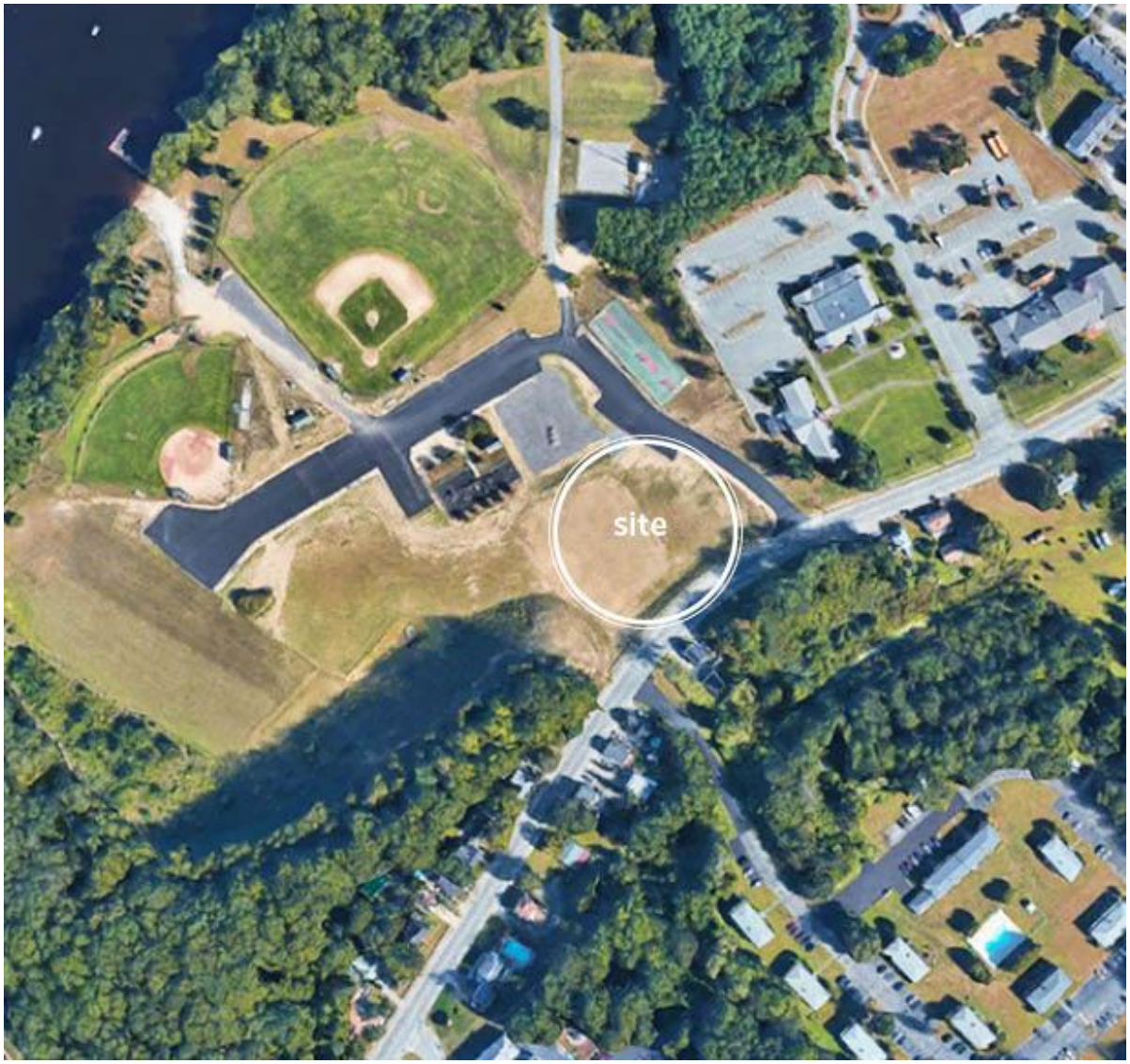
PROJECT MANUAL

Groveland Dog Park

185 Main Street, Groveland, Massachusetts



March 9, 2022

Copley Wolff Design Group
Landscape Architects & Planners
www.copley-wolff.com

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Invitation to Bid

INVITATION TO BID

Bids shall be received and publicly opened at the Office of the Town Administrator, 183 Main Street, Groveland, MA until the following Date and Time:

Wednesday, March 23, 2022, 1:00 PM

No site visit is scheduled. Bidders are encouraged to perform a site visit on their own to become familiar with current site conditions.

This project is being funded by the Stanton Foundation, K-9s Unleashed Inc., and the Town of Groveland. All bids for this project are subject to the provisions and State of Massachusetts prevailing wage rates required by M.G.L. c.30, §39M as amended.

Bid security in the form of a bid bond, cash, certified check, or treasurer's or cashier's check payable to The Town of Groveland, is required in the amount of five (5%) percent of the bid, in accordance with the bid documents.

The selected Contractor shall furnish a performance bond and a payment bond in an amount equal to fifty (50%) percent of the contract price, as stipulated in the construction contract.

The Owner reserves the right to waive any informalities in bidding and to reject any and all bids if it deems it to be in the Owner's interest to do so.

Bid Forms and Contract Documents will be available for download on Wednesday, March 9, 2022, 3:00PM on the Town of Groveland website: https://www.grovelandma.com/procurement/pages/bid-documents.

Instructions To Bidders

INSTRUCTIONS TO BIDDERS

1.0 CONTRACT DOCUMENTS

Bid Forms and Contract Documents will be available for download on March 9, 2022 on the Town of Groveland website: https://www.grovelandma.com/procurement/pages/bid-documents.

2.00 INTERPRETATION OF DOCUMENTS: NOTIFICATION OF ERRORS

A. Interpretation of the provisions of the Contract Documents will be made by the Town Administrator upon written request of any bidder, provided that such request is received by the Town Administrator at least three (3) days prior to date of applicable bid opening, and that the Town Administrator considers such interpretation to be of sufficient importance.

B. Such written interpretations shall be in the form of Addenda to the Contract Documents.

C. Bidders are urged to communicate all errors and discrepancies found in the Contract Documents to the Town Administrator. Telephone calls pointing out any such errors or discrepancies will be taken by the Town Administrator, but only for the purpose of receiving the information in order that it may be properly processed, and not for interpretation or clarification.

3.00 EXAMINATION OF CONTRACT DOCUMENTS

A. Each Bidder shall carefully examine the Contract Documents to obtain a thorough understanding of the work of his bid in addition to work of related trades. In addition, each Bidder shall personally visit the site to thoroughly acquaint himself with the conditions, as they exist thereon.

B. Failure of any Bidder to thoroughly examine the Contract Documents or to visit and examine the site shall in no way relieve him of any obligation with respect to his bid or of any responsibility assigned him under the Contract.

4.00 SUMMARY SCOPE OF WORK

A. It is not intended that every minor detail or feature be shown or described herein, as the assumption is made that the Bidder is an expert in this area of responsibility and is capable of interpreting the plans and specifications. The work described herein is intended primarily to be the responsibility of the General Contractor.

B. The scope of work shall include installation and furnishing of all materials required to complete the improvements at the site, including but not limited to all excavation, erosion control, gravel, pavement, sand, peastone, concrete walkways, fencing, metal edging, pet stations, boulders, drinking fountains, site lighting, site irrigation, seeding and all other work required for or incidental to the construction of Groveland Dog Park. The limit of work shall include all work within the boundaries noted on the plans, and any required associated grading and utility work outside these boundaries, and stormwater management systems as indicated on the plans. The successful bidder ("The Contractor") shall coordinate all work required in this area.

5.00 MODIFICATION AND WITHDRAWAL OF BIDS

A. Modifications or withdrawals of the Bids will be permitted after submission of such bids provided clearly written, readily understandable instructions for same are received by the Owner in writing prior to time established for opening of such bids. No Bid may be withdrawn after that time.

6.00 ADDENDA

A. Addenda may be required during the bidding period to modify, clarify, or interpret the Contract Documents. It is intended, but not guaranteed, that such Addenda shall be made available at **www.grovelandma.com** or at Town Hall at 183 Main Street, Groveland, MA 01834 (978-556-7204) to all persons or parties to whom Contract Documents have been issued (Bidders of Record). Failure to receive such Addenda shall in no way relieve any bidder from the execution of its provisions. All bidders are cautioned to verify the number of Addenda that have been issued and to secure any needed copies from **www.grovelandma.com** or at Town Hall at 183 Main Street, Groveland, MA 01834 (978-556-7204) before submitting a bid.

7.00 FORM FOR BIDS

A. The Owner, will, through **www.grovelandma.com,** make available to every person applying therefor, a Form for Bid. Each bona fide Bidder and will be furnished forms for his proposal upon request. Such form will be made available at **www.groveland.com** or at Town Hall at 183 Main Street, Groveland, MA 01834 (978-556-7204) throughout the bidding period. Bids must be submitted on the form included in the bid documents of the Project Manual.

B. All blank spaces provided on the bid forms shall be filled in. Where space is provided, sums shall be expressed in both words and figures. In case of discrepancy between the two, the written words shall govern.

C. No additions, alterations, or erasures shall be made on the forms.

8.00 BREAKDOWN OF WORK

A. All work shown on the drawings and specifications shall be included as the Base Bid, including but not limited to those listed in the Summary Scope of Work above. The Bidder shall provide a single price for the Base Bid in the appropriate space on the Form For Bid, and a price for each Add Alternate.

9.00 SUBMISSION OF BIDS

A. The Form For Bid shall be properly executed and enclosed in a sealed envelope plainly marked on the outside with the following information:

Bid for:
Groveland Dog Park
Groveland, Massachusetts

SUBMITTED BY:

_____(Name of Bidder)

_____(Address of Bidder)

B. If Bids are mailed, the above required envelope shall be enclosed in a second envelope identified with the above markings and mailed to the place of general bid opening, as described in the INVITATION TO BID. Mailed Bids must be received before the scheduled time for opening of Bids.

10.00 BID BOND AND PERFORMANCE AND PAYMENT BONDS

A. A Bid Bond in the form of a certified or bank check, made payable to "Town of Groveland" in the amount of 5% of the total dollar amount bid must accompany this bid. Bid Bonds are acceptable.

B. A Performance Bond and Payment Bond both in the amount of 50% of the total dollar award for this project is required.

11.00 AWARD OF CONTRACT

A. The Contract will be awarded to the lowest, responsible and eligible bidder deemed most appropriate for the Owner.

12.00 COMMENCEMENT AND COMPLETION OF WORK

A. The successful bidder shall commence the work of the Contract starting on or about April 1, 2022 or the date specified in the Notice To Proceed which will be issued to the Contractor, and shall thereafter diligently and continuously carry on the work in such manner as to achieve substantial completion of the work on or before September 1, 2022.

END OF SECTION

Form For Bid

FORM FOR BID

A. The undersigned proposes to furnish all labor and materials required for the construction of

Groveland Dog Park
Groveland, Massachusetts

in accordance with the accompanying Contract Documents prepared by the Landscape Architect

Copley Wolff Design Group
10 Post Office Square
Suite 1315
Boston, MA 02109

for the Contract Price specified below, subject to additions and for deductions according to the terms of the Contract Documents.

B. This bid includes addenda numbered_____.

C. LUMP SUM BID

BASE BID-Description	**Amount**
For all work in the Contract; said work is to include but is not limited thereto: excavation, erosion control, gravel, pavement, sand, peastone, concrete walkways, fencing, metal edging, pet stations, boulders, drinking fountains, site lighting, site irrigation, seeding and all other work required for or incidental to the construction of Groveland Dog Park; Base Bid as specified hereinafter; the Lump Sum price of:	
_____ Lump Sum (Written Out)	**$** _____ Bid Amount in Numbers

D. ALTERNATES

Add Alternate #1
Demolition, regrading, and repaving of existing roadway for ADA parking stalls, as shown on C-1 and C-2.
Add: $_____

Add Alternate #2
Electrical trench excavation and conduit installation for new post-top light fixtures, as shown on C-1.
Add: $_____

E. The undersigned agrees that if selected as the Contractor, they will within five (5) days, Saturdays, Sundays, and legal holidays excluded, after presentation thereof by the Owner, execute a Contract in accordance with the terms of this bid and furnish a performance bond and a payment bond, each of a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the Owner and each in the sum of fifty percent (50%) of the Contract Price, the premiums for which are to be paid by the Contractor and are included in the Contract price.

The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work.

F. The undersigned further certifies under the penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

Date _____

If Bidder is a corporation,
affix corporate seal here.

_____
(Name of the Bidder)

Signed: _____

By: _____
(Name and Title of Person Signing Bid)

_____
(Business Address)

_____
(City, State & Zip Code)

Note: If the bidder is a corporation, indicate state of incorporation under signature and affix corporate seal; if a partnership, give full names and residential address of all partners; and if an individual, give residential address if different from business address.

SUPPLEMENTAL BID DATA
(This form must be filled in by all Bidders)

I. All questions must be answered and the data given must be clear and comprehensive. This statement must be notarized. If necessary, questions may be answered on separate attached sheets. The Bidder may submit any additional information he desires.

A. Name of Bidder: _____

B. Permanent main office address, including zip code and telephone number:

_____

_____

C. Firm, Partnership or Corporation: Title of individual signing proposal:

_____

1. If Firm or Partnership: names of other members:

_____

_____

2. If Corporation: required data:

_____

_____

D. How many years have you been engaged in the contracting business under your present firm or trade name?

_____years

E. Contracts on hand (Schedule these, showing amount of each contract and the appropriate anticipated dates of completion).

F. Have you ever failed to complete any work awarded to you?

If so, where and why?

G. Have you every defaulted on a contract?

If so, where and why?

H. List your major equipment <u>available for this contract</u>.

I. Experience in construction work similar in importance to this project. Provide at least three references for similar projects: recreational/park, size, price.

II. Proposed Surety

A. Name _____

B. Home Office Address _____

_____

C. Agent's Name and Address _____

_____

_____

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

_____
(Name of Bidder)

_____
(Title)

State of _____

County of _____

_____ being duly sworn deposes ad says that he is

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

Subscribed and sworn before me this _____ day of _____, 20___.

_____
(Notary Public)

My commission expires _____, 20___.

UNIT PRICES

The unit prices listed here are for informational purposes only and have not been made part of the bid or contract. The contractor shall not be held to the unit prices listed but such unit prices may form a basis to determine adjustments to the Contract Sum when changes in the work involving said items are made in accordance with the Contract Documents.

a. The conditions of the contract and other Sections of Division I, General Requirements, apply to the work under this Section.

b. All materials, methods of installation, and definitions of terms set forth under the various Unit Price items in the Schedule of Unit Prices shall be indicated in the Change Order Documents.

c. Prior to commencing removal of materials or placement of materials set forth in the Schedule of Unit Prices as Unit Price items, the Contractor shall notify the Landscape Architect in sufficient time to permit proper measurements to be taken on behalf of the Owner. Only quantities which have been approved in writing by the Landscape Architect will be considered in the determination of adjustments to the Contract Sum on Unit Price basis.

d. Performance of work which is not required under the Contract Documents or which is not authorized by Change Order, whether or not such items set forth hereunder as a Unit Price item, shall not be considered cause for any extra payment on account of the Contract. The Contractor will be held fully responsible for such unauthorized work, including the performance of all corrective measures required by the Landscape Architect.

F & I: Furnish and Install

Description of Work	Unit of Measure	Amount **Add** or **(Deduct)**
F & I: peastone surfacing, incl. gravel base	SF	$ _____
F & I: sand surfacing, incl. gravel base	SF	$ _____
F & I: concrete paving, incl. gravel base	SF	$ _____
F & I: 6'-ht. chain-link fence	LF	$ _____
F & I: 4'-ht. chain-link fence	LF	$ _____
F & I: chain-link gate	EA	$ _____
F & I: pet station	EA	$ _____
F & I: granite boulder	EA	$ _____
F & I: irrigation rotor	EA	$ _____
F & I: lawn, maintain until final acceptance	SF	$ _____
F & I: bench, match drawings	EA	$ _____
F & I: deciduous tree, 2-1/2-3 cal., B&B	EA	$ _____
F & I: evergreen tree, 8-10' ht., B&B	EA	$ _____

Note: Unit prices indicated are for additions or deductions. Unit prices include all costs for labor, materials, set-up, disposal, overhead, profit, bond and all other associated with the completion of the work. All items are prices installed and accepted.

CERTIFICATE OF NON-COLLUSION

The undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person, business, partnership, corporation, union committee, club or other organization, entity or group of individuals.

_____

Signature of individual submitting bid or proposal

_____

Name of Business

CERTIFICATE OF TAX COMPLIANCE

Pursuant to Massachusetts General Law chapter 62C, sec 49A, I hereby certify under penalties of perjury that, to the best of my knowledge and belief, I am in compliance with all laws of the Commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

_____ _____

Social Security or Federal I.D. number Signature: Individual or Corporate Officer

_____

Date

PLEASE PRINT

Corporate Name: _____

Address: _____

City, State, Zip Code: _____

CERTIFICATE OF AUTHORITY

At a duly authorized meeting of the Board of Directors of the

_____ held on _____
(Name of Corporation) (Date)

At which all the Directors were present or waived notice, it was voted that,

_____ _____
(Name) (Officer)

of this company, be appointed and is hereby authorized to execute contracts and bonds in the name and behalf of said company, and affix its Corporate Seal thereto, and such execution of any contract or obligation in this company's name on its behalf by said officer, under seal of the company, shall be valid and binding upon this company.

A TRUE COPY,

ATTEST: _____
(Clerk)

Place of Business: _____

DATE OF THIS CONTRACT: _____

I hereby certify that I am the Clerk of the _____

that _____ is the duly elected _____

of said company, and the above vote has not been amended or rescinded and remains in full force and effect as of the date of this contract.

_____

(Clerk) (Corporate Seal)

Agreement Between Owner and Contractor

AGREEMENT
BETWEEN
OWNER AND CONTRACTOR

AGREEMENT

made as of the _____ day of _____in the year of Two Thousand and Twenty-Two

BETWEEN the Owner: *(Name and Address)*	Town of Groveland 183 Main Street Groveland, MA 01913
and the Contractor: *(Name and Address)*	_____ _____ _____
The Project is: *(Name and Address)*	Groveland Dog Park 185 Main Street, Groveland MA 01834
The Landscape Architect is: *(Name and Address)*	Copley Wolff Design Group 10 Post Office Square Suite 1315 Boston, MA 02109

The Owner and Contractor agree as set forth below.

ARTICLE 1
THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary and Other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement and Modifications issued after execution of this Agreement; these form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. An enumeration of the Contract Documents, other than Modifications, appears in Article 9.

ARTICLE 2
THE WORK OF THIS CONTRACT

The Contractor shall execute the entire Work described in the Contract Documents, except to the extent specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3
DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

3.1 The date of commencement is the date from which the Contract Time of Paragraph 3.2 is measured, and shall be the date of this Agreement, as first written above, unless a different date is stated below or provision is made for the date to be fixed in a notice to proceed issued by the Owner.

Date of Commencement: on or about date specified in paragraph 12.00 of the Instructions To Bidders.

3.2 The Contractor shall achieve Substantial Completion of the entire Work not later than date specified in paragraph 12.00 of the Instructions To Bidders. **Substantial Completion shall mean that all utilities, paving, fencing, hardscape, and seeding shall be complete so that access to the site is achieved and maintained without temporary means, obstructions, or barricades.**

September 1, 2022, subject to adjustments of this Contract Time as provided in the Contract Documents.

ARTICLE 4
CONTRACT SUM

4.1 The Owner shall pay the Contractor in current funds for the Contractor's performance of the Contract the Contract Sum of _____ Dollars ($_____), subject to additions and deductions as provided in the Contract Documents.

4.2 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner.

Alternate #1: As described in the Form for Bid

Alternate #2: As described in the Form for Bid

Alternate #3: As described in the Form for Bid

Alternate #4: As described in the Form for Bid

Alternate #5: As described in the Form for Bid

4.3 Unit prices, if any, are as follows:

See Unit Price schedule in Form for Bid

ARTICLE 5
PROGRESS PAYMENTS

5.1 Based upon Applications for Payment submitted to the Town Administrator by the Contractor and Certificates for Payment issued by the Landscape Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

5.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

5.3 Pursuant to M.G.L. c.30, S39K and based upon Applications for Payment submitted to the Town Administrator by the Contractor and Certificates for Payment issued by the Landscape Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided in the Contract Documents for the period ending the last day of the month.

5.4 Each Application for Payment shall be based upon the Schedule of Values submitted by the Contractor in accordance with the Contract Documents. The Schedule of Values shall allocate the entire Contract Sum among the various portions of the Work and be prepared in such form and supported by such data to substantiate its accuracy as the Landscape Architect may require. This Schedule, unless objected to by the Landscape Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

5.5 Applications for Payment shall indicate the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

5.6 Subject to the provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

5.6.1 Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the total Contract Sum allocated to that portion of the Work in the Schedule of Values, less retainage of FIVE percent (5%). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute may be included as provided in Subparagraph 7.3.7 of the General Conditions even though the Contract Sum has not yet been adjusted by Change Order;

5.6.2 Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing), less retainage of FIVE percent (5%);

5.6.3 Subtract the aggregate of previous payments made by the Owner; and

5.6.4 Subtract amounts, if any, for which the Architect has withheld or nullified a Certificate for Payment as provided in Paragraph 9.5 of the General Conditions.

5.7 Not Used.

5.8 Reduction or limitation of retainage, if any, shall be as follows: Pursuant to MGL. c.30, s.39K

ARTICLE 6
FINAL PAYMENT

Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor pursuant to MGL. c.30, s.39K.

ARTICLE 7
MISCELLANEOUS PROVISIONS

7.1 Where reference is made in this Agreement to a provision of the General Conditions or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

7.2 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated in MGL c.30, s.39K.

ARTICLE 8
TERMINATION OR SUSPENSION

8.1 The Contract may be terminated by the Owner of the Contractor as provided in Article 14 of the General Conditions.

8.2 The Work may be suspended by the Owner as provided in Article 14 of the General Conditions.

ARTICLE 9
ENUMERATION OF CONTRACT DOCUMENTS

9.1 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated as follows:

9.1.1 The Agreement is this executed Agreement Between Owner and Contractor.

9.1.2 The General Conditions are the General Conditions of the Contract for Construction, AIA Document A201, 1987 Edition.

9.1.3 The Supplementary and other Conditions of the Contract are those contained in the Project Manual dated, **March 9, 2022**, and are as follows:

Document	Title	Pages
Bidding Requirements, Contract Forms and Conditions of the Contract	Invitation To Bid	1
	Instructions To Bidders	3
	Form For Bid	8
	Agreement Between Owner & Contractor	12

9.1.4 The Specifications are those contained in the Project Manual dated as in Subparagraph 9.1.3, and are as follows:

Section	Title
	Specification Table of Contents is attached as Exhibit A.
	Refer to Subparagraph 9.1.6 for List of Addenda which may affect this Exhibit.

9.1.5 The Drawings are as follows, and are dated unless a different date is shown below:

Number	Title
	List of Drawings is attached as Exhibit B.
	Refer to Subparagraph 9.1.6 for List of Addenda which may affect this Exhibit.

9.1.6 The Addenda, if any, are as follows:

Number	Date
	List of Addenda is attached as Exhibit C.

9.1.7 Other documents, if any, forming part of the Contract Documents are as follows:

9.1.7.1 Vote of Corporation authorizing execution of Contract attached as Exhibit D.

9.1.7.3 Performance Bond and Payment Bond attached as Exhibit E.

9.1.7.4 Certificate of Insurance attached as Exhibit F.

9.1.7.5 Statement of Management of Internal Accounting Controls.

In witness whereof, the parties hereto have executed, or caused to be executed by their duly authorized officials, this agreement in five (5) copies of which one is to be delivered to the Contractor, one to the Architect for use in the administration of the Contract, and the remainder to the Owner, each of which shall be deemed an original on the date first above written.

GENERAL CONTRACTOR:

By _____
(Signature)

_____

(Printed name and title-_____)

TOWN OF GROVELAND:

By _____
(Signature)

_____

(Printed name and title –_____)

EXHIBIT A

LIST OF SPECIFICATIONS

Division 01 – General Conditions

Section 010000	Insurance Requirements
Section 011000	Summary of Work
Section 012500	Substitution Procedures
Section 012600	Contract Modification Procedures
Section 012900	Payment Procedures
Section 013100	Project Management and Coordination
Section 013200	Construction Progress Documentation
Section 013300	Submittal Procedure
Section 017300	Execution
Section 017700	Closeout Procedures

Division 03 – Concrete

Section 033000	Cast-in-Place Concrete

Division 22 – Plumbing

Section 221113	Facility Water Distribution Piping

Division 31 – Earthwork

Section 311000	Site Clearing
Section 312500	Erosion and Sediment Control
Section 312539	Underground Warning Tape

Division 32 – Exterior Improvements

Section 321216	Asphalt Paving
Section 321313	Landscape Concrete Paving
Section 321316	Decorative Concrete Paving
Section 323000	Site Improvements
Section 323113	Chain-Link Fences and Gates
Section 328400	Irrigation
Section 329000	Landscape Work
Section 329002	Landscape Grading
Section 329219	Seeded Lawns

Division 33 – Site Utilities

Section 330500	Common Work Results for Utilities
Section 331100	Pipe & Pipe Fittings – General

EXHIBIT B

LIST OF DRAWINGS

DRAWING	TITLE	DATE
L-1	Cover Sheet	March 9, 2022
C-1	Utility and Erosion Control Plan	March 9, 2022
C-2	Utility Details	March 9, 2022
L-2	Materials Plan	March 9, 2022
L-3	Layout Plan – Fencing and Site Improvements	March 9, 2022
L-3.1	Layout Plan – Pathways	March 9, 2022
L-4	Grading Plan	March 9, 2022
L-5	Landscape Details	March 9, 2022
L-5.1	Landscape Details	March 9, 2022

EXHIBIT C

LIST OF ADDENDA

NUMBER	DATE	PAGES

EXHIBIT D

Certificate of Vote of Corporation

VOTE OF CORPORATION AUTHORIZING EXECUTION OF CONTRACT

At a meeting of the Board of Directors of _____

duly called and held on _____, 20_____, at which a quorum was present and acting throughout, the following vote was duly adopted:

VOTED: That _____, the _____

of the corporation, be and hereby is authorized to affix the corporate seal, sign and deliver in the name and behalf of the corporation a contract with _____

at _____, Massachusetts, in the amount of _____

_____ DOLLARS

($_____), and also to seal and execute as above surety company bonds to secure the performance of said contract and payment for labor and materials for each year of the term of the Contract, all in such form and on such terms and conditions as he, by the execution thereof, shall deem proper.

A true copy.

ATTEST:

_____ (Affix corporate seal)

Clerk of the Corporation

Countersignature: _____

In the event that the Clerk or Secretary is the same person as the Officer authorized to sign contract or instrument for the Corporation, this certificate must be countersigned by another officer of the Corporation.

EXHIBIT E

PERFORMANCE BOND AND PAYMENT BOND

EXHIBIT F

CERTIFICATE OF INSURANCE

CHARLES D. BAKER
Governor

KARYN E. POLITO
Lt. Governor

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS
Prevailing Wage Rates

As determined by the Director under the provisions of the Massachusetts General Laws, Chapter 149, Sections 26 to 27H

ROSALIN ACOSTA
Secretary
MICHAEL FLANAGAN
Director

City/Town: GROVELAND

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule from the Department of Labor Standards ("DLS") if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or any sub-contractor.
- All apprentices working on the project are required to be registered with the Massachusetts Department of Labor Standards, Division of Apprentice Standards (DLS/DAS). Apprentice must keep his/her apprentice identification card on his/her person during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **Any apprentice not registered with DLS/DAS regardless of whether or not they are registered with any other federal, state, local, or private agency must be paid the journeyworker's rate for the trade.**
- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule. Awarding authorities are required to request these updates no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. For multi-year CM AT RISK projects, awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. Contractors are required to obtain the wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The annual update requirement is not applicable to 27F "rental of equipment" contracts.
- Every contractor or subcontractor which performs construction work on the project is required to submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. A sample of a payroll reporting form may be obtained at http://www.mass.gov/dols/pw.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may report the violation to the Fair Labor Division of the office of the Attorney General at (617) 727-3465.
- Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/01/2021	35.95	13.41	16.01	0.00	65.37
(3 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/01/2021	36.02	13.41	16.01	0.00	65.44
(4 & 5 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/01/2021	36.14	13.41	16.01	0.00	65.56
ADS/SUBMERSIBLE PILOT PILE DRIVER LOCAL 56 (ZONE 1) For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2020	103.05	9.40	23.12	0.00	135.57
AIR TRACK OPERATOR LABORERS - ZONE 2	12/01/2021	36.16	9.10	16.64	0.00	61.90
	06/01/2022	37.06	9.10	16.64	0.00	62.80
	12/01/2022	37.91	9.10	16.64	0.00	63.65
	06/01/2023	38.81	9.10	16.64	0.00	64.55
	12/01/2023	39.71	9.10	16.64	0.00	65.45
For apprentice rates see "Apprentice- LABORER"						
AIR TRACK OPERATOR (HEAVY & HIGHWAY) LABORERS - ZONE 2 (HEAVY & HIGHWAY) For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"	12/01/2021	36.16	9.10	16.64	0.00	61.90
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. HEAT & FROST INSULATORS LOCAL 6 (BOSTON)	12/01/2020	38.10	12.80	9.45	0.00	60.35
ASPHALT RAKER LABORERS - ZONE 2	12/01/2021	35.66	9.10	16.64	0.00	61.40
	06/01/2022	36.56	9.10	16.64	0.00	62.30
	12/01/2022	37.41	9.10	16.64	0.00	63.15
	06/01/2023	38.31	9.10	16.64	0.00	64.05
	12/01/2023	39.21	9.10	16.64	0.00	64.95
For apprentice rates see "Apprentice- LABORER"						
ASPHALT RAKER (HEAVY & HIGHWAY) LABORERS - ZONE 2 (HEAVY & HIGHWAY) For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"	12/01/2021	35.66	9.10	16.64	0.00	61.40
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE OPERATING ENGINEERS LOCAL 4 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2021	51.38	14.00	16.05	0.00	81.43
BACKHOE/FRONT-END LOADER OPERATING ENGINEERS LOCAL 4 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2021	51.38	14.00	16.05	0.00	81.43
BARCO-TYPE JUMPING TAMPER LABORERS - ZONE 2	12/01/2021	35.66	9.10	16.64	0.00	61.40
	06/01/2022	36.56	9.10	16.64	0.00	62.30
	12/01/2022	37.41	9.10	16.64	0.00	63.15
	06/01/2023	38.31	9.10	16.64	0.00	64.05
	12/01/2023	39.21	9.10	16.64	0.00	64.95
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER LABORERS - ZONE 2	12/01/2021	36.16	9.10	16.64	0.00	61.90
	06/01/2022	37.06	9.10	16.64	0.00	62.80
	12/01/2022	37.91	9.10	16.64	0.00	63.65
	06/01/2023	38.81	9.10	16.64	0.00	64.55
	12/01/2023	39.71	9.10	16.64	0.00	65.45
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) LABORERS - ZONE 2 (HEAVY & HIGHWAY) For apprentice rates see "Apprentice- LABORER (Heavy and Highway)	12/01/2021	36.16	9.10	16.64	0.00	61.90
BOILER MAKER BOILERMAKERS LOCAL 29	01/01/2020	46.10	7.07	17.98	0.00	71.15

Apprentice- BOILERMAKER - Local 29
01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$29.97	$7.07	$11.69	$0.00	$48.73
2	65	$29.97	$7.07	$11.69	$0.00	$48.73
3	70	$32.27	$7.07	$12.59	$0.00	$51.93
4	75	$34.58	$7.07	$13.49	$0.00	$55.14
5	80	$36.88	$7.07	$14.38	$0.00	$58.33
6	85	$39.19	$7.07	$15.29	$0.00	$61.55
7	90	$41.49	$7.07	$16.18	$0.00	$64.74
8	95	$43.80	$7.07	$17.09	$0.00	$67.96

Notes:

Apprentice to Journeyworker Ratio:1:4

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) BRICKLAYERS LOCAL 3 (LYNN)	02/01/2022	57.15	11.39	22.34	0.00	90.88

Apprentice- BRICK/PLASTER/CEMENT MASON - Local 3 Lynn
02/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.58	$11.39	$22.34	$0.00	$62.31
2	60	$34.29	$11.39	$22.34	$0.00	$68.02
3	70	$40.01	$11.39	$22.34	$0.00	$73.74
4	80	$45.72	$11.39	$22.34	$0.00	$79.45
5	90	$51.44	$11.39	$22.34	$0.00	$85.17

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER OPERATING ENGINEERS LOCAL 4 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2021	50.83	14.00	16.05	0.00	80.88

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CAISSON & UNDERPINNING BOTTOM MAN LABORERS - FOUNDATION AND MARINE For apprentice rates see "Apprentice- LABORER"	12/01/2021	42.33	9.10	17.72	0.00	69.15
CAISSON & UNDERPINNING LABORER LABORERS - FOUNDATION AND MARINE For apprentice rates see "Apprentice- LABORER"	12/01/2021	41.18	9.10	17.72	0.00	68.00
CAISSON & UNDERPINNING TOP MAN LABORERS - FOUNDATION AND MARINE For apprentice rates see "Apprentice- LABORER"	12/01/2021	41.18	9.10	17.72	0.00	68.00
CARBIDE CORE DRILL OPERATOR LABORERS - ZONE 2 For apprentice rates see "Apprentice- LABORER"	12/01/2021 06/01/2022 12/01/2022 06/01/2023 12/01/2023	35.66 36.56 37.41 38.31 39.21	9.10 9.10 9.10 9.10 9.10	16.64 16.64 16.64 16.64 16.64	0.00 0.00 0.00 0.00 0.00	61.40 62.30 63.15 64.05 64.95
CARPENTER CARPENTERS -ZONE 2 (Eastern Massachusetts)	03/01/2022 09/01/2022 03/01/2023	44.78 45.43 46.03	8.58 8.58 8.58	19.82 19.82 19.82	0.00 0.00 0.00	73.18 73.83 74.43

Apprentice- CARPENTER - Zone 2 Eastern MA

03/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.39	$8.58	$1.70	$0.00	$32.67
2	60	$26.87	$8.58	$1.70	$0.00	$37.15
3	70	$31.35	$8.58	$14.63	$0.00	$54.56
4	75	$33.59	$8.58	$14.63	$0.00	$56.80
5	80	$35.82	$8.58	$16.36	$0.00	$60.76
6	80	$35.82	$8.58	$16.36	$0.00	$60.76
7	90	$40.30	$8.58	$18.09	$0.00	$66.97
8	90	$40.30	$8.58	$18.09	$0.00	$66.97

Notes:
% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $30.19/ 3&4 $36.28/ 5&6 $55.87/ 7&8 $62.01

Apprentice to Journeyworker Ratio:1:5

CARPENTER WOOD FRAME CARPENTERS-ZONE 3 (Wood Frame) All Aspects of New Wood Frame Work	04/01/2021 04/01/2022 04/01/2023	23.16 23.66 24.16	7.21 7.21 7.21	4.80 4.80 4.80	0.00 0.00 0.00	35.17 35.67 36.17

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice- CARPENTER (Wood Frame) - Zone 3

04/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$13.90	$7.21	$0.00	$0.00	$21.11
2	60	$13.90	$7.21	$0.00	$0.00	$21.11
3	65	$15.05	$7.21	$0.00	$0.00	$22.26
4	70	$16.21	$7.21	$0.00	$0.00	$23.42
5	75	$17.37	$7.21	$3.80	$0.00	$28.38
6	80	$18.53	$7.21	$3.80	$0.00	$29.54
7	85	$19.69	$7.21	$3.80	$0.00	$30.70
8	90	$20.84	$7.21	$3.80	$0.00	$31.85

04/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$14.20	$7.21	$0.00	$0.00	$21.41
2	60	$14.20	$7.21	$0.00	$0.00	$21.41
3	65	$15.38	$7.21	$0.00	$0.00	$22.59
4	70	$16.56	$7.21	$0.00	$0.00	$23.77
5	75	$17.75	$7.21	$3.80	$0.00	$28.76
6	80	$18.93	$7.21	$3.80	$0.00	$29.94
7	85	$20.11	$7.21	$3.80	$0.00	$31.12
8	90	$21.29	$7.21	$3.80	$0.00	$32.30

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $17.63/ 3&4 $19.95/ 5&6 $27.22/ 7&8 $29.54

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING BRICKLAYERS LOCAL 3 (LYNN)	01/01/2020	49.07	12.75	22.41	0.62	84.85

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice- CEMENT MASONRY/PLASTERING - Eastern Mass (Lynn)
01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.54	$12.75	$15.41	$0.00	$52.70
2	60	$29.44	$12.75	$17.41	$0.62	$60.22
3	65	$31.90	$12.75	$18.41	$0.62	$63.68
4	70	$34.35	$12.75	$19.41	$0.62	$67.13
5	75	$36.80	$12.75	$20.41	$0.62	$70.58
6	80	$39.26	$12.75	$21.41	$0.62	$74.04
7	90	$44.16	$12.75	$22.41	$0.62	$79.94

Notes:
Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

Apprentice to Journeyworker Ratio:1:3

CHAIN SAW OPERATOR	12/01/2021	35.66	9.10	16.64	0.00	61.40
LABORERS - ZONE 2	06/01/2022	36.56	9.10	16.64	0.00	62.30
	12/01/2022	37.41	9.10	16.64	0.00	63.15
	06/01/2023	38.31	9.10	16.64	0.00	64.05
	12/01/2023	39.21	9.10	16.64	0.00	64.95
For apprentice rates see "Apprentice- LABORER"						
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES	12/01/2021	52.38	14.00	16.05	0.00	82.43
OPERATING ENGINEERS LOCAL 4						
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
COMPRESSOR OPERATOR	12/01/2021	33.69	14.00	16.05	0.00	63.74
OPERATING ENGINEERS LOCAL 4						
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE)	01/01/2022	53.66	8.65	23.05	0.00	85.36
PAINTERS LOCAL 35 - ZONE 2	07/01/2022	54.86	8.65	23.05	0.00	86.56
	01/01/2023	56.06	8.65	23.05	0.00	87.76
	07/01/2023	57.26	8.65	23.05	0.00	88.96
	01/01/2024	58.46	8.65	23.05	0.00	90.16
	07/01/2024	59.66	8.65	23.05	0.00	91.36
	01/01/2025	60.86	8.65	23.05	0.00	92.56

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice- PAINTER Local 35 - BRIDGES/TANKS

01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$26.83	$8.65	$0.00	$0.00	$35.48
2	55	$29.51	$8.65	$6.27	$0.00	$44.43
3	60	$32.20	$8.65	$6.84	$0.00	$47.69
4	65	$34.88	$8.65	$7.41	$0.00	$50.94
5	70	$37.56	$8.65	$19.63	$0.00	$65.84
6	75	$40.25	$8.65	$20.20	$0.00	$69.10
7	80	$42.93	$8.65	$20.77	$0.00	$72.35
8	90	$48.29	$8.65	$21.91	$0.00	$78.85

07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.43	$8.65	$0.00	$0.00	$36.08
2	55	$30.17	$8.65	$6.27	$0.00	$45.09
3	60	$32.92	$8.65	$6.84	$0.00	$48.41
4	65	$35.66	$8.65	$7.41	$0.00	$51.72
5	70	$38.40	$8.65	$19.63	$0.00	$66.68
6	75	$41.15	$8.65	$20.20	$0.00	$70.00
7	80	$43.89	$8.65	$20.77	$0.00	$73.31
8	90	$49.37	$8.65	$21.91	$0.00	$79.93

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN	12/01/2021	41.33	9.10	17.57	0.00	68.00
LABORERS - ZONE 2	06/01/2022	42.33	9.10	17.57	0.00	69.00
	12/01/2022	43.33	9.10	17.57	0.00	70.00
	06/01/2023	44.33	9.10	17.57	0.00	71.00
	12/01/2023	45.58	9.10	17.57	0.00	72.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR	12/01/2021	42.33	9.10	17.57	0.00	69.00
LABORERS - ZONE 2	06/01/2022	43.33	9.10	17.57	0.00	70.00
	12/01/2022	44.33	9.10	17.57	0.00	71.00
	06/01/2023	45.33	9.10	17.57	0.00	72.00
	12/01/2023	46.58	9.10	17.57	0.00	73.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS	12/01/2021	42.08	9.10	17.57	0.00	68.75
LABORERS - ZONE 2	06/01/2022	43.08	9.10	17.57	0.00	69.75
	12/01/2022	44.08	9.10	17.57	0.00	70.75
	06/01/2023	45.08	9.10	17.57	0.00	71.75
	12/01/2023	46.33	9.10	17.57	0.00	73.00
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: CONCRETE CUTTER/SAWYER	12/01/2021	42.33	9.10	17.57	0.00	69.00
LABORERS - ZONE 2	06/01/2022	43.33	9.10	17.57	0.00	70.00
	12/01/2022	44.33	9.10	17.57	0.00	71.00
	06/01/2023	45.33	9.10	17.57	0.00	72.00
	12/01/2023	46.58	9.10	17.57	0.00	73.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR	12/01/2021	42.08	9.10	17.57	0.00	68.75
LABORERS - ZONE 2	06/01/2022	43.08	9.10	17.57	0.00	69.75
	12/01/2022	44.08	9.10	17.57	0.00	70.75
	06/01/2023	45.08	9.10	17.57	0.00	71.75
	12/01/2023	46.33	9.10	17.57	0.00	73.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER	12/01/2021	41.33	9.10	17.57	0.00	68.00
LABORERS - ZONE 2	06/01/2022	42.33	9.10	17.57	0.00	69.00
	12/01/2022	43.33	9.10	17.57	0.00	70.00
	06/01/2023	44.33	9.10	17.57	0.00	71.00
	12/01/2023	45.58	9.10	17.57	0.00	72.25
For apprentice rates see "Apprentice- LABORER"						
DIRECTIONAL DRILL MACHINE OPERATOR	12/01/2021	50.83	14.00	16.05	0.00	80.88
OPERATING ENGINEERS LOCAL 4						
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER	08/01/2020	68.70	9.40	23.12	0.00	101.22
PILE DRIVER LOCAL 56 (ZONE 1)						
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER	08/01/2020	49.07	9.40	23.12	0.00	81.59
PILE DRIVER LOCAL 56 (ZONE 1)						
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT)	08/01/2020	73.60	9.40	23.12	0.00	106.12
PILE DRIVER LOCAL 56 (ZONE 1)						
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT)	08/01/2020	103.05	9.40	23.12	0.00	135.57
PILE DRIVER LOCAL 56 (ZONE 1)						
For apprentice rates see "Apprentice- PILE DRIVER"						
DRAWBRIDGE OPERATOR (Construction)	07/01/2020	26.77	6.67	3.93	0.16	37.53
DRAWBRIDGE - SEIU LOCAL 888						
ELECTRICIAN	03/01/2022	57.32	13.00	20.82	0.00	91.14
ELECTRICIANS LOCAL 103	09/01/2022	58.76	13.00	20.86	0.00	92.62
	03/01/2023	60.43	13.00	20.91	0.00	94.34

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice- ELECTRICIAN - Local 103

03/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$22.93	$13.00	$0.69	$0.00	$36.62
2	40	$22.93	$13.00	$0.69	$0.00	$36.62
3	45	$25.79	$13.00	$15.62	$0.00	$54.41
4	45	$25.79	$13.00	$15.62	$0.00	$54.41
5	50	$28.66	$13.00	$16.10	$0.00	$57.76
6	55	$31.53	$13.00	$16.58	$0.00	$61.11
7	60	$34.39	$13.00	$17.04	$0.00	$64.43
8	65	$37.26	$13.00	$17.52	$0.00	$67.78
9	70	$40.12	$13.00	$17.98	$0.00	$71.10
10	75	$42.99	$13.00	$18.46	$0.00	$74.45

09/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$23.50	$13.00	$0.71	$0.00	$37.21
2	40	$23.50	$13.00	$0.71	$0.00	$37.21
3	45	$26.44	$13.00	$15.64	$0.00	$55.08
4	45	$26.44	$13.00	$15.64	$0.00	$55.08
5	50	$29.38	$13.00	$16.12	$0.00	$58.50
6	55	$32.32	$13.00	$16.60	$0.00	$61.92
7	60	$35.26	$13.00	$17.07	$0.00	$65.33
8	65	$38.19	$13.00	$17.55	$0.00	$68.74
9	70	$41.13	$13.00	$18.01	$0.00	$72.14
10	75	$44.07	$13.00	$18.49	$0.00	$75.56

Notes: :
App Prior 1/1/03; 30/35/40/45/50/55/65/70/75/80

Apprentice to Journeyworker Ratio:2:3***

ELEVATOR CONSTRUCTOR ELEVATOR CONSTRUCTORS LOCAL 4	01/01/2022	65.62	16.03	20.21	0.00	101.86

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice- ELEVATOR CONSTRUCTOR - Local 4

01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$32.81	$16.03	$0.00	$0.00	$48.84
2	55	$36.09	$16.03	$20.21	$0.00	$72.33
3	65	$42.65	$16.03	$20.21	$0.00	$78.89
4	70	$45.93	$16.03	$20.21	$0.00	$82.17
5	80	$52.50	$16.03	$20.21	$0.00	$88.74

Notes:
Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER ELEVATOR CONSTRUCTORS LOCAL 4 For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"	01/01/2022	45.93	16.03	20.21	0.00	82.17
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY) LABORERS - ZONE 2 (HEAVY & HIGHWAY) For apprentice rates see "Apprentice- LABORER (Heavy and Highway)	12/01/2021	35.66	9.10	16.64	0.00	61.40
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY OPERATING ENGINEERS LOCAL 4 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	11/01/2021 05/01/2022	46.53 47.86	13.75 13.75	15.80 15.80	0.00 0.00	76.08 77.41
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY OPERATING ENGINEERS LOCAL 4 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	11/01/2021 05/01/2022	48.06 49.22	13.75 13.75	15.80 15.80	0.00 0.00	77.61 78.77
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY OPERATING ENGINEERS LOCAL 4 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	11/01/2021 05/01/2022	23.16 23.83	13.75 13.75	15.80 15.80	0.00 0.00	52.71 53.38
FIRE ALARM INSTALLER ELECTRICIANS LOCAL 103 For apprentice rates see "Apprentice- ELECTRICIAN"	03/01/2022 09/01/2022 03/01/2023	57.32 58.76 60.43	13.00 13.00 13.00	20.82 20.86 20.91	0.00 0.00 0.00	91.14 92.62 94.34
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONINGELECTRICIANS LOCAL 103 For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"	03/01/2022 09/01/2022 03/01/2023	44.71 46.42 48.34	13.00 13.00 13.00	18.74 18.87 19.01	0.00 0.00 0.00	76.45 78.29 80.35
FIREMAN (ASST. ENGINEER) OPERATING ENGINEERS LOCAL 4 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2021	41.76	14.00	16.05	0.00	71.81
FLAGGER & SIGNALER (HEAVY & HIGHWAY) LABORERS - ZONE 2 (HEAVY & HIGHWAY) For apprentice rates see "Apprentice- LABORER (Heavy and Highway)	12/01/2021	24.50	9.10	16.64	0.00	50.24
FLOORCOVERER FLOORCOVERERS LOCAL 2168 ZONE I	03/01/2022	50.18	8.58	20.12	0.00	78.88

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice- FLOORCOVERER - Local 2168 Zone I

03/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.09	$8.58	$1.79	$0.00	$35.46
2	55	$27.60	$8.58	$1.79	$0.00	$37.97
3	60	$30.11	$8.58	$14.75	$0.00	$53.44
4	65	$32.62	$8.58	$14.75	$0.00	$55.95
5	70	$35.13	$8.58	$16.54	$0.00	$60.25
6	75	$37.64	$8.58	$16.54	$0.00	$62.76
7	80	$40.14	$8.58	$18.33	$0.00	$67.05
8	85	$42.65	$8.58	$18.33	$0.00	$69.56

Notes: Steps are 750 hrs.
% After 10/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps)
Step 1&2 $32.59/ 3&4 $39.26/ 5&6 $59.69/ 7&8 $66.41

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER OPERATING ENGINEERS LOCAL 4 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2021	51.38	14.00	16.05	0.00	81.43
GENERATOR/LIGHTING PLANT/HEATERS OPERATING ENGINEERS LOCAL 4 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2021	33.69	14.00	16.05	0.00	63.74
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) GLAZIERS LOCAL 35 (ZONE 2)	01/01/2022	43.16	8.65	23.05	0.00	74.86
	07/01/2022	44.36	8.65	23.05	0.00	76.06
	01/01/2023	45.56	8.65	23.05	0.00	77.26
	07/01/2023	46.76	8.65	23.05	0.00	78.46
	01/01/2024	47.96	8.65	23.05	0.00	79.66
	07/01/2024	49.16	8.65	23.05	0.00	80.86
	01/01/2025	50.36	8.65	23.05	0.00	82.06

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice- GLAZIER - Local 35 Zone 2

01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.58	$8.65	$0.00	$0.00	$30.23
2	55	$23.74	$8.65	$6.27	$0.00	$38.66
3	60	$25.90	$8.65	$6.84	$0.00	$41.39
4	65	$28.05	$8.65	$7.41	$0.00	$44.11
5	70	$30.21	$8.65	$19.63	$0.00	$58.49
6	75	$32.37	$8.65	$20.20	$0.00	$61.22
7	80	$34.53	$8.65	$20.77	$0.00	$63.95
8	90	$38.84	$8.65	$21.91	$0.00	$69.40

07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.18	$8.65	$0.00	$0.00	$30.83
2	55	$24.40	$8.65	$6.27	$0.00	$39.32
3	60	$26.62	$8.65	$6.84	$0.00	$42.11
4	65	$28.83	$8.65	$7.41	$0.00	$44.89
5	70	$31.05	$8.65	$19.63	$0.00	$59.33
6	75	$33.27	$8.65	$20.20	$0.00	$62.12
7	80	$35.49	$8.65	$20.77	$0.00	$64.91
8	90	$39.92	$8.65	$21.91	$0.00	$70.48

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

HOISTING ENGINEER/CRANES/GRADALLS OPERATING ENGINEERS LOCAL 4	12/01/2021	51.38	14.00	16.05	0.00	81.43

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice- OPERATING ENGINEERS - Local 4

12/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$28.26	$14.00	$0.00	$0.00	$42.26
2	60	$30.83	$14.00	$16.05	$0.00	$60.88
3	65	$33.40	$14.00	$16.05	$0.00	$63.45
4	70	$35.97	$14.00	$16.05	$0.00	$66.02
5	75	$38.54	$14.00	$16.05	$0.00	$68.59
6	80	$41.10	$14.00	$16.05	$0.00	$71.15
7	85	$43.67	$14.00	$16.05	$0.00	$73.72
8	90	$46.24	$14.00	$16.05	$0.00	$76.29

Notes:

Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) SHEETMETAL WORKERS LOCAL 17 - A For apprentice rates see "Apprentice- SHEET METAL WORKER"	02/01/2022	53.70	13.80	25.60	2.79	95.89
HVAC (ELECTRICAL CONTROLS) ELECTRICIANS LOCAL 103 For apprentice rates see "Apprentice- ELECTRICIAN"	03/01/2022 09/01/2022 03/01/2023	57.32 58.76 60.43	13.00 13.00 13.00	20.82 20.86 20.91	0.00 0.00 0.00	91.14 92.62 94.34
HVAC (TESTING AND BALANCING - AIR) SHEETMETAL WORKERS LOCAL 17 - A For apprentice rates see "Apprentice- SHEET METAL WORKER"	02/01/2022	53.70	13.80	25.60	2.79	95.89
HVAC (TESTING AND BALANCING -WATER) PIPEFITTERS LOCAL 537 (Local 138) For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"	03/01/2021	54.86	10.95	19.74	0.00	85.55
HVAC MECHANIC PIPEFITTERS LOCAL 537 (Local 138) For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"	03/01/2021	54.86	10.95	19.74	0.00	85.55
HYDRAULIC DRILLS LABORERS - ZONE 2 For apprentice rates see "Apprentice- LABORER"	12/01/2021 06/01/2022 12/01/2022 06/01/2023 12/01/2023	36.16 37.06 37.91 38.81 39.71	9.10 9.10 9.10 9.10 9.10	16.64 16.64 16.64 16.64 16.64	0.00 0.00 0.00 0.00 0.00	61.90 62.80 63.65 64.55 65.45
HYDRAULIC DRILLS (HEAVY & HIGHWAY) LABORERS - ZONE 2 (HEAVY & HIGHWAY) For apprentice rates see "Apprentice- LABORER (Heavy and Highway)	12/01/2021	36.16	9.10	16.64	0.00	61.90
INSULATOR (PIPES & TANKS) HEAT & FROST INSULATORS LOCAL 6 (BOSTON)	09/01/2021 09/01/2022	51.40 53.85	13.80 13.80	17.14 17.14	0.00 0.00	82.34 84.79

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice- ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Boston

09/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.70	$13.80	$12.42	$0.00	$51.92
2	60	$30.84	$13.80	$13.36	$0.00	$58.00
3	70	$35.98	$13.80	$14.31	$0.00	$64.09
4	80	$41.12	$13.80	$15.25	$0.00	$70.17

09/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$26.93	$13.80	$12.42	$0.00	$53.15
2	60	$32.31	$13.80	$13.36	$0.00	$59.47
3	70	$37.70	$13.80	$14.31	$0.00	$65.81
4	80	$43.08	$13.80	$15.25	$0.00	$72.13

Notes:
Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER	09/16/2021	45.72	8.15	25.80	0.00	79.67
IRONWORKERS LOCAL 7 (LAWRENCE AREA)	03/16/2022	46.19	8.20	26.50	0.00	80.89

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice- IRONWORKER - Local 7 Lawrence

09/16/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$27.43	$8.15	$25.80	$0.00	$61.38
2	70	$32.00	$8.15	$25.80	$0.00	$65.95
3	75	$34.29	$8.15	$25.80	$0.00	$68.24
4	80	$36.58	$8.15	$25.80	$0.00	$70.53
5	85	$38.86	$8.15	$25.80	$0.00	$72.81
6	90	$41.15	$8.15	$25.80	$0.00	$75.10

03/16/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$27.71	$8.20	$26.50	$0.00	$62.41
2	70	$32.33	$8.20	$26.50	$0.00	$67.03
3	75	$34.64	$8.20	$26.50	$0.00	$69.34
4	80	$36.95	$8.20	$26.50	$0.00	$71.65
5	85	$39.26	$8.20	$26.50	$0.00	$73.96
6	90	$41.57	$8.20	$26.50	$0.00	$76.27

Notes:
Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:

JACKHAMMER & PAVING BREAKER OPERATOR	12/01/2021	35.66	9.10	16.64	0.00	61.40
LABORERS - ZONE 2	06/01/2022	36.56	9.10	16.64	0.00	62.30
	12/01/2022	37.41	9.10	16.64	0.00	63.15
	06/01/2023	38.31	9.10	16.64	0.00	64.05
	12/01/2023	39.21	9.10	16.64	0.00	64.95

For apprentice rates see "Apprentice- LABORER"

LABORER	12/01/2021	35.41	9.10	16.64	0.00	61.15
LABORERS - ZONE 2	06/01/2022	36.31	9.10	16.64	0.00	62.05
	12/01/2022	37.16	9.10	16.64	0.00	62.90
	06/01/2023	38.06	9.10	16.64	0.00	63.80
	12/01/2023	38.96	9.10	16.64	0.00	64.70

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice- LABOROR - Zone 2

12/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$21.25	$9.10	$16.64	$0.00	$46.99
2	70	$24.79	$9.10	$16.64	$0.00	$50.53
3	80	$28.33	$9.10	$16.64	$0.00	$54.07
4	90	$31.87	$9.10	$16.64	$0.00	$57.61

06/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$21.79	$9.10	$16.64	$0.00	$47.53
2	70	$25.42	$9.10	$16.64	$0.00	$51.16
3	80	$29.05	$9.10	$16.64	$0.00	$54.79
4	90	$32.68	$9.10	$16.64	$0.00	$58.42

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER (HEAVY & HIGHWAY) LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/01/2021	35.41	9.10	16.64	0.00	61.15

Apprentice- LABORER (Heavy & Highway) - Zone 2

12/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$21.25	$9.10	$16.64	$0.00	$46.99
2	70	$24.79	$9.10	$16.64	$0.00	$50.53
3	80	$28.33	$9.10	$16.64	$0.00	$54.07
4	90	$31.87	$9.10	$16.64	$0.00	$57.61

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER LABORERS - ZONE 2	12/01/2021	35.41	9.10	16.64	0.00	61.15
	06/01/2022	36.31	9.10	16.64	0.00	62.05
	12/01/2022	37.16	9.10	16.64	0.00	62.90
	06/01/2023	38.06	9.10	16.64	0.00	63.80
	12/01/2023	38.96	9.10	16.64	0.00	64.70

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: CEMENT FINISHER TENDER	12/01/2021	35.41	9.10	16.64	0.00	61.15
LABORERS - ZONE 2	06/01/2022	36.31	9.10	16.64	0.00	62.05
	12/01/2022	37.16	9.10	16.64	0.00	62.90
	06/01/2023	38.06	9.10	16.64	0.00	63.80
	12/01/2023	38.96	9.10	16.64	0.00	64.70
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER	12/01/2021	35.50	9.10	16.70	0.00	61.30
LABORERS - ZONE 2	06/01/2022	36.40	9.10	16.70	0.00	62.20
	12/01/2022	37.25	9.10	16.70	0.00	63.05
	06/01/2023	38.15	9.10	16.70	0.00	63.95
	12/01/2023	39.05	9.10	16.70	0.00	64.85
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER	12/01/2021	35.66	9.10	16.64	0.00	61.40
LABORERS - ZONE 2	06/01/2022	36.56	9.10	16.64	0.00	62.30
	12/01/2022	37.41	9.10	16.64	0.00	63.15
	06/01/2023	38.31	9.10	16.64	0.00	64.05
	12/01/2023	39.21	9.10	16.64	0.00	64.95
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER (HEAVY & HIGHWAY)	12/01/2021	35.66	9.10	16.64	0.00	61.40
LABORERS - ZONE 2 (HEAVY & HIGHWAY)						
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
LABORER: MULTI-TRADE TENDER	12/01/2021	35.41	9.10	16.64	0.00	61.15
LABORERS - ZONE 2	06/01/2022	36.31	9.10	16.64	0.00	62.05
	12/01/2022	37.16	9.10	16.64	0.00	62.90
	06/01/2023	38.06	9.10	16.64	0.00	63.80
	12/01/2023	38.96	9.10	16.64	0.00	64.70
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER	12/01/2021	35.41	9.10	16.64	0.00	61.15
LABORERS - ZONE 2	06/01/2022	36.31	9.10	16.64	0.00	62.05
	12/01/2022	37.16	9.10	16.64	0.00	62.90
	06/01/2023	38.06	9.10	16.64	0.00	63.80
	12/01/2023	38.96	9.10	16.64	0.00	64.70
This classification applies to the removal of standing trees, and the trimming and removal of branches and limbs when related to public works construction or site clearance incidental to construction . For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR	12/01/2021	35.66	9.10	16.64	0.00	61.40
LABORERS - ZONE 2	06/01/2022	36.56	9.10	16.64	0.00	62.30
	12/01/2022	37.41	9.10	16.64	0.00	63.15
	06/01/2023	38.31	9.10	16.64	0.00	64.05
	12/01/2023	39.21	9.10	16.64	0.00	64.95
For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR (HEAVY & HIGHWAY)	12/01/2021	35.66	9.10	16.64	0.00	61.40
LABORERS - ZONE 2 (HEAVY & HIGHWAY)						
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
MARBLE & TILE FINISHERS	02/01/2022	43.69	11.39	20.37	0.00	75.45
BRICKLAYERS LOCAL 3 - MARBLE & TILE						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice- MARBLE & TILE FINISHER - Local 3 Marble & Tile
02/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.85	$11.39	$20.37	$0.00	$53.61
2	60	$26.21	$11.39	$20.37	$0.00	$57.97
3	70	$30.58	$11.39	$20.37	$0.00	$62.34
4	80	$34.95	$11.39	$20.37	$0.00	$66.71
5	90	$39.32	$11.39	$20.37	$0.00	$71.08

Notes:

Apprentice to Journeyworker Ratio:1:3

MARBLE MASONS,TILELAYERS & TERRAZZO MECH BRICKLAYERS LOCAL 3 - MARBLE & TILE	02/01/2022	57.17	11.39	22.31	0.00	90.87

Apprentice- MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile
02/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.59	$11.39	$22.31	$0.00	$62.29
2	60	$34.30	$11.39	$22.31	$0.00	$68.00
3	70	$40.02	$11.39	$22.31	$0.00	$73.72
4	80	$45.74	$11.39	$22.31	$0.00	$79.44
5	90	$51.45	$11.39	$22.31	$0.00	$85.15

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) OPERATING ENGINEERS LOCAL 4 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2021	50.83	14.00	16.05	0.00	80.88
MECHANICS MAINTENANCE OPERATING ENGINEERS LOCAL 4 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2021	50.83	14.00	16.05	0.00	80.88
MILLWRIGHT (Zone 2)	01/03/2022	40.67	8.58	21.57	0.00	70.82
MILLWRIGHTS LOCAL 1121 - Zone 2	01/02/2023	41.92	8.58	21.57	0.00	72.07

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice- MILLWRIGHT - Local 1121 Zone 2

01/03/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$22.37	$8.58	$5.72	$0.00	$36.67
2	65	$26.44	$8.58	$17.93	$0.00	$52.95
3	75	$30.50	$8.58	$18.98	$0.00	$58.06
4	85	$34.57	$8.58	$20.01	$0.00	$63.16

01/02/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$23.06	$8.58	$5.72	$0.00	$37.36
2	65	$27.25	$8.58	$17.93	$0.00	$53.76
3	75	$31.44	$8.58	$18.98	$0.00	$59.00
4	85	$35.63	$8.58	$20.01	$0.00	$64.22

Notes: Step 1&2 Appr. indentured after 1/6/2020 receive no pension, but do receive annuity. (Step 1 $5.72, Step 2 $6.66)
Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:4

MORTAR MIXER	12/01/2021	35.66	9.10	16.64	0.00	61.40
LABORERS - ZONE 2	06/01/2022	36.56	9.10	16.64	0.00	62.30
	12/01/2022	37.41	9.10	16.64	0.00	63.15
	06/01/2023	38.31	9.10	16.64	0.00	64.05
	12/01/2023	39.21	9.10	16.64	0.00	64.95
For apprentice rates see "Apprentice- LABORER"						
OILER (OTHER THAN TRUCK CRANES,GRADALLS)	12/01/2021	23.48	14.00	16.05	0.00	53.53
OPERATING ENGINEERS LOCAL 4						
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OILER (TRUCK CRANES, GRADALLS)	12/01/2021	28.44	14.00	16.05	0.00	58.49
OPERATING ENGINEERS LOCAL 4						
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS II	12/01/2021	50.83	14.00	16.05	0.00	80.88
OPERATING ENGINEERS LOCAL 4						
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS)	01/01/2022	53.66	8.65	23.05	0.00	85.36
PAINTERS LOCAL 35 - ZONE 2	07/01/2022	54.86	8.65	23.05	0.00	86.56
	01/01/2023	56.06	8.65	23.05	0.00	87.76
	07/01/2023	57.26	8.65	23.05	0.00	88.96
	01/01/2024	58.46	8.65	23.05	0.00	90.16
	07/01/2024	59.66	8.65	23.05	0.00	91.36
	01/01/2025	60.86	8.65	23.05	0.00	92.56

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice- PAINTER Local 35 - BRIDGES/TANKS

01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$26.83	$8.65	$0.00	$0.00	$35.48
2	55	$29.51	$8.65	$6.27	$0.00	$44.43
3	60	$32.20	$8.65	$6.84	$0.00	$47.69
4	65	$34.88	$8.65	$7.41	$0.00	$50.94
5	70	$37.56	$8.65	$19.63	$0.00	$65.84
6	75	$40.25	$8.65	$20.20	$0.00	$69.10
7	80	$42.93	$8.65	$20.77	$0.00	$72.35
8	90	$48.29	$8.65	$21.91	$0.00	$78.85

07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.43	$8.65	$0.00	$0.00	$36.08
2	55	$30.17	$8.65	$6.27	$0.00	$45.09
3	60	$32.92	$8.65	$6.84	$0.00	$48.41
4	65	$35.66	$8.65	$7.41	$0.00	$51.72
5	70	$38.40	$8.65	$19.63	$0.00	$66.68
6	75	$41.15	$8.65	$20.20	$0.00	$70.00
7	80	$43.89	$8.65	$20.77	$0.00	$73.31
8	90	$49.37	$8.65	$21.91	$0.00	$79.93

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	01/01/2022	44.56	8.65	23.05	0.00	76.26
* If 30% or more of surfaces to be painted are new construction,	07/01/2022	45.76	8.65	23.05	0.00	77.46
NEW paint rate shall be used.PAINTERS LOCAL 35 - ZONE 2	01/01/2023	46.96	8.65	23.05	0.00	78.66
	07/01/2023	48.16	8.65	23.05	0.00	79.86
	01/01/2024	49.36	8.65	23.05	0.00	81.06
	07/01/2024	50.56	8.65	23.05	0.00	82.26
	01/01/2025	51.76	8.65	23.05	0.00	83.46

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice- PAINTER Local 35 Zone 2 - Spray/Sandblast - New

01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.28	$8.65	$0.00	$0.00	$30.93
2	55	$24.51	$8.65	$6.27	$0.00	$39.43
3	60	$26.74	$8.65	$6.84	$0.00	$42.23
4	65	$28.96	$8.65	$7.41	$0.00	$45.02
5	70	$31.19	$8.65	$19.63	$0.00	$59.47
6	75	$33.42	$8.65	$20.20	$0.00	$62.27
7	80	$35.65	$8.65	$20.77	$0.00	$65.07
8	90	$40.10	$8.65	$21.91	$0.00	$70.66

07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.88	$8.65	$0.00	$0.00	$31.53
2	55	$25.17	$8.65	$6.27	$0.00	$40.09
3	60	$27.46	$8.65	$6.84	$0.00	$42.95
4	65	$29.74	$8.65	$7.41	$0.00	$45.80
5	70	$32.03	$8.65	$19.63	$0.00	$60.31
6	75	$34.32	$8.65	$20.20	$0.00	$63.17
7	80	$36.61	$8.65	$20.77	$0.00	$66.03
8	90	$41.18	$8.65	$21.91	$0.00	$71.74

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT)	01/01/2022	42.62	8.65	23.05	0.00	74.32
PAINTERS LOCAL 35 - ZONE 2	07/01/2022	43.82	8.65	23.05	0.00	75.52
	01/01/2023	45.02	8.65	23.05	0.00	76.72
	07/01/2023	46.22	8.65	23.05	0.00	77.92
	01/01/2024	47.42	8.65	23.05	0.00	79.12
	07/01/2024	48.62	8.65	23.05	0.00	80.32
	01/01/2025	49.82	8.65	23.05	0.00	81.52

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice- PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint

01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.31	$8.65	$0.00	$0.00	$29.96
2	55	$23.44	$8.65	$6.27	$0.00	$38.36
3	60	$25.57	$8.65	$6.84	$0.00	$41.06
4	65	$27.70	$8.65	$7.41	$0.00	$43.76
5	70	$29.83	$8.65	$19.63	$0.00	$58.11
6	75	$31.97	$8.65	$20.20	$0.00	$60.82
7	80	$34.10	$8.65	$20.77	$0.00	$63.52
8	90	$38.36	$8.65	$21.91	$0.00	$68.92

07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.91	$8.65	$0.00	$0.00	$30.56
2	55	$24.10	$8.65	$6.27	$0.00	$39.02
3	60	$26.29	$8.65	$6.84	$0.00	$41.78
4	65	$28.48	$8.65	$7.41	$0.00	$44.54
5	70	$30.67	$8.65	$19.63	$0.00	$58.95
6	75	$32.87	$8.65	$20.20	$0.00	$61.72
7	80	$35.06	$8.65	$20.77	$0.00	$64.48
8	90	$39.44	$8.65	$21.91	$0.00	$70.00

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, NEW) *	01/01/2022	43.16	8.65	23.05	0.00	74.86
* If 30% or more of surfaces to be painted are new construction,	07/01/2022	44.36	8.65	23.05	0.00	76.06
NEW paint rate shall be used.PAINTERS LOCAL 35 - ZONE 2	01/01/2023	45.56	8.65	23.05	0.00	77.26
	07/01/2023	46.76	8.65	23.05	0.00	78.46
	01/01/2024	47.96	8.65	23.05	0.00	79.66
	07/01/2024	49.16	8.65	23.05	0.00	80.86
	01/01/2025	50.36	8.65	23.05	0.00	82.06

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice- PAINTER - Local 35 Zone 2 - BRUSH NEW

01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.58	$8.65	$0.00	$0.00	$30.23
2	55	$23.74	$8.65	$6.27	$0.00	$38.66
3	60	$25.90	$8.65	$6.84	$0.00	$41.39
4	65	$28.05	$8.65	$7.41	$0.00	$44.11
5	70	$30.21	$8.65	$19.63	$0.00	$58.49
6	75	$32.37	$8.65	$20.20	$0.00	$61.22
7	80	$34.53	$8.65	$20.77	$0.00	$63.95
8	90	$38.84	$8.65	$21.91	$0.00	$69.40

07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.18	$8.65	$0.00	$0.00	$30.83
2	55	$24.40	$8.65	$6.27	$0.00	$39.32
3	60	$26.62	$8.65	$6.84	$0.00	$42.11
4	65	$28.83	$8.65	$7.41	$0.00	$44.89
5	70	$31.05	$8.65	$19.63	$0.00	$59.33
6	75	$33.27	$8.65	$20.20	$0.00	$62.12
7	80	$35.49	$8.65	$20.77	$0.00	$64.91
8	90	$39.92	$8.65	$21.91	$0.00	$70.48

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT)	01/01/2022	41.22	8.65	23.05	0.00	72.92
PAINTERS LOCAL 35 - ZONE 2	07/01/2022	42.42	8.65	23.05	0.00	74.12
	01/01/2023	43.62	8.65	23.05	0.00	75.32
	07/01/2023	44.82	8.65	23.05	0.00	76.52
	01/01/2024	46.02	8.65	23.05	0.00	77.72
	07/01/2024	47.22	8.65	23.05	0.00	78.92
	01/01/2025	48.42	8.65	23.05	0.00	80.12

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice- PAINTER Local 35 Zone 2 - BRUSH REPAINT

01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.61	$8.65	$0.00	$0.00	$29.26
2	55	$22.67	$8.65	$6.27	$0.00	$37.59
3	60	$24.73	$8.65	$6.84	$0.00	$40.22
4	65	$26.79	$8.65	$7.41	$0.00	$42.85
5	70	$28.85	$8.65	$19.63	$0.00	$57.13
6	75	$30.92	$8.65	$20.20	$0.00	$59.77
7	80	$32.98	$8.65	$20.77	$0.00	$62.40
8	90	$37.10	$8.65	$21.91	$0.00	$67.66

07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.21	$8.65	$0.00	$0.00	$29.86
2	55	$23.33	$8.65	$6.27	$0.00	$38.25
3	60	$25.45	$8.65	$6.84	$0.00	$40.94
4	65	$27.57	$8.65	$7.41	$0.00	$43.63
5	70	$29.69	$8.65	$19.63	$0.00	$57.97
6	75	$31.82	$8.65	$20.20	$0.00	$60.67
7	80	$33.94	$8.65	$20.77	$0.00	$63.36
8	90	$38.18	$8.65	$21.91	$0.00	$68.74

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY) LABORERS - ZONE 2 (HEAVY & HIGHWAY) For apprentice rates see "Apprentice- LABORER (Heavy and Highway)	12/01/2021	35.41	9.10	16.64	0.00	61.15
PANEL & PICKUP TRUCKS DRIVER TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/01/2021	35.78	13.41	16.01	0.00	65.20
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) PILE DRIVER LOCAL 56 (ZONE 1) For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2020	49.07	9.40	23.12	0.00	81.59
PILE DRIVER PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2020	49.07	9.40	23.12	0.00	81.59

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice- PILE DRIVER - Local 56 Zone 1

08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.54	$9.40	$23.12	$0.00	$57.06
2	60	$29.44	$9.40	$23.12	$0.00	$61.96
3	70	$34.35	$9.40	$23.12	$0.00	$66.87
4	75	$36.80	$9.40	$23.12	$0.00	$69.32
5	80	$39.26	$9.40	$23.12	$0.00	$71.78
6	80	$39.26	$9.40	$23.12	$0.00	$71.78
7	90	$44.16	$9.40	$23.12	$0.00	$76.68
8	90	$44.16	$9.40	$23.12	$0.00	$76.68

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $34.01/ 3&4 $41.46/ 5&6 $62.80/ 7&8 $69.25

Apprentice to Journeyworker Ratio:1:5

PIPEFITTER & STEAMFITTER PIPEFITTERS LOCAL 537 (Local 138)	03/01/2021	54.86	10.95	19.74	0.00	85.55

Apprentice- PIPEFITTER Local 537 (Local 138)

03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$21.94	$10.95	$8.00	$0.00	$40.89
2	45	$24.69	$10.95	$19.74	$0.00	$55.38
3	60	$32.92	$10.95	$19.74	$0.00	$63.61
4	70	$38.40	$10.95	$19.74	$0.00	$69.09
5	80	$43.89	$10.95	$19.74	$0.00	$74.58

Notes:

** 1:3; 3:15; 1:10 thereafter / Steps are 1 yr.
Refrig/AC Mechanic **1:1;1:2;2:4;3:6;4:8;5:10;6:12;7:14;8:17;9:20;10:23(Max)

Apprentice to Journeyworker Ratio:**

PIPELAYER LABORERS - ZONE 2	12/01/2021	35.66	9.10	16.64	0.00	61.40
	06/01/2022	36.56	9.10	16.64	0.00	62.30
	12/01/2022	37.41	9.10	16.64	0.00	63.15
	06/01/2023	38.31	9.10	16.64	0.00	64.05
	12/01/2023	39.21	9.10	16.64	0.00	64.95

For apprentice rates see "Apprentice- LABORER"

PIPELAYER (HEAVY & HIGHWAY) LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/01/2021	35.66	9.10	16.64	0.00	61.40

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PLUMBER	03/01/2022	63.39	13.57	17.26	0.00	94.22
PLUMBERS & GASFITTERS LOCAL 12 (Local 138)	09/04/2022	63.49	14.07	18.36	0.00	95.92
	02/26/2023	65.19	14.07	18.36	0.00	97.62
	09/03/2023	66.94	14.07	18.36	0.00	99.37
	03/03/2024	68.74	14.07	18.36	0.00	101.17
	09/01/2024	70.54	14.07	18.36	0.00	102.97
	03/02/2025	72.34	14.07	18.36	0.00	104.77

Apprentice- PLUMBER/GASFITTER - Local 12 (Local 138)

03/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$22.19	$14.07	$6.63	$0.00	$42.89
2	40	$25.36	$14.07	$7.52	$0.00	$46.95
3	55	$34.86	$14.07	$10.24	$0.00	$59.17
4	65	$41.20	$14.07	$12.04	$0.00	$67.31
5	75	$47.54	$14.07	$13.85	$0.00	$75.46

09/04/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$22.22	$14.07	$6.63	$0.00	$42.92
2	40	$25.40	$14.07	$7.52	$0.00	$46.99
3	55	$34.92	$14.07	$10.24	$0.00	$59.23
4	65	$41.27	$14.07	$12.04	$0.00	$67.38
5	75	$47.62	$14.07	$13.85	$0.00	$75.54

Notes: ** 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr
Steps are 1 yr
Step 4 with lic$69.00, Step5 with lic$76.87

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) PIPEFITTERS LOCAL 537 (Local 138)	03/01/2021	54.86	10.95	19.74	0.00	85.55
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
PNEUMATIC DRILL/TOOL OPERATOR	12/01/2021	35.66	9.10	16.64	0.00	61.40
LABORERS - ZONE 2	06/01/2022	36.56	9.10	16.64	0.00	62.30
	12/01/2022	37.41	9.10	16.64	0.00	63.15
	06/01/2023	38.31	9.10	16.64	0.00	64.05
	12/01/2023	39.21	9.10	16.64	0.00	64.95
For apprentice rates see "Apprentice- LABORER"						
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY) LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/01/2021	35.66	9.10	16.64	0.00	61.40
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
POWDERMAN & BLASTER	12/01/2021	36.41	9.10	16.64	0.00	62.15
LABORERS - ZONE 2	06/01/2022	37.31	9.10	16.64	0.00	63.05
	12/01/2022	38.16	9.10	16.64	0.00	63.90
	06/01/2023	39.06	9.10	16.64	0.00	64.80
	12/01/2023	39.96	9.10	16.64	0.00	65.70
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
POWDERMAN & BLASTER (HEAVY & HIGHWAY) LABORERS - ZONE 2 (HEAVY & HIGHWAY) For apprentice rates see "Apprentice- LABORER (Heavy and Highway)	12/01/2021	36.41	9.10	16.64	0.00	62.15
POWER SHOVEL/DERRICK/TRENCHING MACHINE OPERATING ENGINEERS LOCAL 4 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2021	51.38	14.00	16.05	0.00	81.43
PUMP OPERATOR (CONCRETE) OPERATING ENGINEERS LOCAL 4 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2021	51.38	14.00	16.05	0.00	81.43
PUMP OPERATOR (DEWATERING, OTHER) OPERATING ENGINEERS LOCAL 4 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2021	33.69	14.00	16.05	0.00	63.74
READY-MIX CONCRETE DRIVER TEAMSTERS 170 - J.G. MacLellan (Lowell)	01/01/2022	25.50	10.37	6.35	0.00	42.22
	05/01/2022	25.85	10.37	6.35	0.00	42.57
	01/01/2023	25.85	10.77	6.35	0.00	42.97
RECLAIMERS OPERATING ENGINEERS LOCAL 4 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2021	50.83	14.00	16.05	0.00	80.88
RIDE-ON MOTORIZED BUGGY OPERATOR LABORERS - ZONE 2 For apprentice rates see "Apprentice- LABORER"	12/01/2021	35.66	9.10	16.64	0.00	61.40
	06/01/2022	36.56	9.10	16.64	0.00	62.30
	12/01/2022	37.41	9.10	16.64	0.00	63.15
	06/01/2023	38.31	9.10	16.64	0.00	64.05
	12/01/2023	39.21	9.10	16.64	0.00	64.95
ROLLER/SPREADER/MULCHING MACHINE OPERATING ENGINEERS LOCAL 4 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2021	50.83	14.00	16.05	0.00	80.88
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) ROOFERS LOCAL 33	02/01/2022	47.03	12.28	19.45	0.00	78.76

Apprentice- ROOFER - Local 33

02/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.52	$12.28	$5.21	$0.00	$41.01
2	60	$28.22	$12.28	$19.45	$0.00	$59.95
3	65	$30.57	$12.28	$19.45	$0.00	$62.30
4	75	$35.27	$12.28	$19.45	$0.00	$67.00
5	85	$39.98	$12.28	$19.45	$0.00	$71.71

Notes: ** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1
Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.
(Hot Pitch Mechanics' receive $1.00 hr. above ROOFER)

Apprentice to Journeyworker Ratio:**

ROOFER SLATE / TILE / PRECAST CONCRETE ROOFERS LOCAL 33 For apprentice rates see "Apprentice- ROOFER"	02/01/2022	47.28	12.28	19.45	0.00	79.01

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
SHEETMETAL WORKER SHEETMETAL WORKERS LOCAL 17 - A	02/01/2022	53.70	13.80	25.60	2.79	95.89

Apprentice- SHEET METAL WORKER - Local 17-A

02/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	$22.55	$13.80	$6.01	$0.00	$42.36
2	42	$22.55	$13.80	$6.01	$0.00	$42.36
3	47	$25.24	$13.80	$11.26	$1.51	$51.81
4	47	$25.24	$13.80	$11.26	$1.51	$51.81
5	52	$27.92	$13.80	$12.23	$1.62	$55.57
6	52	$27.92	$13.80	$12.48	$1.63	$55.83
7	60	$32.22	$13.80	$13.87	$1.80	$61.69
8	65	$34.91	$13.80	$14.84	$1.91	$65.46
9	75	$40.28	$13.80	$16.77	$2.13	$72.98
10	85	$45.65	$13.80	$18.20	$2.33	$79.98

Notes:

Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

SPECIALIZED EARTH MOVING EQUIP < 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/01/2021	36.24	13.41	16.01	0.00	65.66
SPECIALIZED EARTH MOVING EQUIP > 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/01/2021	36.53	13.41	16.01	0.00	65.95
SPRINKLER FITTER	03/01/2022	57.92	10.44	22.10	0.00	90.46
SPRINKLER FITTERS LOCAL 550 - (Section B) Zone 2	10/01/2022	59.45	10.44	22.10	0.00	91.99
	03/01/2023	60.98	10.44	22.10	0.00	93.52
	10/01/2023	62.56	10.44	22.10	0.00	95.10
	03/01/2024	64.18	10.44	22.10	0.00	96.72
	10/01/2024	65.80	10.44	22.10	0.00	98.34
	03/01/2025	67.42	10.44	22.10	0.00	99.96

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice- SPRINKLER FITTER - Local 550 (Section B) Zone 2

03/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$20.27	$10.44	$12.35	$0.00	$43.06
2	40	$23.17	$10.44	$13.10	$0.00	$46.71
3	45	$26.06	$10.44	$13.85	$0.00	$50.35
4	50	$28.96	$10.44	$14.60	$0.00	$54.00
5	55	$31.86	$10.44	$15.35	$0.00	$57.65
6	60	$34.75	$10.44	$16.10	$0.00	$61.29
7	65	$37.65	$10.44	$16.85	$0.00	$64.94
8	70	$40.54	$10.44	$17.60	$0.00	$68.58
9	75	$43.44	$10.44	$18.35	$0.00	$72.23
10	80	$46.34	$10.44	$19.10	$0.00	$75.88

10/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$20.81	$10.44	$12.35	$0.00	$43.60
2	40	$23.78	$10.44	$13.10	$0.00	$47.32
3	45	$26.75	$10.44	$13.85	$0.00	$51.04
4	50	$29.73	$10.44	$14.60	$0.00	$54.77
5	55	$32.70	$10.44	$15.35	$0.00	$58.49
6	60	$35.67	$10.44	$16.10	$0.00	$62.21
7	65	$38.64	$10.44	$16.85	$0.00	$65.93
8	70	$41.62	$10.44	$17.60	$0.00	$69.66
9	75	$44.59	$10.44	$18.35	$0.00	$73.38
10	80	$47.56	$10.44	$19.10	$0.00	$77.10

Notes: Apprentice entered prior 9/30/10:
40/45/50/55/60/65/70/75/80/85
Steps are 850 hours

Apprentice to Journeyworker Ratio:1:3

STEAM BOILER OPERATOR OPERATING ENGINEERS LOCAL 4 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2021	50.83	14.00	16.05	0.00	80.88
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN OPERATING ENGINEERS LOCAL 4 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2021	50.83	14.00	16.05	0.00	80.88
TELECOMMUNICATION TECHNICIAN ELECTRICIANS LOCAL 103	03/01/2022	44.71	13.00	18.74	0.00	76.45
	09/01/2022	46.42	13.00	18.87	0.00	78.29
	03/01/2023	48.34	13.00	19.01	0.00	80.35

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice- TELECOMMUNICATION TECHNICIAN - Local 103

03/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$20.12	$13.00	$0.60	$0.00	$33.72
2	45	$20.12	$13.00	$0.60	$0.00	$33.72
3	50	$22.36	$13.00	$15.06	$0.00	$50.42
4	50	$22.36	$13.00	$15.06	$0.00	$50.42
5	55	$24.59	$13.00	$15.43	$0.00	$53.02
6	60	$26.83	$13.00	$15.79	$0.00	$55.62
7	65	$29.06	$13.00	$16.16	$0.00	$58.22
8	70	$31.30	$13.00	$16.53	$0.00	$60.83
9	75	$33.53	$13.00	$16.91	$0.00	$63.44
10	80	$35.77	$13.00	$17.27	$0.00	$66.04

09/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$20.89	$13.00	$0.63	$0.00	$34.52
2	45	$20.89	$13.00	$0.63	$0.00	$34.52
3	50	$23.21	$13.00	$15.13	$0.00	$51.34
4	50	$23.21	$13.00	$15.13	$0.00	$51.34
5	55	$25.53	$13.00	$15.51	$0.00	$54.04
6	60	$27.85	$13.00	$15.88	$0.00	$56.73
7	65	$30.17	$13.00	$16.26	$0.00	$59.43
8	70	$32.49	$13.00	$16.62	$0.00	$62.11
9	75	$34.82	$13.00	$17.00	$0.00	$64.82
10	80	$37.14	$13.00	$17.37	$0.00	$67.51

Notes:

Apprentice to Journeyworker Ratio:1:1

TERRAZZO FINISHERS BRICKLAYERS LOCAL 3 - MARBLE & TILE	02/01/2022	56.09	11.39	22.34	0.00	89.82

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice- TERRAZZO FINISHER - Local 3 Marble & Tile
02/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.05	$11.39	$22.34	$0.00	$61.78
2	60	$33.65	$11.39	$22.34	$0.00	$67.38
3	70	$39.26	$11.39	$22.34	$0.00	$72.99
4	80	$44.87	$11.39	$22.34	$0.00	$78.60
5	90	$50.48	$11.39	$22.34	$0.00	$84.21

Notes:

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER LABORERS - FOUNDATION AND MARINE For apprentice rates see "Apprentice- LABORER"	12/01/2021	42.58	9.10	17.72	0.00	69.40
TEST BORING DRILLER HELPER LABORERS - FOUNDATION AND MARINE For apprentice rates see "Apprentice- LABORER"	12/01/2021	41.30	9.10	17.72	0.00	68.12
TEST BORING LABORER LABORERS - FOUNDATION AND MARINE For apprentice rates see "Apprentice- LABORER"	12/01/2021	41.18	9.10	17.72	0.00	68.00
TRACTORS/PORTABLE STEAM GENERATORS OPERATING ENGINEERS LOCAL 4 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2021	50.83	14.00	16.05	0.00	80.88
TRAILERS FOR EARTH MOVING EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/01/2021	36.82	13.41	16.01	0.00	66.24
TUNNEL WORK - COMPRESSED AIR LABORERS (COMPRESSED AIR) For apprentice rates see "Apprentice- LABORER"	12/01/2021	53.41	9.10	18.17	0.00	80.68
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) LABORERS (COMPRESSED AIR) For apprentice rates see "Apprentice- LABORER"	12/01/2021	55.41	9.10	18.17	0.00	82.68
TUNNEL WORK - FREE AIR LABORERS (FREE AIR TUNNEL) For apprentice rates see "Apprentice- LABORER"	12/01/2021	45.48	9.10	18.17	0.00	72.75
TUNNEL WORK - FREE AIR (HAZ. WASTE) LABORERS (FREE AIR TUNNEL) For apprentice rates see "Apprentice- LABORER"	12/01/2021	47.48	9.10	18.17	0.00	74.75
VAC-HAUL TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/01/2021	36.24	13.41	16.01	0.00	65.66

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
WAGON DRILL OPERATOR	12/01/2021	35.66	9.10	16.64	0.00	61.40
LABORERS - ZONE 2	06/01/2022	36.56	9.10	16.64	0.00	62.30
	12/01/2022	37.41	9.10	16.64	0.00	63.15
	06/01/2023	38.31	9.10	16.64	0.00	64.05
	12/01/2023	39.21	9.10	16.64	0.00	64.95
For apprentice rates see "Apprentice- LABORER"						
WAGON DRILL OPERATOR (HEAVY & HIGHWAY)	12/01/2021	35.66	9.10	16.64	0.00	61.40
LABORERS - ZONE 2 (HEAVY & HIGHWAY)						
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
WASTE WATER PUMP OPERATOR	12/01/2021	51.38	14.00	16.05	0.00	81.43
OPERATING ENGINEERS LOCAL 4						
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER	03/01/2022	63.39	13.57	17.26	0.00	94.22
PLUMBERS & GASFITTERS LOCAL 12 (Local 138)	09/04/2022	63.49	14.07	18.36	0.00	95.92
	02/26/2023	65.19	14.07	18.36	0.00	97.62
	09/03/2023	66.94	14.07	18.36	0.00	99.37
	03/03/2024	68.74	14.07	18.36	0.00	101.17
	09/01/2024	70.54	14.07	18.36	0.00	102.97
	03/02/2025	72.34	14.07	18.36	0.00	104.77
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						

Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)
Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

** Multiple ratios are listed in the comment field.
*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.
**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

Division 1 - General Conditions

SECTION 010000

INSURANCE REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Include General Conditions and applicable parts of Division I as part of this Section.

B. Examine all other Sections of the Specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this Section.

C. Provide all insurance coverage specified.

1.2 GENERAL

A. General Contractor shall purchase and maintain such insurance as will protect the Contractor from claims under workmen's compensation acts and from claims for damages because of bodily injury, including death, and property damage which might arise from and during operations under this Contract, or anyone directly or indirectly employed by either of them.

B. Contractor shall not commence work under this Contract until all insurance required herein has been obtained nor until such insurance has been approved by the Owner.

1.3 INSURANCE REQUIREMENTS

A. Workmen's Compensation and Employer's Liability Insurance as required by the Workmen’s Compensation Laws of the Commonwealth of Massachusetts, MGL Chapter 149, Section 34A.

Bodily Injury by Accident:	$500,000 each accident
Bodily Injury by Disease:	$500,000 each employee
	$500,000 policy limit

B. Commercial General Liability Insurance covering Bodily Injury and Property Damage as follows:

Limits of Liability	
General aggregate limit (other than products completed operations)	$3,000,000
Products Completed Operations aggregate limits	$2,000,000
Personal and advertising injury limit	$1,000,000
Each occurrence limit	$1,000,00
Fire damage limit	$100,000 any one fire

Medical expense limit	$10,000 any one person

The Commercial General Liability Policy shall include Broad Form contractual liability insurance and shall provide insurance for the Contractor for Bodily Injury and Property Damage to third persons arising out of:

1. Work performed by the Contractor himself with his own employees, called "premises-operations"
2. Work performed by his subcontractor, called "sublet work" or "independent contractors" (this is referred to as Contractor's Protective Liability)
3. Broad Form Contractor's Liability Insurance including a "hold harmless" clause or indemnity agreement. This "Hold Harmless" clause as listed in Section B paragraph 4 of Article 4 must be written out on each of the Contractor's insurance certificates.
4. Products Liability Coverage covering the completed building or installation or products furnished (this is called Products Liability Insurance for the manufacturer and Completed Operations Liability Insurance for the Contractor).
5. Coverage shall be extended to include protection against property damage caused by explosion (this is known as "XCU" coverage).

C. Owner's Protective Liability Insurance

The Contractor shall take out and furnish to the Town of Groveland as Owner and maintain during the life of this Contract complete Owner's Protective Liability Insurance in amounts as specified above for Bodily Injury Liability Insurance and for Protective Damage Liability Insurance. The Owner shall be provided with a copy of the actual insurance policy.

D. Commercial Automobile Liability Insurance

The Contractor shall take out Commercial Automobile Liability Insurance covering bodily injury and property damage as follows:

Limits of Liability	
Bodily Injury	$1,000,000 each person
	$1,000,000 each accident
Property Damage	$1,000,000 each accident

This insurance is to include all owned or hired vehicles of the Contractor and non-ownership protection for all employees of the Contractor engaged in the performance of the Contract.

E. All policies shall be so written that the Owner will be notified of cancellation or restrictive amendments by Registered Mail at least 30 days prior to the effective date of such cancellation or amendment. Certificates from the insurance carrier shall have this statement included thereon and shall be filed with the Engineer before the Contract is executed. Such certificates not only shall name the types of policy provided, but shall also refer specifically to this Contract, Article and the above paragraphs in accordance with which insurance is being furnished, and shall state that such insurance is as required by such paragraph of this Contract, and shall be sufficiently comprehensive as to permit the Owner or the Engineer to determine that the required insurance coverage has been provided without the necessity of examining the individual insurance policies.

If the initial insurance expires prior to completion of the work, renewal certificates must be furnished prior to the date of expiration.

F. The Contractor shall require each of his subcontractors to procure and maintain, until the completion of that subcontractor's work, insurance of the types and to the limits specified in paragraphs A to E inclusive, above. It shall be the responsibility of the Contractor to ensure that all of his subcontractors comply with all of the insurance requirements contained herein relating to such subcontractors.

END OF SECTION 007316

SECTION 011000

SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work by Owner.
4. Access to site.
5. Work restrictions.
6. Specification and drawing conventions.

1.3 PROJECT INFORMATION

A. Project Identification: Groveland Dog Park.

1. Project Location: 222 Main Street, Pines Recreation Area, Groveland, MA 01834

B. Owner: Town of Groveland, 183 Main Street Groveland, MA 01834

1. Owner's Representative: Rebecca Oldham, ROldham@grovelandma.com

C. Landscape Architect: Copley Wolff Design Group, 10 Post Office Square, Suite 1315, Boston, MA 02109, 617-654-9000.

D. Civil Engineer: TEC, The Engineering Corp, 146 Dascomb Road, Andover, MA 01810,

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Construction of the dog park including clearing, grubbing, excavation, erosion control, gravel, pavement, sand, peastone, concrete, fencing, topsoil, drainage, metal edging, pet stations, boulders, new waterlines from new backflow

preventer, drinking fountain, site lighting, site irrigation, seeding, and coordination with appropriate utility companies.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.5 WORK BY OWNER

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

1.6 ACCESS TO SITE

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to project limit line as shown on the Drawings.
2. Driveways, Walkways and Entrances: Keep driveways, walkways, and entrances always serving premises clear and available to Owner’s employees and emergency vehicles. Do not use these areas for parking or storage of materials.

    a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.7 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to normal business working hours of 8:00 a.m. to 7:00 p.m., Monday through Friday, unless otherwise indicated.

1. Weekend Hours: 8:00 a.m. to 7:00 p.m. Saturdays with prior approval of the owner. Submit requests for weekend work a minimum of 14 days in advance of the work date.
2. Early Morning Hours: With prior approval of the Owner. Submit request for early morning work a minimum of 7 days in advance of the work date.
3. Hours for Utility Shutdowns: Restrict any activity that requires utility shutdowns to normal weekday working hours.
4. Hours for noisy activity: Restrict any activity that generates significant noises to normal weekday working hours.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Owner’s Representative not less than five days in advance of proposed utility interruption.
2. Obtain written permission from Owner’s Representative before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Owner’s Representative not less than five days in advance of proposed disruptive operations.
2. Obtain written permission from Owner’s Representative before proceeding with disruptive operations.

E. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.

1. Maintain list of approved screened personnel with Owner's Representative.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012500

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable

Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of designers and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

2. Action by Owner’s Representative: If necessary, Owner’s Representative will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Owner’s Representative will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Supplemental Instructions from Owner’s Representative for minor changes in the Work.
b. Use product specified if Owner’s Representative does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Owner’s Representative will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Owner’s Representative will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Owner’s Representative will consider requests for substitution if received within 60 days the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Owner’s Representative.

1. Conditions: Owner’s Representative will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Owner’s Representative will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Designer for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012600

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Owner’s Representative will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Owner’s Representative will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Owner’s Representative are not instructions either to stop work in progress or to execute the proposed change.
2. Within 20 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

c. Include costs of labor and supervision directly attributable to the change.
d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
e. Quotation Form: Use forms acceptable to Owner's Representative.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Designer.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Owner's Representative.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Changes Proposal Request, a Change Order shall be issued for signatures of Owner's Representative and Contractor on AIA Document G701.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:

1. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
2. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

a. Application for Payment forms with continuation sheets.
b. Submittal schedule.
c. Items required to be indicated as separate activities in Contractor's construction schedule.

2. Submit the schedule of values to Owner's Representative at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.

B. Format and Content: Use Table of Contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

    a. Project name and location.
    b. Name and address of Owner's Representative.
    c. Name and address of Contractor.
    d. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:

    a. Related Specification Section or Division.
    b. Description of the Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

        1) Labor.
        2) Materials.
        3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Table of Contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

    a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
8. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.
9. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

10. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Owner’s Representative and paid for by Owner.

    1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Submit Application for Payment to Owner’s Representative by the first day of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

E. Application for Payment Forms: Use forms provided by Owner for Applications for Payment.

F. Application for Payment Forms: Use forms acceptable to Owner’s Representative for Applications for Payment. Submit forms for approval with initial submittal of schedule of values.

G. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Owner's Representative will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

H. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

I. Transmittal: Submit signed and notarized Application for Payment to Owner's Representative, including waivers of lien and similar attachments if required.

J. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

K. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms, acceptable to Owner.

L. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
5. Products list (preliminary if not final).
6. Schedule of unit prices.
7. Submittal schedule (preliminary if not final).
8. List of Contractor's staff assignments.
9. List of Contractor's principal consultants.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Report of preconstruction conference.
13. Certificates of insurance and insurance policies.
14. Performance and payment bonds.
15. Data needed to acquire Owner's insurance.

M. Application for Payment at Substantial Completion: After Owner’s Representative issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

N. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.

4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. Requests for Information (RFIs).
4. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:

1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Owner’s Representative or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.6 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Owner’s Representative will return RFIs submitted by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Owner’s Representative.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: AIA Document G716 or software-generated form with substantially the same content as indicated above, acceptable to Designer.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Owner’s Representative will review each RFI, determine action required, and respond. Allow 7 working days for Owner’s Representative to respond to each RFI. RFIs received by Owner’s Representative after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Incomplete RFIs or inaccurately prepared RFIs.

2. Action may include a request for additional information, in which case time for response will date from time of receipt of additional information.

3. Action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Owner's Representative in writing within 10 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log bi-weekly.

1. Project name.
2. Name and address of Contractor.
3. Name and address of Owner's Representative.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date the response was received.
8. Identification of related Minor Change in the Work, and Proposal Request, as appropriate.

F. On receipt of action from Owner's Representative, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Owner's Representative within 7 days if Contractor disagrees with response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

G. PDF Document Preparation: Where PDFs are required to be submitted to Designer, prepare as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner's Representative of scheduled meeting dates and times.

2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Designer, within three days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Designer, but no later than 15 days after execution of the Agreement.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of the Owner; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Responsibilities and personnel assignments.
    b. Tentative construction schedule.
    c. Phasing.
    d. Critical work sequencing and long-lead items.
    e. Designation of key personnel and their duties.
    f. Lines of communications.
    g. Procedures for processing field decisions and Change Orders.
    h. Procedures for RFIs.
    i. Procedures for testing and inspecting.
    j. Procedures for processing Applications for Payment.
    k. Distribution of the Contract Documents.
    l. Submittal procedures.
    m. Preparation of record documents.
    n. Use of the premises.
    o. Work restrictions.
    p. Working hours.
    q. Owner's occupancy requirements.
    r. Responsibility for temporary facilities and controls.
    s. Procedures for disruptions and shutdowns.
    t. Construction waste management and recycling.
    u. Parking availability.
    v. Office, work, and storage areas.
    w. Equipment deliveries and priorities.
    x. First aid.
    y. Security.
    z. Progress cleaning.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Designer of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

    a. Contract Documents.
    b. Options.
    c. Related RFIs.
    d. Related Change Orders.
    e. Purchases.
    f. Deliveries.
    g. Submittals.
    h. Review of mockups.
    i. Possible conflicts.
    j. Compatibility requirements.
    k. Time schedules.
    l. Weather limitations.
    m. Manufacturer's written instructions.
    n. Warranty requirements.
    o. Compatibility of materials.
    p. Acceptability of substrates.
    q. Temporary facilities and controls.
    r. Space and access limitations.
    s. Regulations of authorities having jurisdiction.
    t. Testing and inspecting requirements.
    u. Installation procedures.
    v. Coordination with other work.
    w. Required performance results.
    x. Protection of adjacent work.
    y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Designer, but no later than 30 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

    a. Preparation of record documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Submittal of written warranties.
    d. Requirements for preparing operations and maintenance data.
    e. Requirements for delivery of material samples, attic stock, and spare parts.
    f. Requirements for demonstration and training.
    g. Preparation of Contractor's punch list.
    h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    i. Submittal procedures.
    j. Coordination of separate contracts.
    k. Owner's partial occupancy requirements.
    l. Installation of Owner's furniture, fixtures, and equipment.
    m. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Conduct progress meetings at monthly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

        1) Review schedule for next period.

    b. Review present and future needs of each entity present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.

6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items.
12) Field observations.
13) Status of RFIs.
14) Status of proposal requests.
15) Pending changes.
16) Status of Change Orders.
17) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

   a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's construction schedule.
3. Construction schedule updating reports.
4. Site condition reports.
5. Special reports.

B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submitting schedules and reports.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by the Owner’s Representative.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. PDF electronic file.

B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

C. Construction Schedule Updating Reports: Submit with Applications for Payment.

D. Site Condition Reports: Submit at time of discovery of differing conditions.

1.5 QUALITY ASSURANCE

A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:

1. Verify availability of qualified personnel needed to develop and update schedule.
2. Discuss constraints, including work stages and interim milestones.
3. Review delivery dates for Owner-furnished products.
4. Review schedule for work of Owner's separate contracts.
5. Review submittal requirements and procedures.
6. Review time required for review of submittals and resubmittals.
7. Review requirements for tests and inspections by independent testing and inspecting agencies.
8. Review time required for Project closeout and Owner startup procedures.
9. Review and finalize list of construction activities to be included in schedule.
10. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Time Frame: Extend schedule from date established for Notice to Proceed to date of Substantial Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 10 days, unless specifically allowed by Owner’s Representative.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for administrative procedures necessary for certification of Substantial Completion.
6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.

4. Products Ordered in Advance: Include a separate activity for each product.
5. Owner-Furnished Products: Include a separate activity for each product.
6. Work Restrictions: Show the effect of the following items on the schedule:

    a. Uninterruptible services.
    b. Seasonal variations.
    c. Environmental control.

7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

    a. Subcontract awards.
    b. Submittals.
    c. Purchases.
    d. Mockups.
    e. Fabrication.
    f. Sample testing.
    g. Deliveries.
    h. Installation.
    i. Tests and inspections.
    j. Adjusting.
    k. Curing.
    l. Building flush-out.
    m. Startup and placement into final use and operation.

8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities.

D. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.

E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and Contract Time.

F. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.

1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

C. Distribution: Distribute copies of approved schedule to Owner’s Representative, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

END OF SECTION 013200

SECTION 013300

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:

1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Designer’s responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require responsive action from Owner’s Representative. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Owner’s Representative and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Designer’s final release or approval.
    g. Scheduled date of fabrication.
    h. Scheduled dates for purchasing.
    i. Scheduled dates for installation.
    j. Activity or event number.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submit electronic submittals via email as PDF electronic files directly to Owner’s Representative.

    a. Owner’s Representative will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

    a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
    b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams showing factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:

    a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of applicable Specification Section.
    e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

    a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Owner’s Representative will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.

4. Location within room or space.
5. Submit product schedule in the following format:

    a. PDF electronic file.

F. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."

G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."

H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."

I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."

J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."

K. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."

L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Owner’s Representative, and other information specified.

M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

S. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

W. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

X. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Owner’s Representative.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 REVIEW BY OWNER'S REPRESENTATIVE

A. Action Submittals: Owner's Representative will review each submittal, make marks to indicate corrections or revisions required, and return it.

B. Informational Submittals: Owner's Representative will review each submittal and will not return it, or will return it if it does not comply with requirements.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Owner's Representative.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Owner's Representative will return without review submittals received from sources other than Contractor.

F. Submittals not required by the Contract Documents may be returned by the Owner's Representative without action.

END OF SECTION 013300

SECTION 017300

EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.
9. Correction of the Work.

B. Related Requirements:

1. Section 011000 "Summary of Work" for limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

    a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

E. Certified Surveys: Submit two copies signed by land surveyor.

F. Final Property Survey: Submit two copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Designer of locations and details of cutting and await directions from Designer before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Designer's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Owner’s Representative for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Owner’s Representative according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Owner's Representative promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Owner's Representative when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Designer.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Owner's Representative. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Owner's Representative before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately

located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Owner's Representative.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in other sections of these specifications.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 017700

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:

1. Section 017300 "Execution" for progress cleaning of Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Designer. Label with manufacturer's name and model number where applicable.

    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain signature from Owner’s Representative for receipt of submittals.

5. Submit test/adjust/balance records.
6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.

5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
6. Advise Owner of changeover in heat and other utilities.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Owner’s Representative will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner’s Representative will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Owner’s Representative, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Owner’s Representative. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Owner’s Representative will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner’s Representative will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A.

1. Include the following information at the top of each page:

a. Project name.
b. Date.
c. Name of Designer
d. Name of Contractor.
e. Page number.

2. Submit list of incomplete items in the following format:

a. PDF electronic file. Designer will return annotated file.

1.9 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Owner’s Representative for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the Table of Contents.

1. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide table of contents at beginning of document.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access.
f. Clean exposed hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited access spaces, including trenches, equipment vaults, manholes, and similar spaces.
h. Remove labels that are not permanent.
i. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
j. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
k. Clean light fixtures to function with full efficiency.
l. Leave Project clean and ready for occupancy.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating

components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

    a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

END OF SECTION 017700

Division 03 – Concrete

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Formwork for cast-in-place concrete.
2. Form accessories.
3. Form stripping.
4. Reinforcing steel for cast-in-place concrete.
5. Cast-in-place concrete footings
6. Concrete curing.

1.2 DEFINITIONS

A. Unexposed Finish: A general-use finish, with no appearance criteria, applicable to all formed concrete concealed from view after completion of construction.

B. Exposed Finish: A general use finish applicable to all formed concrete exposed to view.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's product data for the following:
1. Formwork accessories.
2. Mechanical connectors for reinforcing steel.
3. Concrete admixtures.
4. Reinforcement.
5. Grout.
6. Curing compound.
7. Bonding compound.
8. Test results: Slump, compression at 7, 14 and 28 days

B. Aggregates: Submit test reports showing compliance with specified quality and gradation.

C. Shop Drawings:
1. Reinforcement: Comply with ACI SP-66. Include bar schedules, diagrams of bent bars, arrangement of concrete reinforcement, and splices.
a. Show construction joints.
b. Include details of reinforcement at openings through concrete structures.

D. Quality Control Submittals: Submit the following information related to quality assurance requirements specified:
1. Design data: Submit proposed mix designs and test data before concrete operations begin. Identify for each mix submitted the method by which proportions have been selected.
a. For mix designs based on trial mixtures, include trial mix proportions, test result, and graphical analysis and show required average compressive strength.
b. Indicate type and quantity of admixtures proposed or required.
2. Certifications: Submit affidavits from testing agency certifying that all materials furnished under this section conform to specifications.
a. Submit four test cylinders and one slump test per ten cubic yards of concrete.
3. Certifications. Provide certification from testing agency that mechanical connectors for

reinforcing steel comply with specified requirements.
4. Delivery tickets: Submit copies of delivery tickets complying with ASTM C 94 for each load of concrete delivered to site.
   a. Include on the tickets the additional information specified in the ASTM document.
5. Cold weather concreting: Submit description of planned protective measures.
6. Hot weather concreting: Submit description of planned protective measures.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with the following documents, except where requirements of the contract documents or of governing codes and governing authorities are more stringent:
   1. ACI 301.
   2. ACI 318.
   3. CRSI Manual of Standard Practice.

B. Testing Agency Services:
   1. Contractor will engage testing agency to conduct tests and perform other services specified for quality control during construction.

C. Source of Materials: Obtain materials of each type from same source for the entire project.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver reinforcement to project site bundled and tagged with metal tags indicating bar size, lengths, and other data corresponding to information show on placement drawings.
   1. Store concrete reinforcement materials at the site to prevent damage and accumulation of dirt or rust.

1.6 PROJECT CONDITIONS

A. Cold-Weather Concreting: Comply fully with the recommendations of ACI 306.
   1. Well in advance of proposed concreting operations, advise the architect of planned protective measures including but not limited to heating of materials, heated enclosures, and insulating blankets.

B. Hot-Weather Concreting: Comply fully with the recommendations of ACI 305R.
   1. Well in advance of proposed concreting operations, advise the architect of planned protective measures including but not limited to cooling of materials before or during mixing, placement during evening to dawn hours, fogging during finishing and curing, shading, and windbreaks.

PART 2 - PRODUCTS

2.1 FORMWORK

A. Facing Materials:
   1. Unexposed finish concrete: Any standard form materials that produce structurally sound concrete.
   2. Exposed finish concrete: Materials selected to offer optimum smooth, stain-free final appearance and minimum number of joints. Provide materials with sufficient strength to resist hydrostatic head without bow or deflection in excess of allowable tolerances, and as follows:
      a. Plywood: PS-1 AB-B (Concrete Form) Plywood, Class I, Exterior Grade, mill-oiled and edge-sealed.

B. Formwork Accessories:
   1. Form coating: Form release agent that will not adversely affect concrete surfaces or prevent subsequent application of concrete coatings.
   2. Metal ties: Commercially manufactured types; cone snap ties, taper removable bolt, or other type which will leave no metal closer than 1-1/2 inches from surface of concrete when forms are removed, leaving surface.
   3. Fillets: Wood or plastic fillets for chamfered corners, in maximum lengths possible.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars: Provide deformed bars complying with the following, except where otherwise indicated:
   1. ASTM A 615, Grade 60, epoxy coated

B. Provide mechanical connections for reinforcement splices of the type indicated and capable of developing at least 125 percent of the specified yield strength of the bar when tested in tension and compression.

C. Reinforcing Accessories:
   1. Tie wire: Black annealed type, 16-1/2 gage or heavier.

2.3 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, and as follows:
   1. Type 1, except where other type is specifically permitted or required.
      a. Type 1 may be replaced by Type III (high early strength) for concrete placed during cold weather.

B. Water: Potable.

C. Aggregates:
   1. Normal weight concrete: ASTM C 33.
      a. Class 4S.
      b. Local aggregates not in compliance with ASTM C 33 but which have demonstrated capacity to produce concrete of adequate strength and durability may be used when specifically approved through normal approval process.

   2. Maximum size of coarse aggregates, whichever is least:
      a. One-fifth narrowest dimension between sides of forms.
      b. One-third of depth of slabs.
      c. Three-fourths of minimum clear distance between reinforcing bars or between bars and side of form.
      d. Columns and piers: Two-thirds of minimum clear distance between bars.

D. Admixtures - General: Admixtures which result in more than 0.1 percent of soluble chloride ions by weight of cement are prohibited.

E. Air-Entraining Admixture: ASTM C 260 and certified by manufacturer for compatibility with other mix components.
   1. Products: Provide one of the following:
      a. “Air Mix”; The Euclid Chemical Company.
      b. “Sika-Aer”; Sika Corporation.
      c. “Micro-Air”; Master Builders, Inc.
      d. “Darex AEA”; W. R. Grace & Co.
      e. “Burke 2001" or ‘Burke 2002"; The Burke Company.

F. Water-Reducing Admixture: ASTM C 494, Type A.
   1. Products: Provide one of the following:
      a. “WRDA Hycol’; W. R. Grace & Co.
      b. “Eucon WR-75"; The Euclid Chemical Company.
      c. ‘Pozzolith Normal”; Master Builders, Inc.
      d. “Plastocrete 161"; Sika corporation
      e. “Prokrete N”; Master Builders, Inc. (former Conchem product).

G. Water-Reducing, Retarding Admixture: ASTM C 494, Type D.
   1. Products: Provide on the following:
      a. “Pozzolith Retarder”; Master Builders, Inc.
      b. “Eucon Retarder 75"; The Euclid Chemical Company.
      c. “Daratard-17"; W. R. Grace & Co.
      d. “Plastiment”; Sika Corporation.
      e. “Protard”; Master Builders, Inc. (former Conchem product).

H. Water-Reducing and Accelerating Admixtures: ASTM C 494, Type E.
   1. Products: Provide one of the following:
      a. “Accelguard 80"; The Euclid Chemical Company.
      b. “Possutec 20"; Master Builders, Inc.

I. High-Range Water-Reducing Admixture (Superplasticizer): ASTM C 494, Type F or G.
   1. Products: Provide one of the following:
      a. “WRDA 19”; or ADaracem-100"; W. R. Grace & Co.
      b. “PSP Superplasticizer”; Master Builders, Inc. (former Conchem product).
      c. “A-H Super P”; Anti Hydro International, Inc.
      d. “Sikament 300” Sika Corporation.;
      e. “Eucon 37”; The Euclid Chemical Company.
      f. ‘Rheobuild’; Master Builders, Inc.

J. Non-Corrosive, Non-Chloride Set Accelerating Admixture ASTM C494, Type C.
   1. Products: Provide the following:
      a. “Polarset”; W. R. Grace Co.

2.4 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Nonshrink Grout: ASTM C 1107.
   1. Type: Provide nonmetallic type only.

B. Burlap: AASHTO M 182, Class 2 jute or kenaf cloth.

C. Moisture-Retaining Cover: ASTM C 171, and as follows:
   1. Curing paper.
   2. Polyethylene film
   3. White burlap-polyethylene sheeting.

D. Liquid Curing Compounds:
   1. Manufacturers: Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
      a. Master Builders, Inc.
      b. The Euclid Chemical Company.
      c. A. C. Horn, Inc.
      d. W. R. Meadows, Inc.
      e. Sonneborn Building Products Division/ChemRex, Inc.
      f. L & M Construction Chemicals, Inc.
   2. Material - curing compounds: Comply with ASTM C 309, Type 1.

a. Non-yellowing formulation where subject to ultraviolet light.
3. Solvents: Water-based products where used on interior surfaces.

E. Bonding Compound: Non-redispersable acrylic bonding admixture, ASTM C 1059, Type II, unless otherwise noted on the drawings.

F. Expansion Joint Filler:
1. Nonextruding bituminous type: ASTM D 1751.

G. Expansion Joint Dowels:
1. Stainless Steel Dowels - Grade 316.

2.5 CONCRETE MIX DESIGN

A. Review: Do not begin concrete operations until proposed mix has been reviewed by the landscape architect.

B. Proportioning of Normal Weight Concrete: Comply with recommendations of ACI 211.1.

C. Required Average Strength: Establish the required average strength of the design mix on the basis or trial minutes as specified in ACI 301 and proportion mixes accordingly. Employ an independent testing agency acceptable to the architect for preparing and reporting proposed mix design.

D. Specified Compressive Strength at 28 Days for Locations as Indicated on Drawings:
1. All concrete: 4000 psi.

E. Slump limit: 3 inches +/-1”

F. Maximum Water-Cementitious Material Ratio: 0.50

G. Admixtures:
1. Air-entraining admixture: Use in mixes for exterior exposed concrete unless otherwise specifically indicated. Add at rate to achieve total air content in accordance with Table 1.4.3 of ACI 201.2.
2. Water-reducing admixture: Add as required for placement and workability.
3. Water-reducing and retarding admixture: Add as required in concrete mixes to be placed at ambient temperatures above 90 degrees F.
4. Water-reducing and accelerating admixture or Non-Corrosive, Non-Chloride Set Accelerating Admixture: Add as required in concrete mixes to be placed at ambient temperatures below 50 degrees F.
5. High-range water-reducing admixture (superplasticizer): Add as required for placement and workability.
6. Do not use admixtures not specified or approved.

H. Mix adjustments: Provided that no additional expense to owner is involved, contractor may submit for architect’s approval requests for adjustment to approved concrete mixes when circumstances such as changed project conditions, weather, or unfavorable test results occur. Employ an independent testing agency acceptable to the landscape architect for preparing and reporting on mix design and slump and compression testing.

2.6 CONTROL OF MIX IN THE FIELD

A. Slump: A tolerance of up to 1 inch above approved design mix slump will be permitted for 1 batch in 5 consecutive batches tested. Concrete of lower slump than that specified may be used, provided proper placing and consolidation is obtained.

B. Total Air Content: A tolerance of plus or minus 1-1/2 percent of approved design mix air content will be allowed for field measurements.

C. Do not use batches that exceed tolerances.

2.7 CONCRETE MIXING

A. Transit Mixers: Mix concrete materials in transit mixers, complying with requirements of ASTM C 94.
   1. At ambient temperatures of 85 to 90 degrees F, reduce mixing and delivery time to 75 minutes.
   2. At ambient temperatures above 90 degrees F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 CONCRETE FORM PREPARATION

A. General: Comply with requirements of ACI 301 for formwork, and as herein specified. The contractor is responsible for design, engineering, and construction of formwork, and for its timely removal.

B. Earth Forms: Earth forms are not permitted.

C. Design: Design and fabricate forms for easy removal, without impact, shock, or damage to concrete surfaces or other portions of the work. Design to support all applied loads until concrete is adequately cured, within allowable tolerances and deflection limits.

D. Construction: Construct and brace formwork to accurately achieve end results required by contract documents, with all elements properly located and free of distortion. Provide for necessary openings, inserts, anchorages, and other features shown or otherwise required.
   1. Joints: Minimize form joints and make watertight to prevent leakage of concrete.
      a. Align joints symmetrically at exposed conditions.
   2. Chamfers: Provide chamfered edges and corners at exposed locations, unless specifically indicated otherwise on the drawings.

E. Tolerances for Formed Surfaces: Comply with minimum tolerances established in ACI 117 unless more stringent requirements are indicated on the drawings.

F. Release Agent: Provide either form materials with factory-applied nonabsorptive liner or field-applied form coating. If field-applied coating is employed, thoroughly clean and recondition formwork and reapply coating before each use. Rust on form surfaces is unacceptable. Apply release agent to forms before erecting forms.

3.2 PLACING REINFORCEMENT

A. General: Comply with requirements of ACI 301 and as herein specified.

B. Preparation: Clean reinforcement of loose rust and mill scale, soil, and other materials which adversely affect bond with concrete.

C. Placement: Place reinforcement to achieve not less than minimum concrete coverages required for protection. Accurately position, support, and secure reinforcement against displacement. Provide Class B tension lap splices complying with ACI 318 unless

otherwise indicated. Do not field-bend partially embedded bars unless otherwise indicated or approved.

1. Use approved tie wire, as required. Set wire ties to avoid contact with or penetration of exposed concrete surfaces. Tack welding of reinforcing is not permitted.

D. Welding: Welding of reinforcement is not permitted.

3.3 JOINT CONSTRUCTION

A. Construction Joints: Locate and install construction joints as indicated on drawings. If construction joints are not indicated, locate in manner which will not impair strength and will have least impact on appearance, as acceptable to the architect.
   1. Keyways: Provide keyways not less than 1-1/2 inches deep.
   2. Reinforcement: Continue reinforcement across and perpendicular to construction joints unless details specifically indicate otherwise.

B. Isolation Joints: Construct isolation joints at points of contact with vertical components, such as foundations walls and column pedestals. Install expansion joint filler to full concrete depth. Recess top edge of filler 1/8 inch where joints are unsealed.

3.4 INSTALLATION OF EMBEDDED ITEMS

A. General: Set anchorage devices and other items required for other work connected to or supported by cast-in-place concrete, using templates, setting drawings, and instructions from suppliers of items to be embedded.
   1. Edge Forms and Screeds: Set edge forms and intermediate screeds as necessary to achieve final elevations indicated for finished slab surfaces.

3.5 CONCRETE PLACEMENT

A. Preparation: Provide materials necessary to ensure adequate protection of concrete during inclement weather before beginning installation of concrete.

B. Inspection: Before beginning concrete placement, inspect formwork, reinforcing steel, and items to be embedded, verifying that all such work has been completed.
   1. Wood forms: Moisten immediately before placing concrete in locations where form coatings are not used.

C. Placement - General: Comply with requirements of ACI 304 and as follows:
   1. Schedule continuous placement of concrete to prevent the formation of cold joints.
   2. Provide construction joints if concrete for a particular element or component cannot be placed in a continuous operation.
   3. Deposit concrete as close as possible to its final location, to avoid segregation.

D. Placement in Forms: Limit horizontal layers to depths which can be properly consolidated, but in no event greater than 24 inches.
   1. Consolidate concrete by means of mechanical vibrators, inserted vertically in freshly placed concrete in a systematic pattern at close intervals. Penetrate previously placed concrete to ensure that separate concrete layers are knitted together.
   2. Vibrate concrete sufficiently to achieve consistent consolidation without segregation of coarse aggregates.
   3. Do not use vibrators to move concrete laterally.

E. Cold Weather Placement: Comply with recommendations of ACI 306 when air temperatures are expected to drop below 40 degrees F either during concrete placement operations or before concrete has cured.

1. Do not use frozen or ice-laden materials.
2. Do not place concrete on frozen substrates.

F. Hot Weather Placement: Comply with recommendations of ACI 305R when ambient temperature before, during, or after concrete placement is expected to exceed 90 degrees F or when combinations of high air temperature, low relative humidity, and wind speed are such that the rate of evaporation from freshly poured concrete would otherwise exceed 0.2 pounds per square foot per hour.
1. Do not add water to approved concrete mixes under hot weather conditions.
2. Provide mixing water at lowest feasible temperature and provide adequate protection of poured concrete to reduce rate of evaporation.
3. Use fog nozzle to cool formwork and reinforcing steel immediately prior to placing concrete.

3.6 FINISHING FORMED SURFACES

A. Repairs, General: No patching or parging of new concrete work is allowed. Landscape Architect shall inspect finished surface for defects and determine whether work is acceptable or to be rejected and repoured.

B. Unexposed Form Finish: Repair tie holes and patch defective areas. Rub down or chip off fins or other raised areas exceeding 1/4-inch height.

3.8 CONCRETE CURING AND PROTECTION

A. General:
1. Prevent premature drying of freshly placed concrete and protect from excessively cold and 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.

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 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 48 hours by uninterrupted use of any of the following:
   a. Water ponding.
   b. Water-fog spray.
   c. Saturated burlap: Provide 4-inch minimum overlap at joints.
3.. Begin final curing procedures immediately following initial curing and before concrete has dried.
   a. Water ponding.
   b. Water-fog spray.
   c. Saturated burlap: Provide 4-inch minimum overlap at joints.

d. Moisture-retaining sheet.
e. Liquid curing compounds.
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 in intimate contact with concrete surface. Secure to avoid displacement.
   1. Extend covering past slab edges at least twice the thickness of slab.
   2. Do not use plastic sheeting on surfaces which will be exposed to view when in service.
g. 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.
h. Use curing compounds only in locations permitted or required. Do not apply to surfaces to receive other finishes, coatings, or coverings.

4. 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.

3.9 REMOVAL OF FORMS AND SUPPORTS

A. Non-Load-Bearing Formwork: Provided that concrete has hardened sufficiently that it will not be damaged, forms not actually supporting weight of concrete or weight of soffit forms may be removed after concrete has cured at not less than 50 degrees F for 24 hours. Maintain curing and protection operations after form removal.

3.10 MISCELLANEOUS CONCRETE ITEMS

A. Fill-in: Fill in holes and openings left in concrete structures for passage or work by other trades after such work is in place. Place such fill-in concrete to blend with existing construction, using same mix and curing methods.

3.11 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. Composite Sampling and Making and Curing of Specimens: ASTM C 172 and ASTM C 31.

   1. Take samples at point of discharge.

B. Slump: ASTM C 143. One test per strength test and additional tests if concrete consistency changes.
   1. Modify sampling to comply with ASTM C 94.
   2. Maximum slump 3” +/-1”

C. Air Content of Normal Weight Concrete: ASTM C 173 or ASTM C 231. One test per strength test performed on air-entrained concrete.

D. Concrete Temperature:
   1. Test hourly when air temperature is 40 degrees F or below.
   2. Test hourly when air temperature is 90 degrees F or above.
   3. Test each time a set of strength test specimens is made.

E. Compressive Strength Tests: ASTM C 39.
   1. Compression test specimens: Mold and cure one set of 4 standard cylinders for each compressive strength test required.
   2. Testing for acceptance of potential strength of as-delivered concrete:
      a. Obtain samples on a statistically sound, random basis.
      b. Minimum frequency:
         1. One set per 10 cubic yards or fraction thereof for each days pour.
         2. When less than 5 cubic yards is placed in one day, the architect or engineer may, at architect's or engineer's option, waive laboratory testing of specimens if adequate evidence of satisfactory strength is provided. (Molding and curing of these specimens are not waived.)
         3. When the above testing frequency would provide fewer than 5 strength tests for a given class of concrete during the project, conduct testing from not less than 5 randomly selected batches, or from each batch if fewer than 5.
      c. Test one specimen per set at 7 and 14 days for information unless an earlier age is required.
      d. Test 1 specimens per set for acceptance of strength potential; test at 28 days unless other age is specified.
      e. Retain one specimen from each set for later testing, if required.
      f. Strength potential of as-delivered concrete will be considered acceptable if all the following criteria are met:
         1. No individual test result falls below specified compressive strength by more than 500 psi.
         2. Not more than 10 percent of individual test results fall below specified compressive strength.
         3. Average of any 3 consecutive strength test results equals or exceeds specified compressive strength.
      g. Evaluate construction and curing procedures and implement corrective action when strength results for field-cured specimens are less than 85 percent of test values for companion laboratory-cured specimens.

F. Test Results: Testing agency shall report test results in writing to architect, structural engineer, and contractor within 24 hours of test.
   1. Test reports shall contain the following data:
      a. Project name, number, and other identification.
      b. Name of concrete testing agency.
      c. Date and time of sampling.
      d. Concrete type and class.
      e. Location of concrete batch in the completed work.
      f. All information required by respective ASTM test methods.

   2. Nondestructive testing devices such as impact hammer or sonoscope may be used at architect's option for assistance in determining probable concrete strength at various locations or for selecting areas to be cored, but such tests shall not be the sole basis for acceptance or rejection.

   3. The testing agency shall make additional tests of in-place concrete as directed by the architect when test results indicate that specified strength and other concrete characteristics have not been attained.
      a. Testing agency may conduct tests of cored cylinders complying with ASTM C 42, or tests as directed.
      b. Cost of additional testing shall be borne by the contractor when unacceptable concrete has been verified

END OF SECTION 033000

Division 22 – Plumbing

SECTION 221113

FACILITY WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes water-distribution piping and related components for water service.

B. Utility-furnished products include water meters (provided by the Town of Groveland, if required) that will be furnished to the site, ready for installation.

1.3 DEFINITIONS

A. EPDM: Ethylene propylene diene terpolymer rubber.

B. PVC: Polyvinyl chloride plastic.

C. CLDI: Concrete lined ductile iron pipe.

D. CTS: Copper tube size pipe.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. NSF Compliance:
1. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of water-distribution service without Architect's written permission.

1.9 COORDINATION

A. Coordinate connection to water main with municipality or utility company.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Soft Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L, water tube, annealed temper.

1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
2. Copper, Pressure-Seal Fittings:

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Viega; Plumbing & Heating Systems.

c. NPS 2 and Smaller: Wrought-copper fitting with EPDM O-ring seal in each end.
d. NPS 2-1/2 to NPS 4: Bronze fitting with stainless-steel grip ring and EPDM O-ring seal in each end.

B. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.

C. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.2 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.3 SPECIAL PIPE FITTINGS

A. Ductile-Iron Rigid Expansion Joints:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. EBAA Iron, Inc.
b. U.S. Pipe and Foundry Company.

3. Description: Three-piece, ductile-iron assembly consisting of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

    a. Pressure Rating: 250 psig minimum.

B. Ductile-Iron Flexible Expansion Joints:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. EBAA Iron, Inc.
    b. Hays Fluid Controls; a division of ROMAC Industries Inc.
    c. Star Pipe Products.

3. Description: Compound, ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections. Assemble components for offset and expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

    a. Pressure Rating: 250 psig minimum.

C. Ductile-Iron Deflection Fittings:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. EBAA Iron, Inc.

3. Description: Compound, ductile-iron coupling fitting with sleeve and 1 or 2 flexing sections for up to 15-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

    a. Pressure Rating: 250 psig minimum.

2.4 GATE VALVES

A. AWWA, Cast-Iron Gate Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. East Jordan Iron Works, Inc.

4. Nonrising-Stem, Resilient-Seated Gate Valves:

   a. Description: Ductile-iron body and bonnet; with Ductile-iron gate, resilient seats, bronze stem, and stem nut.

      1) Standard: AWWA C509.
      2) Minimum Pressure Rating: 200 psig.
      3) End Connections: Mechanical joint.
      4) Interior Coating: Complying with AWWA C550.

2.5 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. East Jordan Iron Works, Inc.

4. Description: Sleeve and valve compatible with drilling machine.

   a. Standard: MSS SP-60.
   b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
   c. Valve: AWWA, cast-iron, nonrising-stem, resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.

B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches in diameter.

1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

C. Indicator Posts: UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

2.6 PLUG VALVES

A. Plug Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. DeZURIK/Copes-Vulcan; a unit of SPX Corporation.
    b. Homestead Valve; a division of Olson Technologies, Inc.
    c. Milliken Valve Company.
    d. McWane, Inc.; M & H Valve Company Div.
    e. Pratt, Henry Company.
    f. Val-Matic Valve & Manufacturing Corp.

4. Description: Resilient-seated eccentric.

    a. Standard: MSS SP-108.
    b. Body: Cast iron.
    c. Pressure Rating: 175-psig minimum CWP.
    d. Seat Material: Suitable for potable-water service.

2.7 WATER METERS

A. Water meters will be furnished by Town of Groveland or local utility company.

2.8 CTS Water Service Piping

A. All CTS Water Service Piping shall be ADS PolyFlex Potable Water Service Pipe or approved equal.

B. Piping shall meet the requirements of ASTM D2737, AWWA C901 and NSF/ANSI Standards 14 and 61. Pipe dimensions shall meet copper tubing size (CTS) standards.

C. Tube material shall be high-density polyethylene conforming to the minimum requirements of cell classification 445574C or 445574E as defined and described in ASTM D3350. The resin shall have a material designation code of PE4710 by the Plastic Pipe Institute.

D. Active chlorine content of disinfecting solutions shall not exceed 12%. All disinfecting solution must be flushed from all lines within the system. Industry accepted procedures should be followed for both new and repaired potable water lines.

E. Pipe properties shall meet the following:

Pipe properties

Nominal Diameter in (mm)	¾" (19)	1" (25)	1¼" (32)	1½" (38)	2" (50)
Outside diameter in (mm)	0.875 ±0.004 (22.2 ±0.10)	1.125 ±0.005 (28.6 ±0.13)	1.375 ±0.005 (34.9 ±0.13)	1.625 ±0.006 (41.3 ±0.15)	2.125 ±0.006 (54.0 ±0.51)
Wall Thickness in (mm)	0.097 +0.010 (2.5 +0.25)	0.125 +0.012 (3.2 +0.30)	0.153 +0.015 (3.9 +0.38	0.181 +0.018 (4.6 +0.46)	0.236 +0.024 (6.0 +0.61)
Pressure rating @ 73° F psi (kPa)	250 (1724)	250 (1724)	250 (1724)	250 (1724)	250 (1724)
Weight gm/ft (gm/m)	46 ±2 (151 ±7)	78 ±3 (256 ±10)	125 ±4 (410 ±13)	162 ±4 (531 ±13)	275 ±5 (902 ±16)

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.

C. Do not use flanges or unions for underground piping.

D. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

E. Underground water-service piping NPS 3/4 to NPS 3 shall be the following:

1. Soft copper tube, ASTM B 88, Type L; copper, pressure-seal fittings, and pressure-sealed joints.

F. Underground Fire-Service-Main Piping NPS 4 to NPS 12 shall be the following:

1. Ductile-iron, mechanical-joint pipe; ductile iron, mechanical-joint fittings, and pressure-sealed joints.

3.3 VALVE APPLICATIONS

A. General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.

B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
1. Relief Valves: Use for water-service piping in vaults and aboveground.

3.4 PIPING INSTALLATION

A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.

B. Make connections larger than NPS 2 with tapping machine according to the following:

1. Install tapping sleeve and tapping valve according to MSS SP-60.
2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.

4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.

C. Make connections NPS 2 and smaller with drilling machine according to the following:

1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
4. Install corporation valves into service-saddle assemblies.
5. Install manifold for multiple taps in water main.
6. Install curb valve in water-service piping with head pointing up and with service box.

D. Comply with NFPA 24 for fire-service-main piping materials and installation.
1. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

E. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

F. Bury piping with depth of cover over top at least 60 inches.

G. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.

1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.

H. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.5 JOINT CONSTRUCTION

A. Make pipe joints according to the following:

1. Copper-Tubing, Pressure-Sealed Joints: Use proprietary crimping tool and procedure recommended by copper, pressure-seal-fitting manufacturer.
2. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
3. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.

3.6 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:

1. Concrete thrust blocks.
2. Locking mechanical joints.
3. Set-screw mechanical retainer glands.
4. Bolted flanged joints.
5. Pipe clamps and tie rods.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
2. Fire-Service-Main Piping: According to NFPA 24.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.7 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.

C. MSS Valves: Install as component of connected piping system.

D. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

3.8 WATER METER INSTALLATION

A. Install water meters, piping, and specialties according to utility company's written instructions.

3.9 ROUGHING-IN FOR WATER METERS

A. Rough-in piping and specialties for water meter installation according to utility company's written instructions.

3.10 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.

B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.

C. Do not install bypass piping around backflow preventers.

3.11 FIRE HYDRANT INSTALLATION

A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.

3.12 CONNECTIONS

A. Connect water-distribution piping to existing water main.

B. Piping installation requirements are specified in other Division 22 sections. Drawings indicate general arrangement of piping, fittings, and specialties.

3.13 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.

1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

C. Prepare reports of testing activities.

3.14 IDENTIFICATION

A. Install continuous underground warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Section 312000 "Earth Moving."

END OF SECTION 221113

Division 31 – Earthwork

SECTION 311000

SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, and removing site utilities.
7. Temporary erosion- and sedimentation-control measures.

1.3 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

E. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and indicated on Drawings.

F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or videotape.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

D. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

E. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

F. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Erection of sheds or structures.

4. Impoundment of water.
5. Excavation or other digging unless otherwise indicated.
6. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

I. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Flag each tree trunk at 54 inches above the ground.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

A. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

3.4 EXISTING UTILITIES

A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.
2. Owner will arrange to shut off indicated utilities when requested by Contractor.

C. Locate, identify, and disconnect utilities indicated to be abandoned in place.

D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than ten days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

E. Excavate for and remove underground utilities indicated to be removed.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
3. Use only hand methods for grubbing within protection zones.
4. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depths encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
1. The maximum side slope of a stockpile is 1:1.
2. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

SECTION 312500

EROSION CONTROL

PART 1 GENERAL

1.1 SUMMARY

A. Standard Specifications

1. Massachusetts Department of Transportation “Standard Specifications for Road and Bridge Construction”, latest edition

2. All Work shall be in compliance with the Massachusetts Stormwater Handbook.

B. Scope of Work

1. Provide such erosion control measures as may be necessary to correct conditions that develop prior to the completion of permanent erosion control devices or as required to control erosion that occurs during normal construction operations.

2. Construction operations shall comply with all federal, state and local Regulations pertaining to erosion control.

3. Prior to commencement of construction activities, meet with the Engineer and approval agency to discuss erosion control requirements and develop a mutual understanding relative to details of erosion control.

PART 2 PRODUCTS

2.1 MATERIALS

A. Silt Sock: Sediment control used for perimeter control of sediment and soluble pollutants in storm runoff shall meet Filtrexx Material Specifications or approved equal and use certified Filtrexx Filter Media or approved equal.

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

C. Mulches: Compost, manure, corn stalks, gravel, crushed stone, loose hay, straw, peat moss, pine straw or needles, sawdust, wood chips, wood excelsior, or wood fiber cellulose.

D. Mats and Nettings

1. Jute matting shall be of open weave, single jute yarn averaging 130 pounds per spindle of 14,400 yards. The yarn shall be of loosely twisted construction, not varying the thickness by more than 1/2 its normal diameter. The woven material shall be 48 inches wide, plus or minus one 1 inch, and with approximately 78 warp ends per width of cloth and 41 weft ends per linear yard. The woven material shall weigh 1.22 pounds per linear yard with a tolerance of plus or minus 5 percent.

2. Excelsior matting shall be wood excelsior, at least 35 inches in width, weighing 0.8 pounds per square yard plus or minus 5 percent. The excelsior material shall be covered with a netting on one side to facilitate handling and to increase strength.

3. Staples shall be number 11 (or heavier) plain iron wire, made from lengths of at least 12 inches each.

E. Seed

1. See landscape plans.

2. Equivalent seed mixture may be used as approved by the Owner's Representative based on its suitability for use in controlling erosion of the various soil types and slopes.

3. If the seeding fails to grow, it shall be re-established as required to provide adequate erosion control.

PART 3 EXECUTION

3.1 SILT SOCK

A. Place and maintain staked silt sock along the entire length of the proposed construction where shown on the Drawings or required by permit.

B. Install as follows:

1. Sediment control should be installed parallel to the base of the slope or other disturbed area.

2. Stakes shall be installed through the middle of the silt sock on 10 ft centers, using 2 inch by 2 inch by 3 feet wooden stakes. In the event staking is not possible, (i.e. when used on pavement) heavy concrete blocks shall be used behind the silt sock to help stabilize during rainfall/runoff events.

3. Staking depth for sand and silt loam soils shall be 12 inches and 8 inches for clay soils.

4. Loose compost may be backfilled along the upslope side of the silt sock, filling the seam between the soil surface and the device, improving filtration and sediment retention.

C. Silt sock barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. They shall be repaired if there are any signs of undercutting at the center or edges, or impounding of large volumes of water behind them, sediment barriers should be replaced with a temporary check dam.

D. Should the fabric on a silt sock barrier decompose or become ineffective prior to the end of the expected usable life and the barrier still is necessary, the fabric shall be replaced promptly.

E. The silt sock filter media and remaining sediment deposits remaining in place after the silt sock barrier is no longer required shall be dressed to conform to the existing grade and restored.

3.2 MULCH

A. Mulching shall be installed as part of phased construction to serve as a ground cover for the time period of November through March.

B. Mulching shall be done immediately after each area has been properly prepared. When seed for erosion control is sown prior to placing the mulch, the mulch shall be placed on the seeded areas within 24 hours after seeding. Hay that has been thoroughly fluffed shall be applied at approximately, three (3) tons per acre unless ordered. Blowing chopped mulch will be permitted when authorized. Authorization will be given when it can be determined

that the mulch fibers will be of such length and applied in such a manner that there will be a minimum amount of matting that would retard the growth of plants. Hay mulch should cover the ground enough to shade it, but the mulch should not be so thick that a person standing cannot see ground through the mulch. Matted mulch or bunches shall be removed or otherwise taken care of.

C. In order to prevent its being blown away, after the mulch has been spread to the required depth, a light covering of loose branches, a system of pegs and strings, or other approved anchoring method shall be employed. Unless otherwise ordered, such means of control shall be removed prior to the acceptance of the Project.

D. All baling wire or rope, such as that used in the shipment of mulch shall be disposed of outside the limits of the Project in approved areas.

3.3 MATTING

A. Surfaces of ditches and slopes to receive matting shall conform to the grades and cross sections shown on the plans and shall be finished to a smooth and even condition with all debris, roots, stones, and lumps raked out and removed. The soil surface shall be sufficiently loose to permit bedding of the matting. Unless otherwise directed, seed ordered shall be applied prior to placement of the matting.

B. Jute

1. Strips of jute matting shall be placed lengthwise in the direction of the flow of water. Where strips are laid parallel or meet as in a tee, they shall overlap at least four (4) inches. Ends shall overlap at least six (6) inches, shingle fashion. In addition, the upslope end of each strip of the matting shall be turned down and buried to a depth of not less than six (6) inches with the soil firmly tamped against it. The Owner's Representative may require that any other edge exposed to more than normal flow of water be buried in a similar manner.

C. Check slots, built at right angles to the direction of the flow of water, shall be placed so that one check slot or one end occurs within each 50 feet of length of slope. Check slots shall be constructed by placing a tight fold of the matting at least six (6) inches vertically into the ground. These shall be tamped the same as the upslope ends.

3.4 SEED FOR EROSION CONTROL

A. Seeding, when required, shall be performed as ordered by the Engineer.

B. Areas to be left temporarily and which will be re-graded or otherwise disturbed later during construction may be ordered to be seeded to obtain temporary control. The seed shall be sown at the rate indicated on the Drawings.

3.5 MAINTENANCE

A. If any staples become loosened or raised, or if any matting becomes loose, torn, or undermined, satisfactory repairs shall be made immediately.

B. Hay mulch that blows or washes away shall be replaced immediately.

END OF SECTION 312500

SECTION 312539

UNDERGROUND WARNING TAPE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes

1. Underground Warning Tape

1.2 SUBMITTALS

A. Shop Drawing Submittals

1. Product Data

PART 2 - PRODUCTS

2.1 MATERIALS

A. All metallic warning tape for underground piping shall be polyethylene tape with metallic core for easy detection and location of piping with a metal detector.

B. The tape shall be 6-inches wide.

C. The tape shall be as manufactured by Seton Name Plate Corp., New Haven, CT; Presco Detectable Underground Warning Tape, Sherman, Texas; Blackburn Manufacturing, Neligh, NE; Mercotape, Hachensach, NJ; or equal.

D. The warning tape shall be heavy gauge 0.004-inch polyethylene and shall be resistant to acids, alkaline and other soil components. It shall be highly visible in the following colors with the associated phrases stamped in black letters and repeated at a maximum interval of 40 inches.

Type of Utility	Color	Warning Message
Water	Blue	CAUTION – WATER LINE BURIED BELOW
Electric	Red	CAUTION – ELECTRIC LINE BURIED BELOW

E. The tape shall be of the type specifically manufactured for making and location utilities.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All buried pipe and fitting shall be installed with metallic-lined underground warning tape located no more than 24 inches below final grade to allow detection by a metal detector.

END OF SECTION

Division 32 – Exterior Improvements

SECTION 321216

ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Hot-mix asphalt paving.
2. Pavement marking paint.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
2. Job-Mix Designs: For each job mix proposed for the Work.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each paving material, from manufacturer

B. Material Test Reports: For each paving material, by a qualified testing agency.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Massachusetts Department of Transportation for asphalt paving work.

1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D 692/D 692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

C. Fine Aggregate: AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.

1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

A. Asphalt Binder: AASHTO M 320.

B. Asphalt Cement: ASTM D 3381/D 3381M for viscosity-graded material.

C. Emulsified Asphalt Prime Coat: Must comply with MassDOT requirements.

D. Tack Coat: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

E. Water: Potable.

F. Undersealing Asphalt: ASTM D 3141/D 3141M; pumping consistency.

2.3 AUXILIARY MATERIALS

A. Sand: AASHTO M 29, Grade No. 2 or No. 3.

B. Joint Sealant: AASHTO M 324, Type II or III, hot-applied, single-component, polymer-modified bituminous sealant.

C. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248; colors complying with FS TT-P-1952.

1. Color: As indicated on plans.

2.4 MIXES

A. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Provide mixes complying with composition, grading, and tolerance requirements in ASTM D 3515 for the following nominal, maximum aggregate sizes:

a. Base Course: ½ inch.
b. Surface Course: ½ inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.

3.3 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Emulsified Asphalt Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. per inch depth. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.

2. Protect primed substrate from damage until ready to receive paving.

C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd..

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.4 PLACING HOT-MIX ASPHALT

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
2. Place hot-mix asphalt surface course in single lift.
3. Spread mix at a minimum temperature of 250 deg F.
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches from strip to strip to ensure proper compaction of mix along longitudinal joints.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.5 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
3. Offset transverse joints, in successive courses, a minimum of 12 inches.
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.6 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 96 percent of reference laboratory density according to AASHTO T 245, but not less than 94 percent or greater than 100 percent.
2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent or greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.7 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch.
2. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch.
2. Surface Course: 1/8 inch.
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.8 WASTE HANDLING

A. General: Handle asphalt-paving waste according to approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."

END OF SECTION 321216

SECTION 321313

LANDSCAPE CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section includes the following:

1. Concrete paving;
2. Concrete pads for site furnishings;

B. Related Sections:

1. Section 32 90 02 Landscape Grading for subgrade preparation, grading and subbase courses.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured material and product specified.

B. Design Mixes: For each concrete mix, include alternate mix designs when characteristics of materials, project conditions, weather, test results or other circumstances warrant adjustments.

C. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements.

1. Cementitious materials and aggregates
2. Admixtures
3. Curing compounds
4. Bonding agent or adhesive
5. Joint fillers

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performances.

B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94b requirements for production and equipment.

C. Source Limitations: Obtain each type of class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups of full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.
2. Build mockups of concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Owner's Representative and not less than 96 inches by 96 inches.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner's Representative specifically approves such deviations in writing.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field-Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

F. Testing Agency Services:

1. Contractor will engage testing agency to conduct tests and perform other services specified for quality control during construction.

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal framed plywood, or other approved panel type materials to provide full depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves of a radius 100 feet or less.

B. Form Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 REINFORCEMENT

A. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
B. Epoxy-Coated, Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60, plain-steel bars.

C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.3 CONCRETE MATERIALS

A. General: As specified in Section 03300 – Cast-In-Place Concrete. Use the same brand and type of cementitious material from the same manufacturer through out the project.

B. Water: ASTM C 94

2.4 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.

B. Air –Entraining Admixture: ASTM C 260

C. Water-Reducing Admixture: ASTM C 494, Type A

D. High Range, Water Reducing Admixture: ASTM C 494, TYPE F

E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E

F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.5 CURING MATERIALS

A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

B. Water: Potable.

2.6 RELATED MATERIALS

A. Expansion and Isolation Joint Filler Strips: flexible foam type, conforming to ASTM D545, ASTM D5249 and ASTM D7174 standards and as manufactured by W.R. Meadows inc., or Approved Equal. All flexible foam type expansion joints shall be accompanied and installed with a “snap cap”.

1. Premolded filler shall be one piece and full depth and width of the joint, leaving a sealant recess as indicated. Use of multiple pieces of lesser dimensions to make up required depth and width of joint will not be permitted.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Elastomeric Sealant Standard: Comply with ASTM C920 and other requirements indicated for each liquid-applied chemically curing sealant in the Elastomeric Joint-Sealant Schedule at the end of Part 3, including those referencing ASTM C920 classifications for type, grade, class, and uses.

D. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

E. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.

F. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

2.7 CONCRETE MIXES

A. Prepare design mixes. Proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

B. Proportion mixes to provide concrete with the following properties:

1. Compressive Strength (28 Days): 4000 psi
2. Maximum Water-Cementitious Material Ratio: 0.50
3. Slump Limit: 3 inches +/- 1”

C. Add air-entraining admixture at manufacturer’s prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus or minus 1.5 percent:

1. Air Content: 6.0 percent for 1-inch maximum aggregate.

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94 and ASTM C 1116:

1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1 ½ hours to 75 minutes; when air temperature is above 90 deg F reduce mixing time and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 PREPARATION

A. Proof roll prepared subbase to check for unstable and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Set brace and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.3 JOINTS

A. General: Construct construction, isolation and contraction joints and tool edging true to line with faces perpendicular to surface plane of concrete. Construct traverse joints at right angles to centerline, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

1. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of pavement strips unless otherwise indicated.
2. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 20 feet, unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filer less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required lace or clip joint-filler sections together.
6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
7. Joint Filler: Self-leveling sealer that matches color of the concrete. Provide color swatches for initial selection and color sample for final approval.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

    a. Tolerance: Ensure that sawed joints are within 3 inches either way from centers of dowels.

2. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Eliminate edging-tool marks on concrete surfaces.

1. Radius: 1/4 inch (6 mm).
2. Tool Joint: see walk detail.

3.4 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow ice, or frost from subbase surface before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.

D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.

E. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

F. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

G. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations.

H. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

I. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.5 CONCRETE FINISHING

A. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared, and the concrete surface has stiffened to permit operations. Float surface with power driven floats, or by hand floating is area is small or inaccessible to power units. Float surface to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Surface Finish: Medium Broom Finish

B. Final Tooling: Tool edges of paving and curbs formed in fresh concrete with jointing tool as detailed and with the following radius.

1. Radius: ¼ inch

3.6 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

a. Water.
b. Continuous water-fog spray.
c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3.7 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/16 inch
2. Thickness: Plus 3/8 inch, minus ¼ inch
3. Contraction Joint Depth: Plus ¼ inch, no minus
4. Joint Width: Plus 1/8 inch, no minus

3.8 REPAIRS AND PROTECTION

B. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.

C. Drill test cores where directed by Owner's Representative when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

D. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

E. Contractor shall provide surveillance for all poured-in-place concrete pavements until concrete has set firmly to prevent unwarranted markings of the concrete surface. Unauthorized marking or graffiti in the finished surfaces shall be cause for rejection, and replacement by the Contractor at no additional cost.

F. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

3.9 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. Composite Sampling and Making and Curing of Specimens: ASTM C 172 and ASTM C 31.

1. Take samples at point of discharge.

B. Slump: ASTM C 143. One test per strength test and additional tests if concrete consistency changes.

1. Modify sampling to comply with ASTM C 94.

C. Air Content of Normal Weight Concrete: ASTM C 173 or ASTM C 231. One test per strength test performed on air-entrained concrete.

D. Concrete Temperature:

1. Test hourly when air temperature is 40 degrees F or below.
2. Test hourly when air temperature is 90 degrees F or above.
3. Test each time a set of strength test specimens is made.

E. Compressive Strength Tests: ASTM C 39.

1. Compression test specimens: Mold and cure one set of 4 standard cylinders for each compressive strength test required.

2. Testing for acceptance of potential strength of as-delivered concrete:

a. Obtain samples on a statistically sound, random basis.
b. Minimum frequency:
   i. One set per 10 cubic yards or fraction thereof for each day's pour.
   ii. When less than 5 cubic yards is placed in one day, the architect or engineer may, at architects' or engineers' option, waive laboratory testing of specimens if adequate evidence of satisfactory strength is provided. (Molding and curing of these specimens is not waived.)
   iii. When the above testing frequency would provide fewer than 5 strength tests for a given class of concrete during the project, conduct testing from not less than 5 randomly selected batches, or from each batch if fewer than 5.

c. Test one specimen per set at 7 and 14 days for information unless an earlier age is required.
d. Test 1 specimens per set for acceptance of strength potential; test at 28 days unless other age is specified.
e. Retain one specimen from each set for later testing, if required.
f. Strength potential of as-delivered concrete will be considered acceptable if all the following criteria are met:

   i. No individual test result falls below specified compressive strength by more than 500 psi.
   ii. Not more than 10 percent of individual test results fall below specified compressive strength.
   iii. Average of any 3 consecutive strength test results equals or exceeds specified compressive strength.

g. Evaluate construction and curing procedures and implement corrective action when strength results for field-cured specimens are less than 85 percent of test values for companion laboratory-cured specimens.

F. Test Results: Testing agency shall report test results in writing to architect, structural engineer, and contractor within 24 hours of test.

1. Test reports shall contain the following data:

   a. Project name, number, and other identification.
   b. Name of concrete testing agency.
   c. Date and time of sampling.
   d. Concrete type and class.
   e. Location of concrete batch in the completed work.
   f. All information required by respective ASTM test methods.

2. Nondestructive testing devices such as impact hammer or sonoscope may be used by the Owner's Representative for assistance in determining probable concrete strength at various locations or for selecting areas to be cored, but such tests shall not be the sole basis for acceptance or rejection.

3. The testing agency shall make additional tests of in-place concrete as directed by the architect when test results indicate that specified strength and other concrete characteristics have not been attained.

    a. Testing agency may conduct tests of cored cylinders complying with ASTM C 42, or tests as directed.
    b. Cost of additional testing shall be borne by the contractor when unacceptable concrete has been verified.

3.10 JOINT PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean, porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:

    a. Concrete.
    b. Remove laitance and form-release agents from concrete.

B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.11 INSTALLATION OF JOINT SEALANTS

A. Comply with joint sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM Cl193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backing of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed seal ants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.

3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.

E. Install sealants by proven techniques to comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses provided for each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealants from surfaces adjacent to joint.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM CI193, unless otherwise indicated.
4. Use masking tape to protect adjacent surfaces of recessed tooled joints.

3.12 JOINT CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.13 JOINT PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

3.14 ELASTOMERIC JOINT-SEALANT SCHEDLE

A. Multicomponent Pourable Urethane Sealant: Where joint sealants of this type are indicated, provide products complying with the following:

1. Products: Provide one of the following or equal:
   a. Chem-Calk 550; Bostik Inc.
   b. Vulkem 245; Mameco International.
   c. NR-200 Urexpan; Pecora Corporation.
   d. Sikaflex - 2c SL; Sika Corporation.
   e. THC-900; Tremco.
2. Type and Grade: M (multicomponent) and P (pourable).
3. Class: 25.

4. Use Related to Exposure: T (traffic)
5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, 0.
    a. Use 0 Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, granite, limestone, marble, ceramic tile, and wood.
6. Applications: Exterior joints in horizontal surfaces of concrete and where indicated.

END OF SECTION 321313

SECTION 321316

DECORATIVE CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes the following:

1. Integrally colored concrete.
2. Curing of integrally colored concrete.

B. Related Sections:

1. Section 03 30 00 "Cast-in-Place Concrete" for general building applications of concrete.
2. Section 32 13 13 "Landscape Concrete Paving" for cast-in-place concrete paving with other finishes.

1.3 REFERENCES

A. American Concrete Institute (ACI):

1. ACI 303.1 "Standard Specification for Cast-In-Place Architectural Concrete."
2. ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing of Concrete."
3. ACI 305R "Recommended Practice for Hot Weather Concreting."
4. ACI 306R “Recommended Practice for Cold Weather Concreting.”

B. American Society for Testing and Materials (ASTM):

1. ASTM C309 "Liquid Membrane-Forming Compounds for Curing Concrete."
2. ASTM C494 "Standard Specification for Chemical Admixtures for Concrete."
3. ASTM C979 “Standard Specification for Pigments for Integrally Colored Concrete.”

C. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO M194 "Chemical Admixtures."

D. International Organization for Standardization Documentation ISO 14021 – Environmental labels and declarations - Self-declared environmental claims (Type II Environmental labeling).

1.4 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.5 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's complete technical data sheets for the following:

1. Colored admixture.
2. Curing compound.
3. Joint Sealant.

B. Design Mixes: For each type of integrally colored concrete.

C. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available. Three samples for each type of product, ingredient, or admixture requiring color selection.

D. Samples for Verification: For each type of exposed color, pattern, or texture indicated.

E. Other Action Submittals:

1. Design Mixtures: For each decorative concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.

C. Material Test Reports: For each of the following:

1. Aggregates Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

D. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer with 5 years experience who has completed pavement work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performances.

B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

C. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. Source Limitations: Obtain decorative concrete paving products and each type or class of cementitious material of the same brand from same manufacturer's plant, and obtain each aggregate from single source.

E. Concrete Testing Service: Engage a qualified testing agency to perform material evaluation tests and to design concrete mixtures.

F. ACI Publications: Comply with ACI 301 unless otherwise indicated.

G. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups of full-thickness sections of decorative concrete paving to demonstrate typical joints; surface color, pattern, and texture; curing; and standard of workmanship.
2. Build mockups of decorative concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Architect and not less than 96 inches by 96 inches.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

H. Preinstallation Conference: Conduct conference at project site.

1. Review methods and procedures related to decorative concrete paving, including but not limited to, the following:

a. Concrete mixture design.
b. Quality control of concrete materials and decorative concrete paving construction practices.

2. Require representatives of each entity directly concerned with decorative concrete paving to attend, including the following:

a. Contractor's superintendent.

b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Decorative concrete paving Installer.
e. Manufacturer's representative of decorative concrete paving system.

1.8 DELIVERY, STORAGE AND HANDLING

A. Colored Admixture: Comply with manufacturer’s instructions. Deliver colored admixtures in original, unopened packaging. Store in dry conditions.

1.9 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

A. Manufacturers: Subject to compliance with requirements, provide products by the following or approved equal.

1. SCOFIELD CORPORATION

2.2 MATERIALS

A. Colored Admixture for Integrally Colored Concrete

1. Admixture shall be a colored, water-reducing, admixture containing no calcium chloride with coloring agents that are limeproof and ultra-violet resistant.
2. Colored admixture shall conform to the requirements of ACI 303.1, ASTM C979, ASTM C494 and ASSHTO M194
3. Concrete color agent shall be “Chromix,” as supplied by L. M. Scofield or approved equal.

B. Curing Compound for Integrally Colored Concrete: Curing compound shall comply with ASTM C309 and be of same manufacturer as colored admixture, for use with integrally colored concrete.

2.3 CONCRETE COLORS

A. Cement: Colors shall be variations of dark gray.
B. Sand: Color shall be locally available natural sand.
C. Aggregate: Concrete producer’s standard aggregate complying with specifications.
D. Colored Admixture: Equal to Chromix integral color admixture as manufactured by Scofield Corporation, Sika Scofield Corporation, 4155 Scofield Road, Douglasville, GA 30134, Phone: 800-800-9900, www.scofield.com. Color shall be determined by Owner’s Representative.

2.4 CONCRETE MIXES

A. Minimum Cement Content: 5 sacks per cubic yard of concrete.

B. Slump of concrete shall be consistent throughout Project at 4-inches or less. At no time shall slump exceed 5-inches.

C. Add calcium chloride to mix as it causes mottling and surface discoloration.

D. Supplemental admixtures shall not be used unless approved by manufacturer.

E. Do not add water to mix in the field.

F. Add colored admixture to concrete mix according to manufacturer's written instructions.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

B. Protect adjacent construction from discoloration and spillage during application of color hardeners, release agents, stains, curing compounds, and sealers.

3.2 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating joint devices.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

K. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms**[, steel reinforcement,]** and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.3 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

3.4 INTEGRALLY COLORED CONCRETE FINISH

A. Integrally Colored Concrete Finish: After final floating, apply the following finish:

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.5 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Compound: Apply curing compound immediately after final finishing. Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas that have been subjected to heavy rainfall within three hours after application. Maintain continuity of coating, and repair damage during curing period.

1. Cure integrally colored concrete with a curing compound.
2. Cure concrete finished with pigmented mineral dry-shake hardener with a curing compound.

F. Curing and Sealing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

G. Curing Paper: Cure with unwrinkled curing paper in pieces large enough to cover the entire width and edges of slab. Do not lap sheets. Fold curing paper down over paving edges and secure with continuous banks of earth to prevent displacement or billowing due to wind. Immediately repair holes or tears in paper.

3.6 REPAIRS AND PROTECTION

A. Remove and replace decorative concrete paving that is broken or damaged or does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Detailing: Grind concrete "squeeze" left from tool placement. Color ground areas with slurry of color hardener mixed with water and bonding agent. Remove excess release agent with high-velocity blower.

C. Protect decorative concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain decorative concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321316

SECTION 323000

SITE IMPROVEMENTS

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. This Section includes the following:

1. Drinking Fountain
2. Pet Station
3. Peastone Surfacing
4. Sand
5. Placed Boulder
6. Metal Edger
7. Bench

1.3 DEFINITIONS

A. The following related items are included herein, made part of this Section and shall mean:

1. ASTM: American Society for Testing and Materials.
2. AWS: American Welding Society, Code for Welding in Building Construction.
3. AISI: American Iron and Steel Institute, Specifications for the Design of Light Gauge Cold Form Structural members.
4. American Institute of Steel Construction (AISC): Specification for the Design, Fabrication and Erection of Structural Steel for Buildings; Code of Standard Practice for Steel Buildings and Bridges.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, field assembly requirements, and installation details.

B. Shop drawings for ALL items specified in this Section showing fabrication and installation details of furnishings required. These items include:

1. Drinking Fountain
2. Pet Station
3. Peastone Surfacing
4. Sand
5. Placed Boulder
6. Metal Edger
7. Bench

1.5 PROJECT CONDITIONS

A. Sequence furnishing installation with other work to minimize possibility of damage and soiling during remainder of construction period.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, and lot number.

B. Store materials in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity; laid flat, blocked off ground to prevent sagging and warping.

1.7 SAMPLES/SUBMITTALS

A. Prior to ordering the below listed materials, submit representative samples to Landscape Architect for selection and approval. Do not order materials until Landscape Architect's approval has been obtained. Delivered materials shall closely match the approved samples. Approved samples to be stored on site until completion of project.

B. Material Certificates - Provide copies of material certificates signed by material producers and Contractor certifying that each material complies with or exceeds specific requirements.

C. Submit notarized Certificate of Compliance from galvanizer, fabricator and coating manufacturer indicating compliance with the requirements of galvanizing and paint specifications prior to application for payment. Certificate of compliance shall also contain the following:

1. Evidence that the galvanizer meets requirements of ANSI Q 90.
2. Submit notarized independent laboratory analysis indicating compliance with specified percentage of nickel in kettle prior to, during and after galvanizing of materials at no additional cost to the Owner.
3. Do not engage galvanizer, fabricator or coating manufacturer who will not provide notarized Certificate of Compliance as specified.

D. If the General or Subcontractor wishes to use materials or equipment other than those specifically designated herein as being equal to those specifically designated, he/she shall submit the proposed substitution before purchasing and/or fabrication in accordance with the requirements of the General Conditions for approval.

1.8 SHOP DRAWINGS

A. The Contractor shall submit required shop drawings, including fabrication details and layout and dimensioning for the approval of the Landscape Architect.

B. Shop drawings for all shop-fabricated items described herein shall be submitted for approval in accordance with requirements of the General Conditions.

1. Submit shop drawings of work showing size and thickness of each member, type of material, method of connection and assembly. Show dimensions clearances, anchorages, relationships to surrounding work, coatings and other pertinent details of fabrication and installation.
2. Show profiles, reinforcing, fasteners, and any other accessories.
3. Indicate welded connections using standard AWS welding symbols; indicate net weld lengths.

C. Take all necessary field dimensions and verify all dimensions given on the plans pertaining to the existing work. Include this information on the shop drawings as required for the proper fabrication.

D. No variations from design sizes and details will be permitted on submitted shop drawings, but requests for modification of connections or details to better suit their shop practice or other reasons therefore will be considered by the Landscape Architect.

E. Coordinate all shop drawings with the Erector for full scope of all field work, including sequence of erection, alignment, bolting, welding, camber, etc.

F. 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.

G. Approval of the shop drawings will be for size and arrangement of principal and auxiliary members and strength of connections. Any errors on the shop drawings shall be the responsibility of the Steel Fabricator, including the dimensions, fabrication and correct fitting of the structural members.

H. Shop drawings shall include layouts and details showing type of steel for each member, sizes of members, connections, cuts, copes, holes, bolts, welds, painting and galvanizing. All dimensional details shall maintain the required architectural clearances. Provisions for the connections of other work shall be indicated on the shop drawings, such as all exterior facings. Show identity and sequence marks of all members on the erection drawings.

I. Product Data: Provide manufacturer's product data, installation instructions, use limitations and recommendations for each material used. Provide certifications that materials comply with requirements.

J. Welders Certification: Provide certifications, signed by Contractor, certifying that welders employed at project comply with requirements specified under AWS D1.1 and AWS D 1.2.

PART 2 – PRODUCTS

2.1 DRINKING FOUNTAIN

A. MODEL #10155 SMSS bottle filler with pet fountain by MDF (Most Dependable Fountains, Inc.), www.mostdependable.com, 5705 Commander Drive, Arlington, TN 38002, or approved equal. Fountain shall have a single, barrier free arm and bowl, and freeze-resistant below ground valve.
   a. Bottle Filler shall provide 1 gallon per minute with minimal splash.
   b. Bubbler shall be vandal-resistant bubbler integral hood guard to prevent contamination.
   c. Basin: Contour formed stainless steel design with rounded edges.
   d. Activator shall be push button for all features and shall be self-closing vandal resistant.
   e. Access panel: Heavy gauge steel with vandal-resistant screw for access to plumbing connections.
   f. Mounting: Surface mounting.
   g. Color shall be Green.
   h. Recessed hose bibb and lock door.

2.2 PET STATION

B. Dog Stations shall be supplied by DOGIPOT, Inc., www.dogipot.com, or approved equal.

C. Products:
   1. “Poly DOGIPOT Quik Pet Station” (#1011-POLY)

D. Color: Green

E. Posts shall be steel square posts as supplied by Manufacturer. Mounting hardware shall be as recommended by manufacturer.

F. Provide concrete footings as specified in Cast-in-Place Concrete, Section 033000.

2.3 PEASTONE SURFACING

A. Pea Gravel: 3/8” rounded natural washed stone, conforming to ASTM C-33, with 100% passing ½” sieve by weight, color gray.

2.4 SAND

A. Sand: Washed concrete sand, no greater than 1/4" in size, conforming to ASTM C-33, color: beige

2.5 PLACED BOULDER

A. Boulder shall be naturally occurring rounded boulder selected from single source and approved by Owner’s Representative.

B. Boulder size shall be 2’-6” minimum to 4’-0” maximum in any direction.

2.6 METAL EDGER

A. Edging shall be Mid City Steel, www.midcitysteel.com, 774-319-5400, or approved equal.
B. Model: Steel Landscaping Edging (3/8” thick x 6” high x 16”)
C. Steel with black powder coat finish.
D. Steel edging shall have slotted holes for staking steel edging every 30 inches.
E. Steel stakes shall be 15 inches long, tapered.

2.7 BENCH

A. Benches shall be “Bench 505” as manufactured by Dumor, www.dumor.com. Local Rep: John McConkey, johnmcconkey@obrienandsons.com, 508-359-4200, or approved equal.

B. Materials:
1. End Supports shall be ASTM B26 cast aluminum.
2. Seat Assembly Horizontal Channel “HC”: seat surface shall be manufactured from 1/8” thick ASTM A36 steel plate, and support braces
3. Surface mounted

C. Dimensions: 6’ bench: overall 74-7/8” long x 25-7/8” deep x 34-1/16” high.

D. Finish: Powder Coated

E. Color: Juniper Green

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances and other conditions affecting performance.

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

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written installation instructions, unless more stringent requirements are indicated. Complete field assembly of site and street furnishings, where required.

B. Unless otherwise indicated, install site and street furnishings after landscaping and paving have been completed.

C. Install site and street furnishings level, plumb, true and securely anchored at locations indicated on Drawings.

3.3 CLEANING

A. After completing site improvements installation, inspect components. Remove spots, dirt and debris.

B. Repair damaged finishes to match original finish.

END OF SECTION 323000

SECTION 323113

CHAIN-LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to furnish and install the chain-link fence work of this Section, as indicated on the Contract Documents and as specified herein.

1. New 6’-height black vinyl-coated chain-link fences.
2. New 4’-height black vinyl-coated chain-link fences.

1.3 QUALITY ASSURANCE

A. Prior to installation the fence contractor shall provide the fence manufacturer's notarized certification to the Owner’s Representative that the vinyl-coated chain-link fabric is warranted by the manufacturer for a minimum of 15 years against rust and corrosion.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design chain-link fences, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Chain-link fence shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7

1.5 REFERENCES

A. The following standards shall apply to the work of this Section.

1. Commonwealth of Massachusetts Highway Department (MHD):

Specifications Standard Specifications for Highways and Bridges

2. AWS: American Welding Society

a. D1.1 Structural Welding Code

3. ASTM: American Society for Testing and Materials

A-90/A90M-95a(1999)	Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc Alloy Coatings

A 307	Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
A392-96	Standard Specification for Zinc-coated Steel Chain Link Fence Fabric
A491-96	Standard Specification for Aluminum-coated Steel Chain Link Fence Fabric
A1011/A1011M	Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Allow and High Strength Low-alloy with Improved Formability
A500-99	Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
A900-00	Standard Specification for Industrial and Commercial Swing Gates
B-6-00	Standard Specification for Zinc
B-117-97	Standard Practice for Operating Salt Spray (Fog) Apparatus
F567	Standard Practice for Installation of Chain-Link Fence
F668-99a	Standard Specification for Poly(Vinyl Chloride) (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric
F964-00	Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Exterior Profiles Used for Fencing
F1043-00	Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework
F1083-97	Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures

1.6 SUBMITTALS

A. Prior to ordering the below listed materials, submit sample to Owner's Representative for approval. Sample shall be representative of designated items. Do not order materials until approval from the Owner's Representative has been obtained. Delivered materials shall closely match the approved samples.

1. One square foot of each fence fabric type
2. One sample of each type of hardware and fitting

B. Submit manufacturer's product data and certification for the following:

1. Each fence fabric type
2. Each type of hardware and fitting
3. Manufacturer’s vinyl coating system

C. Submit complete shop drawings of each type of fence for approval by the Owner’s Representative.

1. Shop drawings shall show typical materials, elevations, connections, fittings, and details for all elements as well as detailed layout showing all post locations.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which Installer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL

A. Material shall be new and products of recognized reputable manufacturers. Used, re-rolled or re-galvanized materials are not acceptable.

B. Like items of materials provided hereafter shall be the end products of one manufacturer in order to achieve standardization for appearance, maintenance and replacement.

C. All welding shall conform to AWS standards.

2.2 VINYL-COATED ALUMINIZED OR GALVANIZED STEEL CORE FABRIC FOR FENCE

A. Vinyl-coated galvanized steel core fabric shall be an extruded and adhered process in accordance with ASTM F668, Class 2A. Provide exposed fabric heights by using one section entire height. Vinyl coating shall be as specified in this Division 32 Section, CHAIN-LINK FENCE AND GATES.

B. Fabric Size:
1. For 6’-height:
   a. Core wire size 9 gauge
   b. Finished (coated) wire size 6 gauge
   c. Mesh size 2 inch
   d. Selvage top knuckled, bottom knuckled
   e. Vinyl wall thickness 0.006 inch minimum, 0.010 maximum

2. For 4’-height:

a. Core wire size 9 gauge
b. Finished (coated) wire size 6 gauge
c. Mesh size 2 inch
d. Selvage top knuckled, bottom knuckled
e. Vinyl wall thickness 0.006 inch minimum, 0.010 maximum

2.3 VINYL COATING FOR WIRE AND HARDWARE

A. The PVC vinyl coating shall be extruded and adhered to the zinc-coated steel wire in accordance with ASTM F668, Class 2A. The vinyl covering shall, in addition, resist attack from prolonged exposure to dilute solutions of most common mineral acids, sea water and dilute solutions of most salts and alkali. All vinyl coating shall be black in color.

B. The wire shall be vinyl-coated before weaving and shall be free and flexible at all joints. The mesh size shall be measured by the distance between the wires forming parallel sides of the mesh.

TABLE 1: VINYL-COATED GALVANIZED STEEL CORE WIRE SPECIFICATION

VINYL COATED WIRE GAUGE	STEEL CORE WIRE GAUGE	VINYL COATED WIRE SIZE TOLERANCE	AVERAGE VINYL WALL THICKNESS	GALV. COATING OZ/SQ.FT.
6	9	.192 in.+/-.005 in.	0.006 – 0.010 in.	.40 OZ.

2.4 HARDWARE FITTINGS AND MISCELLANEOUS MATERIALS

A. All hardware fittings and miscellaneous materials shall be vinyl coated with 10 to 15 mils (0.254 mm to 0.38 mm) of PVC per ASTM F964.

B. Fabric Ties: Tie wire for fastening 2 inch (50 mm) mesh fabric top, middle, bottom, or brace rails shall be 9 gauge (3.76 mm) galvanized vinyl coated steel tie wire placed at maximum 12 inch (300 mm) on-center intervals and twisted to form a secure connection.

C. Bolts and Nuts: Bolts and nuts shall be in accordance with ASTM A 307 Grade A and thermally coated to match color of fence fabric.

2.5 RELATED MATERIALS

A. For touch-up to welded areas use a zinc rich paint equal to "Tneme Zinc 90-93", by Tnemec Paint Co., Woburn, Massachusetts; "ZRC" cold galvanizing compound by Sealube Co., Quincy, Massachusetts; or "Zirp" by Duncan Industries, Everett Massachusetts, or approved equal.

PART 3 - EXECUTION

3.1 PREPARATION FOR FENCE INSTALLATION

A. All Shop Drawings for fencing shall have been returned "Approved" before any fencing shall commence.

B. Contractor shall review as-built conditions in the field prior to preparing required Shop Drawings.

C. Constructed samples, as required, shall have been submitted and approved before materials are ordered or fabricated for the work as a whole.

D. Prior to the installation of any fence, all necessary clearing and grading on both sides of the fence shall be performed by the Contractor in accordance with the requirements of the Contract Documents.

3.2 INSTALLATION

A. General: Unless modified in this Division 32 Section, CHAIN-LINK FENCE AND GATES, installation of fencing shall meet the requirements of ASTM F567. Erect fencing in straight lines between angle points by skilled mechanics experienced in this type of construction. Erect in accordance with the manufacturer's recommendations as approved and with these Specifications.

B. Grounding: All chain-link fences shall be grounded. Provide ground rods per Contract Documents for all gate posts, at all corners or angles in fencing, at all terminal posts, and at minimum 250 feet (75 m) on center if not required otherwise. Provide flexible grounding connection for gates in accordance with Contract Documents. Abrade vinyl fence fabric coating where necessary to make mechanical grounding connections.

C. Fasten chain-link fence fabric to terminal posts, pull posts, and gate posts with tension bars and tension bands at spacing herein specified.

D. Fence fabric shall be secured to all rails and to posts that are not terminal, gate or pull posts with steel wire ties at specified spacing. Tie down wire shall be woven through the fence fabric, completely around the rail and wire shall be twisted securely with three twists on the rails side of the fence and the tails of the wire cut off to preclude untwisting by hand. Twisted tie wire ends shall be turned under at horizontal rails. Twist shall be on non-secure side of fence. Where designated for buried portion of fence fabric bottom, secure fabric to tension wire with vinyl-coated hog rings as specified.

E. Fabric shall be installed such that it will pass the fabric tension test as specified in this Division 32 Section, CHAIN-LINK FENCE AND GATES.

A.3 TESTING OF FENCE FABRIC

A. Each fence panel shall be constructed such that it will pass the following test:
   1. Deflection of fence fabric shall be no greater than 2 inches (50 mm) when a force of 30 pounds is applied in the center of the panel, perpendicular to the plane of the fence fabric.
   2. Fabric shall return to original position when force is released.

3.4 ACCEPTANCE STANDARDS

A. Fence layout shall conform to the requirements of the Contract Documents. Straight runs of fencing shall be straight and true without visible deviation.

B. Rails shall form a continuous smooth line parallel with the grade unless otherwise described on the Contract Documents.

C. All posts shall be plumb and cut to the same height above grade.

D. Tension bands and hog rings shall be placed on standard on-center spacing consistent between posts.

E. Post caps shall be completely secure.

F. Gates shall be plumb, level, and secure for full opening without interference. Action shall be smooth. All components of gate shall function as designed.

END OF SECTION 323113

SECTION 328400

IRRIGATION

PART 1 - GENERAL

1.1 SUMMARY OF WORK

A. Provide design and all materials, labor, installation equipment, and technical service to complete construction of automatic irrigation system with a smart controller and domestic water service, as well as the testing and warranty of the system as defined in this Specification and Construction Drawings. Items of work specifically included are:

1. Procurement of all applicable licenses, permits, and fees.
2. Coordination of all utilities.
3. Verification of site conditions.
4. Maintenance during guarantee period.
5. Connection of electrical power supply to the irrigation control system.

1.2 QUALIFICATIONS

A. Qualified irrigation system installers must have a minimum experience of five (5) years with work and products specified herein, including:

1. Two-Wire Controller and Valve Installation.
2. Weather-Based and Smart Controllers.
3. Solvent Weld and/or Gasket Joint PVC Pipe 2-inches and Greater.
4. Commercial/Municipal Irrigation Systems.

B. Attest qualifications below for three (3) recent projects in the last five (5) years:

Bidding Irrigation Contractor Qualifications Form					
This Form Must be Filled Out Completely and Reviewed by Owner's Representative for Approval					
Installing Contractor Company Name:					
Company City, State:			Company Founding Date:		
Project Reference #1		**Project Reference #2**		**Project Reference #3**	
Project Name:		Project Name:		Project Name:	
City, State:		City, State:		City, State:	
Contact Name:		Contact Name:		Contact Name:	
Phone Number: ( )		Phone Number: ( )		Phone Number: ( )	
Project Description (Check All That Apply)		Project Description (Check All That Apply)		Project Description (Check All That Apply)	
☐	Commercial or Institutional	☐	Commercial or Institutional	☐	Commercial or Institutional
☐	Submittal & RFI Process	☐	Submittal & RFI Process	☐	Submittal & RFI Process
☐	Green Roof or On-Structure	☐	Green Roof or On-Structure	☐	Green Roof or On-Structure
☐	Two-Wire & Decoders	☐	Two-Wire & Decoders	☐	Two-Wire & Decoders
☐	Weather, Flow, or Soil Sensing	☐	Weather, Flow, or Soil Sensing	☐	Weather, Flow, or Soil Sensing
☐	Set-Up Internet Access	☐	Set-Up Internet Access	☐	Set-Up Internet Access
☐	Solvent-Weld or Gasket Pipe	☐	Solvent-Weld or Gasket Pipe	☐	Solvent-Weld or Gasket Pipe
☐	Drip Systems	☐	Drip Systems	☐	Drip Systems
☐	Domestic Water Source	☐	Domestic Water Source	☐	Domestic Water Source
By signing below, you, as irrigation installer contractor attest that the qualifications provided above are accurate, acknowledge reviewing this specification and drawings in full, and can meet all insurance requirements provided in Division 01 - General Requirements					
Signature			Printed Name & Title:		
			Signature Date:		

1.3 WORK NOT INCLUDED (PROVIDED BY OTHERS)

A. Water Service Point of Connection.

1. New building domestic water service to be provided by Town in approximate location shown on Drawings.

a. Equipment requirements, must meet all local codes and provide adequate service flow as specified below. Required equipment provided by Town includes at a minimum:

1) Backflow Preventer
2) Water Meter
3) Domestic Water Connection

b. Flow and pressure requirements at point of connection:

1) Flow: Maximum 70 gallons per minute
2) Pressure (dynamic): 50 pounds per square inch (at outdoor points of connection)

B. Electrical Power Source to Controller

1. New electrical circuits to be provided by Electrical Contractor.

a. Power Requirements for Irrigation Controller

1) 120-Volt, 1-Phase, 60-Hz, 20-Amp

b. Conduits to exterior point of connection

1) Comply with all applicable building codes. Minimum Schedule 80 PVC with Long Sweep Elbows.
2) Coordinate all conduit location requirements for valve wire with electrical contractor
3) Coordinate earth ground for irrigation controller and two-wire grounding

C. Communications to Indoor Controller

1. Communications to be provided by Communications Contractor.

a. Communication Requirements for Irrigation Controller

1) Ethernet CAT/5 Cable to Local Area Network

D. Pipe Sleeves

1. Pipe sleeves to be provided by Earthwork Contractor beneath all hardscape, as indicated on Construction Drawings.

a. Pipe sleeve requirements

1) Two (2) parallel 6-inch Schedule 40 PVC
2) Extend 18 inches beyond edge of hardscape
3) Minimum cover: 24 inches

4) Provide Link-Seal per details through Walls

1.4 RELATED REQUIREMENTS

A. Coordinate with other project trades and refer to overall project Construction Document Specifications and Drawings, including, but not limited to:

1. Division 01 – General Requirements
2. Division 02 – Existing Conditions
3. Division 03 – Concrete
4. Division 31 – Earthwork
5. Division 32 – Exterior Improvements
6. Division 33 – Utilities
7. Construction Drawings:

a. Review all other Project Construction Documents for coordination.

1.5 APPLICABLE STANDARDS AND CODES

A. At a minimum, comply with the following standards and codes:

1. American Society for Testing and Materials (ASTM)
2. National Standard Plumbing Code (NSPC)
3. National Electric Code (NEC)
4. National Sanitary Foundation (NSF)
5. Underwriters Laboratories, Inc. (UL)
6. Occupational Safety and Health Administration (OSHA)

B. Comply with applicable laws, standards, and regulations of the local governing authority. All local laws more stringent than those referenced above shall take precedent.

1.6 SUBMITTALS

A. Submit the following under provisions of Section 013300 - Submittal Procedures:

1. At least 30 days prior to ordering materials, the Contractor shall submit Shop Drawings and Catalog Cuts, Manufacturer's product data and certified test results for materials as specified below. No materials shall be ordered or delivered until the required submittals have been reviewed and approved by the Owner’s Representative. Delivered materials shall closely match the approved samples. Approval shall not constitute final acceptance. The Owner’s Representative reserves the right to reject, on or after delivery, any material which does not meet these Specifications and in accordance with the SUPPLEMENTARY GENERAL CONDITIONS, including but not limited to the following:

a. Complete Schematic Layout Plans For Entire System, including all irrigation details.
b. All piping materials, joints and fittings.
c. Pipe supports.
d. Valves, sprinkler heads, valve boxes and accessories.
e. Miscellaneous special fittings.
f. Sprinkler automatic control system, Controller, Enclosures, Wiring and Rainstat.
g. Sieve test for well-draining backfill, gravel, crushed stone, sand, etc.

2. Literature: Manufacturer's product data sheets, specifications and installation instructions for materials listed in this Specification (Part 2 – Products).

h. Product submittals shall be concise (no extraneous pages or sections) and clearly marked to show submitted product model, type, size, etc.
i. Substitute Product Submittal:

1) Provide specified product submittals for “an approved equal” to Owner’s Representative for approval.
2) Alternate products are acceptable when products of equal or better quality and performance are submitted and approved by the Owner’s Representative.
3) Substitute Product Submittals constitute representation that:

a) Substitute products have been thoroughly investigated and have been determined to be equal or superior in all respects to that specified.
b) Substitute products shall provide the same warranties as specified products.
c) Substitute products are compatible with interfacing items.
d) Assume responsibility of and guarantee system performance as a result of product substitution, including making all subsequent changes to meet design specifications.

j. Work shall not commence until all products specified are submitted and approved in a written notification by Owner’s Representative.
k. All product installed shall be new, without defects, and of quality and performance as specified.

3. Schedule: Submit Schedule of all products to be furnished hereunder, indicating manufacturer, size, and model.

a. Ensure that all of the types/styles of products and installation equipment specified herein can be furnished by the manufacturer submitted.
b. Provide all spare irrigation parts as noted (see Spare Irrigation Parts)
c. Prior to submitting schedule, confirm current site conditions are as provided in the Construction Drawings.

4. Qualifications: Submit qualification package as requested by Owner’s Representative. Qualifications package must include:

a. Three (3) references for similar work performed in last five (5) calendar years.
b. Contact name
c. Company Name
d. Contact Phone Number
e. Project Name and Location
f. Brief Project Description

1.7 DELIVERY, STORAGE AND HANDLING

A. Do not deliver materials to the site, until all specified submittals have been submitted to, and approved by, the Owner’s Representative.

B. Coordinate with Owner’s Representative for temporary storage and staging areas.

C. Protect materials from damage from construction traffic, weather, corrosion, and other causes while stored on-site. Minimize on-site storage as possible.

D. Store and handle all products and materials in compliance with manufacturer instructions and recommendations.

1.8 GUARANTEE AND REPLACEMENT

A. Guarantee entire irrigation system, parts and labor, for one (1) year from official written date of acceptance by Owner's Representative. Provide written warranty showing date of completion and period of warranty prior to request for final payment.

B. System malfunctions occurring during the guarantee period due to defective materials, poor workmanship, or improper adjustment shall be corrected to satisfaction of Owner's Representative at no additional cost to the Owner.

1. Repair all defects within 10 days of notification from Owner or Owner's Representative.
2. Repair defects with approved products.

C. First-year spring system start-up and winterization shall be included in system guarantee.

D. Manufacturer warranties shall be provided for all products and materials where such warranties are offered in published product data. Copies of manufacturer warranties are to be included in the Operations & Maintenance Manual (See Operation and Maintenance)

PART 2 – PRODUCTS

2.1 AUTOMATIC IRRIGATION CONTROLLER

A. Controller

1. Size: Approximately 7.7 inches (tall) x 10.7 inches (wide) x 4.4 inches (deep)
2. Construction: Electronic with 120-Volt Input and 24-28 Volt Output, Stainless Steel Wall-Mounted Enclosure
3. Standards: UL-Listed
4. Features: Manual and Automatic Control, Water Budgeting, Cycle-Soak, Sensor Input Terminals, Internal Transformer, Flow Monitoring Capability, Lightning Protection, Remote Control, Two-Wire System with Conventional Wire Retrofit Capability.
5. Manufacturer/Model: Rain Bird ESP-ME3 Modular Controller ; or Approved Equal

B. External Devices

1. Add-On Module

a. Manufacturer/Model: Rain Bird – ESP-SM6; or Approved Equal.

2. Rain Sensor

a. Manufacturer/Model: Rain Bird WR2 Series Wireless Rain Sensor; or Approved Equal

C. Grounding

1. Ground Controller to Earth Ground (coordinate with Electrical Contractor)

2. Ground Decoders to Earth Ground in Building (coordinate with Electrical Contractor, run Bare Copper Wire back to building alongside valve two-wire, no grounding rods).

2.2 WIRE

A. Two-Wire (From Controller to Decoders)

1. Size: 14/2 AWG Minimum
2. Construction: Dual Strand Solid Copper Conductors with PVC Insulation and Poly Jacket.
3. Ratings: UL-Listed, NEC (Class II Circuit), Direct Burial UF/TWU, up to 600-Volt Potential
4. Standards: ASTM B-3, ASTM B-8
5. Markings: Manufacturer, Rating, Size, and Type
6. Manufacturer/Model: Coleman Cable #51452; Paige P7072D, P7296D, P7350D, and P7354D; Regency 14/2 and 12/2 Maxi Cable; Hunter Decoder Jacketed; Service Wire Company DEC12/2BE and DEC 14/2BE; or Approved Equal.

B. Conventional Wire (From Decoders to Electric Zone Valves)

1. Size: 14AWG Minimum
2. Construction: Single Strand Solid Copper Conductor with PVC Insulation
3. Ratings: UL-Listed, NEC (Class II Circuit), Direct Burial UF/TWU, up to 600-Volt Potential
4. Standards: ASTM B-3, ASTM B-8
5. Markings: Manufacturer, Rating, Size, and Type
6. Manufacturer/Model: Paige Electric Model P7001D; Service Wire Company UF14, UF12; Regency Wire & Cable 14AWG, 12AWG; or Approved Equal.

C. Wire Splices

1. Type: Direct Burial Wire Splice Kit (All Components Intact)
2. Construction: Lockable Plastic Tube, Pre-Filled with Insulation Gel
3. Ratings: UL-Listed, NEC, Direct Burial and Submersion, up to 600-Volt Potential
4. Manufacturer/Model: 3M DBY-6; Rain Bird DB Series; or Approved Equal.

D. Wire Conduit

1. Size: 1.5-Inch Minimum
2. Construction: PVC, Solvent Weld
3. Ratings: Schedule 40
4. Fittings: Long Sweep Elbows
5. Manufacturer: Cresline; Certainteed, JM Eagle; or Approved Equal.

2.3 PIPE AND FITTINGS

A. PVC Mainline Pipe

1. Size: 1-Inch Maximum
2. Construction: Polyvinyl Chloride (PVC), Solvent Weld
3. Ratings: Class 200 SDR21 Pressure Pipe
4. Standards: ASTM D-1785
5. Markings: Manufacturer, Nominal Size, Class or Schedule, Pressure, Extrusion Date
6. Manufacturer: Cresline; Certainteed; JM Eagle; or Approved Equal.

B. PE Lateral Pipe

1. Size: 1-inch Maximum

2. Construction: Polyethylene (PE) 3408
3. Ratings: Class 100, Type III, SDR 15, Class C
4. Standards: ASTM D-2239
5. Colors: Black
6. Fittings: PVC Insert (per ASTM D-2609) with Stainless Steel Clamps on Each Side
7. Markings: Manufacturer, Nominal Size, Class or Schedule, Pressure, Extrusion Date, Pipe Insertion Mark
8. Manufacturers: Oil Creek; Certainteed; JM Eagle; or Approved Equal. Insert Fittings: Lasco, Dura, or Approved Equal. Clamps: Oetiker, or Approved Equal
9. Fittings

    a. Type: PVC Insert with dual (2) Stainless Steel Claps on Each connection.
    b. Standards: ASTM D-2609

2.4 ELECTRIC ZONE VALVES

A. Diaphragm Valve

1. Size: 1-Inch
2. Construction: High Impact Weather Resistant Plastic, Stainless Steel and other chemical/UV resistant materials.
3. Ratings: 15-150 psi, Minimum Flow of 0.2 gpm
4. Features: Manual Bleed Screw, and Flow Control
5. Manufacturer/Model: Rain Bird 1” DV Electric Valve; or Approved Equal

B. Master Valve

1. Size: 1-Inch
2. Construction: Brass Globe Valve
3. Ratings: 220 psi
4. Features: Manual Bleed Screw, Flow Control, Pressure Regulation, and Filter
5. Manufacturer/Model: Hunter IBV-FS; or Approved Equal

2.5 ISOLATION VALVES

A. Small Isolation Valve (at Each Point of Connection)

1. Size: 1.5-Inch and Smaller
2. Construction: Bronze, Gate Valve
3. Ratings: 200 psi
4. Features: Steel Cross Handle, Non-Rising Stem
5. Manufacturer/Model: Nibco T-113K; Apollo 102T-K; or Approved Equal

2.6 VALVE BOXES

A. Plastic Valve Boxes in Landscape

1. Size:

    a. Jumbo Rectangular Valve Box

    b. 6-Inch Round

        1) Flush Valve

c. 10-Inch Round

1) Isolation Valve

2. Construction: Resin
3. Ratings: Tensile Strength 3,000-5,000 psi
4. Color: Green or Black (per Owner's Representative)
5. Features: Lockable, Bolt-Down Covers, Brick Supported
6. Manufacturer/Model: Rain Bird VB; or Approved Equal

2.7 ROTORS

A. 1" (26/34) Female (NPT or BSP) Bottom Inlet

a. Radius: 63 feet
b. Pressure: 70 minimum psi
c. Flow: 14 gpm
d. Manufacturer/Model: Rain Bird 8005 Series; or Approved Equal

2.8 EARTH MATERIALS

A. Stone (in Valve Boxes)

1. Type: ¾-Inch (minimum) Crushed Stone

2.9 SPARE PARTS

A. Wrenches, Keys, and Tools for Servicing and Adjusting Irrigation (2)

B. Gate Valve (1)

C. Assorted Valves Fittings

PART 3 - EXECUTION

4.1 GENERAL

A. Competent superintendents and assistants shall be on-site at all times during product delivery, installation, testing, and system adjustments.

1. Field communication by Owner or Owner's Representative to superintendent shall be binding.

B. System features shall be laid out as indicated on Drawings, making minor adjustments for variations in planting arrangements or field conditions. Major changes shall be reviewed with Owner's Representative before acceptance.

1. Irrigation lines shown on Construction Drawings are diagrammatic only. Location of irrigation equipment is contingent upon and subject to integration with all other underground utilities, subsurface structures, and hardscape design elements.

4.2 EXAMINATION

A. Review and verify project conditions are as indicated on Construction Drawings prior to starting work, including but not limited to:

1. Utilities provided by Others
2. Site grades and dimensions
3. Landscaping and features
4. Structures
5. Pipe sleeves

B. Report any irregularities of site conditions to the Owner's Representative prior to beginning work.

C. Beginning of installation connotes acceptance of existing project conditions.

4.3 PROJECT COORDINATION

A. Coordinate with Owner's Representative to expeditiously install system.

B. Provide written notifications (electronic is acceptable) to Owner's Representative prior to work commencement, weekly for progress report, for any proposed changes to system design, and upon installation completion.

C. All questions of design intent, proposed design changes, field notifications, and product substitution after installation commences shall be in writing to Owner's Representative as a Request for Information (RFI).

4.4 SITE PROTECTION

A. Protect landscaping, paving, structures, walls, footings, etc. from damage caused during work. Damage to work of another trade shall be reported at once.

B. Replace or repair any damage with same product or material, to the satisfaction of Owner's Representative at no additional cost to the Owner per Guarantee.

4.5 PIPE INSTALLATION

A. PVC Pipe Installation:

1. Cut plastic pipe with handsaw or pipe cutter, removing all burrs at cut ends. All pipe cuts shall be square and true. Bevel cut end as required to conform to manufacturer instructions.
2. Make all solvent-weld joints as per manufacturer's instructions and avoid applying excess primer or solvent. Do not wipe off excess solvent from each connection.

    a. Allow welded joints minimum 5 minutes set-up/curing time before moving or handling.

        1) Above 80°F: Allow connections to set 24 hours.
        2) Below 80°F: Follow manufacturer instructions.
        3) Below 40°F: Prohibited.

3. Maximum deflection per joint shall not exceed manufacturer limits.
4. Maintain 1-inch minimum between lines which cross at angels of 45 to 90 degrees

B. PE Lateral Pipe Preparation

1. Cut PE pipe with pipe cutter, removing all burrs at cut ends. All pipe cuts are to be square and true.
2. Clean ends as per manufacturer instructions.
3. Push PE pipe through stainless steel clamp—do not clamp at this point.
4. Soften PE pipe in hot water as per manufacturer recommendations for insert barbed fittings. If a propane blowtorch is used to soften PE ends for fittings, assume responsibility for and warranty all PE pipe to same level as manufacturer.
5. Do not use lubricants or pipe dope with PE pipe.
6. Insert barbed fittings fully and position stainless steel clamp over barbs. At this time, crimp or screw worm gear clamps down with appropriate tools to secure pipe and fitting.
7. Where PE Mainline is proposed, use TWO (2) CLAMPS per fitting.

C. Pipe and wire shall run in same trench as mainline, at the elevation of the pipe invert (See Wire Installation).

D. Pipe Cover (unpaved surfaces, where depth allows):

1. PVC Mainline = 22 inches
2. PE Lateral = 16 inches

E. Pipe Protection:

1. Prevent foreign material from entering pipe during installation.
2. Open ends of pipe shall be closed by watertight plug or seal when not in use.
3. Securely store pipe when not scheduled for installation.
4. Pipe shall not be installed when water is in trench, during rainstorms, or when temperature is below 40ºF.

    a. No additional pipe may be installed or backfilled if water enters trench during pipe installation. Remove all water from trench before resuming installation.
    b. Pipe installed at temperatures below 40 ºF shall be removed and replaced at no cost to owner.

4.6 PIPE SLEEVE INSTALLATION

A. Coordinate with Owner's Representative for provided pipe sleeves and locations installed by Earthwork Contractor.

B. New Pipe Sleeves:

1. Pipe Sleeve Cover: Minimum 24 inches
2. Install pipe sleeves where irrigation pipe runs under hardscape (see Construction Drawings).
3. Extend pipe sleeves minimum 18 inches beyond edges of hardscapes.
4. Prior to installation of pipe, pipe sleeve ends shall be field marked with vertical wood stakes extending above grade to allow field location during irrigation system installation.

C. Cutting through or jacking under new pavement shall be strictly prohibited. Failure to provide sleeves shall require notification to Owner's Representative for resolution.

4.7 ELECTRICAL CONDUIT INSTALLATION (IN LANDSCAPE)

A. Electrical conduit shall be installed:

1. Under and through all hardscape areas
2. Above ground wiring

B. Electrical conduit shall extend 18-inches beyond edges of hardscape.

4.8 ELECTRICAL ZONE VALVE INSTALLATION

A. Install electric zone valves on level crushed stone base generally where shown on Construction Drawings. Do not pour stone around valves that are already installed.

B. Install all Schedule 80 PVC threaded nipples with Teflon tape, isolation valves, and/or union couplings in and out of electric zone valves as shown on details on Construction Drawings.

C. Set valves plumb with adjusting handle and all bolts, screws, and wiring accessible through valve box opening.

D. Install at sufficient depth to provide between 4-6 inches of cover from top of valve to finish grade.

E. Install specified valve box over all electric zone valves. Ensure lid is flush with final proposed grade (coordinate with Site Contractor).

F. Adjust zone valve operation after installation using flow control device on valve.

4.9 ISOLATION VALVE INSTALLATION

A. Coordinate isolation gate valve installation with Plumbing Contractor at all 6 points of connection required.

4.10 WIRE INSTALLATION

A. Install wiring per local codes for less than 30-Volt service.

B. Run valve two-wire in conduit from irrigation controller (provided by Electrical) to each of the six (6) points of connection required.

C. Maintain sufficient slack for expansion, contraction and servicing. Do not install wiring tightly.

1. Provide and install additional 8 to 12 inches slack for conventional wire from decoder to valve.
2. Provide 30 inches slack between decoders for two-wire.
3. Provide sufficient length of wire in valve boxes to allow valve solenoid, splice, decoder wire, and all connections to be brought above grade for servicing.
4. Coil slack for neatness in valve box.

D. Provide waterproof splices at all in-ground wire connections using approved splice kits. All splices shall be made in valve boxes and recorded on Record Drawings.

E. Provide complete wiring diagram showing wire routing for connections between controller and valves as specified in Record Documents.

F. Securely store wire when not scheduled for installation.

4.11 GROUND INSTALLATION

A. Decoder Grounding

1. Provide grounding for decoders – with lightning surge arrestor (as required by Manufacturer) – as shown on Drawings.
2. Lightning/Surge Arrestor

    a. With waterproof splices, connect lightning arrestor red wire to site red wire and lightning arrestor black wire to site black wire. Decoder, lightning arrestor, and site two-wire may be connected in the same waterproof splice as per manufacturer.
    b. With waterproof splice, connect lightning arrestor ground green wire to 8AWG solid bare copper wire. Run to approved building earth ground (no grounding rods).
    c. Place wired lightning arrestor neatly inside valve box.

B. Controller Grounding

1. Wire bare copper 8AWG wire to irrigation controller ground lug.

    a. Coordinate acceptable earth grounding with site Electrical Contractor or Owner's Representative.

4.12 DECODER INSTALLATION

A. Wiring

1. With waterproof splices, connect decoder red wire to site red wire and decoder black wire to site black wire.
2. With waterproof splices, connect decoder valve leads to electric zone valve solenoid leads.
3. Place wired decoder neatly inside valve box.
4. Connect with irrigation controller and run diagnostic decoder search to link.

4.13 ROTOR INSTALLATION

A. 1" (26/34) Female (NPT or BSP) Bottom Inlet

1. Install rotor at location shown on Construction Drawings.
2. All rotors to be installed flush with finish grade materials per manufacturer's recommendations.
3. Each rotor shall have an electric valve.

4.14 AUTOMATIC IRRIGATION CONTROLLER INSTALLATION

B. Controller

1. Install controller at location shown on Construction Drawings.
2. Wire valves and external sensors into controller through conduits and set proper programming.

    a. Program "Cycle-Soak" feature for all zones with sloped or poorly draining soils.
    b. Install and calibrate soil moisture sensors as per manufacturer instructions.
    c. Soil moisture sensors are not required for each irrigation zone. Assign representative soil moisture sensors for similar zones, such as:

1) Sun vs. Shade
2) Lawn vs. Plantings
3) Heavy vs. Light Soils
4) Use Irrigation Plans provided for Recommended Quantity and Assignment

3. Using licensed electrical, wire controller to 120-Volt, 20-Amp electrical supply provided by Electrical Contractor.
4. Provide keys to Owner after final walkthrough.

C. Flow Sensor

1. Install Flow Sensor approximately where shown on Construction Drawings downstream of Master Valve.
2. Provide straight pipe for Flow Sensor to reduce turbulence:

a. Upstream: 10 inches (10 times pipe diameter)
b. Downstream: 5 inches (5 times pipe diameter)

3. Wire Flow Sensor to Automatic Irrigation Controller as specified with waterproof connectors. Do not use splices between Controller and Flow Sensor.

4.15 VALVE BOX INSTALLATION

A. Furnish and install valve boxes as per valve schedule above for each valve, splice, or sensor.

B. Install valve boxes on minimum 4-inches crushed stone base. Pouring stone into valve box after installation is not acceptable.

C. Finish elevation of all boxes shall be at grade, unless otherwise noted in Drawings.

D. Provide level brick supports beneath valve boxes.

1. For square/rectangular boxes, provide four (4) supports - one at each corner.TESTING AND ADJUSTMENTS

A. Include all testing and adjustments in submitted bid price.

B. System Flushing:

1. Open electric zone valves and flush out irrigation system under full head of water before installing rotor irrigation components.
2. Flush entire irrigation system after complete installation.
3. Clogged nozzles shall be remedied after completion of irrigation system.

C. Testing:

1. Test all pipe and valves for leaks at operating pressure. Repair all leaks and retest until leaks are remedied.
2. Perform coverage test with Owner's Representative present. Operate electric zone valves for five (5) minutes minimum during coverage test. Readjust irrigation (as necessary) to attain proper coverage. Replace any equipment that does not meet specified standards.
3. After testing, clean all equipment of debris during installation.

D. Adjust irrigation and valve boxes as necessary for mowing and landscaping.

E. Throughout guarantee period, adjust irrigation and ensure coverage due to settlement and landscaping operations.

4.16 RECORD DOCUMENTS

A. Record (As-Built) Drawings

1. Maintain and update Record Drawings with red-line markings as project progresses, including locations of:

    a. Rotors.
    b. Valve Boxes and descriptions (valve type, zone numbers, splice, etc.)
    c. All equipment installed with distinct symbols.
    d. Pipe routing and tees.
    e. Wire routing and splices.

2. Locations of installed equipment (valve, controller, sensors) shall be referenced by two permanent locations (swing ties) or GPS.
3. Make all notes legible as work progresses, any new equipment added shall use distinct symbols denoting location.
4. Document any changes from original Construction Drawings.
5. Prints of original Construction Drawings may be obtained from the Owner's Representative at cost (0% markup).
6. Record Drawings shall be used as basis of payment for work completed. Provide copies of red-lined set to Owner's Representative along with payment request.

B. Record Documents

1. Record Documents shall be on-site at all times. Maintain record of the following as the project progresses:

    a. Plumbing and Electrical permits (state whether or not required)
    b. Materials Approved and approval date
    c. Pressure Test results, testing personnel and testing date.
    d. Materials delivered, Accepted, and Installed by whom and date.
    e. Field Communications and Requests for Information (RFI)

C. Prior to final punchlist, provide complete electronic and hard copy files of Record Drawings and Documents to Owner's Representative as part of project completion. All information must be complete and shall be added to submitted documents prior to acceptance.

4.17 OPERATION AND MAINTENANCE

A. General

1. Bid price shall include up to four (4) hours of irrigation system overview and instruction with Owner and/or Owner's Representative.

B. Operation and Maintenance Manual

1. Operation and Maintenance Manual shall include, but not be limited to:

    a. Title Page and Table of Contents

b. One-Paragraph Written Description of Irrigation System
c. Manufacturers' Data and Cut Sheets of Equipment, including:

1) Copies of all approved submittals
2) Wire resistance readings to each electric valve at completion (for future troubleshooting)
3) Recommended operating settings
4) Recommended maintenance schedule
5) Name, address, and telephone number of installer (for repairs, spring startup, and winterization during 1-year guarantee period)
6) Irrigation program for periods without rain and recommended settings including, zone run time, days per week, cycle-soak, and rain sensor suspension.

d. Winterization and Spring Startup Instructions (after 1-year guarantee period)
e. Guarantee Data
f. Pockets with Folded Plans of:

1) Original Design Drawing
2) Final Record Drawing
3) Controller Valve and Wiring System Diagram Drawing

4.18 SITE CLEANUP

A. Remove all unused materials and equipment from project site safely and efficiently. Dispose of all unused materials legally - including construction debris and trash.

B. Adjust ground, compact, and re-plant around irrigation valve boxes as necessary for proper angle and elevation.

C. Fill all depressions, erosion rills, etc. with proper planting soil mix to ensure site drainage.

4.19 FINAL OWNER ACCEPTANCE

A. Final Owner Acceptance of Irrigation System is predicated on:

1. Complete system installation, adjustment, testing, and instructional overview.
2. Submission of Operation and Maintenance Manuals to Owner's Representative.
3. Proper Programming of Automatic Irrigation Controller.
4. Completed and approved all punchlist items.

B. Owner and/or Owner's Representative shall provide written notice (hard copy and/or electronic) for Final Acceptance. Date of Final Acceptance notice shall serve as start of 1-year Guarantee period as described above.

END OF SECTION 328400

SECTION 329000

LANDSCAPE WORK
(ADD ALTERNATE #5)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Tree installation.
2. Fertilizing, mulching, trimming, and edging.
3. Maintenance of installed plant material.
4. Warranty.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 31 23 01 Earthwork for excavation, filling, rough grading, and subsurface aggregate drainage and drainage backfill.
2. Section 31 30 00 Site Clearing for stockpiling and site clearing.
3. Section 32 90 02 Landscape Grading for topsoil placement and finish grading.
4. Section 32 92 19 Seeding for lawn re-establishment.

1.3 REFERENCES

A. American Joint Committee on Horticultural Nomenclature Publication: Standardized Plant Names.

B. ANSI Z60.1 - American Standard for Nursery Stock.

C. ASTM D2607 - Classification of Peats, Mosses, Humus and Related Products.

D. FS 0-F-241 - Fertilizers, Mixed, Commercial.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Submit complete list of plant material growers 4 weeks prior to digging of plants. List is to include names of individuals to contact, phone numbers, addresses and latest possible date for completion of tagging.

C. Submit waterproof tags prior to tagging trip. Tags to contain following information:

1. Contractor’s name.
2. Plant genus, species, and cultivar/variety.
3. Plant common name.

4. Name of nursery.
5. Size of plant.
6. Quantity of plant (i.e. 2 of 10)

D. Submit proposed planting schedule, indicating dates for each type of landscape work during normal seasons for such work in area of site. Correlate with specified maintenance periods to provide maintenance from date of substantial completion. Once accepted, revise dates only as approved in writing, after documentation of reasons of delay.

E. Submit schedule of arrival of “specimen plant material”.

F. Submit instructions for continuing Owner maintenance. Include pruning and trimming methods and types, application frequency and recommended coverage of fertilizer, and water requirements for year-round care of installed plants. Document is to be in bound 8 ½" x 11" format. Submit prior to expiration of required maintenance period(s).

G. Submit for approval a proposed maintenance procedure and schedule of the storage of plant materials. Tree stored on and off site shall be maintained by watering, fertilizing, mulching, and spraying for infestation and disease to maintain these plants in a healthy condition. Plants stored offsite shall be available for inspection by the Owner’s Representative.

H. Samples of each of the following:

1. 5 lb (2 kg) of mulch for each type required for the Project, in labeled plastic bags.
2. Edging materials and accessories to verify color selected.

I. Qualification data for firms and persons specified in the “Quality Assurance” Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names, and addresses of Owner’s Representative, and other information specified.

1.5 QUALITY ASSURANCE

A. Prior to being approved, the successful bidder will be required to submit to the Owner’s Representative a statement of qualifications listing the names of contact references for at least three jobs of similar scope that have been completed in the last five years. Attention is called to the fact that the installation will not be awarded to a firm that does not possess the required technical expertise and construction organization.

B. Allow Owner’s Representative option of traveling to grower’s facility to select trees from available stock.

C. Allow four weeks, after receipt of list of growers, to finish tagging trees.

D. Trees dug prior to tagging by Owner’s Representative are subject to rejection.

E. Owner’s Representative will confirm the trees satisfy the requirements of ANSI Z60.1 and all special conditions stated in project manual and drawings.

F. Measure trees according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches (150mm) above ground for trees up to 4-inch (100-mm) caliper size, and 12 inches (300-mm) above ground for larger sizes. Measure main body of tree for height and spread; do not measure branches or roots tip-to-tip.

G. Unacceptable trees will not be tagged, and a different Grower will be selected by Contractor at no expense to Owner. A second tagging trip will then be scheduled.

H. Decision by Owner's Representative to forego tagging trip does not release Contractor from responsibility of obtaining plant material which meets standards and conditions stated in project manual and drawings.

I. Minimum three years experience installing plant material of this type required of Installer.

J. Minimum five years experience specializing in growing and cultivating the specified material is required by of Grower.

1.6 REGULATORY REQUIREMENTS

A. Comply with regulatory requirements for fertilizer and herbicide composition.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Plant material is to be covered with tarpaulin during transport.

B. Deliver soil conditioners and fertilizer in unopened waterproof bags showing weight, chemical analysis, and name of manufacturer. Keep materials in dry storage away from contaminants.

C. Provide freshly dug trees. Do not prune prior to delivery unless otherwise approved by Owner's Representative. Do not bend or bind tie trees in such a manner as to damage bark, break branches, or destroy natural shape. Do not drop balled and burlapped stock during delivery. Protect plants until planted to prevent damage to root balls or desiccation of leaves.

D. Deliver trees after preparations for planting have been completed and plant immediately. If planting is delayed more than six hours after delivery, set trees in shade, protect from weather and mechanical damage, and keep roots moist by covering with mulch, burlap, or other acceptable means of retaining moisture.

E. Provide water to staged material as required to keep root balls moist.

F. Do not remove container-grown stock from containers until planting time.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not install plant life when ambient temperatures may drop below 30 degrees F or above 90 degrees F.

B. Do not install plants when wind velocity exceeds 30 mph.

C. Planting shall be done when the ground is not frozen, snow covered, or in an otherwise unsuitable condition for planting.

D. Conduct planting operations during recommended planting seasons. Preferable planting season is March 15 to May 30 and October 15 to December 1, inclusive.

E. At the Subcontractor's option and full responsibility, planting operations may be conducted under unseasonable conditions without additional compensation.

1.9 JOB CONDITIONS

A. Locate above grade and underground utilities and perform Work in manner which will avoid damage. Hand excavate as required.

B. Maintain grade stakes set by others until removal is mutually agreed upon by concerned parties.

C. Notify Owner's Representative, before proceeding, when conditions detrimental to plant growth are encountered, such as rubble fill or adverse drainage conditions.

D. Install plants after final grades are established and prior to establishment of lawns, unless otherwise approved by Owner's Representative. If planting occurs in undisturbed lawn areas or after lawn work, protect lawn areas and promptly repair damage to lawns resulting from planting operations.

1.10 SEQUENCING AND SCHEDULING

A. Coordinate the Work of this Section with installation of underground utilities, sodding and remainder of Work associated with this Project.

B. Proceed with and complete landscape work as rapidly as portions of site become available, working within seasonal limitations.

1.11 MAINTENANCE

A. Trees are to receive establishment care for 12 months from the date of Preliminary Acceptance.

B. Tree care shall begin immediately after each tree is planted to ensure the viability of the tree throughout the Establishment Period.

C. Plants shall be straightened, re-staked and re-guyed, watered, mulched, weeded, pruned, sprayed, and treated for insect pests and diseases with Park's approval, fertilized, cultivated, and otherwise cared for, and shall be protected until final acceptance of the project at the end of the Establishment Period.

D. The watering of trees during the Establishment Period should follow the standards set forth in part 3.5.

E. The Contractor shall meet with the Owner semi-annually during the Establishment Period to inspect the plantings and shall take immediate action to identify potential problems and undertake corrective measures. If required, the Contractor shall engage professional specialists such as arborists and horticulturists to inspect plants, identify problems, recommend, and carry out remedial procedures.

F. Defective work shall be corrected immediately after becoming apparent, weather and season permitting. Any tree that is not rooted solidly in the ground after planting will have to be re-planted at the expense of the contractor. Plants that die during the Establishment Period shall be removed at once. Replacement of dead trees will be done immediately if during the specified installation season. If a dead tree has been removed out of planting season, the contractor shall wait until the beginning of the subsequent planting season, at which time the replacement tree will be planted. If tree to be replaced is a fall hazard species the contractor shall wait until the beginning of the spring planting season, at which time the replacement tree will be planted. If a species is a fall hazard the Owner reserves the right to have the tree replaced with a species of tree that is not a fall hazard.

G. Replacements shall be of the same species (at the Owner's discretion) and size and shall conform in all respects to the specifications for furnishing and installing new plants. Replacements shall be maintained and guaranteed as specified for the original plantings. If, at the end of the guarantee period for the replacement planting, the replacement is not in acceptable condition, the Owner may elect to accept a credit in lieu of a second replacement.

H. At the end of the Establishment Period, the Owner to determine if the work is acceptable shall carry out an inspection. Each tree must exhibit the form typical to its species with at least 75% of its canopy viable. Any tree that is dying from the top down as well as any tree that has lost its central leader will be rejected. If stakes and guys were placed, they must be removed at this

time by the Contractor. All weeds must be removed, and mulch restored to specified depth. Based on the inspection, the Owner will prepare a list of deficiencies in the work. When the deficiencies are corrected to the owner's satisfaction and if the watering was completed as outlined in section 3.07, the Owner will issue a written notice beginning the Guarantee Period. All this work must be satisfied as a condition of Acceptance and release of retainage.

1.11 GUARANTEE PERIOD

A. Following completion of the Establishment Period the trees shall be guaranteed for a period of one (1) year. At the end of the Guarantee Period, a Final Inspection with the Contractor and Owner will be held to determine whether any plant material replacements are required.

B. During the Guarantee Period the Contractor shall provide tree care as required to produce an acceptable planting at the Final Inspection. To be found acceptable at that time each tree shall have been established in place for one (1) year, shall show at least 75% healthy growth and shall have the natural character of its species as determined by the Owner. Any tree that is dying from the top down as well as any tree that has lost its central leader will be rejected. Any tree that is not rooted solidly in the ground after planting will have to be re-planted at the expense of the contractor.

C. Trees found unacceptable or dead shall be removed promptly from the site and replaced during the specified planting season. Replacements shall be of the same species (at the Owner's discretion) and size and shall conform in all respects to the specifications for furnishing and planting new trees. Replacements shall be established and guaranteed as specified for the original plantings. If, at the end of the Guarantee Period for the replacement planting, the replacement is not in acceptable condition, the Owner may elect to accept a credit in lieu of a second replacement.

D. Cost of replacements shall be borne by the Contractor, except when such replacement is required due to vandalism or neglect by others.

E. At the end of the Guarantee Period, the Owner shall carry out an inspection to determine if the trees are acceptable. Each tree must exhibit the form typical to its species with at least 75% of its canopy viable. Any dieback from the central leader will also constitute tree rejection. Any tree that has lost its leader will be rejected. All weeds in pit must be removed and mulch restored to specified depth. Based on the inspection, the Owner will prepare a list of deficiencies in the work. Deficiencies must be corrected, and watering completed as outlined in section 3.5, to the Owner's satisfaction as a condition of Final Acceptance and release of the retainage.

PART 2 - PRODUCTS

2.1 TREES

A. Plant material to be nursery grown stock conforming to ANSI Z60.1.

B. Publication for Standardized Plant Names will govern nomenclature issues.

C. Plans will supersede planting material schedule where a discrepancy in quantity occurs.

D. Provide plant material which is well branched and formed, sound, vigorous, healthy, and free from disease, sun-scald, windburn, abrasion, and harmful insects, eggs, larvae and such defects as knots sun scald, injuries, abrasions and disfigurement, and shall have healthy, normal, and unbroken root systems.

E. Provide symmetrically developed plant material, of uniform habit with straight boles and free from objectionable disfigurements. Tree leader shoots shall not be cut or broken.

F. Where formal arrangements or consecutive order of trees are shown, select stock for uniform height and spread, and label with number to assure symmetry in planting.

G. Plants shall have been grown in the same or colder climatic zone of this project.

H. Provide plants according to measurements indicated. Measure sizes before pruning and with branches in normal position. Plants larger in size than specified may be used as approved.

I. Spray plants, budding into leaf or having soft growth, with an anti-desiccant at the nursery or collecting field before digging.

2.2 SOIL MATERIALS

A. Tree Plant Pit Backfill: Excavated material amended with fertilizer only.

2.3 SOIL AMENDMENT MATERIALS

A. Tree Fertilizer: Tightly compressed, slow-release planting tablets. Provide 50% of Nitrogen as water insoluble.

B. Peat Moss: Shredded, loose, sphagnum moss peat conforming to ASTM D2607; free of lumps, roots, inorganic material, or acidic materials; minimum of 85 percent organic material measured by oven dry weight; 4 to 5 pH range; moisture content of 30 percent.

C. Topsoil: Topsoil for backfill shall be as specified in Section 329002 - Landscape Grading.

D. Water: Clean, fresh, and free of substances or matter which could inhibit vigorous growth of plants.

E. Herbicide: Comply with all applicable State and Federal Laws.

F. Pesticide: Comply with all applicable State and Federal Laws.

2.4 MULCH MATERIALS

A. Mulching Material: Shredded, aged, dark brown/black, native hemlock mulch free of growth or germination inhibiting ingredients.

2.5 MISCELLANEOUS MATERIALS

A. Anti-Desiccant: Emulsion type, film-forming agent, designed to permit transpiration but retard excessive loss of moisture from plants. Deliver in manufacturer’s fully identified containers and mix in accordance with manufacturer’s instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify site is ready to accept Work of this section.

B. Test drainage of plant beds and pits by filling with water twice in succession. Notify Owner’s Representative of conditions permitting the retention of water in planting beds for more than twenty-four (24) hours.

C. Prior to the excavation of planting pits, or placing tree stakes, the Contractor shall ascertain the location of utility lines, electric cables, and conduits, so that proper precautions may be taken not to

disturb or damage subsurface improvements. Should obstructions be found, the Contractor shall promptly notify the Owner's Representative.

D. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION OF PLANT PITS AND BEDS

A. Plant Pits: Dig to produce vertical sides and flat, undisturbed bottoms. Scarify glazed side surfaces of pits. Size plant pits as shown on drawings.

C. Remove all sticks, stones, roots, and other objectionable materials during tilling operations larger than one inch in diameter.

D. Damage to paving, sidewalks or other materials shall be removed and replaced at the Contractor's expense and to the satisfaction of the Owner's Representative.

3.3 LAYOUT

A. Stake tree locations with 3/4" x 2" x 18" wood stakes driven into the soil at center points of plants. Paint tops of stakes representing tree locations.

B. Mark all underground utilities.

C. Notify Owner's Representative, in writing, of portions of plant material which have been staked. Allow one week for Owner's Representative to review and adjust stake locations.

D. Plants which are planted prior to contractor receiving approval from Owner's Representative of staking are subject to being relocated at no cost to Owner.

3.4 PLANTING

A. Setting Plants: Handle balled and burlapped and container-grown plants by ball or container. Set plants and hold in plumb position until sufficient soil has been firmly placed around roots or ball. Set plants in relation to surrounding grade so that they are even with depth at which they were grown in nursery, collecting field, or container.

B. Place fertilizer prior to backfilling and in accordance with the manufacturer's recommendations. Ground cover plants may be planted after mulch is in place. Take care to avoid contaminating mulch with planting soil.

C. Backfill excavations for balled and burlapped stock with planting soil mixture to approximately half the depth of the ball and then tamp and water. Carefully remove, open or fold back burlap and tying materials. Completely remove plastic wrap before the placement of backfill. Finish backfilling and tamp. Form earth saucers around isolated plants of size ample enough to hold at least 5 gallons for trees. Do not use planting stock if ball is cracked or broken before or during planting operation.

3.5 FERTILIZATION, WATERING, EDGING, AND MULCHING

A. Trees: Fertilize according to manufacturer's recommendations.

B. Watering: Provide uniform coverage which will not cause erosion or damage to the finished surface. Water sufficiently to penetrate the planting bed to a depth of 4 inches. Provide supplemental water to provide 1" per week.

C. Uniformly edge beds or individual plants using a sharp tool to provide a clear-cut division line between the planted area and the adjacent lawn. Provide plant pits circular in shape for individual pits.

D. Mulch within 24 hours after planting. Spread to uniform thickness of 3 inches.

3.6 PRUNING AND REPAIR

A. Plants shall be neatly pruned and or clipped to preserve the natural character of the, in a manner appropriate to the particular requirements of each plant and to the satisfaction of the Owner's Representative. Unless otherwise directed by Owner's Representative, do not cut tree leaders; remove only injured or dead branches.

B. Remove broken or badly bruised branches with a clean cut. All pruning shall be done with sharp tools in accordance with instructions of the Owner. Accidental damage to trees occurring during the course of planting operations which is not so great as to necessitate removal of a branch or replacement of a plant shall promptly be treated as required in accordance with recognized horticultural practices.

3.7 CLEANING

A. Keep worksite in clean and orderly condition as Work progresses. Leave worksite "broom clean" at end of Work.

END OF SECTION 329000

SECTION 329002

LANDSCAPE GRADING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section includes the following:

1. Proof roll subgrade.
2. Furnish, place, compact and finish grade topsoil.
3. Stockpile existing topsoil, test and amend as necessary to meet imported topsoil specification.

B. Related Sections:

1. Section 312301 Earthwork for filling and grading work.
2. Section 329000 Landscape Work for plant material installation work.

1.3 REFERENCES

A. ASTM D2607 - Classification of peats, mosses, humus, and related products.

B. ASTM D2976 - Standard test method for pH of peat materials.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

1. Topsoil test results from UMASS (testing by GC).

1.5 SEQUENCING AND SCHEDULING

A. Topsoil to be placed after utilities are installed.

PART 2 PRODUCTS

2.1 MATERIALS

A. Imported Topsoil: Imported topsoil shall be sandy loam, free from hard clods, stiff clay, sod, stones, roots, sticks or other debris over one inch in size. Topsoil shall be free of toxic materials and shall be tested for pH and adjusted if required to range of 5.5 to 6.5. Topsoil shall be tested for percentage of sand, silt, clay and organic matter. Topsoil shall fall within the following ranges: Gravel, less than 10%; Course to Medium Sand, 50%-65%; Fine Sand, 5-15%; Very Fine Sand, 0-15%; Silt, 10%-30%; Clay, 15%-20%. Organic matter shall not be less than 6% nor more than 12% as determined by loss on ignition of moisture-free samples dried at 65 degrees centigrade.

B. Peat: Peat moss according to ASTM D2607. PH of peat to be in range of 5.9 to 7.0 according to ASTM D2976.

C. Sand: Hard, granular natural sand, washed free of materials and chemicals deleterious to plant growth.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions and note irregularities affecting Work of this Section.

B. Beginning Work of this Section means acceptance of existing conditions.

3.2 PROTECTION

A. Do not damage features remaining as final work.

3.3 PREPARATION OF SUBSOIL AT DISTURBED AREAS

A. Scarify subgrade in areas where topsoil is to be placed. Scarify to a minimum depth of 12 inches. Repeat cultivation in areas where equipment has compacted subgrade.

B. Remove any contaminated subsoil.

3.4 PLACING TOPSOIL

A. Place topsoil in disturbed areas where planting is scheduled.

B. Use topsoil in relatively dry state. Place during dry weather.

C. Fine grade topsoil eliminating rough or low areas. Maintain levels, profiles, and contours of subgrade.

D. Remove stone, roots, grass, weeds, debris, and foreign material over 1 inch in any dimension.

E. Manually spread topsoil around improvements to prevent damage.

F. Lightly compact placed topsoil.

G. Remove surplus subsoil and topsoil from site.

H. Leave site clean and raked, ready to receive plant materials.

3.5 TOLERANCES

A. Top of topsoil: Plus or minus 1 inch.

3.6 FIELD QUALITY CONTROL

A. Testing and analysis will be performed under provisions of Division One.

B. Any existing topsoil reinstalled prior to Owner’s Representative indicating the submittal meets the specification is subject to rejection.

C. Remove or amend, as required to meet specification, any imported topsoil not conforming to specification.

3.7 SCHEDULE OF LOCATIONS

A. The following identify compacted topsoil thickness:

1. Seeded Lawn: 6 inches

END OF SECTION 329002

SECTION 329219

SEEDED LAWNS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Drawings, Contract Forms, and Conditions of the Contract, and other Division 1 - GENERAL REQUIREMENTS, shall be included in and made a part of this Section.

1.2 SUMMARY

A. This section includes the following:

1. Seeding or Hydroseeding.
3. Mulching.
4. Seed protection on slopes.
5. Maintenance.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 329002 Landscape Grading for topsoil placement and finish grading.
2. Section 329000 Planting for coordination with plant material installation.

1.3 DEFINITIONS

A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

B. A satisfactory stand of grass is hereby defined as a healthy thick lawn that has: no bare spots larger than one square foot, not more than ten percent of total area with bare spots larger than six inches square, free from weeds, and grass height between 2 1/4" and 2 ½".

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Certification of grass seed from seed vendor for each grass seed mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

C. If hydro-seeding is chosen application method, submit contents of slurry for approval.

D. Qualification data for firms and persons specified in the “Quality Assurance” Article to demonstrate their capabilities and experience. Include list of completed projects with project names and addresses, names and addresses of Owner’s Representative, and other information specified.

1.5 QUALITY ASSURANCE

A. Seeding Contractor to have three years of documented experience of Work of this type.

1.6 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer, herbicide, and pre-emergent composition.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.

B. Deliver grass seed mixture in original sealed, labeled, and undamaged containers. Seed in damaged packaging is not acceptable.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not sow seed when soil is wet and unable to support the load of equipment.

B. Do not sow seed when winds cause uneven distribution of seed.

1.9 SEQUENCING AND SCHEDULING

A. Coordinate sowing of seed with remainder of work on project.

B. Proceed with Work as rapidly as portions of site become available while working within seasonal limitations.

C. Notify Architect when conditions detrimental to lawn growth are encountered. Do not execute work until notification has been made and acknowledged.

1.10 MAINTENANCE SERVICE

A. Maintain seeded areas immediately after placement, and not less than 90 days after completion of seeding. Where seeding is phased, maintenance shall continue for the entire project until last phase meets above specification.

PART 2 - PRODUCTS

2.1 SEED MIXTURES

A. Seed mixture to consist of approximate percentages indicated below.

1. Species: Blend of Grasses

a. 40% Perennial Ryegrass
b. 30% Chewings Fescue
c. 15% Barrari Kentucky Bluegrass
d. 15% Barrister Kentucky Bluegrass

2. 8 Pounds of seed per 1,000 sq ft.

2.2 HYDROSEED MIX

A. All work will be carried out by an approved spraying machine specifically used for this work. Amounts of fertilizer used shall reflect recommendations outlined in the Soil Analysis, see Section 2.01 C. The Contractor shall submit to the Owner's Representative for approval,

prior to the start of work, a certified statement as to number of pounds of fertilizer, amounts and types of grass seed, and processed fiber, per one hundred (100) gallons of water.

B. Hydromulch: Shall be Terra-Sorb GB, or an approved equal. Add Terra-Sorb to the hydroseed tank at the amount of 60 pounds per acre.

2.3 ACCESSORIES

A. Mulching Material: Dry oat or wheat straw, free from weeds and foreign matter detrimental to plant life. Hay or chopped cornstalks are not acceptable.

B. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.

C. Herbicide: Must comply with all applicable State and Federal Laws.

D. Pre-Emergent: Must comply with all applicable State and Federal Laws.

E. Stakes: Softwood lumber, chisel pointed.

F. String: Inorganic fiber.

G. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application, nontoxic and free of plant growth or germination inhibitors.

H. Erosion Control Blanket: The following are acceptable:

1. Short term single net erosion control blanket shall be a machine produced mat of 100% agricultural straw and lightweight biodegradable netting with a functional longevity of up to 12 months for 3:1 slopes.

a.	Thickness	ASTM D6525	0.50 in. (12.7 mm)
b.	Resiliency	ECTC Guidelines	78.8%
c.	Water Absorbency	ASTM D1117	301%
d.	Mass/Unit Area	ASTM D6475	9.76 oz/sy (332 g/sm)
e.	Swell	ECTC Guidelines	15%
f.	Smolder Resistance	ECTC Guidelines	Yes
g.	Stiffness	ASTM D1388	6.31 oz-in
h.	Light Penetration	ASTM D6567	6.0%
i.	Tensile Strength - MD	ASTM D6818	122.4 lbs/ft (1.81 kN/m)
j.	Elongation - MD	ASTM D6818	36.1%
k.	Tensile Strength - TD	ASTM D6818	79.2 lbs/ft (1.17 kN/m)
l.	Elongation - TD	ASTM D6818	26.8%
m.	Biomass Improvement	ASTM D7322	301%

2. Long term double net erosion control blanket shall be a machine produced mat of 100 % coconut fiber with a functional longevity of up to 36 months for any slopes steeper than 3:1.

a.	Thickness	ASTM D6525	0.22 in. (5.59 mm)
b.	Resiliency	ECTC Guidelines	82%
c.	Water Absorbency	ASTM D1117	167%
d.	Mass/Unit Area	ASTM 6475	7.73 oz/sy (262.8 g/sm)
e.	Swell	ECTC Guidelines	13%
f.	Smolder Resistance	ECTC Guidelines	Yes
g.	Stiffness	ASTM D1388	0.75 oz-in
h.	Light Penetration	ASTM D6567	16.6%

i.	Tensile Strength - MD	ASTM D6818	472.8 lbs/ft (7.01 kN/m)
j.	Elongation - MD	ASTM D6818	25.6%
k.	Tensile Strength - TD	ASTM D6818	225.6 lbs/ft (3.35 kN/m)
l.	Elongation - TD	ASTM D6818	33.9%
m.	Biomass Improvement	ASTM 7322	257%

I. Watering: Provide and maintain temporary piping, hoses, and lawn watering equipment to convey water from Contractor supplied sources and to keep lawns uniformly moist to a depth of four inches (100 mm).

1. Water lawn at the minimum of one inch (25 mm) per week.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that prepared topsoil is ready to receive the Work of this Section.

B. Verify required utilities are available and ready for use.

C. Beginning of installation means acceptance of existing site conditions.

D. Apply pre-emergent weed control prior to seed installation regardless of time of year.

3.2 FERTILIZING, SEEDING AND MULCHING

A. Contractor has option of hydro-seeding or manually fertilizing, seeding, and mulching or drill/Slice seeding. Follow appropriate specification below:

1. Manual seeding and mulching.

a. Apply seed evenly in two intersecting directions. Rake in lightly. Do not seed area in excess of that which can be mulched on same day.
b. Planting Season: March 15 to May 15 and late August to mid-October. Any deviation must be approved and does not release the Contractor from meeting any other requirement of this section.
c. Slightly firm seeded area with roller not exceeding 90 lbs.
d. Immediately following seeding and compacting, protect seeded slopes less than 1:6 against erosion by spreading straw mulch after completion of seeding operations. Spread uniformly to form a continuous blanket 1/8“loose depth over seeded areas. Spread by hand, blower, or other suitable equipment. Maintain clear of shrubs and trees.
e. Apply water with a fine spray after each area has been mulched. Saturate top 4 inches of soil.

2. Hydro-seeding.

a. Mix slurry with nonasphaltic tackifier.
b. Apply slurry at rate of 8 lbs, per 1,000 square feet evenly in two intersecting directions and with hydraulic seeder. Slurry is to apply a minimum of 1,500 lbs. of mulch per acre.
c. Mulch is to be dyed green.

3.3 CLEANING

A. Clean Project Site under provisions of Division One.

3.4 PROTECTION

A. Protect according to provisions of Division One.

B. Protect seeded areas with stakes and tape around area periphery. Set highly visible warning tape and banners at 36" height.

3.5 MAINTENANCE

A. Water to prevent grass and soil from drying out.

B. Control growth of weeds. Carefully apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

C. Immediately reseed areas which show bare spots.

D. Repair washed out areas by filling with topsoil, regrading, fertilizing, and reseeding.

E. Replace and/or provide new mulch on banks when washed or blown away.

F. Provide stand of grass acceptable to the Owner’s Representative, by watering, weeding, mowing, regrading, and reseeding where necessary, and otherwise maintaining seeded areas until final acceptance.

G. If a satisfactory lawn has not been established, another inspection will be made after written notice from the Contractor (but no sooner than 90 days) that the lawn is ready for inspection.

END OF SECTION 329219

Division 33 – Site Utilities

SECTION 330500

COMMON WORK RESULTS FOR UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Piping joining materials.
2. Transition fittings.
3. Sleeves.
4. Flowable fill.
5. Piping system common requirements.
6. Equipment installation common requirements.
7. Painting.
8. Concrete bases.

1.3 DEFINITIONS

A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.

B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

C. PE: Polyethylene plastic.

D. PVC: Polyvinyl chloride plastic.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.5 COORDINATION

A. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

B. Coordinate installation of identifying devices after completing covering and painting if devices are applied to surfaces.

C. Coordinate size and location of concrete bases.

PART 2 - PRODUCTS

2.1 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness, unless otherwise indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Solvent Cements for Joining Plastic Piping:

1. ABS Piping: ASTM D 2235.
2. CPVC Piping: ASTM F 493.
3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
4. PVC to ABS Piping Transition: ASTM D 3138.

H. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.2 TRANSITION FITTINGS

A. Transition Fittings, General: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

B. Transition Couplings NPS 1-1/2 and Smaller:

1. Underground Piping: Manufactured piping coupling or specified piping system fitting.
2. Aboveground Piping: Specified piping system fitting.

C. AWWA Transition Couplings NPS 2 and Larger:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cascade Waterworks Mfg. Co.
b. Dresser, Inc.; DMD Div.
c. Ford Meter Box Company, Inc. (The); Pipe Products Div.
d. JCM Industries.
e. Smith-Blair, Inc.
f. Viking Johnson.

2. Description: AWWA C219, metal sleeve-type coupling for underground pressure piping.

D. Flexible Transition Couplings for Underground Nonpressure Drainage Piping:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cascade Waterworks Mfg. Co.
b. Fernco, Inc.
c. Mission Rubber Company.
d. Plastic Oddities.

2. Description: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

2.3 SLEEVES

A. Mechanical sleeve seals for pipe penetrations are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

B. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized, plain ends.

D. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

E. Molded PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.

G. Molded PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Install piping according to the following requirements and utilities Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping to permit valve servicing.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Select system components with pressure rating equal to or greater than system operating pressure.

I. Sleeves are not required for core-drilled holes.

J. Permanent sleeves are not required for holes formed by removable PE sleeves.

K. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of equipment areas or other wet areas 2 inches above finished floor level.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

a. PVC Pipe Sleeves: For pipes smaller than NPS 6.
b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.

L. Verify final equipment locations for roughing-in.

M. Refer to equipment specifications in other Sections for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and utilities Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

G. Grooved Joints: Assemble joints with grooved-end pipe coupling with coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

H. Soldered Joints: Apply ASTM B 813 water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B 32.

I. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

J. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.

K. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Nonpressure Piping: Join according to ASTM D 2855.

L. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

M. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

N. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End PE Pipe and Fittings: Use butt fusion.
2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.

O. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Install dielectric fittings at connections of dissimilar metal pipes.

3.4 EQUIPMENT INSTALLATION

A. Install equipment level and plumb, unless otherwise indicated.

B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.

C. Install equipment to allow right of way to piping systems installed at required slope.

3.5 PAINTING

A. Painting of piped utility systems, equipment, and components is specified in Section 099113 "Exterior Painting," Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.6 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

END OF SECTION 330500

SECTION 331100

PIPE AND 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

A. Administrative Submittals

1. Construction details and schedule of operation for each connection to existing piping at least 15 days prior to beginning the Work. Approval must be received before commencement of Work on-site.

B. Shop Drawings

1. Manufacturer’s scale drawings, cuts or catalogs including descriptive literature and complete characteristics and specifications and code requirements. Submit shop drawings for ductile iron pipe, types of joint, fittings, couplings, filling rings, lining and coating.

C. Quality Control Submittals

1. Certificates of compliance on pipe materials.

2. Prior to first shipment of pipe, submit certified test reports that the pipe for this Contract was manufactured and tested in accordance with the ASTM and ANSI/AWWA Standards specified herein.

3. Manufacturers of pipe on the project shall have an established, annually audited and certified, quality control procedure for manufacturing of pipe. Each manufacturer shall be certified by an independent, third party auditor for compliance with all requirements of the AWWA standards. The manufacturer shall submit a current certificate of compliance for the plant facility where the pipe is to be made. Certificate of compliance shall be submitted for each additional year of pipe manufacturing during the duration of the Project. The manufacturer shall not change the plant manufacturing the pipe during the duration of the Work.

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 EXAMINATION

A. Provide all labor and equipment necessary to assist the Engineer to observe 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 that 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 provided by the City of Lowell Water Department, at no cost to the Contractor. However, the Contractor will remain 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