade.

1. Site-Fabricated Staking-and-Guying Method:

a. For trees more than 6 inches (150 mm) in caliper, anchor guys to wood deadmen buried at least 36 inches (900 mm) below grade. Provide [turnbuckle] for each guy wire and tighten securely.

b. Support trees with bands of flexible ties at contact points with tree trunk and reaching to [turnbuckle]. Allow enough slack to avoid rigid restraint of tree.

c. Support trees with strands of cable or multiple strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk and reaching to [turnbuckle]. Allow enough slack to avoid rigid restraint of tree.

d. Attach flags to each guy wire, 30 inches (760 mm) above finish grade.

e. Paint [turnbuckles] with luminescent white paint.

2. Proprietary Staking and Guying Device: Install staking and guying system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.

C. Root-Ball Stabilization: Install at- or below-grade stabilization system to secure each new planting by the root ball unless otherwise indicated.

1. Wood Hold-Down Method: Place vertical stakes against side of root ball and drive them into subsoil; place horizontal wood hold-down stake across top of root ball and screw at each end to one of the vertical stakes.

2. Install stakes of length required to penetrate at least [18 inches (450 mm)] below bottom of backfilled excavation. Saw stakes off at horizontal stake.

3. Install screws through horizontal hold-down and penetrating at least 1 inch (25 mm) into stakes. Predrill holes if necessary to prevent splitting wood.

4. Install second set of stakes on other side of root trunk for larger trees as indicated.

5. Proprietary Root-Ball Stabilization Device: Install root-ball stabilization system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.

D. Palm Bracing: Install bracing system at three or more places equally spaced around perimeter of trunk to secure each palm until established unless otherwise indicated.

1. Site-Fabricated Palm-Bracing Method:

a. Place battens over padding and secure battens in place around trunk perimeter with at least two straps, tightened to prevent displacement. Ensure that straps do not contact trunk

b. Place diagonal braces and cut to length. Secure upper ends of diagonal braces with galvanized nails into battens or into nail-attached blocks on battens. Do not drive nails, screws, or other securing devices into

palm trunk; do not penetrate palm trunk in any fashion. Secure lower ends of diagonal braces with stakes driven into ground to prevent outward slippage of braces.

2. Proprietary Palm-Bracing Device: Install palm-bracing system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.

3.07 ROOT BARRIER INSTALLATION

A. Install root barrier where trees are planted within [66 inches (1500 mm)] of paving or other hardscape elements, such as walls, curbs, and walkways unless otherwise shown on Drawings.

B. Align root barrier [vertically] [with bottom edge angled at 20 degrees away from the paving or other hardscape element] and run it linearly along and adjacent to the paving or other hardscape elements to be protected from invasive roots.

C. Install root barrier continuously for a distance of [60 inches (1500 mm)] in each direction from the tree trunk, for a total distance of [10 feet (3 m)] per tree. If trees are spaced closer, use a single continuous piece of root barrier.

1. Position top of root barrier [flush with finish grade] [1/2 inch (13 mm) above finish grade] [per manufacturer's recommendations].

2. Overlap root barrier a minimum of 12 inches (300 mm) at joints.

3. Do not distort or bend root barrier during construction activities.

4. Do not install root barrier surrounding the root ball of tree.

3.08 GROUND COVER AND PLANT PLANTING

A. Set out and space ground cover and plants other than trees, shrubs, and vines [12 inches (225 mm) apart] [24 inches (300 mm) apart] [as indicated] in even rows with triangular spacing.

B. Use planting soil <6 parts loam, 4 parts med-course sand, 1 part aged compost> for backfill.

C. Dig holes large enough to allow spreading of roots.

D. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.

E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.09 PLANT AREA MULCHING

A. Mulch backfilled surfaces of planting areas and other areas indicated.

1. Trees [and Tree-like Shrubs] in Turf Areas: Apply [organic] mulch ring of [2-inch (50-mm)] average thickness, with [12-inch (300-mm)] radius around trunks or stems. Do not place mulch within [3 inches (75 mm)] of trunks or stems.

2. Organic Mulch in Planting Areas: Apply [2-inch (50-mm)] average thickness of organic mulch [extending 12 inches (300 mm) beyond edge of individual planting pit or trench] [and] [over whole surface of planting area], and finish level with adjacent finish grades. Do not place mulch within [3 inches (75 mm)] of trunks or stems.

3.10 PLANT MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and

performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.

B. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated past management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.11 CLEANUP AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.

B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

C. After installation and before [Substantial Completion], remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.12 DISPOSAL

A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION

DIVISION 3
CONCRETE

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
03700	Concrete Pavers

SECTION 03000
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 ACT Code arid 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 MATERIALS

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.
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.

END OF SECTION

SECTION 03010
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 PERFORMANCE

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 than 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.

END OF SECTION

SECTION 03100
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 REMOVAL

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^{O}F or 2 days after placement when ambient temperatures are above 50^{O}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 RESHORING

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 REMOVAL STRENGTH

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.

END OF SECTION

SECTION 03200
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 DESCRIPTION

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 PLACING

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.
   4. Crosswise of Members: Spaced evenly within 2 inches.
   5. Lengthwise of members: +/- 2 inches.

B. Interference:
   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:
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.

K. 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.

END OF SECTION

SECTION 03300
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 REFERENCE SPECIFICATIONS

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 SHOP DRAWINGS

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 RELATED TRADES

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%)	Min.-Max 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):

Type II Portland Cement	20 lb.
Ground Granulated Blas Furnace Slag	100 lb.
Sand	2,830 lb.
Water	40 – 50 gal.
Air Entrainment	10% to 15%

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 PLACING

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 SURFACE REPAIRS

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 CUTTING OF HOLES

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.

END OF SECTION

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.

END OF SECTION

SECTION 03604
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 than 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 MIXES

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 PREPARATION

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 CURING

A. Cure grout for 3 days after placing.

B. Keep grout wet and covered with curing paper or other methods approved by the Engineer.

END OF SECTION

SECTION 3700
CONCRETE PAVERS

PART 1 GENERAL

1.01 SUMMARY
A. Section includes the following:
1. Concrete Pavers
2. Joint Sand

1.02 REFERENCES

Note: Design street, industrial, port and airport pavement thicknesses in consultation with a qualified civil engineer, in accordance with established flexible pavement design procedures, LOCKPAVE® software, and in accordance with Interlocking Concrete Pavement Institute Technical Bulletins. Sample construction detail drawings are available from Unilock®. This specification may require modifications.

A. ASTM International, latest edition:

1. C 33, Standard Specification for Concrete Aggregates.
2. C 67, Standard Test Methods for Sampling and Testing Brick and Structural Clay, Tile, Section 8, Freezing and Thawing.
4. C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
5. C 140, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
6. C 144 Standard Specifications for Aggregate for Masonry Mortar.
7. D 448, Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
8. C 936, Standard Specification for Solid Concrete Interlocking Paving Units.
9. C 979, Standard Specification for Pigments for Integrally Colored Concrete.
10. D 698 Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 5.5 lb (24.4 N) Rammer and 12 in. (305 mm) drop.
11. D 1557 Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 10-lb (44.5 N) Rammer and 18 in. (457 mm) drop.
12. C1645 Standard Test Method for Freeze-thaw and De-icing Salt Durability of Solid Concrete Interlocking Paving Units
13. D 1883, Test Method for California Bearing Ratio of Laboratory-Compacted Soils.
14. D 2940 Graded Aggregate Material for Bases or Subbases for Highways or Airports.
15. D 4254, Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.

Note: In order to determine the latest version of the listed specifications and standards, please consult the ASTM web page (www.astm.com)

1.03 SUBMITTALS
A. Concrete Pavers:

1. Samples for verification: Three representative full-size samples of each paver type, thickness, color and finish that indicate the range of color variation and texture expected upon project completion.
2. Accepted samples become the standard of acceptance for the product produced.
3. Test results from an independent testing laboratory for compliance of concrete pavers with ASTM C 936.
4. Manufacturer's catalog product data, installation instructions, and material safety data sheets for the safe handling of the specified materials and products.

B. Joint and Setting Bed Sand:

1. Provide three representative one pound samples in containers of Joint Sand materials.
2. Provide three representative one pound samples in containers of Setting Bed Sand materials.
3. Test results from an independent testing laboratory for sieve analysis per ASTM C 136 conforming to the grading requirements of ASTM C 144.

D. Base and Subbase Aggregate:

1. Test results from an independent testing laboratory for sieve analysis per ASTM C 136.

E. Paving Installation Contractor:

1. Job references from a minimum of three projects similar in size and complexity. Provide Owner/Client/General Contractor names, postal address, phone, fax, and email address.

1.04 QUALITY ASSURANCE

A. Utilize a Manufacturer having at least ten years of experience manufacturing concrete pavers on projects of similar nature or project size.

B: Source Limitations:

1. Obtain Concrete Pavers from one source location with the resources to provide products of consistent quality in appearance and physical properties.
2. Obtain Joint and Setting Bed Sands from one source with the resources to provide materials and products of consistent quality in appearance and physical properties.

C. Paving Contractor Qualifications:

1. Utilize an installer having successfully completed concrete paver installation similar in design, material, and extent indicated on this project.

D. Mockups:

1. Install a 5 ft x 5 ft paver area per each paving pattern.
2. Use this area to determine surcharge of the Setting Bed Sand layer, joint sizes, lines, laying pattern(s) and levelness. This area will serve as the standard by which the workmanship will be judged.
3. Subject to acceptance by owner, mock-up may be retained as part of finished work.
4. If mock-up is not retained, remove and dispose legally.

1.05 DELIVERY, STORAGE & HANDLING

A. In accordance with Conditions of the Contract and Division 1 Product Requirement Section.

B. Deliver Concrete Pavers in manufacturer's original, unopened and undamaged container packaging with identification labels intact.

1. Coordinate delivery and paving schedule to minimize interference with normal use of streets and sidewalks adjacent to paver installation.
2. Deliver Concrete Pavers to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by forklift or clamp lift.
3. Unload Concrete Pavers at job site in such a manner that no damage occurs to the product or adjacent surfaces.

C. Store and protect materials free from mud, dirt and other foreign materials.

D. Prevent Joint and Setting Bed Sand from exposure to rainfall or removal by wind with secure, waterproof covering.

1.06 PROJECT/SITE CONDITIONS

A. Environmental Requirements:

1. Install Concrete Pavers only on unfrozen and dry Setting Bed Sand.
2. Install Setting Bed Sand only on unfrozen and dry Base or Subbase Aggregate materials.
3. Install Base or Subbase Aggregates only over unfrozen subgrade.
4. Install Setting Bed Sand or Concrete Pavers when no heavy rain or snowfall are forecast within 24 hours.

1.07 CONCRETE PAVER OVERAGE AND ATTIC STOCK

A. Provide a minimum of 5% additional material for overage to be used during construction.

B. Contractor to provide 100 square feet of each product and size used to owner for maintenance and repair. Furnish Pavers from the same production run as installed materials.

C. Manufacture to supply maintenance and reinstatement manuals for Concrete Paver units.

PART 2 PRODUCTS

2.01 CONCRETE PAVERS

A. Basis-of-Design Product: The Concrete Paver shapes are based on:

1. Unilock:

f. Series 3000
2. As manufactured by: Unilock
35 Commerce Dr.
Uxbridge, MA 01569
Contact Daniel.neviackas @unilock.com c) 508.341.4306
3. Substitutions: No substitutions permitted.

B. Product requirements:
1. Concrete Paver Type 1: Series 3000
a. Color: Crystalline Basalt
b. Finish: Exposed Granite (Series 3000) – this is a face mix finish.
c. Edge: Beveled
d. Size: Manufacture the sizes indicated with a maximum tolerance of plus or minus 1/16 in all directions.
1. 4" x 8"
Note: Imperial dimensions are nominal equivalents to the metric dimensions.
2. Concrete Paver Type 2: Series 3000
a. Color: Crystalline Basalt
b. Finish: Exposed Granite (Series 3000) – this is a face mix finish.
c. Edge: Beveled
d. Size: Manufacture the sizes indicated with a maximum tolerance of plus or minus 1/16 in all directions.

C. Provide pavers meeting the minimum material and physical properties set forth in ASTM C 936, Standard Specification for Interlocking Concrete Paving Units. Efflorescence is not a cause for rejection.
1. Average compressive strength 8000 psi (55MPa) with no individual unit under 7,200 psi (50 MPa).
2. Average absorption of 5% with no unit greater than 7% when tested according to ASTM C 140.
3. Resistance to 50 freeze-thaw cycles, when tested according to ASTM C1645, with no breakage greater than 1.0% loss in dry weight of any individual unit. Conduct this test method not more than 12 months prior to delivery of units. Note: Efflorescence is a whitish powder-like deposit that sometimes appears on concrete products. Calcium hydroxide and other water-soluble materials form or are present during the hydration of Portland cement. Pore water becomes saturated with these materials, and diffuses to the surface of the concrete. When this water evaporates,
the soluble materials remain as a whitish deposit on the concrete surface. The calcium hydroxide is converted to calcium carbonate during a reaction with carbon dioxide from the atmosphere. The calcium carbonate is difficult to remove with water. However, the efflorescence will wear off with time, and it is advisable to wait a few months before attempting to remove any efflorescence. Commercially available cleaners can be used, provided directions are carefully followed. Some cleaners contain acids that may alter the color of the pavers.

D. Accept only pigments in concrete pavers conforming to ASTM C 979.
Note: ACI Report No. 212.3R provides guidance on the use of pigments.

E. Maximum allowable breakage of product is 5%.

2.02 JOINT SAND

A. Provide polymeric Joint Sand manufactured by Polybind or approved equal. Color to be provided.
:

2.04 SETTING BED SAND

A. Provide Setting Bed Sand as follows:
1. Washed, clean, non-plastic, free from deleterious or foreign matter, symmetrically shaped, natural or manufactured from crushed rock. Mix with 1 part portland cement for every 3 parts sand.
2. Do not use limestone screenings, stone dust, or sand material that does not conform to conform to the grading requirements of ASTM C 33.
3. Do not use mason sand or sand conforming to ASTM C 144.
4. Utilize sands that are as hard as practically available where concrete pavers are subject to vehicular traffic.
5. Conform to the grading requirements of ASTM C 33 with modifications as shown in
Table 2 below:

TABLE 2 – SETTING BED SAND
GRADATION REQUIREMENTS FOR SETTING BED SAND
ASTM C 33

Sieve Size	**Percent Passing**
3/8 in (9.5 mm)	100
No. 4 (4.75 mm)	95 to 100
No. 8 (2.36 mm)	85 to 100
No. 16 (1.18 mm)	50 to 85
No. 30 (0.600 mm)	25 to 60
No. 50 (0.300 mm)	10 to 30
No. 100 (0.150 mm)	2 to 10
No. 200 (0.075)	0 to 1

2.08 EDGE RESTRAINTS

A. Granite Curb Edge Restraint as indicated.

Note: The provision of suitable edge restraints is critical to the satisfactory performance of interlocking concrete block pavement. Abut pavers tightly against the restraints to prevent rotation under load and any consequent spreading of joints. Install sufficiently stable edge restraints that are, in addition to providing suitable edge support for the paver units, able to withstand the impact of temperature changes, vehicular traffic and/or snow removal equipment. Curbs, gutters or curbed gutter, constructed to the dimensions of municipal standards (noting that these standards generally refer to cast-in-place concrete sections), are considered to be acceptable edge restraints for heavy duty installations. Where extremely heavy industrial equipment is involved such as container handling equipment, review the flexural strength of the edge restraint carefully particularly if a section that is flush with the surface is used and may be subjected to high point loading.

2.09 ACCESSORIES

A. Joint Stabilizing Sealers

1. Supplier: B.P. Pro (2941 W MacArthur Blvd, Santa Ana, CA 92704
2. Material Type and Description: Natural Stabilizing Sealer

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas indicated to receive paving for compliance with requirements for installation tolerances and other conditions affecting performance for the following items before placing the Concrete Pavers.

1. Verify that subgrade preparation, compacted density and elevations conform to specified requirements.
2. Verify that the Base and Subbase Aggregate materials, thickness, compacted density, surface tolerances and elevations conform to specified requirements.
3. Provide written density test results for soil subgrade, Base and Subbase Aggregate materials to the Owner, General Contractor and paver installation subcontractor.
4. Verify location, type, and elevations of edge restraints, concrete curbing, concrete collars around utility structures, and drainage inlets.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Beginning of Bedding Sand and Concrete Paver installation signifies acceptance of Base and edge restraints.

3.02 PREPARATION

A. Verify that the subgrade soil is free from standing water.

B. Stockpile Setting Bed Sand, Joint Sand, Base and Subbase Aggregate materials such that they are free from standing water, uniformly graded, free of any organic material or sediment, debris, and ready for placement.

C. Remove any excess thickness of soil applied over the excavated soil subgrade to trap sediment from adjacent construction activities before placing the Subbase Aggregate materials.
D. Keep area where pavement is to be constructed free from sediment during entire job.
Remove and replace all Joint Sand, Setting Bed Sand, Base and Subbase Aggregate materials contaminated with sediment with clean materials.
E. Complete all subdrainage of underground services within the pavement area in conjunction with subgrade preparation and before the commencement of Base or Subbase Aggregate construction.
F. Prevent to damage underdrain pipes, overflow pipes, observation wells, or inlets and other drainage appurtenances during installation. Report all damage immediately.
G. Compact soil subgrade uniformly to at least 95 percent of Standard Proctor Density per ASTM D 698 for pedestrian areas. Compact soil subgrade uniformly to at least 98 percent Modified Proctor per ASTM D 1557 for vehicular areas. Stabilization of the subgrade and/or base material may be necessary with weak or saturated subgrade soils.
H. Backfill all service trenches within the pavement area to the sub- grade level with approved material placed in uniform lifts not exceeding 4 in. (100 mm) loose thickness. Compact each lift to at least 100 percent Standard Proctor Density as specified in ASTM D 698.
I. Trim the subgrade to within 0 to ½ in. (0 to 13mm) of the specified grades. Do not deviate the surface of the prepared subgrade by more than 3/8 in. (10mm) from the bottom edge of a 39 in. (1m) straight edge laid in any direction.
J. Proof-roll prepared subgrade according to requirements in Section 02229 Backfill and Compaction to identify soft pockets and areas of excess yielding. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting and replace with compacted backfill or fill as directed.
K. Do not proceed with further pavement construction, under any circumstances, until the subgrade has been inspected by the Engineer.

Note: Base compaction of the subgrade soil on the recommendations of the Design Engineer.
Request the Architect/Engineer to inspect subgrade preparations, elevations and conduct density tests for conformance to specifications.

Note: Mechanical tampers (jumping jacks) are recommended for compaction of soil subgrade and aggregate base around lamp standards, utility structures, building edges, curbs, tree wells and other protrusions. Compact areas, not accessible to roller compaction equipment, to the specified density with mechanical tampers.

CAUTION – Proceed with care around the perimeters of excavations, buildings, curbs, etc. These areas are especially prone to consolidation and settlement. Do not place wedges of backfill in these areas. If possible particularly in these areas, proceed with backfilling and compacting in
shallow lifts, parallel to the finished surface.

3.03 INSTALLATION
A. EDGE RESTRAINTS

1. Provide granite edge restraints as indicated.
    a. Install job-built granite edge restraints to comply with requirements in Division 3 Section "Cast-in-Place Concrete."
    b. Provide concrete edge restraint along the perimeter of all paving as indicated. Install the face of the concrete edge restraint, where it abuts pavers vertical down to the subbase.
    c. Construct concrete edge restraint to dimensions and level specified and support on a compacted subbase not less than 6 in (150 mm) thick.

B. CONCRETE PAVERS

1. Replace Concrete Pavers with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.
2. Mix Concrete Pavers from a minimum of three (3) bundles simultaneously drawing the paver vertically rather than horizontally, as they are placed, to produce uniform blend of colors and textures. (Color variation occurs with all concrete products. This phenomenon is influenced by a variety of factors, e.g. moisture content, curing
conditions, different aggregates and, most commonly, from different production runs. By installing from a minimum of three (3) bundles simultaneously, variation in color is dispersed and blended throughout the project).

3. Exercise care in handling face mix concrete pavers to prevent surfaces from contacting backs or edges of other units. 4. Provide Concrete Pavers using laying pattern as indicated. Adjust laying pattern at pavement edges such that cutting of edge pavers is minimized. Cut all pavers exposed to vehicular tires no smaller than one-third of a whole paver.
5. Use string lines or chalk lines on Setting Bed Sand to hold all pattern lines true.
6. Set surface elevation of pavers 1/8 in. (3 mm) above adjacent drainage inlets, concrete collars or channels.
7. Place units hand tight against spacer bars. Adjust horizontal placement of laid pavers to align straight.
a. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.
8. Provide space between paver units of 1/32 in. (1 mm) wide to achieve straight bond lines.
9. Prevent joint (bond) lines from shifting more than ±1/2 in. (±13 mm) over 50 ft. (15m) from string lines.
10. Fill gaps between units or at edges of the paved area that exceed 3/8 inch (10 mm) with pieces cut to fit from full-size unit pavers.
11. Cut Concrete Pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
12. Prevent all traffic on installed Concrete Pavers until Joint Sand has been vibrated into joints. Keep skid steer and forklift equipment off newly laid Concrete Pavers that have not received initial compaction and Joint Sand material.
13. Vibrate Concrete Pavers into leveling course with a low-amplitude plate vibrator capable of a to 5000-lbf (22-kN) compaction force at 80 to 90 Hz. Perform at least three passes across paving with vibrator. Vibrate under the following conditions:
    a. After edge pavers are installed and there is a completed surface or before surface is exposed to rain.
    b. Compact installed Concrete Pavers to within 6 feet (2 meters) of the laying face before ending each day's work. Cover Concrete Pavers that have not been compacted and leveling course on which pavers have not been placed, with nonstaining plastic sheets to prevent Setting Bed Sand from becoming disturbed.
14. Protect face mix Concrete Paver surface from scuffing during compaction by utilizing a urethane pad.
15. Remove any cracked or structurally damaged Concrete Pavers and replace with new units prior to installing Joint Sand material.

C. JOINT SAND
1. Provide, spread and sweep dry Polymeric Sand into joints immediately after vibrating pavers into Setting Bed Sand course until full. Vibrate pavers and add Joint Sand material until joints are completely filled, then remove excess material. This will require at least 4 passes with a plate compactor.
2. Leave all work to within 3 ft. (1 m) of the laying face fully compacted with sand-filled joints at the completion of each day.
3. Remove excess Joint Sand broom clean from surface when installation is complete.

3.04 FIELD QUALITY CONTROL
A. Verify final elevations for conformance to the drawings after sweeping the surface clean.
1. Prevent final Concrete Paver finished grade elevations from deviating more than ±3/8 in. (±10 mm) under a 10 ft (3 m) straightedge or indicated slope, for finished surface of paving.
B. Lippage: No greater than 1/32 in. (0.8 mm) difference in height between Concrete Pavers and adjacent paved surfaces.

3.05 REPAIRING, CLEANING AND SEALING
A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.
B. Cleaning: Remove excess dirt, debris, stains, grit, etc. from exposed paver surfaces; wash and scrub clean.
1. Clean Concrete Pavers in accordance with the manufacturer’s written recommendations.
C. Seal as indicated.
1. Apply Sealer for Permeable Concrete Pavers in accordance with the sealer and paver manufacturer’s written recommendations.

3.06 PROTECTION
A. Protect completed work from damage due to subsequent construction activity on the site.

END OF SECTION

DIVISION 4
MASONRY

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)
04660	Stone Masonry

SECTION 04000
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 REFERENCE STANDARDS

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.
   2. 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.

END OF SECTION

SECTION 04201
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 portland cement.
      b. 1/2 part hydrate lime.
      c. 3 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.

END OF SECTION

SECTION 04860
STONE MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Monolithic granite sitting walls

B. Granite Cylinders

C. Granite Panels in Arch Base

1.02 RELATED REQUIREMENTS

A. Division 2 Section 02560 “Granite Curbing”
B. Division 3 Section 03700 “Concrete Pavers”
C. Division 2 Section 02229 “Backfill and Compaction”

1.03 REFERENCE STANDARDS

A. ASTM – American Standards for Testing and Materials

B. NBGQA – National Building Granite Quarries Association Specifications for Architectural Granite

1.04 SUBMITTALS

A. Product Data: For each type of product indicated to Landscape Architect

B. Shop Drawings:

1. Illustrate layout, cutting, and setting showing dimensions, arrangement, and provisions for lighting.

C. Samples:

1. For each stone type indicated to Landscape Architect.

1.05 PROJECT CONDITIONS

A. Protection of Stone Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day’s work.

B. Cold weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with Cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602..

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried.

C. Hot-Weather Requirements: Comply with hot-weather requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 PRODUCTS

2.01 GRANITE

A. Granite: Monolithic granite blocks complying with ASTM C 615. Specification for Structural Granite

1. Physical characteristics:

a. Standard grade, Architectural Building Granite.

b. Absorption: ASTM C97, 0.4% maximum.

c. Density: ASTM C97, 160 lbs.

d. Compressive Strength: ASTM C170, 19,000 psi minimum.

e. Modulus of rupture: ASTM C99, 1,500 psi minimum

2. Products: Provide the following:

a. Stone sitting walls: stone set #1-5

b. Stone cylinders: stone set #6 and #7.

3. Manufacturers: Subject to compliance with requirements, products available by the following:

a. Swenson Granite
369 North State Street
Concord, New Hampshire 03301
(603) 225-4322

b. North Carolina Granite Corporation
PO Box 151
Mount Airy, NC 27030
(336) 786-5141

2.02 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar and grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by cleaner manufacturer and stone producer.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Diedrich Technologies, Inc.
b. Dominion Restoration Products
c. EaCo Chem, Inc.
d. Hydrochemical Techniques, Inc.
e. Prosoco, Inc.

2.03 MORTAR MIXES

A. General: Do not use admixtures unless otherwise indicated.

1. Do not use calcium chloride.

2. Limit cementitious materials in mortar to Portland cement and lime.

B. Mortar for Stone Masonry: Comply with ASTM C 270. Proportion Specification.

1. Mortar for Setting Stone: Type S.

2.04 FABRICATION

A. Cut stone to produce pieces of thickness, size, and shape indicated, including details as accepted and detailed on final Shop Drawings. Provide holes and sinkages cut or drilled for railing and weeps. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated.

B. Finish exposed faces and edges of stone to comply with requirements indicated for finish and to match approved samples and mockups.

1. Finish: As indicated on drawings.

a. Finish exposed ends same as front and back faces.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates and installation conditions. Do not start stone masonry work until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Establish lines, levels, and coursing.

B. Clean rough stone before setting. Provide edges and surfaces free of dirt and foreign matter.

C. Do not use stone units with chips, cracks, voids, stains, or other visible defects.

3.03 SETTING OF STONE MASONRY

A. GENERAL

1. Perform necessary field cutting and trimming as stone is set.

a. Use power saws to cut stone that is fabricated with saw-cut surfaces.

b. Use hammer and chisel to split stone that is fabricated with split surfaces.

2. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that otherwise unsuitable for intended use.

3. Arrange stones as shown in plans and previously approved Shop Drawings in range ashlar pattern with course heights as indicated, uniform joint widths, and with offset between vertical joints as indicated.

4. Maintain uniform joint widths.

B. SPECIAL

1. Contractor shall drill holes for pinned sculptures and informational markers to match actual pin locations. Drilling shall be done only when sculptures and informational markers are on site and ready for installation.

3.04 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces, do not exceed ½ inch in 40 feet or more. For external corners, expansion joints, and other conspicuous lines, do not exceed ½ inch in 40 feet or more.

B. Variation from Level: For bed joints and lines of retaining wall, do not exceed ¼ inch in 20 feet or more.

3.05 EXCESS MATERIALS AND WASTE

A. Disposal as Fill Material: Dispose of clean masonry waste, including mortar and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.

1. Do not dispose of masonry waste as fill within 18” of finished grade.

END OF SECTION

DIVISION 7
WATERPROOFING

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)

SECTION 07114
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 APPLICATION

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.

END OF SECTION