BID DOCUMENTS AND SPECIFICATIONS FOR:

Whittemore Park Improvements- Phase 2 Arlington, Massachusetts

Bid # 22-04

February 9, 2022

Prepared for:

Department of Planning and Community Development

Town of Arlington, Massachusetts

Prepared by: Crowley Cottrell, LLC

SEALED BIDS will be received:

Date: Wednesday February 23, 2022

Time: 10:00 AM

Place: Office of the Purchasing Agent 730 Massachusetts Avenue

Arlington, MA 02476

DOCUMENT 000110
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TOWN OF ARLINGTON
MASSACHUSETTS

INVITATION TO BID

BID No. 22-04 WHITTEMORE PARK IMPROVEMENTS- PHASE 2

Sealed bids for Whittemore Park Improvements- Phase 2 for the Town of Arlington, Massachusetts, will be received at the Purchasing Department, 730 Massachusetts Avenue, Arlington, MA 02476 until **10:00 AM prevailing time, on Wednesday February 23 , 2022**

at which time and place said bids will be publicly opened and read aloud.

All bids must be in a sealed envelope plainly marked: **BID No. 22-04 WHITTEMORE PARK IMPROVEMENTS- PHASE 2.**

"Phase 2 landscape improvements to Whittemore Park, located around the Cutter House, includes but is not limited to the following; demolition of existing brick walks, stone wall, site furnishings, lighting and fencing; temporary tree protection; new brick paving; modifications and additions to the existing granite stairs, handrails, and landings; improvements to the existing irrigation systems, lighting, new furnishings and new plantings throughout."

Pre-bid conference will be held on Wednesday February 16, 2022 at 11:00 AM via Zoom:

https://town-arlington-ma-us.zoom.us/meeting/register/tZcqf-CgrTsiEt1JKJ0_DI604BZwRoq8to0B

Bid Security in the form of a bid bond, cash, certified check, treasurer's or cashier's check payable to the Owner, is required in the amount of five percent of the bid, in accordance with Section 00200, INSTRUCTIONS TO BIDDERS.

The contract duration for the Base Bid is 120 consecutive days.

Contract Documents and plans are available for down load and review on the Town Website:

www.arlingtonma.gov/purchasing

The selected contractor shall furnish a performance bond and a payment bond in amount at least equal to one hundred percent (100%) of the contract price.

The conditions of employment as set forth in Federal Wage Determination MA20220021 dated January 7, 2022, issued by the U.S. Department of Labor, shall prevail in the execution of the work under this contract. Attention is called to the fact that minimum wage rates and health and welfare and pension fund contributions are established for this contract and are part of the specifications.

All bids for this project are subject to applicable bidding laws of Massachusetts, including General Laws Chapter 30, Section 39M as amended.

The Bidder agrees that this bid shall be good and may not be withdrawn for a period of 30 working days, Saturdays, Sundays and legal holidays excluded after the opening of bids.

The Owner reserves the right to waive any informalities or to reject any or all bids.

TOWN OF ARLINGTON

Adam W. Chapdelaine
Town Manager

INSTRUCTIONS TO BIDDERS

1. COMPLEMENTARY DOCUMENT

   A. INVITIATION TO BID, including herewith, is complementary to this document and shall be reviewed by bidder for specific instruction which are not repeated herein.

2. STATUTES REGUALTING COMPETITIVE BIDDING

   A. Bidding procedures and award of general contract and subcontracts shall be in accordance with the provisions of Chapter 30, Section 39M and Chapter 149, Section 44A through 44L inclusive, of the General Laws of the Commonwealth of Massachusetts, including all current amendments.

   B. In the event of any discrepancy or inconsistency between the provisions of these Bid and Contract Documents and the above-mentioned statutes, the provisions of the above-mentioned statutes shall govern. In such event, the application of all remaining provisions not in conflict to any circumstance other than that in which the conflict occurs shall not be affected thereby.

3. BIDDER'S QUALIFICATIONS

   A. DCPO Certification not required.

   B. The Contractors' Update Statements are not public records and will not be open to public inspection.

4. INTERPRETATION OF DOCUMENTS: NOTIFICATION OF ERRORS

   A. Interpretations of the provisions of the Bid and Contract Documents will be made by the designer upon written request of any general bidder or subbidder, provided that such request is received by the Designer at least seven (7) days prior to the date of the applicable bid opening, and that the Designer considers such interpretation to be of sufficient importance. Oral or telephone interpretations will not generally be made, and if made shall be strictly informal and not legally valid or binding.

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

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

5. EXAMINATION OF BIDDING AND CONTRACT DOCUMENTS

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

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

6. PRE-BID CONFERENCE

A. Pre-bid conference will be held at the location and time stipulated in the Invitation to Bid.

7. MODIFICATION AND WITHDRAWAL OF BIDS

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

8. ADDENDA

A. Addenda may be required during the bidding period to modify, clarify or interpret the Bid and Contract Documents. It is intended, but not guaranteed, that such Addenda shall be mailed by the Owner to all persons or parties to whom Bid and Contract Documents have been issued (Bidders of Record). Failure to receive such Addend shall in no way relieve any bidder from the execution of its provisions. All bidders are cautioned to verify the number of Addenda which have been issued and to secure any needed copies from the Designer before submitting a Bid.

9. FORM FOR BIDS

A. The Owner will make available, to every person applying therefor, a Bid Form. Each bona fide Bidder will be furnished forms for his proposal upon request. Such forms will be made available at the Owner's office during the regular office hours throughout the bidding period. Bids must be submitted on the forms provided by Owner or of forms included in the bid documents of the Project Manual.

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

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

10. SUBMISSION OF BIDS

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

Bid For:

_____

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 bid opening, as described in the Invitation to Bid. Mailed Bids must be received before the time scheduled for opening of Bids.

11. PERFORMANCE AND PAYMENT BONDS

A. The Performance and Labor and Materials Payment Bonds required of the General Contractor shall each be in the amount of 100% of the contract sum from a surety company qualified to do business under the laws of the Commonwealth of Massachusetts and approved by the Owner.

12. FOREIGN CORPORATIONS

A. The attention of bidders is called to General Laws, Chapter 30, Section 39L, as amended by Acts of 1967, Chapter 3, under which the Owner may not enter into a contract with a foreign corporation as a subcontractor unless the foreign corporation has filed with the Owner a certificate by the State Secretary stating that the foreign corporation has complied with General Laws Chapter 181, Sections 3 and 5 and stating the date of such compliance.

13. AWARD OF CONTRACT

A. The Contract will be awarded to the lowest responsible and eligible bidder except in the event of a substitution as provided by under Chapter 149, Sections 44E and 44F of the above-reference General Laws.

14. COMMENCEMENT AND COMPLETION OF WORK

A. The successful bidder, upon completion of the Contract Agreement, shall commence the work of the Contract within seven (7) calendar days from receipt of written Notice to Proceed issued by the Owner within fourteen (14) calendar days after said execution of the Contract Agreement, and shall therefore diligently and continuously carry on the work in such manner as to substantially complete the work on or before September 30, 2016 except as noted herein.

15. LIQUIDATED DAMAGES

A. The attention of bidders is particularly called to the requirements as to the conditions of employment to be observed, the minimum wage rates to be paid under the Contract and affirmative action to ensure equal employment opportunity.

B. Contractor shall make full good faith efforts to secure at least ten percent (10%) of the Labor and Materials incorporated in the Work from Minority Business Enterprises and five percent (5%) of the Labor and Materials incorporated in the Work from Women Business Enterprises certified by the Commonwealth of Massachusetts and consistent with the Federal Equal Employment Opportunity requirements attached hereto as Attachment A. Satisfactory documentation of such effort shall be furnished promptly upon request by Owner.

C. The Owner is an equal employment opportunity employer and has an active Affirmative Action Plan (AAP). For more information, direct correspondence to Patricia M. Libby, Affirmative Action Officer for the Town of Arlington.

BID FORM

For: Whittemore Park Improvements/Phase 2 (Bid #22-04)

Proposal (BID) of _____
(hereinafter called "Bidder") a corporation, organized and existing under the laws of the Commonwealth of Massachusetts.

_____

doing business as _____
(corporation, proprietorship, partnership)

to the TOWN OF ARLINGTON hereinafter called "Owner". Gentlemen:

A. The Bidder, in compliance with your invitation for bids for the Whittemore Park Improvements/Phase 2, Arlington Massachusetts, having examined the plan and specifications with related documents and the site of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials and supplies, and to construct the project in accordance with the Contract Documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

Bidder hereby agrees to commence work under this Contract on or before a date to be specified in the written "Notice to Proceed" from the Owner, and to complete the work within 120 consecutive days . The Bidder further agrees to pay as liquidated damages, the sum of $100.00 for each consecutive calendar day thereafter that the works remains incomplete, as provided in the Instruction to Bidders, Modifications to General Conditions. Required completion dates are as follows:

B. Bidder acknowledges receipt of the following addendum:

_____ Dated _____

_____ Dated _____

_____ Dated _____

C. Bidder agrees to perform all work described in the specifications and shown on the drawings, for the following lump sum price of:

1. Total Proposed Base Bid Contract Price:

_____ Dollars ($_____)

2. Total Bid for Add Alternative #1 _____ Dollars ($_____)

3. Total Bid for Add Alternative #2 _____ Dollars ($_____)

4. Bid Deposit on total bid price, <u>including alternates</u>, in the sum of:

_____ Dollars ($_____) in the form of _____ is submitted herewith in accordance with the INSTRUCTION FOR BIDDERS and is to become property of the Owner in

the event the Contract and bonds are not executed within the time above set forth, as liquidated damages for the delay and additional expense to the Owner caused thereby.

5. The Bid does not include premiums on Performance/Labor and Materials Bond. Cost of required Bond Premiums (for base bid and any and all alternates):

   Bid Premiums Add $_____

6. The Supplemental Unit Prices set forth herein shall be used to determine any equitable adjustment of the Contract in connection with the changes or extra work performed under this Contract as directed by the **Town of Arlington**. Contractor to refer to Specification Section 012200 UNIT PRICES and submit the from within this section as part of the bid.

   It is mutually understood and agreed that such Supplemental Unit Prices include all items of costs, equipment, taxes and insurance of every kind, overhead, and profit for the **Contractor** and they shall be used uniformly, without modification for addition and deductions. Prices listed under ADDITIONS and DEDUCTIONS are to be the complete total price billed to and paid by the **Town of Arlington** therefor. There can be no more than fifteen (15) percent difference in price between the additions and deductions.

D. If the Bid is accepted by the Owner, the undersigned agrees to complete the entire work provided to be done under the contract within the time stipulated by the Owner.

E. The undersigned agrees that for extra work, if any, performed in accordance with the AGREEMENT, he will accept compensation as stipulated therein in full payment for such extra work.

F. Bidder understands that the Owner reserves the right to reject any and all bids.

G. The undersigned hereby agrees that he will not withdraw the Bid within sixty (60) consecutive calendar days after the actual date of the opening of Bids and that, if the Owner accepts this Bid, the undersigned will duly execute and acknowledge the required Contract Bonds within 10 days after notification that the AGREEMENT is ready for signature.

H. Should the undersigned fail to fulfill any of his agreements as here in before set forth, the Owner shall have the right to retain as liquidated damages the amount of the Bid security, which shall become the Owner/s property. If a bid was furnished as bid security, it is agreed that the amount thereof shall be paid as liquidated damages to the Owner by the Surety.

I. The Undersigned certifies under penalty of perjury that this Bid is in all respect bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the "person" shall men natural person, joint venture, partnership, corporation or other business or legal entity.

J. The undersigned certifies that he is able to furnish labor that can work in harmony with all with all laws and regulations applicable to awards made subject forty-four A.

1. Have been in business under the present name for____years.

2. Ever failed to complete any work awarded?_____(Yes),_____(No). If yes, explain: _____

3. Bank Reference: _____

K. The Bidder is required to state below all work he/she and his/her subcontractors (if subcontractors are to perform substantial portions of the work) has compete within the past 5 years of a similar character and value to that of the work included in the proposed Contract and to give references that will enable the Owners to judge the Bidder's experience, skill and business standing. The Bidder is required to list a minimum of 3 completed projects that are comparable in scope, complexity and value. For each project, include the name, location, type, date complete, construction value and owner contact. (add supplementary pages as needed)

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

L. The Bidder is required to state below all construction projects he/she currently has under contract. For each project, include the name, location, type, scheduled completion date, construction value and owner contact.

_____

_____

_____

_____

_____

_____

_____

M. The undersigned bidder hereby certifies that the tools and equipment required to meet the specified requirements of the Contract document, with special attention called to Section 02300 Earthwork, will be utilized in the performance of the work.

N. The undersigned further certifies under the penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth of Massachusetts under the provisions of section 29F, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation declared there under.

Date: _____

Name of General Bidder: _____

Name and Title of Person Signing Bond: _____

Business Address: _____

FORM A

CERTIFICATE OF NON-COLLUSION

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

_____

Authorized Name

_____

Authorized Signature Date

_____

Social Security Number or Federal Identification Number

_____

Legal Name of Business Entity (Print or

_____

Type) Address

_____

City, State, Zip Code

Corporate Seal (If applicable)

FORM B

BIDDER CERTIFICATION REGARDING PAYMENT OF PREVAILING WAGES

The undersigned hereby certifies, under pains and penalties of perjury, that the foregoing bid is based upon the payment to laborers to be employed on the project of wages in an amount no less that the applicable wage rates established for the project by the Massachusetts Department of Labor and Industries. The undersigned bidder agrees to identify the awarding authority for, from, and against any loss, expense, damages, action, or claims, including any expense incurred in connection with any delay or stoppage of the project work, arising out of or as a result of (1) the failure of the said bid to be based upon the payment of the said applicable prevailing wage rates or
(2) the failure of the bidder, of selected as the contractor, to pay laborers employed on the project the said applying prevailing wage rates.

_____
Date

_____
Name of Person Signing the Bid or Proposal

_____
Signature of Person Signing the Bid or Proposal Title

_____
Name of Business (Print or Type)

Corporate Seal (If applicable)

FORM C

CERTIFICATION OF PAYMENT OF STATE TAXES

Legislation enacted by the Commonwealth of Massachusetts, effective, 1983, requires that attestation below be signed:

Pursuant top M.G.L c. 62C, sec. 49A, I certify under the penalties of perjury, that I,to my best knowledge and belief, have filed all state tax returns and paid all state taxes required by law.

APPROVAL OF A CONTRACT OR ANY OTHER AGREEMENT WILL NOT BE GRANTED UNLESS THIS CERITIFCATION CLAUSE IS SIGNED BY AN AUTHORIZED CORPROATE OFFICER.

THE TAX PAYER IDENTIFICATION NUMBER WILL BE FURNISHED TO THE MASSACHUSETIS DPEARTMENT OF REVENUE TO DETERMINE IF TAX FILINGS AND/OR TAX PAYMENT OBLIGATIONS HAVE BEEN MET. PROVIDERS WHO FAIL TO CORRECT THIER NON-FILING AND/OR DELIQUENCY STATUS SHALL NOT HAVE A CONTRACT OR ANY OTHER AGREEMENT ISSUED, RENEWED OR EXTENDED

_____

(Signature of Individual) Title

_____

Social Security Number or Federal Identification Number

_____

Corporate Name

_____

Name of Person Signing the Proposal (Print or Type) Date

_____

Legal Name of Business Entity (Print or

_____

Type) Business Address

Corporate Seal (If applicable)

FORM D

CERTIFICATION OF AUTHORITY MEETING OF BOARD OF DIRECTORS

(Note: if business entity is a partnership or individual, all owners shall sign this form.)

At a meeting of the Directors of the _____ duly called and held at

(Corporation)

_____ on the _____ day of _____, 20_____,
(Location)

at which a quorum was present and acting, it was voted that _____, the
(Name)

_____ of this Corporation, is hereby authorized and empowered to make,
(Title/Position)

into, sign, seal and deliver on behalf of the Corporation a Contract for _____

with the _____, and the performance and payment bonds each in the amount as specified by the Owner.

I hereby certify that the above is a true and correct copy of the record, that said vote has not been amended or repealed and is in full force, and effect as of this date and that

_____ is duly elected _____ of the corporation
(Name) (Title/Position)

_____

Clerk or secretary of the Corporation Date

(Note: If the Bidder is a corporation, affix corporate seal and give below the names of its president, treasurer, and general manager, if any: if a partnership, give full names and residential addresses of all partners; and if an individual, give residential dress if different form business address.)

the required names and addresses of all person interested in this proposal, as Principals, are as follows:

_____

Applicability

The Project or Program to which the construction work covered by this contract pertains is being assisted by the United States of America and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance.

A. 1. (i) Minimum Wages. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section l(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period.

Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible, place where it can be easily seen by the workers.

(ii) (a) Any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met:

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

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

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

(b) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB control number 1215-0140.)

(c) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

(d) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii)(b) or (c) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

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

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part

of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

2. Withholding. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work, all or part of the wages required by the contract, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the contractor, disburse such amounts withheld for and on account of the contractor or subcontractor to the respective employees to whom they are due. The Comptroller General shall make such disbursements in the case of direct Davis-Bacon Act contracts.

3. (i) Payrolls and basic records. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section l(b)(2)(B) of the Davis-bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5 (a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section l(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and Budget under OMB Control Numbers 1215-0140 and 1215-0017.)

(ii) (a) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i) except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at *http://www.dol.gov/esa/whd/forms/wh347instr.htm* or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this subparagraph for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to HUD or its designee. (Approved by the Office of Management and Budget under OMB Control Number 1215-0149.)

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

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

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

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

(c) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph A.3.(ii)(b).

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

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

4. Apprentices and Trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant ',to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by

the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under 29 CFR Part 5 shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR Part 3 which are incorporated by reference in this contract

6. Subcontracts. The contractor or subcontractor will insert in any subcontracts the clauses contained in subparagraphs 1 through 11 in this paragraph A and such other clauses as HUD or its designee may by appropriate instructions require, and a copy of the applicable prevailing wage decision, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this paragraph.

7. Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act Requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.

10. (i) Certification of Eligibility. By entering into this contract the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001. Additionally, U.S. Criminal Code, Section 1 01 0, Title 18, U.S.C., "Federal Housing Administration transactions", provides in part: "Whoever, for the purpose of . . . influencing in any way the action of such Administration..... makes, utters or publishes any statement knowing the same to be false..... shall be fined not more than $5,000 or imprisoned not more than two years, or both."

11. Complaints, Proceedings, or Testimony by Employees. No laborer or mechanic to whom the wage, salary, or other labor standards provisions of this Contract are applicable shall be discharged or in any other manner discriminated against by the Contractor or any subcontractor because such employee has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable under this Contract to his employer.

B. Contract Work Hours and Safety Standards Act. The provisions of this paragraph B are applicable where the amount of the prime contract exceeds $100,000. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in subparagraph (1) of this paragraph, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph (1) of this paragraph, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by the clause set forth in sub paragraph (1) of this paragraph.

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

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

C. Health and Safety. The provisions of this paragraph C are applicable where the amount of the prime contract exceeds $100,000.

(1) No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.

(2) The Contractor shall comply with all regulations issued by the Secretary of Labor pursuant to Title 29 Part 1926 and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, (Public Law 91-54, 83 Stat 96). 40 USC 3701 et seq.

(3) The contractor shall include the provisions of this paragraph in every subcontract so that such provisions will be binding on each subcontractor. The contractor shall take such action with respect to any subcontractor as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.

Project Wage Rate Sheet

U.S. Department of Housing and Urban Development
Office of Labor Relations

PROJECT NAME:	WAGE DECISION NUMBER/MODIFICATION NUMBER:
PROJECT NUMBER:	PROJECT COUNTY:

WORK CLASSIFICATION	BASIC HOURLY RATE (BHR)	FRINGE BENEFITS	TOTAL HOURLY WAGE RATE	LABORERS FRINGE BENEFITS:		$
				GROUP #	BHR	TOTAL WAGE
Bricklayers			$			
Carpenters			$			$
Cement Masons			$			$
Drywall Hangers			$			$
Electricians			$			$
Iron Workers			$			$
Painters			$	OPERATORS FRINGE BENEFITS:		$
Plumbers			$	GROUP #	BHR	TOTAL WAGE
Roofers			$			$
Sheet Metal Workers			$			$
Soft Floor Layers			$			$
Tapers			$			$
Tile Setters			$	TRUCK DRIVERS FRINGE BENEFITS:		$
OTHER CLASSIFICATIONS				GROUP #	BHR	TOTAL WAGE
			$			$
			$			$
			$			$

ADDITIONAL CLASSIFICATIONS (HUD Form 4230-A)

WORK CLASSIFICATION	BASIC HOURLY RATE	FRINGE BENEFITS	TOTAL HOURLY WAGE RATE	DATE OF HUD SUBMISSION TO DOL	DATE OF DOL APPROVAL
			$		
			$		
			$		
			$		

"General Decision Number: MA20220021 01/07/2022

Superseded General Decision Number: MA20210021

State: Massachusetts

Construction Type: Highway

County: Middlesex County in Massachusetts.

HIGHWAY CONSTRUCTION PROJECTS

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022, Executive Order 14026 generally applies to the contract. The contractor must pay all covered workers at least $15.00 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.

If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022, Executive Order 13658 generally applies to the contract. The contractor must pay all covered workers at least $11.25 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/07/2022

ELEC0103-007 09/01/2021

	Rates	Fringes
ELECTRICIAN	$ 56.36	34.39

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* ENGI0004-026 12/01/2021

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
Group 1	$ 48.73	29.25+A

GROUP 1.....$ 51.38 31.10
Group 2.....$ 48.23 29.25+A
GROUP 2.....$ 50.83 31.10

FOOTNOTE FOR POWER EQUIPMENT OPERATORS:
A. PAID HOLIDAYS: New Year's Day, Washington's Birthday, Labor Day, Memorial Day, Independence Day, Patriot's Day, Columbus Day, Veteran's Day, Thanksgiving Day, Christmas Day

POWER EQUIPMENT OPERATORS CLASSIFICATIONS
Group 1: Backhoe/Excavator/Trackhoe; Bobcat/Skid Steer/Skid Loader; Broom/Sweeper; Gradall; Loader; Paver (Asphalt, Aggregate, and Concrete)
Group 2: Bulldozer; Grader/Blade; Milling Machine; Roller

IRON0007-031 09/16/2021

	Rates	Fringes
IRONWORKER (ORNAMENTAL, REINFORCING, AND STRUCTURAL).....	$ 50.13	34.81

LABO0039-002 06/01/2018

	Rates	Fringes
LABORER		
Asphalt, Includes Raker, Shoveler, Spreader and Distributor.....	$ 33.50	22.92
Landscape.....	$ 33.25	22.92

PAIN0035-023 07/01/2019

	Rates	Fringes
PAINTER (Steel).....	$ 50.66	30.90

SUMA2014-011 01/11/2017

	Rates	Fringes
CARPENTER, Includes Form Work....	$ 47.93	19.46
CEMENT MASON/CONCRETE FINISHER...	$ 56.70	21.08
LABORER: Common or General.....	$ 36.58	19.40
LABORER: Concrete Saw (Hand Held/Walk Behind).....	$ 41.78	18.37
LABORER: Guardrail Installation.....	$ 37.70	15.37
OPERATOR: Crane.....	$ 57.61	0.00
OPERATOR: Forklift.....	$ 64.67	0.00
OPERATOR: Mechanic.....	$ 48.14	17.02
OPERATOR: Piledriver.....	$ 44.46	16.94
OPERATOR: Post Driver (Guardrail/Fences).....	$ 41.49	23.07

PAINTER: Spray (Linestriping)....$ 40.87 13.86

PILEDRIVERMAN.....$ 45.65 23.33

TRAFFIC CONTROL: Flagger.....$ 23.00 20.44

TRAFFIC CONTROL:
Laborer-Cones/
Barricades/Barrels -
Setter/Mover/Sweeper.....$ 44.49 12.41

TRUCK DRIVER: Concrete Truck....$ 33.69 15.79

TRUCK DRIVER: Dump Truck.....$ 38.92 9.73

TRUCK DRIVER: Flatbed Truck.....$ 48.53 0.00

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

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

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

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were

prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union, which prevailed in the survey for this classification, which in this example would be Plumbers 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

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

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter

* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Division National Office Branch of Wage Surveys. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

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

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

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

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

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

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

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

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

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END OF GENERAL DECISION"

DOCUMENT 000110
TABLE OF CONTENTS

SPECIFICATIONS

DIVISION 01 - GENERAL REQUIREMENTS

DIVISION 02- 32 - TECHNICAL SPECIFICATIONS

SECTION 011000

GENERAL REQUIREMENTS

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 PROJECT REQUIREMENTS

A. Project Identification: Whittemore Park Improvments- Phase 2, Arlington, Massachusetts.

B. Project Requirements for Temporary Utilities and Facilities:

1. Utility Costs: The Contractor shall meter and pay for cost of utility services consumed, including electricity, water, gas and temporary heat.
2. Temporary Offices: A separate field office for the Architect and the Owner's Representative is not required.
3. Toilet Facilities: The Contractor shall provide and maintain temporary toilets outside the building.

C. Permits and Fees: Apply for, obtain, and pay for permits, fees, and utility company backcharges required to perform the work. Submit copies to Architect.

D. Codes: Comply with applicable codes and regulations of authorities having jurisdiction. Submit copies of inspection reports, notices and similar communications to Architect.

E. Dimensions: Verify dimensions indicated on drawings with field dimensions before fabrication or ordering of materials. Do not scale drawings.

F. Existing Conditions: Notify Architect of existing conditions differing from those indicated on the drawings.

G. Contractor's Conduct on Premises: The Contractor and their employees shall behave in a respectful, courteous and safe manner. Abusive, harassing, and lewd behavior is prohibited. Music playing is prohibited. Alcohol, tobacco, and drug use is prohibited.

1.3 SPECIFICATION INFORMATION

A. These specifications are a specialized form of technical writing edited from master specifications and contain deviations from traditional writing formats. Capitalization, underlining and bold print is only used to assist reader in finding information and no other meaning is implied.

B. Except where specifically indicated otherwise, the subject of all imperative statements is the Contractor.

C. Sections are generally numbered in conformance with Construction Specifications Institute Masterformat System. Numbering sequence is not consecutive. Refer to the table of contents for names and numbers of sections included in this Project.

D. Pages are numbered separately for each section. Each section is noted with "End of Section" to indicate the last page of a section.

1.4 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.5 INDUSTRY STANDARDS

A. Referenced standards are part of the Contract Documents and have the same force and effect as if bound with these specifications.

B. Except where specifically indicated otherwise, comply with the current standard in effect as of the date of the Owner/Contractor Agreement. Obtain copies of industry standards directly from publisher.

C. The titles of industry standard organizations are commonly abbreviated; full titles may be found in Encyclopedia of Associations or consult Architect.

1.6 CODES AND REGULATIONS

A. Comply with all applicable codes, ordinances, regulations and requirements of authorities having jurisdiction.

B. Submit copies of all permits, licenses, certifications, inspection reports, releases, notices, judgments, and communications from authorities having jurisdiction to the Architect.

1.7 PROGRESS SCHEDULE

A. Provide comprehensive bar chart schedule showing all major and critical minor portions of the work, sequence of work and duration of each activity. Update and reissue regularly, but not less than monthly.

1.8 SCHEDULE OF VALUES

A. Prepare Schedule of Values to coordinate with application for payment breakdown. Submit at least 10 days before first payment application. Update and reissue regularly, but not less than monthly.

1.9 PAYMENT REQUESTS

A. Provide three copies of each request on completely filled out copies of AIA G702 and continuation sheet G703. Substantiate requests with complete documentation; include change orders to date. Provide partial lien waivers for work in progress and full lien waivers for completed work.

B. Record Drawing Certification: Certify as a part of each application for payment that the project record documents are current at the time of application is submitted. The Contractor shall require such drawings to be current as a condition of approving any payment to the trade Contractor and Subcontractor.

C. Before first payment application, provide the following:

1. List of subcontractors, suppliers and fabricators.
2. Schedule of values.
3. Progress schedule.
4. Submittal schedule keyed to project schedule.
5. List of Contractor's key project personnel.
6. Copies of permits and other communications from authorities.
7. Contractor's certificate of insurance.

8. Performance and payment bonds if required.
9. Unit price schedule.

D. Before final payment application, provide and complete the following:

1. Complete closeout requirements.
2. Complete punch list items.
3. Settle all claims.
4. Transmit record documents to Architect.
5. Prove that all taxes, fees and similar obligations have been paid.
6. Remove temporary facilities and surplus materials.
7. Change lock cylinders or cores.
8. Clean the work.
9. Submit consent of surety, if any, for final payment.

1.10 PROCEDURES AND CONTROLS

A. Project Meetings: Arrange for and attend meetings with the Architect and such other persons as the Architect requests to have present. The Contractor shall be represented by a principal, project manager, general superintendent or other authorized main office representative, as well as by the Contractor's field superintendent. An authorized representative of any subcontractor or sub-subcontractor shall attend such meetings if the representative's presence is requested by the Architect. Such representatives shall be empowered to make binding commitments on all matters to be discussed at such meetings, including costs, payments, change orders, time schedules and manpower. Any notices required under the Contract may be served on such representatives. Written reports of meeting minutes shall be prepared by the Contractor and distributed by the Contractor to attendees, the Architect, and Owner within three business days.

1. Pre-Construction Conference: Attendance by Architect, Contractor, major subcontractors. Agenda shall include: Quality of workmanship, coordination, interpretations, job schedule, submittals, approvals, requisition procedures, testing, protection of construction, indoor air quality, and construction waste management.
2. Exterior Envelope Meeting: Attendance by Architect, Contractor, major subcontractors. Agenda shall include as applicable: Review of exterior wall details, wall construction, sample panel preparation, cleaning, control and expansion joints, cold weather procedures.
3. Progress Meetings: Hold regularly before preparation of payment requests and additional meetings as requested by the Architect. Attendance by Architect, Contractor, and others as determined by Contractor. Agenda shall include work in progress and payment requests.
4. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction, as specified. Preinstallation Conferences may be part of Progress Meeting agenda. Attendance by 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. Agenda shall include a review of progress of other construction activities and preparations for the particular activity under consideration.

B. Emergency Contacts: Furnish the Owner and Architect, in writing, the names and telephone numbers of individuals to be contacted in the event of an out-of-hours emergency at the building site. Post a similar list readily visible from the outside of the field office or a location acceptable to the Architect.

C. Layout: Layout work and be responsible for all lines, elevations, and measurements of the building, grading, utilities and other work executed under the contract.

D. Field Measurements: Verify measurements at the building prior to ordering materials or commencing work. No extra charge or compensation will be allowed because of differences between actual dimensions and measurements indicated on the Drawings. Differences which may be found shall be submitted to the Architect for decision before proceeding with the work.

E. Field Measurements for Fixed Equipment: Dimensions for fixed equipment to be supplied under this Contract or separate contracts shall be determined by field measurements taken jointly by the Contractor and the equipment supplier involved. A record of the field measurements shall be kept until time of substantial completion of the project, or until the equipment has been fully installed and accepted by the Owner, whichever is later. Responsibility for fixed equipment fabricated accurately to field measurements for proper fit and operation shall be that of the Contractor. Contractor shall pay all costs involved in correcting any misfitting fixed equipment as fabricated.

F. Project Limit Line: The boundaries of the site do not limit the responsibility of the Contractor to perform the work in its entirety. Make utility connections as indicated.

G. Matching: Where matching is indicated, the Architect shall be the sole and final judge of what is an acceptable match. Mockups and sample submissions are required.

H. Observation: Notify the Architect and authorities having jurisdiction at least thirty-six hours in advance of concealing any work.

I. Utilities: Prior to interrupting utilities, services or facilities, notify the utility owner and the Owner and obtain their written approval a minimum 48 hours in advance.

J. Clean-Up: Frequently clean-up all waste, remove from site regularly, and legally dispose of off-site.

K. Installer's Acceptance of Conditions: All installers shall inspect substrates and conditions under which work is to be executed and shall report in writing to the Contractor all conditions detrimental to the proper execution and completion of the work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning work means installer accepts previous work and conditions.

L. Coordination: The Contractor shall be fully responsible for coordinating all trades, coordinating construction sequences and schedules, and coordinating the actual installed location and interface of all work.

M. Request For Interpretation (RFIs):

1. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
   a. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
2. Content of the RFI: Include a detailed, legible description of item needing interpretation.
3. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow three working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

4. The following RFIs will be returned without action:
   a. Requests for approval of submittals.
   b. Requests for approval of substitutions.
   c. Requests for coordination information already indicated in the Contract Documents.
   d. Requests for adjustments in the Contract Time or the Contract Sum.
   e. Requests for interpretation of Architect's actions on submittals.
   f. Incomplete RFIs or RFIs with numerous errors.

N. Existing Articles of Unusual Value: If during demolition, excavation, or disposal work articles of unusual value or of historical or archaeological significance are encountered, the ownership of such articles is retained by the Owner, and information regarding their discovery shall be immediately furnished to the Architect. If the nature of the article is such that work cannot proceed without danger of damage, work in the area shall be immediately discontinued until the Architect has determined the proper procedure to be followed. Delays in time thereby shall be a condition for which the time of the Contract may be extended. Costs incurred after discovery in the salvaging of such articles shall be borne by the Owner.

1.11 SUBMITTALS

A. Required Submittals: Submit shop drawings, product data, initial selection samples, verification samples, calculations, coordination drawings, schedules, and all other submittals as specified in individual specification sections.

B. Submittal Schedule: Within 30 days after award of contract and before first application for payment, prepare list of submittals in chronological sequence showing all submittals and proposed date first due at Architect's office and proposed date due to be returned to Contractor. Note relevant specification section number.

C. Contractor's Preparation of Submittals: Modify and customize all submittals to show interface with adjacent work and attachment to building. Identify each submittal with name of project, date, Contractor's name, subcontractor's name, manufacturer's name, submittal name, relevant specification section numbers, and Submittal Schedule reference number. Stamp and sign each submittal to show the Contractor's review and approval of each submittal before delivery to Architect's office; unstamped and unsigned submittals will be returned without action by the Architect. Leave 4" x 6" open space for Architect's "action" stamp.

1. Electronic Submittals: Provide a copy of all submittals in electronic format to the Architect. Architect will return a file of reviewed submittal in electronic format to the Contractor for distribution to subcontractors, suppliers, fabricators, governing authorities and others as necessary for proper performance of the Work. Unless otherwise amenable to the Architect, additional hard copies of submittals will not be reviewed by the Architect (or Consultant) and will not be returned to the Contractor.
2. 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.
3. Name file with submittal number or other unique identifier, including revision identifier.
4. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect and Construction Manager.
5. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Architect.

D. Product Data: Provide manufacturer's preprinted literature including, without limitation, manufacturer's standard printed description of product, materials and construction,

recommendations for application and use, certification of compliance with standards, instructions for installation, and special coordination requirements. Collect data into one submittal for each unit of work or system; mark each copy to show which choices and options are applicable to project.

1. Installer Copy: Verify that the Installer has a current copy of the relevant product data, including installation instructions, before permitting installation to begin.

E. Shop Drawings: Provide accurately prepared, large scale and detailed shop drawings prepared specifically for this project. Show adjacent conditions and related work. Show accurate field dimensions and clearly note field conditions. Identify materials and products in the work shown. Note special coordination required.

1. After Architect's action, follow specified distribution procedure.

F. Samples: Provide units identical with final materials and products to be installed in the work. Where indicated, prepare samples to match Architect's sample. Label each sample with description, source, generic name or manufacturer's name and model number. Architect will review samples for confirmation of visual design intent, color, pattern, texture and type only; Architect will not test samples for compliance with other Contract requirements which shall remain the exclusive responsibility of the Contractor.

1. Initial Selection Samples Submittal Quantities: For initial selection purposes, submit 1 set of samples showing the complete range of colors and finishes available.
2. Verification Samples Submittal Quantities: For verification of an initial selection, submit 3 sets of samples; one set will be returned to Contractor to be maintained at project site for quality control comparisons.

G. Timing of Submittals: Submit submittals in a timely fashion to allow at least 10 business days for each office's review and handling. This means that submittals which have to be reviewed by the Architect and one of their consultants require at least 20 business days for review and handling. Add ten business days for each additional consultant who must review a submission.

H. Architect's Action on Submittals: Architect will review submittals, stamp with "action stamp", mark action, and return to Contractor. Architect will review submittals only for conformance with the design concept of the project. The Contractor is responsible for confirming compliance with other Contract requirements, including without limitation, performance requirements, field dimensions, fabrication methods, means, methods, techniques, sequences and procedures of construction, coordination with other work. The Architect's review and approval of submittals shall be held to the limitations stated in the Owner/Architect Agreement and the Conditions of the Contract. In no case shall approval or acceptance by the Architect be interpreted as a release of Contractor of their responsibilities to fulfill all of the requirements of the Contract Documents.

1. Required Resubmittal: Unless submittal is noted "reviewed" or "reviewed except as noted, resubmission not required," make corrections or changes to original and resubmit to Architect.
2. Distribution: When submittal is noted "reviewed" or "reviewed as noted, resubmittal not required," make prints or copies and distribute to Owner, Subcontractors involved, and to all other parties requiring information from the submittal for performance or coordination of related work.

1.12 WARRANTIES

A. Warranties Required: Refer to individual trade sections for specific product warranty requirements.

B. Procurement: Where a warranty is required, do not purchase or subcontract for materials or work until it has been determined that parties required to countersign warranties are willing to do so.

C. Warranty Forms: Submit written warranty to Owner through Architect for approval prior to execution. Furnish two copies of executed warranty to Owner for their records; furnish two additional conformed copies where required for maintenance manual.

D. Work Covered: Contractor shall remove and replace other work of project which has been damaged as a result of failure of warranteed work or equipment, or which must be removed and replaced to provide access to work under warranty. Unless otherwise specified, warranty shall cover full cost of replacement or repair, and shall not be pro-rated on basis of useful service life.

E. Warranty Extensions: Work repaired or replaced under warranty shall be warranted until the original warranty expiration date or for ninety days whichever is later in time.

F. Warranty Effective Starting Date: Guarantee period for all work, material and equipment shall begin on the date of substantial completion, not when subcontractor has completed their work nor when equipment is turned on. In addition to the one year guarantees for the entire work covered by these Contract Documents, refer to the various sections of the specifications for extended guarantee or maintenance requirements for various material and equipment.

1.13 CUTTING AND PATCHING

A. Limitations: Do not cut and patch any work in a manner that would result in a failure of the work to perform as intended, decreased energy performance, increased maintenance, decreased operational life, or decreased safety.

1. Structural Work: Do not cut structural work or bearing walls without written approval from Architect. Where cutting and patching of structural work is necessary and approved by Architect, perform work in a manner which will not diminish structural capacity nor increase deflection of member. Provide temporary shoring and bracing as necessary. Ensure the safety of people and property at all times.

B. Cutting and Patching Materials: Use materials identical to materials to be cut and patched. If identical materials are not available or cannot be used, use materials that match existing materials to the greatest extent possible. Provide finished work that will result in equal to or better than existing performance characteristics.

C. Inspection: Before cutting and patching, examine surfaces and conditions under which work is to be performed and correct unsafe and unsatisfactory conditions prior to proceeding.

D. Protection: Protect adjacent work from damage. Protect the work from adverse conditions.

E. Cutting: Cut work using methods least likely to damage adjoining work. Use tools designed for sawing or grinding, not hammering or chopping. Use saws or drills to ensure neat, accurately formed holes to sizes required with minimum disturbance to adjacent work. Temporarily cover openings; maintain weathertightness and safety.

1. Utilities: Locate utilities before cutting. Provide temporary utilities as needed. Cap, valve, or plug and seal ends of abandoned utilities to prevent entrance of moisture or other foreign matter.

F. Patching: Patch with seams and joints which are durable and not visible. Comply with specified tolerances for similar new work; create true even planes with uniform continuous appearance. Restore finishes of patched areas and, if necessary, extend finish restoration onto adjoining unpatched area to eliminate evidence of patching and refinishing. Repaint entire assemblies, not just patched area. Remove and replace work which has been cut and patched in a visually unsatisfactory manner as determined by the Architect.

G. Qualifications: Retain experienced and specialized firms, original installers if possible, to perform cutting and patching. Workmen shall be skilled in type of cutting and patching required.

1.14 TEMPORARY FACILITIES AND UTILITIES

A. Scope of Temporary Work: This article is not intended to limit the scope of temporary work required under the Contract. Provide all temporary facilities and utilities needed.

B. Permits and Fees: Obtain and pay for all permits, fees and charges related to temporary work.

C. Codes and Authorities Having Jurisdiction for Temporary Facilities and Utilities: Comply with all requirements of authorities having jurisdiction, codes, utility companies, OSHA, and industry standards including, but not limited to the following:

1. NFPA Code 241, Building Construction and Demolition Operations.
2. ANSI-A10 Series, Safety Requirements for Construction and Demolition.
3. NECA National Joint Guideline NJG-6, Temporary Job Utilities and Services.
4. Electrical Service: NEMA, NECA, and UL.

D. Field Offices: Provide Contractor's field offices as needed. Keep current copies of all Contract Documents and project paperwork neatly on file at jobsite. Permit Architect's unrestricted use of Contractor's field office facilities including copiers, telephones, plan tables, and other equipment. Furnish, maintain, and pay for light, power, phone, fax, and other field office services.

E. Shops and Sheds: At Contractor's option, provide shops and sheds for Contractor's use as needed. Locate shops and sheds where acceptable to Owner and authorities having jurisdiction. Prior to completion of construction, temporary storage facilities and surplus stored materials shall be removed from the site.

F. Storage/ Laydown Area: The Contractor will be allowed the use of an area within the adjacent parking lot as parking, storage, and a laydown area as required for the duration of the project as required.

G. Temporary Heat: Provide temporary heat as needed to protect the work and create a suitable work environment. Provide temporary heat to protect the exterior construction against injury or damage resulting from cold temperature and dampness, to heat materials, and to maintain the minimum temperatures specified herein and in individual specification sections. Protect building from soot, smoke and fire damage. Do not use heaters which would interfere with curing of mortar and grout or damage any materials.

1. Heaters for temporary heat shall be approved temporary steam generators or forced warm air heaters located outside the building or vented to the outside, or other safety type UL approved heating devices acceptable to the Architect.
2. Oil burning salamander type heaters will not be permitted. Non-vented, open flame heaters will not be permitted inside the building once the building is closed-in.
3. Propane type-heaters will not be permitted within the area of the building or near stockpiles of combustible materials.
4. Permanent building equipment shall not be used without written permission from the Owner. If the equipment is used for temporary heating or cooling, it shall be adequately maintained per manufacturer's instructions and protected with filters, strainers, controls, reliefs, and similar items. Prior to turnover to Owner, the equipment shall be in a clean, like new condition. The guarantee period shall not start until the equipment is turned over to the Owner for their use. Do not invalidate existing warranty by any action or failure to act. Clean and change air filters frequently to prevent construction dust and debris from contaminating system.

H. Pumping and Drainage: Protect excavations, trenches, buildings and materials from rain water, ground water, backup or leakage of sewers, drains and other piping, and from water of any other origin. Promptly remove any accumulation of water. Provide and operate all pumps, piping and other equipment necessary for pumping, drainage and protection from water.

I. Temporary Enclosures: Provide temporary enclosures to maintain proper temperatures and to prevent weather damage. Always maintain legal means of egress.

J. Snow and Ice: Remove all snow and ice which interferes with work or safety.

K. Streets, Walks and Grounds: Maintain public and private roads and walks clear of debris caused by construction operations. Repair all damage caused to streets, drives, curbs, sidewalks, fences, poles and similar items where disturbed or damaged by building construction and leave them in as good condition after completion of the work as before operations started.

L. Protection: Protect nearby property and the public from construction activities. Provide and maintain barricades, warning signs and lights, railings, walkways and similar items. Immediately repair damaged property to its condition before being damaged.

M. Construction Fencing: Provide construction fencing and barriers as applicable to the project to protect personnel, the public, and to control access.

1. Provide fencing of adequate size to allow ongoing construction work, material storage and dumpster.

N. Security: Secure site against unauthorized entry at all times. Provide secure, locked temporary enclosures. Protect the work at all times. Provide watchman service, if necessary, to protect the work.

O. Signs: Erect project identification signs in compliance with details to be provided by Architect. Signs shall be minimum 4' x 8' exterior grade plywood and shall contain the names of the project, Owner, Architect, major Consultants, Contractor, and major financing institution. Except for safety and warning signs, no other signs are permitted. Location as acceptable to the Architect.

P. Fire Prevention: Take every precaution to prevent fire. Provide and maintain in good operating condition suitable and adequate fire protection equipment and services, and comply with

recommendations regarding fire protection made by the representative of the fire insurance company carrying insurance on the Work or by the local fire chief or fire marshal. The area within the site limits shall be kept orderly and clean, and all combustible rubbish shall be promptly removed from the site.

Q. Egress: Maintain safe and legal means of egress at all times. At all times, provide at least two separate means of egress.

1.15 PRODUCTS AND SUBSTITUTIONS

A. Specified Products: In all cases in which a manufacturer's name, trade name or other proprietary designation is used in connection with materials or articles to be furnished under this Contract, whether or not the phrase "or equal" is used after such name, the Contractor shall provide the product of the named manufacturers without substitution, unless a written request for a substitution has been submitted by the Contractor and approved in writing by the Architect.

B. Deviations from Detailed Requirements: If the Contractor proposes to use material which, while suitable for the intended use, deviates in any way from the detailed requirements of the Contract Documents, the Contractor shall inform the Architect in writing of the nature of such deviations at the time the materials is submitted for approval, and shall request written approval of the deviation from the requirements of the Contract Documents.

C. Approval of Substitutions: In requesting approval of deviations or substitutions, the Contractor shall provide evidence, including, but not limited to manufacturer's data, leading to a reasonable certainty that the proposed substitution or deviation will provide a quality of result at least equal to that attainable if the detailed requirements of the Contract Documents were strictly followed. If, in the opinion of the Architect, the evidence presented by the Contractor does not provide a sufficient basis for such reasonable certainty, the Architect may reject such substitution or deviation without further investigation.

D. Intent of Contract Documents: The Contract Documents are intended to produce a landscape of consistent character and quality of design. All components of the landscape have been selected to have a coordinated design in relation to the overall appearance of the project. The Architect shall judge the design and appearance of proposed substitutes on the basis of the suitability in relation to the overall design of the Project, as well as for their intrinsic merits. The Architect will not approve as equal to materials specified proposed substitutes which in the Architect's opinion, would be out of character, obtrusive, or otherwise inconsistent with the character or quality of design of the Project. In order to permit coordinated design of color and finishes the Contractor shall furnish the substituted material in any color, finish texture, or pattern which would have been available from the manufacturer originally specified, at no additional cost to the owner.

E. Additional Costs or Impact: Any additional cost, or any loss or damage arising from the substitution of any material or any method for those originally specified shall be borne by the contractor, notwithstanding approval or acceptance of such substitution by the Owner or the Architect, unless such substitution was made at the written request or direction of the Owner and the Architect. Any decrease in the cost of the substitution shall be returned to the Owner.

F. Manufacturers: To the greatest degree possible, provide primary materials and products from one manufacturer for each type or kind. Provide secondary materials as recommended by manufacturers of primary materials.

G. Substitution Requests: Refer to Section 016200 - SUBSTITUTION REQUEST FORM. Submit 3 copies. Identify product to be replaced by substitute by reference to specification sections and drawing numbers. Provide Contractor's certification and evidence to prove compliance with Contract Document requirements as acceptable to Architect.

H. Substitution Conditions: Substitution requests will be returned without action unless one of the following conditions is satisfied. The Contractor shall state which of the following conditions applies to the requested substitution:

1. Request is due to an "or equal" clause.
2. Specified material or product cannot be coordinated with other work.
3. Specified material or product is not acceptable to authorities having jurisdiction.
4. Substantial advantage is offered Owner in terms of cost, time, or other valuable consideration.
5. Specified material or product is not available.

I. Invalid Substitutions: Contractor's submittal and Architect's acceptance of shop drawings, samples, product data or other submittal is not a valid request for, nor an approval of a substitution unless the Contractor presents the information when first submitted as a Request for Substitution.

Compatibility of Materials Used in the Work:

1. Ensure complete compatibility between materials.
2. Compatibility shall include adhesion, erosion, solubility, differential thermal response, and galvanic action.
3. Provide evidence of compatibility.
4. Provide custom testing where evidence is not available.
5. Where materials are not compatible, provide necessary isolation or transition materials and provide details of same.
6. Correct defects resulting from incompatibility including de-construction and re-construction of assemblies – whether materials are part of a submittal and substitution process or not.
7. Proposed substitutions may be rejected where compatibility information is not provided; or where compatibility is not adequately addressed, according to the Architect’s judgment; or where incompatible materials would negatively impact the project’s success.

1.16 DELIVERY, STORAGE AND HANDLING

A. Manufacturer's Instructions: Strictly comply with manufacturer's instructions and recommendations and prevent damage, deterioration and loss, including theft. Minimize long-term storage at the site. Maintain environmental conditions, temperature, ventilation, and humidity within range permitted by manufacturers of materials and products used.

1.17 RECORD DOCUMENTS

A. General: Keep record documents neatly and accurately. Record information as the work progresses and deliver to Architect at time of final acceptance. Include in record documents all field changes made, all relevant dimensions, and all relevant details of the work. Keep record documents up to date with all field orders and change orders clearly indicated.

B. Drawings: Keep four separate sets of blackline prints at the site. Neatly and accurately note all deviations from the Contract Documents and the exact actual location of the work as installed.

Marked-up and colored prints will be used as a guide to determine the progress of the work installed. Requisitions for payment will not be approved until the record documents are accurate and up-to-date.

1. At completion of the work, submit one complete set of marked-up prints for review. After acceptance, these marked-up prints shall be used in the preparation of the record drawings.
2. Architect shall furnish Contractor with AutoCAD files for originals of the Contract Drawings. Make modifications to these files as shown on the marked-up prints. Remove superseded data to show the completed installation.
3. Deliver the completed AutoCAD record drawings, in the same version as Contract Drawings, properly titled and dated to the Architect. Indicate preparer of record drawings. These record drawings shall become the property of the Owner.

C. Specifications: Maintain one clean copy of complete specifications [including addenda, modifications, and bulletins with changes, substitutions, and selected options clearly noted. Circle or otherwise clearly indicate which manufacturer and products are actually used.

D. Operating and Maintenance Manuals: Manuals shall be submitted which contain the following:

1. Description of the system provided.
2. Handling, storage, and installation instructions.
3. Detailed description of the function of each principal component of the systems or equipment.
4. Operating procedures, including prestartup, startup, normal operation, emergency shutdown, normal shutdown and troubleshooting.
5. Maintenance procedures including lubrication requirements, intervals between lubrication, preventative and repair procedures, and complete spare parts list with cross reference to original equipment manufacturer's part numbers.
6. Safety and environmental considerations.

E. Copies of Operating and Maintenance Manuals: Three copies of the manuals shall be provided within sufficient time to allow for training of Owner's personnel. Submit one copy of the manuals to the Architect for review no later than 90 calendar days prior to substantial completion, or building turn over, whichever comes first. Submit the remaining five copies within 15 days after first review set is returned to contractor. Progress payment may be withheld if this requirement is not met.

1.18 PROJECT CLOSE OUT

A. Complete the following prior to Substantial Completion:

1. Provide Contractor's Punch List of incomplete items stating reason for incompletion and value of incompletion.
2. Advise Owner of insurance change over requirements.
3. Submit all warranties, maintenance contracts, final certificates and similar documents.
4. Obtain Certificate of Occupancy and similar releases which permit the Owner's full and unrestricted use of the areas claimed "Substantially Complete".
5. Submit record documents.
6. Deliver maintenance stocks of materials where specified.
7. Complete startup of all systems and instruct Owner's personnel in proper operation and routine maintenance of systems and equipment.
8. Complete clean up and restoration of damaged finishes.
9. Remove all temporary facilities and utilities that are no longer needed.

10. Request Architect's inspection for Substantial Completion.

B. Architect will either issue a Certificate of Substantial Completion or notify Contractor of work which must be performed prior to issue of certificate.

C. Complete the following prior to Final Acceptance and payment:

1. Obtain Certificate of Substantial Completion.
2. Submit final application for payment, showing final accounting of changes in the work.
3. Provide final releases and lien waivers not previously submitted.
4. Submit certified copy of final punch list stating that Contractor has completed or corrected each item.
5. Submit final meter readings, record of stored fuel and similar information.
6. Submit Consent of Surety for final payment.
7. Submit evidence of Contractor's continuing insurance coverage (if required by Contract Documents).

1.19 FINAL CLEANING AND REPAIR

A. Clean Up: Immediately prior to the Architect's inspection for Substantial Completion, the Contractor shall completely clean the premises and clean and prepare the completed work in order for it to be used for its intended purpose in accordance with the Contract Documents.

B. Pest Control: Engage a licensed exterminator, who practices integrated pest management (IPM), to inspect the project and eliminate rodents, termites and all other insects and pests. Coordinate pest control plan with Owner. Owner’s written approval is required prior to application. Submit proposed program to Owner and Architect. Program shall clearly indicate the following:

1. Area or areas to be treated.
2. Manufacturer's printed instructions and MSDS for each chemical to be used.
3. Pollution preventive measures to be employed.

C. Repairs: Repair and touch-up all damaged and deteriorated products and surfaces.

PART 2 - PRODUCTS [Not Used]

PART 3 - EXECUTION [Not Used]

END OF SECTION

DOCUMENT 012200

UNIT PRICES

PART 1 GENERAL

1.00 GENERAL PROVISIONS

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 SUMMARY

A. This section establishes pre-agreed upon prices, per certain units of work, as a means to determine adjustments to the Contract Price in the event of changes to the scope of the project. The Unit Prices listed below are not to be used to tabulate the extent of the project or for use in determining the lump sum bid.

1.02 RELATED REQUIREMENTS

A. Refer to GENERAL CONDITIONS for limitations.

B. Examine Contract Documents for requirements that affect work of this Section.

1.03 QUANTITIES AND COST ADJUSTMENTS

A. As soon as the work involved in each unit cost item has been completed, submit documentation to establish the actual quantities provided. Submit to the Architect for review and issuance of Change Order.

B. Change Order amount for each unit cost item will be based on actual quantities multiplied by the unit cost. This unit cost includes all mark-ups applicable taxes, overhead, and profit as described below.

1.04 UNIT PRICES

A. Should certain work be increased or decreased from those required by the Contract Documents, by authorization and at the option of the Owner, the below unit prices shall, be the basis of payment to the Contractor or credit to the Owner, for such increase or decrease in the work. The Unit Prices shall represent the exact net amount per unit to be paid the Contractor (in the case of additions or increases) or to be refunded the Owner (in the case of decreases). No additional adjustment will be allowed for overhead, profit, insurance, or other direct or indirect expenses of the Contractor or Subcontractors. No additional adjustments will be allowed for over excavation, overblasting, or other work without the prior written approval of the Owner.

	Unit	Add	Deduct
1.	Brick Paving with footings, complete, per sq ft.	$_____	$_____
2.	Granite Tread, complete, each	$_____	$_____
3.	Stone Wall, complete, per sq ft face	$_____	$_____

4.	Painted Metal Handrail,complete, per linear ft.	$_____	$_____
5.	6’ Bench with footings, complete, each	$_____	$_____
6.	Light Post with Base, installed complete, each	$_____	$_____
7.	Sod, furnished and installed complete, per sq ft.	$_____	$_____
8.	Hydroseed, furnished and installed complete, per sq. ft.	$_____	$_____
9.	Mulch, furnished and installed complete, per sq ft.	$_____	$_____
10.	Shrub – Steeds Holly, 3’ B&B, furnished and installed complete, each	$_____	$_____
11.	Perennial- #5 pot, furnished and installed, each	$_____	$_____
12.	Ground Cover– Vinca minor, 4” pot, furnished and installed complete, each	$_____	$_____
13.	Planting soil, as specified, per c.y.	$_____	$_____

B. The above unit prices shall include all labor, materials, dewatering, shoring, removal, overhead, profit, insurance, etc., to cover the finished work of the several kinds called for. Changes shall be processed in accordance with the provisions of the Document 005210, AGREEMENT FORM governing Changes in the Work and Section 012600, CONTRACT MODIFICATION PROCEDURES.

C. The above unit prices shall be guaranteed through December 31, 2022.

END OF SECTION

Advancement of Construction Technology

SUBMITTAL TRANSMITTAL

Project: _____ Date: _____

_____ A/E Project Number: _____

TRANSMITTAL A

To (Contractor): _____ Date: _____ Submittal No. _____

From (Subcontractor): _____ By: _____ ☐ Resubmission

Qty.	Reference / Number	Title / Description / Manufacturer	Spec. Section Title and Paragraph / Drawing Detail Reference

☐ Submitted for review and approval
☐ Resubmitted for review and approval
☐ Complies with contract requirements
☐ Will be available to meet construction schedule
☐ A/E review time included in construction schedule

☐ Substitution involved - Substitution request attached
☐ If substitution involved, submission includes point-by-point comparative data or preliminary details
☐ Items included in submission will be ordered immediately upon receipt of approval

Other remarks on above submission:

☐ One copy retained by sender

TRANSMITTAL B

To (A/E): _____ Attn: _____ Date Rec'd by Contractor: _____

From (Contractor): _____ By: _____ Date Trnsmt'd by Contractor: _____

☐ Approved
☐ Approved as noted

☐ Revise / Resubmit
☐ Rejected / Resubmit

Other remarks on above submission:

☐ One copy retained by sender

TRANSMITTAL C

To (Contractor): _____ Attn: _____ Date Rec'd by A/E: _____

From (A/E): _____ ☐ Other By: _____ Date Trnsmt'd by A/E: _____

☐ Approved
☐ Approved as noted
☐ Not subject to review
☐ No action required
☐ Revise / Resubmit
☐ Rejected / Resubmit
☐ Approved as noted / Resubmit

☐ Provide file copy with corrections identified
☐ Sepia copies only returned

☐ Point-by-point comparative data required to complete approval process

☐ Submission Incomplete / Resubmit

Other remarks on above submission:

☐ One copy retained by sender

TRANSMITTAL D

To (Subcontractor): _____ Attn: _____ Date Rec'd by Contractor: _____

From (Contractor): _____ By: _____ Date Trnsmt'd by Contractor: _____

Copies: ☐ Owner ☐ Consultants ☐ _____ ☐ _____ ☐ _____ ☐ One copy retained by sender

Advancement of Construction Technology

SUBCONTRACTORS AND MAJOR MATERIAL SUPPLIERS LIST

Project: _____ From (Contractor): _____

_____ Date: _____

To (A/E): _____ A/E Project Number: _____

_____ Contract For: _____

List Subcontractors and Major Material Suppliers proposed for use on this Project as required by the Construction Documents. Attach supplemental sheets if necessary.

Section Number	Section Title	Firm	Address	Phone Number (Fax Number)	Contact

☐ Attachments

Signed by: Date:

Copies: ☐ Owner ☐ Consultants ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ File

DOCUMENT 014339

MOCK-UP REQUIREMENTS

PART 1 GENERAL

1.00 GENERAL PROVISIONS

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 SUMMARY

A. Furnish and install mock-ups suitable to illustrate finish colors, materials and methods of construction. Maintain mock-ups as standard of colors, patterns, materials, performance and workmanship for entire project.

B. Contractor shall be required to set aside a minimum of 200 square feet of area dedicated exclusively for mock-up construction and exhibition for the entire life of the Contract.

1.02 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:

1. Section 011000, GENERAL REQUIREMENTS.

2. Individual Specification Sections that specify field mock-ups of individual pieces of the Work.

1.03 SUBMITTALS

A. Samples: Refer to individual Specification Sections for submittal requirements of mock-up components and coordinate accordingly

1.04 QUALITY ASSURANCE

A. Design Modifications: Make design modifications to work only as required to meet performance requirements and to coordinate the work. Indicate proposed design modifications on shop drawings. Maintain original design concept without altering profiles and alignments indicated.

1.05 MOCK-UP SCHEDULE

A. Contractor shall prepare “Mock-Up Site” immediately following mobilization to allow the maximum quantity of time for Architect’s viewing and examination.

B. Mock-ups shall be completed for Architect’s examination at least 45 days prior to scheduled start of construction or fabrication, as applicable for each type of work, unless otherwise specified.

C. Refer to attached mock-up schedule for list of required mock-ups and related types

and sizes. This list is not intended to be all inclusive. Contractor shall be responsible for all mock-ups required under each individual specification section.

PART 2 PRODUCTS

2.01 MATERIALS AND PRODUCTS

A. Provide materials, components, and products for exterior assembly as specified in individual specification sections.

PART 3 EXECUTION

3.01 GENERAL

A. Refer to PART 1, GENERAL PORTIONS OF THE VARIOUS Specification Sections for specific requirements regarding condition of surfaces, mockup size, erection, and erection tolerances.

3.02 MOCK-UP PROCEDURES

A. Provide mock-ups and field samples of finishes at project as required by individual Specification Sections.

1. Mock-ups shall not be used in final, completed work.

2. Architect may reject, or withhold action on mock-ups requiring coordination with other mock-ups until related mock-ups are constructed and reviewed by Architect.

B. Contractor shall erect field samples and mock-ups at the Project “Mock-Up Site”, at location acceptable to Architect. Size of individual mock-up, protection of mock-up and removal and disposal of mock-up shall be as specified in individual Specification Section.

1. Modify and customize mock-ups as required to show interface with adjacent work and attachment to structures or building.

3.03 PROTECTION OF MOCK-UPS

A. Mock-ups shall be adequately protected from damage until they are no longer necessary.

3.04 REMOVAL AND DISPOSAL OF MOCK-UPS

A. Demolish and remove mock-ups from site at completion of the Project. Legally dispose of demolished mock-up materials.

END OF SECTION

SECTION 015690

TEMPORARY TREE AND PLANT PROTECTION

PART 1 GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Protection of existing trees and plants from damage as a result of the Contractor's operations including, but not limited to:

1. Tree protection fencing.

2. Root pruning and construction pruning.

3. Airspading of root zones.

4. Root invigoration and fertilization.

1.3 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 024113, SELECTIVE SITE DEMOLITION AND REMOVALS: Clearing and grubbing.

2. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING: Excavation and backfill.

3. Section 329300, TREES, PLANTS, AND GROUND COVERS: New plant material.

1.4 REFERENCE STANDARDS

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American National Standards Institute (ANSI):

Z133.1 Safety Requirements for Pruning, Trimming, Repairing, Maintaining and Removing Trees, and for Cutting Brush.

2. International Society of Arboriculture (ISA):

Guide Guide for Establishing Values of Trees and Other Plants

3. National Arborist Association (NAA):

Ref. 1 Pruning Standards for Shade Trees

1.5 SUBMITTALS

A. Prepare and submit drawings indicating the extent of tree protection fencing required.

B. Proposed methods, and schedule for effecting tree and plant protection shall be submitted for approval.

C. Proposed methods, materials, and schedule for root pruning, construction pruning, root invigoration, and tree fertilization by Certified Arborist shall be submitted for approval.

1.6 QUALITY ASSURANCE

A. All tree work shall be performed by a professional Certified Arborist with a minimum five years experience, who has successfully completed a certification program equal to the Massachusetts Certified Arborist (MCA) program/examination sponsored by the Massachusetts Arborists Association, 8-D Pleasant Street, South Natick, MA 01760; (508) 653-3320; FAX: (508) 653-4112; E-mail: MaarbAssn@aol.com.

1.7 DAMAGE PENALTIES

A. Certain specimen trees within the construction areas and in other key locations will be identified by the Owner and the Architect, and marked with red tags. Loss of any of these trees will result in fines assessed at $10,000 per tree. Damage to all other trees on the property will be assessed at the rate of $200 per inch caliper of the tree.

B. A fine of $1,000 will be levied against the Contractor for each incident of construction inside tree protection areas.

C. Damages to trees, shrubs, and other vegetation will be assessed by the Architect and Owner in accordance with the ISA Guide.

D. Trees or roots visibly damaged will cause the Owner to withold from the Contractor an assessed amount conforming to the requirements stipulated above for a period of two years. After that period the impact of the damage to any tree will be assessed accordingly.

E. If any trees or shrubs designated to be saved are damaged and replacement is required, a number and diameter of trees or shrubs of the same species and variety, as specified by the Owner and Architect, shall be furnished and planted by the Contractor. The total inch diameter of the replacement trees or shrubs shall equal the diameter of the tree or shrub to be replaced.

1.8 PRECONSTRUCTION TREE PREPARATION

A. Trees to remain inside or within 20 ft. of Limit of Work, shall be inspected by Certified Arborist prior to commencement of work. Based on arborist’s evaluation, pre-emptive

measures shall be taken to reduce harm to trees and to the site work.

B. Pre-emptive measures shall include, but not be limited to, deadwood removal, root pruning with airspade, feeding, structural pruning, spraying, root invigoration, or other horticultural treatments to improve vigor of affected plants.

PART 2 PRODUCTS

2.1 TREE PROTECTION FENCING

A. Tree protection fencing shall be the following:

1. Galvanized chain link fencing, 4 ft. high.

2. Fabric shall be a good commercial quality of steel wire of 2 in. mesh and 11 gauge.

3. Fittings shall be malleable iron casting, wrought iron forgings, or pressed steel and
provided with pin connections. Equipment shall be designed to carry 100% overload.

4. Piping shall be steel conforming to ASTM A 120 except that pipe shall be unthreaded
and untested for water pressure.

B. Stakes for fencing shall be 7 ft. galvanized steel posts, driven a minimum of 3 ft. into the ground. Posts shall be spaced 10 ft. o.c. maximum.

C. For fencing within the drip line of trees, surface mounted post anchors may be acceptable. Review with Architect and arborist and obtain written approval prior to installing. Post installation shall not damage tree root systems.

2.2 ROOT PRUNING

A. Peat moss and mulch materials shall be as specified under Section 329300, TREES PLANTS, AND GROUND COVERS.

B. Liquid fertilizer to be applied to root pruned and construction pruned trees shall be Peters M 77 Sequestered-Chelated Soluble Fertilizer manufactured by W.R. Grace and Co., Cambridge, MA 02140, Gold Start Liquid Fertilizer, manufactured by Nutra-Flo Company, 1919 Grand Ave, Sioux City, IA 51106-5708; Phone: 712-277-2011; 800-831-4815; Fax: 712-279-1946; Agro- Culture Liquid Fertilizer, manufactured by Agro-Culture Liquid Fertilizers, 3055 W. M-21, P.O. Box 150, St. Johns, Michigan 48879; 1-800-678-9029, or approved equal. Liquid fertilizer shall be approved by Certified Arborist.

C. Dormant oil spray shall be a dormant miscible spray equal to Sunspray, Scalecide, or Volck Oil.

D. Insecticide shall be Isotox manufactured by Ortho; QuickPRO, manufactureed by Monsanto; LESCO Sevin Brand SL, #019106, manufactured by LESCO, or approved equal. Insecticide shall be approved by Certified Arborist.

PART 3 EXECUTION

3.1 INSTALLATION OF FENCING

A. Prior to start of demolition work and clearing and grubbing operations, tree protection fencing shall be installed in accordance with the following:

1. Fencing shall be installed at the tree protection areas indicated on the Drawings.

2. Fencing shall be installed at the drip line of trees to be protected, unless otherwise approved by the Architect.

3.2 ROOT PRUNING

E. Where construction will be within drip line of existing trees designated to remain, roots shall be pruned with airspade., and as indicated on the drawings.

F. All root pruning shall be done by Certified Arborist only. Trenching, vibrating plow, and stump grinding are NOT suitable means for root pruning.

G. Roots greater than 1 in. diameter shall be pruned by means of a hand saw, or other approved means.

H. Install root protection measures as prescribed by Certified Arborist.

3.3 ROOT INVIGORATION

A. Certified Arborist to provide plan for improving soil conditions by addressing soil compaction and promoting efficient root growth in selected areas. Conditions to be addressed include but are not limited to soil compaction, poor soil nutrients, and girdling roots.

B. Methods to address poor soil conditions to include but not be limited to root collar excavation, air-tilling of roots to find fine roots, incorporating organic matter, fertilizing, importing loam or topsoil, and applying mulch.

3.4 CONSTRUCTION PRUNING

A. Construction pruning shall conform to NAA Ref.1 for Class IV - Crown Reduction Pruning. Work shall conform to the requirements of ANSI Z133.1, and shall be reviewed in the field with the Architect and Certified Arborist prior to start of work.

3.5 FERTILIZATION AND INSECT SPRAYING

A. Root pruned and construction pruned tree shall be treated with liquid fertilizer, dormant oil spray, and insecticide as prescribed by Certified Arborist.

B. Liquid fertilizer shall be applied at a rate recommended by the manufacturer and as required by NAA Ref. 2.

C. Dormant oil spray shall be applied in early spring before buds begin to swell at a rate recommended by the manufacturer.

D. Insecticide spray shall be applied twice to root pruned trees following application of

dormant oil spray. Spray insecticide at rates recommended by spray manufacturer at intervals appropriate for effective insect control.

3.6 REMOVAL OF PROTECTION

A. All protection shall remain in place throughout the construction period. Remove protection devices only after written permission has been granted by the Architect.

END OF SECTION

Advancement of Construction Technology

SUBSTITUTION REQUEST

(After the Bidding Phase)

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Installer: _____ Address: _____ Phone: _____

History: ☐ New product ☐ 2-5 years old ☐ 5-10 yrs old ☐ More than 10 years old

Differences between proposed substitution and specified product: _____

_____

_____

☐ Point-by-point comparative data attached - REQUIRED BY A/E

Reason for not providing specified item: _____

_____

Similar Installation:

Project: _____ Architect: _____

Address: _____ Owner: _____

_____ Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain _____

_____

Savings to Owner for accepting substitution: _____ ($ _____).

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____ days.

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

SUBSTITUTION REQUEST
(Continued)

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

Attachments: _____

_____

_____

_____

A/E's REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01330.
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01330.
☐ Substitution rejected - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

Signed by: Date:

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E ☐ _____

_____

_____

_____

_____

_____

_____

_____

DOCUMENT 018900

SITE CONSTRUCTION PERFORMANCE REQUIREMENTS

PART 1 GENERAL

1.00 GENERAL PROVISIONS

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 SUMMARY

A. This Section specifies the general requirements for the site work included in the Contract.

B. These requirements supplement those contained in the Standard General Conditions of the Construction Contract and their Supplemental Conditions.

C. References are included in this Section to Articles of the General Conditions to call the Contractor's attention to frequently needed requirements.

1.02 PERMITS

A. Unless otherwise provided in the Supplementary Conditions, the Contractor shall obtain and pay for all construction permits and licenses. The Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. The Town will waive all fees associated with permits.

1.03 LAWS AND REGULATIONS

A. Contractor shall give all notices and comply with all laws and regulations applicable to furnishing and performance of the Work.

B. If the Contractor performs any work that is contrary to laws or regulations, the Contractor shall bear all claims, costs, losses and damages caused by, arising out of or resulting therefrom.

1.04 UTILITIES

A. Shown or Indicated: The information and data shown or indicated in the Contract Documents with respect to existing underground facilities (utilities) at or contiguous to the site is based on information and data furnished to Owner or Architect by the owners of such underground facilities (utilities) or by others.

1. The Owner and Architect shall not be responsible for the accuracy or completeness of any such information or data; and

2. The cost of all of the following will be included in the Contract and Contractor shall have full responsibility for: (i) reviewing and checking all such information and data; (ii) locating all underground facilities (utilities) shown or indicated in the Contract Documents; (iii) coordination of the Work with the owners of such underground facilities (utilities) during construction; and (iv) the safety and protection of all such underground facilities (utilities) and repairing any damage thereto resulting from the Work.

B. Not Shown or Indicated: If an underground facility (utility) is uncovered or revealed at

or contiguous to the site which was not shown or indicated in the Contract Documents, the Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency), identify the owner of such underground facility (utility) and give written notice to that facility (utility) owner and to Owner and Architect. Architect will promptly review the underground facility (utility) and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence of the underground facility (utility). If the Architect concludes that a change in the Contract Documents is required, revised plans and specifications will be issued to reflect and document such consequences. During such time, the Contractor shall be responsible for the safety and protection of such underground facility (utility).

C. Contractor shall notify all municipal agencies and utility companies owning or operating utilities, of proposed work affecting the utilities, or agencies.

D. Contractor shall give written notification within the time period required by the agency or company for advance notification before commencing work. A copy of the notification shall be furnished to the Architect. Agencies include but are not limited to Town of Arlington Water and Sewer Division.

E. Contractor shall notify "DIG SAFE" before commencing any work in the vicinity of existing subsurface utilities.

F. Contractor shall secure in-place existing utilities whose support is affected by the work and cooperate and assist the agency or company operating the utility in maintaining the utility services. Contractor shall correct any damage to the utilities caused by construction operations by repair or replacement, as required by the utility owner. When the repair or replacement is made by the utility owner, Contractor shall pay all costs assessed by the utility owner for the work.

G. If the existing utilities are found to conflict with the proposed work, the Contractor shall protect and maintain the utilities and take measurements to determine the location, type and dimensions of the utility. The information shall be furnished to the Architect who will determine the changes required in the proposed work or existing utilities to resolve the conflict as soon thereafter as is reasonable.

H. Contractor shall verify the location, size, invert elevation and type of existing facilities at all points of connection prior to ordering new utility materials.

1.05 SOIL SUPPORT

A. Contractor shall furnish and install excavation soil support devices or use soil strengthening techniques required to perform excavations in accordance with the current requirements of the U.S. Department of Labor, Occupational Health & Safety Administration and all federal, state, and municipal laws and regulations.

1.06 REFERENCE STANDARDS

A. References are made to technical societies, organizations and groups using the following abbreviations. All work so referred shall conform to the current edition of the referenced standard.

AASHTO American Association of State Highway Transportation Officials

ACI American Concrete Institute

ACOE United States Army Corps of Architects

AGC Associated General Contractors of America

ANSI American National Standards Institute

AOAC Association of Official Agricultural Chemists

ASTM American Society for Testing and Materials

AWPA American Wood Preservers Association

AWWA American Water Works Association

NEMA National Electrical Manufacturers Association

NEWWA New England Water Works Association

OSHA Occupational Safety and Health Administration

UL Underwriters Laboratory

1.07 TRAFFIC MAINTENANCE

A. Contractor shall maintain access to the site and through the work zones for personnel and vehicles of emergency services, utility agencies, inspection services, and others authorized to enter, move about and work on the site.

B. When work is required on public roadways, Contractor shall furnish, install, maintain, and remove all signs, drums, barricades, steel plates, and other devices required by the federal or state government or municipality to maintain and protect pedestrians and vehicular traffic.

C. Protective measures shall be installed at site access points to prevent mud and other debris from being deposited on the public roadways by construction traffic. The public roadways shall be swept as required to remove any deposits.

1.08 STATE AND LOCAL REFERENCE STANDARDS

A. Building Code Massachusetts State Building Code

BWSC Boston Water and Sewer Commission

DEP Massachusetts Department of Environmental Protection

MHD Massachusetts Highway Department

MWRA Massachusetts Water Resources Authority

END OF SECTION

SECTION 024113

SELECTIVE SITE DEMOLITION AND REMOVALS

PART 1 GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.2 WORK INCLUDED

A. Provide all equipment and do all work necessary to demolish, remove and salvage site structures, clean up debris and trash and prepare site in general, as indicated on the Drawings.

1.3 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 015690, TREE AND PLANT PROTECTION.

2. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING.

3. Section 312500, EROSION AND SEDIMENT CONTROL.

1.4 INFORMATION NOT GUARANTEED

A. The Contractor's attention is directed to "Information Not Guaranteed" under Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING.

1.5 SUBMITTALS

A. The following shall be submitted:

1. Certificates of severance of utility services.

2. Permit for transport and legal disposal off-site of demolition material and debris.

3. Demolition procedures and operational sequence for review and acceptance by Architect.

4. Location plan of staging areas and schedule for moving staging equipment into those areas shall be submitted for Architect's approval prior to mobilization and related site preparation operations.

B. Pre-demolition photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Submit before the Work begins.

1.6 PROTECTION

A. Prevent movement, settlement or collapse of adjacent services, sidewalks, walls, driveways and trees. Assume liability for such movement, settlement, or collapse. Promptly repair damage at no cost to the Owner.

B. Cease operations and notify Owner immediately if safety of adjacent structures appears to be endangered. Take precautions to properly support structures. Do not resume operations until safety is restored.

C. Provide, erect, and maintain street boardings, sidewalk shed, barricades, lighting, and guardrails as required to protect general public, workers, and adjoining property.

D. Do not interfere with use of adjacent buildings. Maintain free and safe passage to and from.

1.7 EXISTING SERVICES

A. Arrange and pay for disconnecting, removing, capping, and plugging utility services. Disconnect and stub off. Notify the affected utility company in advance and obtain approval before starting this work.

B. Place markers to indicate location of disconnected services. Identify service lines and capping locations on Project Record Documents.

1.8 TREE DAMAGE PENALTIES

A. Damages to trees, shrubs, and other vegetation will be assessed by the Architect and Owner in accordance with the ISA Guide and Section 015690, TREE AND PLANT PROTECTION.

1.9 MAINTAINING TRAFFIC

A. Do not close or obstruct roadways without permits.

B. Conduct operations with minimum interference to public or private roadways.

1.09 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.10 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 PRODUCTS

2.1 SALVAGING

A. Materials indicated on the Drawings or designated in the field by the Owner to be salvaged shall be carefully removed and stockpiled on site or delivered to the Owner. For materials not used within the site for the proposed project, the Owner may request transport by the Contractor to a facility within the Town.

B. Mechanical and electrical items to be salvaged shall be protected from the weather.

PART 3 EXECUTION

3.1 DEMOLITION

A. Structures indicated to be removed shall be completely removed including foundations, except when approved by the Architect, to a minimum of 4 ft. below finished grade for graded areas.

B. Remove from site, contaminated, vermin infested, or dangerous materials encountered and disposed of by safe means so as not endanger health of workers and public.

C. Backfill areas excavated as a result of demolition. Use backfill material specified in Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING.

D. Rough grade areas affected by demolition and leave areas level, maintaining grades and contours of site.

E. Site Access and Temporary Controls: Conduct demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

3.2 ABANDONED PIPES - DRAINS AND SEWERS

A. Drain and sewer pipes indicated to be abandoned shall be completely filled with an 8 in. thick mortar jointed masonry bulkhead. If a pipe indicated to be abandoned and plugged appears to be in active service, it shall not be plugged, and the Architect shall be notified.

B. Other utility pipes shall be cut and capped outside the excavation and abandoned piping removed from the site.

C. Frames, grates, covers, traps, and other castings shall be salvaged.

3.3 CLEARING AND GRUBBING

A. Trees, shrubs, and other vegetation not indicated on the Drawings or designated in the field by the Architect to remain and required for execution of the Work shall be cleared and grubbed.

B. Stumps shall be removed to their full depth. Roots 3 in. and larger shall be removed to a depth of 2 ft. below finished grade. Stumps shall be legally disposed of off-site.

3.4 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

A. Existing memorials, fences, stone walls, catch basins, structures and utilities to remain shall be suitably protected from damage.

3.5 LOAM AND TOPSOIL

A. Loam and topsoil shall be stripped to their full depth from areas to be excavated, filled, regraded, or resurfaced. Avoid mixing with fill/subbase/non-organic material below.

B. Loam and topsoil shall be stockpiled on-site and protected. No loam and topsoil shall be removed from the site without the written permission of the Architect.

C. Stockpiled loam and topsoil which conforms to the specifications may be used as Planting Soil for fill and finish grading within landscaped areas in accordance with Sections 329200, and 329300. Contractor shall submit soil test results of stockpiled material for Architect's approval. Contractor shall bear the cost of soil testing.

3.6 PAVEMENT REMOVAL

A. Where pavement and/or curb to be removed abuts pavement and curb to remain, a neat, straight saw cut shall be made with a concrete power saw.

1. Pavement and/or curb removal shall include removal of subbase as required to accommodate proposed construction materials.

3.7 SITE RESTORATION

A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.

B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.8 PROTECTION OF PROPERTY TO REMAIN

A. The Contractor's attention is directed to Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING for protection of utilities to remain, and Section 015690, TREE AND PLANT PROTECTION for the protection of existing trees.

3.9 DISPOSAL OF MATERIALS

A. Material resulting from demolition and not scheduled for salvaging shall become the property of the Contractor and shall be legally disposed of off-site at Contractor's expense. Disposal shall be performed as promptly as possible and not left until the final clean up.

3.10 SALVAGEABLE MATERIALS

A. Material resulting from demolition and not scheduled for salvaging shall become the property of the Contractor and shall be legally disposed of off-site at Contractor's expense. Disposal shall be performed as promptly as possible and not left until the final clean up.

3.11 ADJUST EXISTING MANHOLES AND CATCH BASINS

A. Existing manholes and catch basins shall be adjusted to line and grade as indicated on the Drawings in accordance with Commonwealth of Massachusetts Highway Department (MHD) Standard Specification for Highways and Bridges..

END OF SECTION

SECTION 033001

CAST-IN-PLACE CONCRETE – SITE WORK

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 DESCRIPTION OF WORK

A. Provide all equipment and materials, and do all work necessary to construct the cast-in-place concrete for sitework, including but not limited to: below grade slabs, pads, bases, foundations, and footings, complete, as indicated on the Drawings and as specified.

1.3 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that relate directly to work of this Section include, but are not limited to the following:

1. Section 079201, EXTERIOR JOINT SEALANTS.
2. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING; Excavation, backfill, compaction and establishment of subgrade elevations.
3. Section 321313, PORTLAND CEMENT CONCRETE PAVING; Exposed concrete paving.
4. Section 321640, GRANITE CURB.

1.4 RELATED WORK

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.

1. American Concrete Institute (ACI):
   - 301 Structural Concrete for Buildings
   - 303R Guide to Cast-In-Place Architectural Concrete Practice
   - 306.1 Cold Weather Concreting
   - 308 Standard Practice for Curing Concrete
   - 325.9R Guide for Construction of Concrete Pavements and Concrete Bases

2. American Plywood Association (APA):
   - Ref. 1 APA Design/Construction Guide, Residential and Commercial

3. American Society for Testing and Materials (ASTM):
   - A 36 Structural Steel
   - A 123 Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
   - A 185 Welded Steel Wire Fabric for Concrete Reinforcement
   - A 307 Carbon Steel Externally Threaded Standard Fasteners
   - A 386 Zinc Coating (Hot-Dip) on Assembled Steel Products

A510	General Requirements for Wire Rods and Course Round Wire, Carbon Steel
A 569	Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality
A 615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
C 33	Concrete Aggregates
C 143	Slump of Portland Cement Concrete
C 150	Portland Cement
C 171	Sheet Materials for Curing Concrete
C 309	Liquid Membrane-Forming Compounds for Curing Concrete
C 494	Chemical Admixtures for Concrete
D 1752	Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

4. Commonwealth of Massachusetts Highway Department (MHD) Standard Specification for Highways and Bridges

1.5 SUBMITTALS

A. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

B. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

C. Formwork Shop Drawings: Show formwork construction including form-facing joints, rustications, construction and contraction joints, form joint-sealant details, form tie locations and patterns, inserts and embedments, cutouts, cleanout panels, and other items that visually affect exposed to view cast-in-place concrete.

D. Samples of the following shall be submitted:

Item	Sample Size
Preformed joint filler	Two pieces, full depth and width, 12 in. length
Form	12 in. x 12 in.
Form ties	1 each, complete

E. Submit manufacturer’s product data for forms and accessories.

F. Field quality-control test and inspection reports.

G. Prior to start of concrete work, Contractor shall submit to the Architect for review a schedule for execution of the work of this section and a location plan indicating sequence of concrete placement and location of proposed control joints and construction joints, if required.

1.6 DESIGN OF CONCRETE MIX

A. Mix design shall be certified by independent testing laboratory. Statement of materials constituting design of mixes (as required by referenced standards) shall be submitted for Architect's approval within one week following award of Contract.

B. Concrete mix design shall include the following information.

1. Proportions of cement, fine and coarse aggregates, and water.
2. Water-cement ratio, design strength, slump, and air content.
3. Type of cement and aggregates.
4. Type and dosage of all admixtures.
5. Special requirements for pumping.
6. Range of ambient temperature and humidity for which the design is valid.
7. Any special characteristics of the mix which require precautions in the mixing, placing, finishing, or curing methods to achieve the finished product specified.

C. No concrete shall be delivered to the job site until the Architect has approved the design mixes.

1.7 QUALITY ASSURANCE

A. Unless otherwise specified, cast-in-place concrete work shall conform to ACI 301. Construction of concrete walks and subbases shall conform to ACI 325.9R.

B. Dimensions, locations, and details of equipment pads, anchors, supports, and similar features indicated on the Drawings are approximate. Manufacturer's approved shop drawings of equipment to be supported, anchored, or contained thereby shall be consulted for exact location, size, and details.

C. Proposed wall footings shall be laid out and staked for review and approval by Architect prior to pouring concrete.

D. 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.

E. Pre-installation Conference: Conduct conference at Project site.

1.8 QUALITY CONTROL

A. Unless otherwise specified herein, or indicated on the Drawings, concrete formwork construction and materials shall conform to ACI 301, 318, and 347, and the following:

1. Variation from plumb

a. In lines and surfaces of arrises: In any 10 ft. of length ¼ in., Maximum for the entire length 1 in.
b. For exposed conspicuous lines: In any 20 ft. length ¼ in, Maximum for the entire length ½ in.

2. Variation in sizes and location of sleeves, wall openings: ¼ in. (+/-)
3. Variation in cross sectional dimensions of beams and in thickness of slabs: Minus 1/4 in. Plus 1/2 in.
4. Variation in location of anchor bolts unless provided with sleeves or other means of adjustment: 1/4 in.

B. Maximum deflection of form facing materials at concrete surfaces exposed to view shall be 1/240 of span between structural members.

C. Reinforcing steel shall be fabricated to conform to the required shapes, dimensions, and tolerances specified in CRSI Manual.

D. Allowable Tolerances:

1. Fabricating:

a. Sheared length: Plus or minus 1 in .
b. Stirrups and ties: Plus or minus 1/2 in .
c. Members more than 8 in., but not over 2 ft. - 0 in. deep: Plus or minus 1/2 in .
d. Members more than 2 ft. - 0 in. deep: Plus or minus 1 in .
e. Crosswise of members: Space evenly within 2 in. of stated separation.
f. Lengthwise of members: Plus or minus 2 in .

2. Maximum bar relocation to avoid interference with other reinforcing steel, conduits, or other embedded item: 1 bar diameter.

1.9 TESTING

A. Inspection and testing of the concrete mix will be performed by an independent testing laboratory approved by the Architect. Testing equipment shall be supplied by the laboratory, and the preparation of samples and all testing shall be performed by the laboratory personnel.

B. Concrete materials and operations will be tested and inspected as work progresses. Failure to detect any defective work or material shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate the Architect to final acceptance.

C. The following testing services shall be provided by the Owner, at no cost to the Contractor:

1. Review and test of the Contractor's proposed materials for compliance with the specifications.
2. Review of the Contractor's proposed mix design.
3. Sampling and testing of materials at plants or stockpiles during the course of the work for compliance with the specifications .
4. Strength tests of concrete specimens .
5. Inspection of concrete batching, mixing, and delivery .

D. The following testing services shall be provided, at the Contractor's expenses:

1. Additional testing and inspection required because of changes in materials or proportions, requested by the Contractor.
2. Additional testing of materials or concrete occasioned by their failure by testing or inspection to meet specification requirements.

E. At least four standard compression test cylinders shall be made and tested from each day's placement of concrete. Four concrete test cylinders will be taken for every 50 cubic yards of each type and design strength of concrete placed. Two cylinders shall be tested at seven days, and two at 28 days. One additional test cylinder will be taken during cold weather concreting, and will be cured at the job site under the same conditions as the concrete it represents. If job experience indicates additional cylinder tests or other tests are required for proper control or determination of concrete quality, such tests shall be made.

F. One slump test will be taken for each set of test cylinders taken.

G. Submit to the Owner, for forwarding to the testing laboratory, proposed concrete mix design for review, before beginning work.

H. Provide free access to work and full assistance and cooperation, concrete for samples, and such auxilliary personnel and equipment as needed for testing agency to take samples for required tests. Notify testing agency and Architect of intent to place concrete at least 24 hours before placement.

PART 2 - PRODUCTS

2.1 DENSE GRADED CRUSHED STONE BASE COURSE

A. Dense Graded Crushed Stone

1. Shall conform with Massachusetts Highway Department (MHD) Standard Specifications for Construction Highways and Bridges.
2. The percent of wear of the crushed stone shall not be more than 40 when tested in accordance with AASHTO T 96. The percent of wear shall not be more than 50 if crushed igneous rock is used.
3. Dense Graded Crushed Stone shall meet the following gradation requirement.

Sieve Size	% Passing by Weight
3-1/2 in.	100
3 in.	90 - 100
2 in.	75 - 100
1 in.	50 - 80
1/2 in.	30 - 60
No. 4	15 - 40
No. 200	0 - 6

2.2 FORM MATERIALS AND ACCESSORIES

A. Formwork :

1. Form-Facing Panels for As-Cast Finishes: Steel, glass-fiber-reinforced plastic, high-density overlay, Class 1, or better, Finnish phenolic overlaid birch plywood or other approved nonabsorptive panel materials that will provide continuous, true, and smooth architectural concrete surfaces in accordance with ACI 303.1. Furnish in largest practicable sizes to minimize number of joints.
2. Formwork shall produce an extremely smooth finish as displayed in approved mockup.
3. Form Sealers: In accordance with ACI 303 Chapter 4, Section 4.8 for each different type of formwork material or liner. Sealers containing oils will not be permitted.
4. Form Release Agents: In accordance with ACI 303 Chapter 4, Section 4.9 for each different type of formwork material or liner.

B. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with smooth form finish. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

1. Forms shall not impart visible straight or spiral mark on concrete columns.

C. Concrete surfaces which will be concealed in completed structure shall be formed to have a "rough form" finish as defined by ACI 301.

D. Forms shall be true to line and free from warp, and shall be of sufficient strength, when braced, to resist the pressure of the concrete during placement within the allowable tolerances.

E. Surfaces of forms to be in contact with concrete shall be coated with nonstaining form release compound; wetting or coating with grease or oil will not be accepted as a substitute. Approval of the Architect shall be obtained before coated (plastic-faced) form material or liners are used in lieu of form release compound.

F. Unless otherwise indicated on the Drawings, exposed concrete arrises shall be chamfered. Where other dimension is not indicated on the Drawings, chamfer shall be 3/4 x 3/4 in.

1. Chamfer shall not be employed where masonry or other material will subsequently be installed flush with one of the adjacent surfaces of the concrete.
2. Where a wash or slope is indicated on the Drawings, no additional chamfer is required.
3. Chamfer shall be mitered at changes in direction.

2.3 FORM ACCESSORIES

A. Form ties shall be factory-fabricated metal ties, shall be of the removable or internal disconnecting or snap-off type, and shall be of a design that will not permit form deflection and will not spall concrete upon removal. Solid backing shall be provided for each tie. Except where removable tie rods are used, ties shall not leave holes in the concrete surface less than 1/4 inch nor more than 1 inch deep and not more than 1 inch in diameter. Removable tie rods shall be not more than 1-1/2 inches in diameter.

B. Where steel adjacent to vertical faces of forms cannot be otherwise secured, mortared doughnuts shall be used to prevent steel lying too close to finish vertical faces of the concrete.

C. Forms at doweled joints shall have accurately sized and located holes for dowels. Split forms may be used to facilitate stripping.

D. Reglets shall be made of polyvinyl chloride, grey color. Where reglets are indicated on the Drawings they shall be assumed to be continuous. Reglets shall be filled with a disposable packing material to prevent entrance of concrete.

E. Form Release Agent: Form releasing agents shall be commercial formulations that will not bond with, stain or adversely affect concrete surfaces. Agents shall not impair subsequent treatment of concrete surfaces depending upon bond or adhesion nor impede the wetting of surfaces to be cured with water or curing compounds.

F. Construction Joint Form: Burke Concrete Products, "Keyed Kold Joint", or approved equal.

2.4 STEEL BARS AND SUPPORTS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 60 percent.

B. Steel reinforcing bars shall conform to ASTM A 615/A 615M, Grade 60, deformed, including Supplementary Requirements S1.

1. Bars employed as reinforcement and dowels shall be deformed type.

a. Cutting of bars by torch will not be permitted.

2. Bars employed as dowels, spirals, and structural ties or supports shall be hot-rolled plain rounds.

    a. Plastic-coated dowels, such as Double-Coat plastic-coated steel dowel bars, manufactured by Republic Steel Corporation, are acceptable.

3. Bars employed in joints subject to movement shall be hot-rolled plain rounds.

    a. Bars for use in joints subject to movement shall be saw-cut. Bars crimped or bent in cutting will not be acceptable.

C. Reinforcing bars shall be manufactured in the United States.

D. Epoxy-Coated Wire: ASTM A 884/A 884M, Class A, Type 1 coated-steel wire, with less than 2 percent damaged coating in each 12-inch (300-mm) wire length.

E. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets. Fabric reinforcement shall be furnished in flat sheets; reinforcement furnished in rolls will not be acceptable.

F. Steel failing to meet the requirements of this specification or the Drawings will be rejected and shall be removed from the site immediately. Rejected steel shall be replaced with new steel conforming to this specification, at no additional cost to the Owner.

G. Bolsters, chairs, supports, and other devices for spacing, supporting, and fastening of reinforcing in place shall conform to requirements of CRSI Manual.

H. Tie wire shall be black annealed wire, 16 gauge or heavier.

2.5 CONCRETE

A. Concrete shall be air-entrained type, conforming to ASTM C 94. Air-Entraining Admixture: ASTM C 260.

B. Unless otherwise indicated on the Drawings, minimum 28 day compressive strength shall be 4,000 psi.

1. Concrete slump shall be no less than 2 in. nor greater than 4 in., determined in accordance with ASTM C 143.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size.

C. Cement shall be Portland cement, conforming to ASTM C 150, Type I or II.

D. Aggregates shall conform to ASTM C 33.

E. Concrete shall contain a water reducing agent to minimize cement and water content of the concrete mix at the specified slump. Water reducing agent shall conform to ASTM C 494.

F. No calcium chloride or admixtures containing calcium chloride shall be added to the concrete. No admixtures other than those specified shall be used in the concrete without the specific written permission of the Architect in each case.

2.6 CURING MATERIALS

A. Curing shall be by moist curing or by use of curing compound.

B. Curing paper shall be a nonstaining, fiber reinforced laminated kraft bituminous product conforming to ASTM C 171. Four mil polyethylene sheeting may be substituted for curing paper.

C. Liquid membrane forming curing compounds will not be permitted.

D. Curing compound shall be a resin-base, white pigmented compound conforming to ASTM C 309, Type 2.

2.7 EXPANSION JOINTS

A. Unless otherwise indicated on the Drawings, wall and foundation expansion joints shall be located 30 ft. o.c., maximum.

B. Below grade base slab jonts shall be located as indicated on the Drawings.

C. Where indicated, wall expansion joints shall be 1/2 in. wide, and recessed ••• in. from face of wall. Expansion joint filler shall be preformed, nonbituminous type joint filler conforming to ASTM D 1752, Type II, similar to Sealtight Cork Expansion Joint Filler, manufactured by W.R. Meadows, Inc., or approved equal.

1. Premolded filler shall be one piece for the full depth and width of the joint.
2. Use of multiple pieces of lesser dimensions to make up required depth and width of joint will not be permitted.
3. Except as otherwise noted on the Drawings, joint filler shall be 3/8 in. thick.

D. Where indicated, concrete slab-on-grade shall be doweled at each expansion joint. One end of the dowel shall be greased.

E. Round Expansion Joint Dowels: ASTM A615, Grade 60, epoxy-coated, smooth, billet-steel bars, clean and free of rust and scale.

F. Square Expansion Joint Dowels: ASTM A108, epoxy-coated, alloy-steel square bar.

G. Sleeves for Square Dowels: Sika Greenstreak square dowel sleeves and bases sized to fit epoxy-coated square dowels.

H. Dowel Caps for Round Dowels: Plastic caps approximately 4" long, designed and manufactured to fit over ends of expansion joint dowels to allow longitudinal movement of dowels after concrete has hardened.

I. Dowel Aligners for Round Dowels: PNA Dowel Aligners, or accepted substitute.

J. Concrete slab-on-grade shall be doweled at each expansion joint. One end of the dowel shall be greased.

2.8 CONTROL JOINTS (BELOW GRADE SLABS)

A. Control joints indicated to be sawn shall be made by saw cutting concrete slab after concrete is finished and when the surface is stiff enough to support the weight of workmen without damage

to the slab. Saw blade shall cut into slab at least 1 in., but in no case less than 25% of slab depth.

B. Unless otherwise indicated on the Drawings, control joints shall be located 10 ft. o.c. maximum.

2.9 BOLTS

A. Anchor bolts shall conform to ASTM A 307.

PART 3 - EXECUTION

3.1 GRADING

A. Areas to receive concrete will be compacted and brought approximately to subgrade elevation under Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING; before work of this section is performed. Final fine grading, filling, and compaction of subgrade to receive concrete, as required to form a firm, uniform, accurate, and unyielding subgrade at required elevations and to required lines, shall be done under this Section.

B. Existing subgrade material which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be material conforming to this Section.

C. Subgrade of areas to receive concrete shall be recompacted as required to bring top 8 in. of material immediately below aggregate base course to a compaction of at least 90% of maximum density, as determined by ASTM D 1557, Method D. Subgrade compaction shall extend for a distance of at least 1 ft. beyond concrete edge.

D. Excavation required in subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade or subbase subsequent backfill and compaction shall be performed as directed by the Architect as specified in Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING. Completed subgrade after filling such areas shall be uniformly and properly graded.

E. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 2 in. deep in subgrade, shall be graded out, reshaped as required, and recompacted before placing concrete.

F. Materials shall not be stored or stockpiled on subgrade.

G. Disposal of debris and other material excavated and/or stripped under this section, and material unsuitable for or in excess of requirements for completing work of this Section shall conform to the following:

1. Material shall be legally disposed of off-site.

H. Prepared subgrade will be inspected and tested by an independent testing agency, provided and paid for by the Contractor, prior to installation of paving base course. Disturbance to subgrade caused by inspection procedures shall be repaired under this Section of the specification.

1. Contractor shall submit a minimum of six (6) Proctor compaction test results indicating conformance to compaction density requirements specified herein.

3.2 AGGREGATE BASE COURSE

A. Aggregate base course for paving and the spreading, grading, and compaction methods employed shall conform to standard requirements for usual base course of this type for first class road work, and the following:

1. Massachusetts Department of Transportation Specification for “Subbase and Base Course”.

B. Compaction of aggregate base course shall be to 95% of maximum density as determined by ASTM D 1557, Method D. Stone greater than 2-1/2 in. shall be excluded from course.

C. Width of base course shall be greater than or equal to the width of pavement surface, if continuous lateral support is provided during rolling, and shall extend at least 2 x base thickness beyond edge of the course above, if not so supported.

D. Aggregate material shall be applied in lifts less than or equal to 6 in. thick, compacted measure. Each lift shall be separately compacted to specified density, using a 6 ton steel wheel roller or vibratory roller equivalent to a 6 ton static roller, or an approved equivalent.

1. Material shall be placed adjacent to wall, manhole, catch basin, and other structures only after they have been set to required grade and level.
2. Rolling shall begin at sides and progress to center of crowned areas, and shall begin on low side and progress toward high side of sloped areas. Rolling shall continue until material does not creep or wave ahead of roller wheels.
3. Surface irregularities which exceed 1/2 in. measured by means of a 10 ft. long straightedge shall be replaced and properly compacted.

E. Subgrade and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with gravel. Materials spilled outside pavement lines shall be removed and area repaired.

F. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise damaged, shall be cleaned, replaced, and otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

3.3 ACCEPTABILITY OF CONCRETE SURFACES

A. Concrete structures to receive concrete topping slab shall be inspected to ensure that surface is suitable to receive concrete. Waterproofed surfaces shall be thoroughly cured and suitably protected with protection board prior to start of concrete work of this section.

3.4 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
2. [Class B, 1/4 inch (6 mm)] [Class C, 1/2 inch (13 mm)] [Class D, 1 inch (25 mm)] for rough-formed finished surfaces.

C. Forms shall be sufficiently tight to prevent leakage of mortar, and, where necessary, shall have temporary openings as required for thorough cleaning and as required for the introduction of concrete to avoid excessive free fall.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

E. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

F. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

G. Chamfer exterior corners and edges of permanently exposed concrete.

H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.5 PLACING OF REINFORCING

A. Reinforcing bars shall be placed in accordance with ACI 301, 318, and CRSI "Manual of Standard Practice". Reinforcing bars showing cracks after bending shall be discarded and replaced with new material conforming to this Section at no additional cost to the Owner.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Reinforcing shall be thoroughly cleaned of loose mill and rust scale, dirt, ice, and other foreign material which may reduce the bond between concrete and reinforcing. Where there is a delay in placing concrete after reinforcement is in place, bars shall be reinspected and cleaned when necessary.

C. Unless permitted by the Architect, reinforcing bars shall not be cut in the field.

D. After forms have been coated with form release compound, but before concrete is placed, reinforcing steel shall be securely wired in exact position called for, and shall be maintained in that position until concrete is placed and compacted. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Chair bars and supports shall be provided in a number and arrangement satisfactory to the Architect.
2. Metal supports shall be the types which will not penetrate and show through or stain surfaces which are to be exposed to view, painted or unpainted. Supports at surfaces which will be exposed to the weather shall be stainless steel, plastic tipped, or other non-corrosive material.
3. Where steel is adjacent to vertical form face and cannot be otherwise secured, mortar doughnuts shall be used to prevent steel from lying too close to finished vertical concrete face.
4. Where waterproofed surfaces are indicated, reinforcing bar chairs, bolsters, and other supports shall not rest on waterproofing membrane. To protect membrane from puncture, chairs, bolsters, etc., shall rest on 1/4 in. thick hardboard, which shall be centered under the support leg. Area of hardboard shall not be less than 3 sq. in. per leg.

E. Except as otherwise noted, laps at joints in welded wire fabric reinforcement shall be at least 6 in. and shall be securely tied with tie wire.

F. Except as otherwise specified, reinforcing steel shall be spliced by lapping bar ends, placing bars in contact, and tightly wiring. Minimum lap of spliced bars shall conform to ACI 318.

1. Bars No. 14 and larger shall not be lap spliced.

G. Doweled Joints

1. Dowels at expansion joints and at other locations where movement of the joint is expected shall be thoroughly clean on the embedded portion to permit good bond, and shall be greased or otherwise treated to prevent bond for the full length of the portion which is intended to move in the concrete.
2. Factory plastic-coated dowels where approved for use need not be lubricated, and the plastic coating need not be removed from any part of the dowel.
3. Dowels in concrete which are placed in locations or under temperature conditions which may be expected to cause movement of the concrete toward the joint, at any time during the life of the structure, shall have a cap on the lubricated end (either end of a factory plastic-coated dowel). Cap shall provide a 2 in. long air space into which dowel may move when concrete expands toward joint. Cap shall be properly secured to the end of the dowel, to prevent cap being dislodged during concrete placing operations, but to permit dowel to slide into the air space when concrete expands.

H. Bending: Bend bars cold; do not use heat reinforcing or bend by make-shift methods. Discard bent, kinked or otherwise damaged bars.

I. Welding of reinforcing bars will be permitted only where permission of the Architect has been obtained in advance. Such welding shall be performed only under conditions established by the Architect.

1. Weld reinforcing bars according to AWS D1.4, where indicated.

J. Unless otherwise indicated on the Drawings, reinforcing shall extend within 2 in. of formwork and expansion joints. Reinforcement shall continue through construction joints.

K. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 PLACING CONCRETE

A. Before placing concrete, forms and space to be occupied by concrete shall be thoroughly cleaned, and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint, and other material which might tend to reduce bond.

B. Existing concrete, earth, and other water-permeable material against which new concrete is to be placed shall be thoroughly damp when concrete is placed. There shall be no free water on surface.

C. Concrete which has set or partially set before placing shall not be employed. Retempering of concrete will not be permitted.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
2. If concrete can not be mechanically consolidated, concrete shall be thoroughly spaded and tamped to secure a solid and homogeneous mass, thoroughly worked around reinforcement and into corners of forms.

E. Cold-Weather Placement: Comply with ACI 306.1.

F. Hot-Weather Placement: Comply with ACI 301.

G. When joining fresh concrete to concrete which has attained full set, latter shall be cleaned of foreign matter, and mortar scum and laitance shall be removed by chipping and washing. Clean, roughened base surface shall be saturated with water, but shall have no free water on surface. A coat of 1:1 cement-sand grout, approximately 1/8 in. thick, shall be well scrubbed into thoroughly dampened concrete base. New concrete shall be placed immediately, before grout has dried or set.

3.7 FINISHING BELOW GRADE SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

1. Concrete slabs and pads shall be screeded off and finished true to line and grade, and free of hollows and bumps. Surface shall be dense, smooth, and at exact level and slope required.
2. Finished concrete surface for subbases shall be wood-floated to a slightly rough surface. Surface shall not deviate more than 1/4 in. in 10 ft.

B. Control joints shall be scored into slab surface with scoring tool.

C. Where finishing is performed before end of curing period, concrete shall not be permitted to dry out, and shall be kept continuously moist from time of placing until end of curing period, or until curing membrane is applied.

3.8 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 ACI 301 for hot-weather protection during curing.

B. It is essential that concrete be kept continuously damp from time of placement until end of specified curing period. It is equally essential that water not be added to surface during floating and troweling operations, and not earlier than 24 hours after concrete placement. Between finishing operations surface shall be protected from rapid drying by a covering of waterproofing paper. Surface shall be damp when the covering is placed over it, and shall be kept damp by means of a fog spray of water, applied as often as necessary to prevent drying, but not sooner than 24 hours after placing concrete. None of the water so applied shall be troweled or floated into surface.

C. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m 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. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
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 (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3.9 EXPANSION JOINTS

A. Expansion joint shall be 3/8 in. wide, clean, dry, and free of loose material, dirt, oil and grease, and shall be formed in the concrete to required width with preformed joint filler in place. Joint filler shall extend the full length of the expansion joint.

1. Depth of filler shall extend to the full thickness of the concrete in vertical surfaces and in concealed horizontal surfaces.
2. Depth of filler in exposed horizontal surfaces shall be as required to form a 1/2 in. deep sealant recess below finished surface to depth recommended by sealant manufacturer.

3.10 EXPANSION JOINT DOWELS

A. Center vertically in slab, unless indicated otherwise.

B. Center longitudinal position of each dowel horizontally on joint, except where indicated otherwise.

C. Install at same spacing as slab bar unless indicated on Drawings.

D. Install a cap or sleeve on one end of each dowel as indicated on Drawings.

E. Prior to installing the cap or sleeve on the dowels, completely coat surfaces of each dowel on the cap-side or sleeve-side of the expansion joint with debonding compound.

F. Cut holes in expansion joint fill material accurately to fit tightly around dowels so that concrete will not leak into gaps between the dowels and the expansion joint material.

G. Install dowels 90 degrees horizontally and vertically to expansion joint using dowel aligners to help maintain alignment.

H. Install the dowel aligners in accordance with the manufacturer's current printed instructions.

3.11 CONTROL JOINTS

A. Joints shall be sawn as soon as the concrete will withstand the energy of sawing without raveling or dislodging aggregate particles. For most concrete mixtures, this means sawing should be completed within the first 6 to 18 hours and never delay more than 24 hours. Early-entry saws may be used to allow cutting to begin within a few hours after placement.

B. Control joints indicated shall be sawn 1/8 in. wide by using a diamond blade concrete power saw. Saw shall cut into slab at least 25% of slab depth. Saw cut joints shall be straight and accurate to line.

1. Saw cut joints shall be sawn flush to vertical surfaces.
2. Unless otherwise indicated on the Drawings, control joints in pedestrian pavements shall be located 10 ft. o.c. maximum.
3. Doweled Control Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.12 REMOVING FORMS AND SUPPORTS

A. Forms shall be removed preventing injury to the concrete and ensuring the complete safety of the structure. Formwork for columns, walls, side of beams and other parts not supporting the weight of concrete may be removed when the concrete has attained sufficient strength to resist damage from the removal operation but not before at least 24 hours has elapsed since concrete placement. Supporting forms and shores shall not be removed from beams, floors and walls until the structural units are strong enough to carry their own weight and any other construction or natural loads. Supporting forms or shores shall not be removed before the concrete strength has reached 70 percent of design strength, as determined by field cured cylinders or other approved methods. This strength shall be demonstrated by job-cured test specimens, and by a structural analysis considering the proposed loads in relation to these test strengths and the strength of forming and shoring system. The job-cured test specimens for form removal purposes shall be provided in numbers as directed and shall be in addition to those required for concrete quality control. The specimens shall be removed from molds at the age of 24 hours and shall receive, insofar as possible, the same curing and protection as the structures they represent.

B. Forms to be reused on the work shall be thoroughly cleaned immediately after stripping. Damaged forms shall not be used. Only clean, sound, dimensionally correct forms shall be used.

3.13 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

END OF SECTION

SECTION 044302

GRANITE

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Provide all equipment and materials, and do all work necessary to furnish and install the granite work as indicated on the Drawings and as specified, including stair treads, as indicated on the Drawings. Contractor to use salvaged stair treads whenever possible, additional new granite to be purchased only at permission of Architect and Owner.

1.2 RELATED WORK

A. Examine Contract Documents for requirements that affect the work of this Section. Other Specification Sections that relate directly to work of this Section include, but are not limited to:
   1. Section 024113, SELECTIVE SITE DEMO AND REMOVALS; salvaged granite piers.
   2. Section 033001, CAST-IN-PLACE CONCRETE; footings.
   3. Section 055501, METAL FABRICATIONS; brackets and metal plates.
   4. Section 061063, EXTERIOR ROUGH CARPENTRY; wood rails.
   5. Section 312300, SITE EXCAVATING, BACKFILLING, AND COMPACTING.

1.3 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.
   1. 1. American Society for Testing and Materials (ASTM):

C 91	Masonry Cement
C 97	Absorption and Bulk Specific Gravity of Natural Building Stone
C 136	Sieve Analysis of Fine and Coarse Aggregates
C 144	Aggregate for Masonry Mortar
C 150	Portland Cement
C 170	Compressive Strength of Dimension Stone
C 207	Hydrated Lime for Masonry Purposes
C 270	Mortar for Unit Masonry
C 615	Granite Dimension Stone
C 880	Flexural Strength of Natural Building Stone
C 920	Elastomeric Joint Sealants
C 962	Use of Elastomeric Joint Sealants
C 1028	Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method

1.4 SAMPLE INSTALLATIONS

A. Provide sample pier installation as directed by Architect, conforming to typical Project construction. Sample shall show the granite pier setting, metal brackets and plate, and wood rail and other pertinent details of installation.

B. Replace sample installation as many times as necessary until Architect's approval of the installation has been obtained. Upon Architect's approval, construct all subsequent granite work to conform to approved sample installation.

1.5 COORDINATION

A. Coordinate work with that of other sections affecting, affected by, this work, as necessary to assure the steady progress of the work under the Contract.

B. Do all cutting and drilling to accommodate work of other sections, as expressly indicated and as reasonably inferred from Contract Documents Specifications, or required for the proper completion of the Work.

1.6 DELIVERY, HANDLING, AND STORAGE

A. Granite shall be stored on wood skids or pallets, covered with non-staining, waterproof membrane and protected from the weather. Skids shall be placed and stacked in such a manner as to evenly distribute the weight of the granite materials and to prevent breakage, cracking, and damage to granite pieces. Granite materials shall be stored in such a manner as to allow air to circulate around the granite material. Granite shall not be permitted to be in direct contact with the ground any time during storage.

B. Granite shall be carefully handled to prevent chipping, breakage, soiling, or other damage. Pinch or wrecking bars shall not be used without protecting edges of granite with wood or other rigid materials. Granite units shall be lifted with wide-belt type slings wherever possible; wire rope or ropes containing tar or other substances which might cause staining or damage to granite finish shall not be used.

C. Granite damaged in any manner will be rejected and shall be replaced with new materials at no additional cost to the Owner.

1.7 PROTECTION OF FINISHED SURFACES

A. Finished surfaces adjacent to the granite work shall be adequately protected from soiling, staining, and other damage.

1.8 JOB CONDITIONS

A. Cold Weather Protection:
   1. Do not use frozen materials or materials mixed or coated with ice or frost.
   2. Do not build on frozen work; remove and replace granite work damaged by frost or freezing.
   3. During all seasons, protect partially completed granite work against weather when work is not in progress.

PART 2 PRODUCTS

2.1 GENERAL STANDARDS

A. Quarrying Supervision
   1. Quarrying shall be supervised and coordinated by the granite fabricator to insure that the as-quarried block orientations will yield finished material with characteristics as described herein.
   2. All granite shall be cut from matched blocks. Matched blocks shall mean blocks extracted from a single bed of stratum in the quarry. The use of blocks chosen at random, though similar in general character and color to that of the approved granite will not be permitted, except by written permission of the Architect.

B. Examinations
   1. Examination at the Quarry: Quarried blocks shall be made available for inspection by the

Architect at his request.

2. Examination at the Fabrication Plant: Production units shall be made available for inspection by the Architect at his request. To this end, the Subcontractor shall, after approval of final shop drawings, advise the Architect when production has begun and of the earliest possible opportunity to inspect a representative sampling of production work.
3. Contractor shall provide lighting that is sufficient in intensity and color range to permit an adequate examination to the satisfaction of the Architect.

C. Criteria for Granite
1. Visual: All examinations, selections, and approvals shall be for the purpose of achieving a final appearance of granite with greatest possible uniformity, and will be based upon the following criteria:
2. All granite shall be of sound stock and uniform texture, and shall be free from holes, seams, shakes, clay pockets, spalls, stains, starts, and other defects which would impair the strength, durability and appearance of the work, as determined by the Architect.
3. Inherent variations characteristic of the granite and the quarry from which the granite is to be obtained shall be brought to the attention of the Architect at the time the samples are submitted for approval, and shall be subject to approval of the Architect.
4. All granite shall be selected for background color, veining, marking and matching, shall run in even shades, and shall be set accordingly.

D. Physical and Mechanical: Contractor to submit data to the Architect.
1. Absorption and Bulk Specified Gravity (ASTM C 97).
2. Flexural strength (ASTM C 880).
3. Compressive Strength (ASTM C 170).
4. Modulus of Rupture (ASTM C 99).
5. Abrasion Resistance, Hardness (ASTM C 241).

E. Any granite materials rejected for non-compliance with these standards shall be replaced at no additional cost to the Owner.

2.2 STONE FABRICATION

A. General: Fabricate stone units in sizes and shapes required to comply with requirements indicated, including details on Drawings and Shop Drawings.
1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."

B. Cut and drill sinkages and holes in stone for anchors, fasteners, supports, and lifting devices as indicated or needed to set stone securely in place; shape beds to fit supports.

C. Cut stone to produce pieces of thickness, size, and shape indicated and to comply with fabrication and construction tolerances recommended by applicable stone association or, if none, by stone source, for faces, edges, beds, and backs.
1. Clean backs of stone to remove rust stains, iron particles, and stone dust.

D. Contiguous Work: Provide chases, reveals, reglets, openings, and similar features as required to accommodate contiguous work.

E. Finish exposed faces and edges of stone, except sawed reveals, to comply with requirements indicated for finish and to match approved samples and mockups.

F. Carefully inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.
1. Grade and mark stone for overall uniform appearance when assembled in place. Natural

variations in appearance are acceptable if installed stone units match range of colors and other appearance characteristics represented in approved samples and mockups.

G. Flatness Tolerance: Variation from true plane, or flat surfaces, shall be determined by use of a 4 ft. long straightedge, applied in any direction on the surface. Such variations on polished, honed and fine rubbed surfaces at the bed and joint arris lines shall not exceed 3/64 in. or 1/16 of the specified joint width, whichever is greater. On surfaces having other finishes the maximum variation from true plane shall not exceed 1/4 of the specified joint width.

H. Variations from true plane on other parts of face surfaces shall not exceed the following:
   1. 4-cut and sawn finishes 1/8 in.
   2. Thermal and coarse stippled sandblasted finishes 3/16 in.

I. Backs of pieces shall be sawn or roughly dressed to approximate true planes. Maximum variation in thickness from the specified shall not exceed the following:
   1. 1/2 in. on pieces above 3 in. modular thick

2.3 GRANITE

A. Granite shall be supplied by Swenson Granite Works 369 North State Street, Concord, NH 03301 Phone: (603) 225-4322; Fax: (603) 228-2915; Swenson Granite Works 86 Route 101A, Amherst, NH 03031; Phone: (603) 672-7827; Fax: (603) 673-3848, or approved equal. Exposed surfaces of granite shall match the existing elements on site.

   1. Granite color and finish: to match existing elements on site.
   2. Granite shall be of the sizes and dimensions indicated on the Drawings.

B. All faces shall be at right angles to the plane of the top.

C. Granite shall be cut accurately to required shapes and dimensions.

D. Unless otherwise indicated on the Drawings, arrises shall be cut sharp and true to square, and continuous with adjoining arrises. Where indicated, arrises shall be eased to radius indicated on the Drawings.

2.4 DENSE GRADED BASE COURSE

A. Material for aggregate base course shall be a graded, granular, non-frost susceptible, free-draining material, consisting of either durable stone and coarse sand or of blast furnace slag, practically free from loam and clay, and which can be readily compacted to form a stable foundation.
   1. Material shall be dense graded crushed stone conforming to MHD Specifications Section M2.01.7.

2.5 SAND SETTING BED

A. Sand shall be a clean, sharp, natural sand conforming to ASTM C 33, except that the fineness modulus shall be 2.25 + 0.10.
   1. Gradation for setting bed sand shall be as follows:

Sieve Size	% Passing by Weight
3/8 in.	100
No. 4	95 - 100
No. 8	80 - 100
No. 16	50 - 85

No. 50	10 - 30
No. 100	5 - 15
No. 200	0 – 10

2.6 ANCHORAGE AND SETTING MATERIALS

A. Pins, Dowels, Anchor Bolts, Nuts, Washers, and Shims: Fabricate from AISI Type 302/304 stainless steel.

B. Stone Anchors: Type and size required to securely anchor and fasten stonework in place and as indicated on the Drawings. Fabricate anchors and dowels from Type 302/304 stainless steel.

C. Epoxy adhesive for fastening stainless steel dowels into adjoining limestone blocks and/or concrete foundations shall be a two-component, 100% solids, moisture-insensitive, high-modulus, high strength, structural, epoxy paste adhesive conforming to ASTM C 881, similar to “Sikadur 31, Hi-Mod Gel”, manufactured by Sika, Glendale Heights, IL 60139, or approved equal.

D. Provide lead or plastic setting buttons sized to maintain uniform joints.

PART 3 EXECUTION

3.1 GRADING

A. Areas to receive gravel paving will be compacted and brought to subgrade elevation under Section 310000, EARTHWORK, before work of this section is performed. Final fine grading, furnishing and installing crushed bluestone surfacing and compaction of these materials as required to form a firm, uniform, accurate, and unyielding aggregate paving at required elevations and to required lines, shall be done under this Section.

B. Existing subgrade material which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be aggregate base material conforming to this Section.

C. Subgrade of areas to receive gravel paving shall be recompacted as required to bring top 4 in. of material immediately below to a compaction of at least 90% of maximum density, as determined by ASTM D 1557. Subgrade compaction shall extend for a distance of at least 1 ft. beyond proposed edge of gravel paving.

D. Excavation required in subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade, subsequent backfill and compaction shall be performed as directed by the Architect as specified in Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING Completed subgrade after filling such areas shall be uniformly and properly graded.

3.2 AGGREGATE BASE COURSE

A. Aggregate base course for paving and the spreading, grading, and compaction methods employed shall conform to standard requirements for usual base course of this type for first class road work, and the following:

1. MHD Specifications Section 405, "Gravel Base Course".

B. Compaction of aggregate base course shall be to 95% of maximum density as determined by

ASTM D 1557, Method D. Stone greater than 2 in. shall be excluded from course.

C. Width of base course shall be greater than or equal to the width of pavement surface, if continuous lateral support is provided during rolling, and shall extend at least 2 x base thickness beyond edge of the course above, if not so supported.

D. Aggregate material shall be applied in lifts less than or equal to 6 in. thick, compacted measure. Each lift shall be separately compacted to specified density, using a 6 ton steel wheel roller or vibratory roller equivalent to a 6 ton static roller, or an approved equivalent.

1. Material shall be placed adjacent to wall, manhole, catch basin, and other structures only after they have been set to required grade and level.
2. Rolling shall begin at sides and progress to center of crowned areas, and shall begin on low side and progress toward high side of sloped areas. Rolling shall continue until material does not creep or wave ahead of roller wheels.
3. Surface irregularities which exceed 1/2 in. measured by means of a 10 ft. long straightedge shall be replaced and properly compacted.

E. Subgrade and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with gravel. Materials spilled outside pavement lines shall be removed and area repaired.

F. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise damaged, shall be cleaned, replaced, and otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

3.2 CLEANING

A. After setting, granite work shall be carefully cleaned, removing all dirt, stains, and other defacements.
1. Mild abrasive cleaners that contain no harsh or caustic ingredients may be used, with fiber brooms or brushes and clear water. Wire brushes, steel wool, and acids or other solutions which may cause discoloration are expressly prohibited.

B. Upon completion of granite work, surfaces shall be left in a clean, unsoiled condition, acceptable to the Architect.

3.2 PROTECTION

A. Granite work shall be properly and adequately protected under the responsibility of the Contractor until final acceptance of the Project by Owner.

B. After the granite work has been installed, it shall be properly and adequately protected from damage. Boxing or other suitable protection shall be provided by Contractor wherever required. However, no lumber which may stain or deface the granite shall be used. Nails shall be high-quality galvanized or non-rusting.

END OF SECTION

SECTION 055213

EXTERIOR PAINTED METAL HANDRAILS

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 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following; handrails at stairs and guardrail at wall. Sections that directly relate to work of this Section include, but are not limited to.

1. Section 033001, CAST-IN-PLACE CONCRETE - SITEWORK; Installation of inserts and sleeves.
2. Section 044302, GRANITE; Granite stairs.
3. Section 321416, BRICK PAVING.

1.3 REFERENCES

A. Comply with applicable requirements of following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.

1. American Society for Testing and Materials (ASTM):
   - A 36 Structural Steel
   - A 53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
   - A 123 Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars, and Strip
   - A 153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware
   - A 385 High-Quality Zinc Coatings (Hot-Dip)
   - A 386 Zinc Coating (Hot-Dip) on Assembled Steel Products
   - A 501 Hot-Formed Welded and Seamless Carbon Steel Structural Tubing

2. American Welding Society (AWS):
   - D1.1 Structural Welding Code - Steel

3. Steel Structures Painting Council (SSPC):
   - SP 6 Commercial Blast Cleaning

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements.

B. Shop Drawings: Provide large scale shop drawings for fabrication, installation and erection of all parts of the work. Provide plans, elevations, and details of anchorages, connections and

accessory items. Provide installation templates for work installed by others. Show all interfaces and relationships to work of other trades.

C. Field Measurements: Take all necessary field measurements before preparation of shop drawings and fabrication. Do not delay progress of the job. If field measurements are not possible prior to fabrication, allow for field cutting and fitting.

D. Initial Selection Samples: Submit samples showing complete range of colors, textures, and finishes available for each material used.

E. Verification Samples: Submit representative samples of each material that is to be exposed in the completed work. Show full color ranges and finish variations expected. Provide samples having minimum size of 144 sq. in.

F. Calculations: Provide professionally prepared calculations and certification of the performance of this work. Indicate how design requirements for loading and other performance criteria have been satisfied.

1.5 MOCKUP

A. Exterior Handrails:

1. Construct a 3 ft. long mockup section on specified concrete support structure before start of any handrail work. Sample section shall exhibit proposed posts, rails, connections, cutouts, frames, and workmanship. Mock-up to demonstrate color galzanized finish.
2. Sample section shall be inspected by the Architect. If the sample is not acceptable, construct additional panels, at no additional cost to the Owner, until an acceptable panel is constructed. Accepted panel; shall become the standard for the entire job and shall remain undisturbed until Substantial Completion.

1.6 GENERAL REQUIREMENTS

A. The Contractor shall verify all measurements and shall take all field measurements necessary before fabrication. Welding to or on structural steel shall be in accordance with AWS D1.1/D1.1M. Items specified to be galvanized, when practicable and not indicated otherwise, shall be hot-dip galvanized after fabrication. Galvanizing shall be in accordance with ASTM A 123/A 123M, ASTM A 653/A 653M, or ASTM A 924/A 924M, as applicable. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and shall harmonize with the material to which fastenings are applied. Materials and parts necessary to complete each item, even though such work is not definitely shown or specified, shall be included. Poor matching of holes for fasteners shall be cause for rejection. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall provide strength and stiffness. Joints exposed to the weather shall be formed to exclude water.

1.7 WORKMANSHIP

A. Handrail and guardrail work shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Welding shall be continuous along the entire area of contact except where tack welding is permitted. Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush. Where tight fits are required, joints shall be milled. Corner joints shall be coped or mitered, well formed, and in true alignment. Work shall be accurately set to established lines and elevations and securely fastened in place. Installation

shall be in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

1.8 PERFORMANCE REQUIREMENTS

A. General: Provide installed handrail assemblies complying with following structural performances, unless otherwise indicated:

1. Live Loads shall not be less than the minimum required by applicable building codes.
2. Design shall incorporate safety factors as required by the applicable building codes.
3. Design and construction shall be as such to assure that under the required design live loads there shall be no failure of any member, deflection of not more than L/240 of length of any member, and without permanent deformation of any member or fastener.

B. Minimum Structural Performances: Provide installed handrail assemblies complying with following minimum structural performances, unless otherwise indicated:

1. Handrails:

a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

1.9 QUALITY ASSURANCE:

A. Source: For each material type required for the work of this section, provide primary materials which are the product of one manufacturer. Provide secondary or accessory materials which are acceptable to the manufacturers of the primary materials.

B. Engineering: Provide services of Professional Engineer, registered in the Commonwealth of Massachusetts, to design and certify that work of this Section meets or exceeds performance requirements specified.

1.10 ANCHORAGE

A. Anchorage shall be provided where necessary for fastening handrails and securely in place. Anchorage not otherwise specified or indicated shall include slotted inserts made to engage with the anchors, expansion shields, and power-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; and lag bolts and screws for wood.

1.11 DISSIMILAR MATERIALS

A. Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of bituminous paint or asphalt varnish.

PART 2 - PRODUCTS

2.1 EXTERIOR STEEL HANDRAILS AND GUARDRAIL

A. Materials shall be new stock, free from defects impairing strength, durability or appearance, and of best commercial quality for each intended purpose.

1. Steel pipe shall be seamless steel pipe conforming to ASTM A 53, Schedule 40. Galvanized steel pipe shall be used at exterior uses.
2. Steel tubing shall be structural steel square tubing conforming to ASTM A 501.
3. Solid steel pickets shall conform to ASTM A 36.
4. All other steel shall conform to ASTM A 36.
5. Construction specialties such as slotted inserts, wedge inserts, etc., shall be as manufactured by Hohmann and Barnard; Gateway Erectors Inc.; Richmond Screw Anchor Co.; or equal approved by the Architect.

2.2 FASTENERS AND ANCHORS

A. Provide all anchors, bolts, sockets, sleeves, and other parts required for securing each item of work of this Section to the construction. Furnish required inserts and sleeves for installation in concrete under Section 033001, CAST-IN-PLACE CONCRETE – SITEWORK.

B. Exposed fastenings shall be of the same material and finish as the metal to which applied, unless otherwise noted.

C. Welding rods shall conform to AWS Standards and the recommendation of the welding rod manufacturer. Welding of steel shall conform to AWS D1.1.

2.3 GROUT

A. Epoxy Grout: Provide non-shrink, non-metallic, non-corrosive epoxy grout conforming to the following requirements:

1. Grout shall be manufactured specifically for use in supporting heavy loads.
2. Shrinkage at 28 days: None (0.00 shrinkage when tested in accordance with ASTMC827modified procedure) with a minimum effective bearing area (EBA) of 95 percent coverage of the tested base plate.
3. Compressive strength, minimum: 10,000 psi at seven days, when tested in accordance with ASTM C579.
4. Initial setting time: Approximately one hour at 70 degrees F.
5. Provide flowable consistency as necessary for the particular application.
6. Epoxy grouts which are volatile and which give off noxious fumes are not acceptable.

2.4 HOT DIP GALVANIZING AND HIGH PERFORMANCE HYPER-DURABLE COATING

A. Hot-dip galvanize all metal in strict compliance with ASTM A123, ASTM A153, or ASTM A386. Provide at least 1.5 oz/ft2 zinc coating Color: will be selected by Architect from manufacturer’s standard offerings.

B. Touch-up: Touch up damaged or abraded galvanized surfaces with ZRC Cold Galvanizing Compound, as manufactured by ZRC Chemical Products Company.

1. ColorGalv, The Duncan Group, 69 Norman Street, Everett, MA 02149, 800.638.1011
2. ColorZinc Voigt & Schweitzer, Inc., 585 John Hancock Rd., Taunton, MA 02780, 508.828.9499
3. ColorCoat, Bay State Galvanizing Co. Inc, 128-132 Spring Street, Everett, MA 02149

C. Color: will be selected by Architect from manufacturer’s standard offerings.

2.5 ELECTROLYTIC SEPARATION

A. Coating for electrolytic separation between steel and concrete and grout shall be a high-build coal tar epoxy providing one coat protection for steel and concrete in a variety of chemical, immersion and underground conditions, manufactured by Tnemec Company, Inc., 6800 Corporate drive, Kansas City, MO 64120-1372; Tel. 816-483-3400; Kop-Coat Inc, 436 Seventh Avenue, Pittsburgh, PA 15219-1818; 1/412/227-2700, parent company RPM, International 2628 Pearl Road - P.O. Box 777 - Medina, Ohio 44258; Phone: 330.273.5090 - Fax: 330.225.8743; Carboline Company, 2150 Schuetz Road, St. Louis, MO 63146; Phone: 800-848-4645 or 314-644-1000; FAX: 314-644-4617, or approved equal.

PART 3 - EXECUTION

3.1 FABRICATION AND WORKMANSHIP

A. Metal surfaces shall be clean and free from mill scale, flake, rust and rust pitting; well formed and finished to shape and size, true to details with straight, sharp lines and angles and smooth surfaces. Curved work shall be to true radii. Exposed sheared edges shall be eased.

B. Weld all permanent connections. Weld shall be continuous on all exposed surfaces and where required for strength on concealed surfaces. Exposed welds shall be ground flush and smooth, with voids filled with metallic filling compound (metallic filling compound not permitted on surfaces to receive hot-dip galvanizing). Tack-welding will not be permitted unless specifically called for. Do not use screws or bolts where they can be avoided. Where used, fastener heads shall be countersunk, screwed up tight, and threads nicked to prevent loosening.

C. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall give ample strength and stiffness. Joints exposed to weather shall be formed to exclude water.

D. Do all cutting, punching, drilling, and tapping required for attachment of hardware and of work by other trades where so indicated or where directions for same are given prior to, or with approval of, shop drawings.

E. Live loads: Refer to Paragraph 1.8, Factor of safety shall not be less than 2-1/2 to 1.

3.2 APPLICATION OF FACTORY-APPLIED METAL COATINGS

A. Galvanizing Application: Galvanize materials in accordance with specified standards and this specification. Galvanizing shall provide an acceptable substrate for applied coatings. The dry kettle process shall be used to eliminate any flux inclusions on the surface of the galvanized material.

B. Prior to galvanizing, the steel shall be immersed in a pre flux solution (zinc ammonium chloride). The pre flux tank must be 12 to 14 Baumé and contain less than 0.4 percent iron. The wet kettle process shall be prohibited.

C. To provide the galvanized surface required, the following procedures shall be implemented:

1. A monitoring recorder shall be utilized and inspected regularly to observe any variances in the galvanizing bath temperature.
2. The pickling tanks shall contain hydrochloric acid with an iron content less than 8 percent and zinc content less than 3 percent. Titrations shall be taken weekly at a minimum.

3. All chemicals and zinc will be tested at least once a week to determine compliance with ASTM standards. All testing will be done using atomic absorption spectrometry or x-ray fluorescence (XRF) equipment at a lab in the galvanizing plant.

D. Finish coatings shall be applied under the following conditions:

1. Minimum air temperature shall be 65 degrees F. Surface temperature of steel shall be 60 degrees to 95 degrees F and, in any event, be 5 degrees F higher than the dew point. Humidity shall be 85 percent maximum.
2. The use of iron or steel shot and sand and aluminum oxide grit as a blast medium, and power wire brushes are not permitted
3. Surface of substrate shall be dry and free from dust, dirt, oil, grease or other contaminants. Coating and cure facility shall be maintained free of airborne dust and dirt until coatings are completely cured.

3.3 INSTALLATION – GENERAL

A. Materials shall be carefully handled and stored under cover in manner to prevent deformation and damage to the materials and to shop finishes, and to prevent rusting and the accumulation of foreign matter on the metal work. All such work shall be repaired and cleaned prior to erection.

B. Work shall be erected square, plumb, and true, accurately fitted, and with tight joints and intersections. All anchors, inserts and other members to be set into concrete or masonry shall be furnished loose by this trade to be built-into concrete and masonry by those trades as the work progresses. Later cutting or drilling shall be avoided wherever possible.

C. Metal work shall be rigidly braced and secured to surrounding construction, and shall be tight and free of rattle, vibration, or noticeable deflection after installation.

D. Where members, other than expansion bolts or inserts, are fastened into concrete, set such members in proprietary-type expanding grout manufactured specifically for such purpose, used strictly in accordance with manufacturer's directions. Holes to receive members shall be formed with galvanized sheet metal sleeves, expanded polystyrene foam, or other approved method to provide at least 1/2 in. clearance around entire perimeter. At exposed applications, hold expanding grout back 1/2 in. from finish surface and fill voids with Portland cement grout to match color and texture of surrounding concrete surface.

E. Electrolytic Isolation: Where dissimilar metals are to come into contact with one another, isolate by application of a heavy coating of bituminous paint on contact surfaces in addition to shop coat specified above. Do not permit the bituminous paint in any way to remain on surfaces to be exposed or to receive sealant.

3.4 EXTERIOR STEEL HANDRAILS

A. Fabricate and install exterior steel handrails at stairs and other locations as called for on the Drawings.

B. Handrails, at all but mechanical and service areas, throughout, shall be of Architectural Quality. Exceptional care shall be taken in welding and grinding, filling and surface sanding to provide truly smooth, clean, neat and flush construction throughout, free of all surface defects and defacements.

1. Steel handrails shall be fabricated of seamless round steel pipe, in accordance with designs and configurations as called for on the Drawings. Sizes and shapes of all members shall be as indicated. Joints shall be full-welded and ground flush and smooth.

C. Include as part of this work all posts, pickets, pipe handrails, intermediate rails, proprietary wall brackets, proprietary weld-on fittings (escutcheons, flanges, and returns, 90 degree corners, bends, crossovers, tees, etc.) anchors, and other items required for complete installations.

D. Exterior handrails shall be hot-dip color galvanized after fabrication as specified hereinbefore.

E. Installation of Steel Handrails: Installation shall be in pipe sleeves embedded in concrete and filled with grout or molten lead as indicated on the Drawings.

END OF SECTION

SECTION 055000

METAL FABRICATIONS

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 WORK INCLUDED

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Miscellaneous bearing and leveling plates.

1.3 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 033000, CAST-IN-PLACE CONCRETE; Placing of inserts and anchors.
2. Section 044302, GRANITE; Stairs.
3. Section 055213, PAINTED METAL HANDRAILS.

1.4 REFERENCES

A. Comply with applicable requirements of following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.

1. American Institute of Steel Construction (AISC):
   Code Code of Standard Practice for Steel Buildings and Bridges
   Specification Specification for the Design, Fabrication and Erection of Structural Steel for Buildings
2. American Iron and Steel Institute (AISI):
   Specifications Specifications for the Design of Light Gage Cold-Formed Steel Structural Members
3. American National Standards Institute (ANSI):
   A14.3 Safety Requirements for Fixed Ladders
   A202.1 Metal Bar Grating Manual
4. American Society for Testing and Materials (ASTM):
   A 27 Steel Castings, Carbon, for General Application
   A 36 Structural Steel
   A 47 Ferritic Malleable Iron Castings
   A 48 Gray Iron Castings
   A 53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
   A 123 Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip

A 153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A 307 Carbon Steel Externally Threaded Standard Fasteners
A 325 High Strength Bolts for Structural Steel Joints
A 366 Steel, Carbon, Cold-Rolled sheet, Commercial Quality
A 385 High-Quality Zinc Coatings (Hot-Dip)
A 386 Zinc Coating (Hot-Dip) on Assembled Steel Products
A 446 Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
A 500 Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
A 501 Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
A 510 General Requirements for Wire Rods and Course Round Wire, Carbon Steel
A 569 Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial Quality
A 570 Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality
A 588 High –Strength Low Alloy Structural Steel with 50 ksi [345 MPa] Minimum Yield Point to 4 in. [100mm] Thick
A 606 Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance
A 611 Steel, Cold-Rolled Sheet, Carbon, Structural
A 743 Castings, Iron-Chromium, Iron-Chromium Nickel, and Nickel-Base Corrosion-Resistant, General Application
A 780 Repair of Damaged Hot-Dip Galvanized Coatings
A 786 Rolled Steel Floor Plates
E 894 Anchorage of Permanent Metal Railing Systems and Rails for Buildings
E 935 Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings
E 985 Specifications for Permanent Metal Railing Systems and Rails for Buildings

5. American Welding Society (AWS):
   D1.1 Structural Welding Code – Steel
   D1.3 Structural Welding Code - Sheet Steel
6. Corps of Engineers (CE):
   CRD-C-621 Specification for Nonshrink Grout
7. Steel Structures Painting Council (SSPC):
   PA 1 Paint Application Specification No. 1
   SP 3 Power Tool Cleaning
   SP 6 Commercial Blast Cleaning

1.5 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.6 SUBMITTALS

A. Shop Drawings: 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.

1. Show profiles, reinforcing, fasteners, and any accessories.
2. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths.

B. Product Data: Provide manufacturer's product data, installation instructions, use limitations, and recommendations for each material used. Provide certifications that materials comply with requirements.

C. Calculations: Where installed metal fabrication work is indicated to comply with certain design loadings, provide professionally prepared calculations, material properties, certification, and other information required for structural analysis of performance of work.

D. Welders Certification: Provide certifications, signed by Contractor, certifying that welders employed at project comply with requirements specified under AWS D1.1 and AWS D1.2.

1.7 GENERAL REQUIREMENTS

A. The Contractor shall verify all measurements and shall take all field measurements necessary before fabrication. Welding to or on structural steel shall be in accordance with AWS D1.1/D1.1M. Items specified to be galvanized, when practicable and not indicated otherwise, shall be hot-dip galvanized after fabrication. Galvanizing shall be in accordance with ASTM A 123/A 123M, ASTM A 653/A 653M, or ASTM A 924/A 924M, as applicable. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and shall harmonize with the material to which fastenings are applied. Materials and parts necessary to complete each item, even though such work is not definitely shown or specified, shall be included. Poor matching of holes for fasteners shall be cause for rejection. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall provide strength and stiffness. Joints exposed to the weather shall be formed to exclude water.

1.8 WORKMANSHIP

A. Miscellaneous metalwork shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Welding shall be continuous along the entire area of contact except where tack welding is permitted. Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush. Where tight fits are required, joints shall be milled. Corner joints shall be coped or mitered, well formed, and in true alignment. Work shall be accurately set to established lines and elevations and securely fastened in place. Installation shall be in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

1.9 ANCHORAGE

A. Anchorage shall be provided where necessary for fastening miscellaneous metal items securely in place. Anchorage not otherwise specified or indicated shall include slotted inserts made to

engage with the anchors, expansion shields, and power-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; and lag bolts and screws for wood.

1.10 QUALITY ASSURANCE

A. Engineering: Provide services of a professional engineer, registered in Commonwealth of Massachusetts, to design and certify that work of this Section meets or exceeds performance requirements specified.

B. Shop fabricate work to greatest extent possible. Label each piece in shop to facilitate field assembly.

C. Welding: Perform welding in conformance with AWS D1.1 and D1.3. as applicable.

1.11 PRODUCT HANDLING AND STORAGE

A. Store work off ground and under cover. Protect from damage. Repair and clean work before erection.

1.12 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Provide allowance for trimming and fitting at site.

B. Do not permit use of metal fabrication work until work is completely and fully installed and ready to assume intended design loads. Do not permit overloading of metal fabrication systems. Do not permit use of concrete filled metal pan stair systems until concrete is placed and cured.

1.13 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. 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.

PART 2 - PRODUCTS

2.1 STEEL

A. General: Provide products and materials of new stock, free from defects, and of best commercial quality for each intended purpose.

B. Steel Plates, Shapes, and Bars: ASTM A 36.

C. Steel Tubing: ASTM A 500 or A 501, hot or cold rolled, as required for design loading.

D. Steel Pipe: ASTM A 53, schedule 40, Type S (seamless), black except where galvanized is indicated, Grade A for cold-bending.

E. Steel Sheet: ASTM A 366, A 570, or A 611, grade required for design loading.

1. Stainless steel pipe, flat bar stock, and related components shall be AISI Type 304 with No. 4 satin finish.

F. Rolled Steel Floor Plates: ASTM A 786.

G. Steel Bars for Gratings: ASTM A 569 or ASTM A 36.

2.2 STAINLESS STEEL

A. Stainless Steel: Comply with following standards and requirements for stainless steel components:

1. Tubing: ASTM A 554, Type 316 stainless steel, as standard with manufacturer.
2. Pipe: ASTM A 312, Type 316 stainless steel.
3. Castings: ASTM A 743, Grade CF 8 or CF 20.
4. Plate: ASTM A 167, Type 316 stainless steel.

2.3 NONFERROUS METALS

A. General: Provide products and materials of new stock, free from defects, and of best commercial quality for each intended purpose.

B. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.

C. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.

D. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.

E. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.4 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 (ASTM F 738M) for bolts and ASTM F 594 (ASTM F 836M) for nuts, Alloy Group 1 (A1).

D. Anchor Bolts: ASTM F 1554, Grade 36.

1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

E. Eyebolts: ASTM A 489.

F. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

G. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

H. Wood Screws: Flat head, ASME B18.6.1.

I. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).

J. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).

K. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

L. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material for Anchors in Exterior Locations: Alloy Group 1 (A1) stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).

M. Inserts: Threaded or wedge type, galvanized ferrous castings; either ASTM A 47 malleable iron, or ASTM A 27 cast steel. Provide threaded inserts and wedge inserts manufactured by one of the following or Architect approved equal:

1. Hohmann and Barnard.
2. Gateway Erections, Inc.
3. Richmond Screw Anchor Co.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Grout for Exterior Applications: Provide Factory-packaged, non-shrink, non-staining, hydraulic controlled expansion cement formulation for mixing with water at project site. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating. Provide Super Por-Rok, Erosion-Resistant Anchoring Cement, manufactured by Minwax Construction Products Division, or equal as approved by Architect.

2.6 FABRICATION – GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Fabricate work of this Section to be straight, plumb, level and square, and to sizes, shapes and profiles indicated on approved shop drawings. Ease exposed edges. Cut, reinforce, drill and tap metal work as required for proper assembly.

1. Fabricate miscellaneous supports, brackets, braces and the like required to fully complete the work.
2. Obtain loading requirements from suppliers of work to be supported. Design and support systems with a safety factor of at least 6 unless otherwise indicated.
3. Allow for thermal movement resulting from 100°F change in ambient temperature.
4. Shear and punch metals accurately. Remove burrs.
5. Ease exposed edges to a radius of approximately 1/32 in., unless indicated otherwise. Form bent corners to smallest radius possible without causing grain separation or impairing work.
6. Remove sharp or rough areas on exposed traffic surfaces.
7. Weld seams continuously. Spot welding is permitted for temporary welding only.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

F. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.

H. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

I. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

J. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

K. Work Exposed to View: For work exposed to view, select materials with special care. Provide materials which are smooth and free of blemishes such as pits, roller marks, trade names, scale and roughness. Fabricate work with uniform hairline joints. Form welded joints and seams continuously. Grind welds flush to be smooth after painting. For exposed fasteners, use hex head bolts or Phillips head machine screws.

L. Galvanizing: Hot-dip galvanize exterior metal fabrications, items located in exterior wall assemblies, and other items indicated to be galvanized, in compliance with ASTM A 123, ASTM A 153, or ASTM A 386. Provide minimum 1.5 oz./ft.2 zinc coating. Galvanize after fabrication.

2.7 FABRICATION

A. Shelf and Relieving Angles: Fabricate shelf and relieving angles from steel angles and shapes of sizes indicated for attachment to building structure. Fabricate shapes with slotted holes to receive anchor bolts, of size and spacings indicated. If not indicated, holes not more than 6 in. from ends and not more than 24 in. on center. Align expansion joints in angles with building expansion joints, and with control joints in masonry cavity wall exterior wythe.

B. Miscellaneous Bearing and Leveling Plate Fabrication: Provide miscellaneous loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Fabricate units flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts as required.

C. Concrete Filled Pipe Bollard Fabrication: Provide minimum 8 in. diameter Schedule 80 steel pipe of length to extend from at least 3 ft. below grade to at least 30 in. above grade, unless otherwise indicated.

D. Miscellaneous Framing and Supports: Fabricate miscellaneous framing and supports to adequately support live and dead loads with a safety factor of 5. Provide necessary anchors, inserts, and fasteners. Fabricate support system to carry entire load of work being supported to structure above. Do not transfer any loads to ceiling systems.

1. Cut, drill, and tap units to receive hardware, hangers and similar items.
2. Coordinate loading and attachment requirements for miscellaneous framing and supports with manufacturers of items being supported.

2.8 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.9 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

C. Shop Paint for assemblies shall be Tnemec "Series 27 F.C. Typoxy", polyamide epoxy, or approved equal. Dry film thickness of application shall be 4.5 to 6.0 mil. Color shall be black; surface texture shall be flat.

D. Field Finish Paint shall be Tnemec Series 2 coat high performance system or approved equal. Color shall be black, with eggshell finish.

E. Bituminous-based paint for electrolytic isolation shall be cold applied black asphaltic mastic conforming to SSPC Paint 12, with no asbestos fibers

2.10 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Bright, Directional Satin Finish: No. 4.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.11 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish – “Mill Finish”: AA-M10 (Mechanical Finish: as fabricated, unspecified).

2.12 ELECTROLYTIC SEPARATION/CORROSION RESISTANCE

A. Coating for electrolytic separation between steel and concrete and grout shall be a high-build coal tar epoxy providing one coat protection for steel and concrete in a variety of chemical, immersion and underground conditions, manufactured by Tnemec Company, Inc., 6800 Corporate drive, Kansas City, MO 64120-1372; Tel. 816-483-3400; Kop-Coat Inc, 436 Seventh Avenue, Pittsburgh, PA 15219-1818; 1/412/227-2700, parent company RPM, International 2628 Pearl Road - P.O. Box 777 - Medina, Ohio 44258; Phone: 330.273.5090 - Fax: 330.225.8743; Carboline Company, 2150 Schuetz Road, St. Louis, MO 63146; Phone: 800-848-4645 or 314-644-1000; FAX: 314-644-4617, or approved equal.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate and furnish anchorage devices, setting drawings, diagrams, templates, instructions, and directions for installation of concrete inserts, sleeves, anchor bolts, and miscellaneous items to be embedded or attached to concrete work, masonry work, or structural steel work.

3.2 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners necessary for securing work of this Section to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Erect work square, plumb and true, accurately fitted, and with tight joints and intersections. All anchors, inserts and other members to be set in concrete or masonry shall be furnished loose by this trade to be built-into concrete and masonry by those trades. Avoid field cutting or drilling to greatest extent possible.

D. Brace work rigid and secure to surrounding construction. Provide temporary bracing or anchors where required.

E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

F. Field Welding: Comply with AWS D1.1 and D1.2 for procedures of manual metal-arc welding, appearance and quality of welds, and correction methods for defective welds.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

G. Where members other than expansion bolts or inserts are fastened into concrete, set such members in proprietary-type expanding grout manufactured specifically for such purpose. Use grouts strictly in accordance with manufacturer's directions. Form to receive members with galvanized metal sleeves, or other approved method to provide at least 1/2 in. clearance around entire perimeter. At exposed applications, hold expanding grout back 1/2 in. from finish surface and fill voids with Portland cement grout to match color and texture of surrounding concrete surface.

H. Electrolytic Isolation: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or where dissimilar metals are to come into contact with one another, with an application of a heavy coating of bituminous paint on contact surfaces in addition to shop coat specified above. Do not permit the bituminous paint in any way to remain on surfaces to be exposed or to receive sealant.

3.3 INSTALLATION

A. Miscellaneous Bearing and Leveling Plates: Clean concrete and masonry surfaces of bond reducing materials. Roughen surfaces if required to improve bond to surface. Clean bottom surface of leveling plates immediately prior to installation.

B. Miscellaneous Items: Carefully review Drawings for miscellaneous metal items required by various trades but not specifically listed above, such as miscellaneous clip angles, miscellaneous steel bracketing, and other miscellaneous metal items as indicated on Drawings, reasonably implied therefrom, or reasonably necessary for thorough completion of work.

3.4 ADJUSTING, REPAIRING, CLEANING, AND PROTECTION

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

C. Non-Galvanized Surfaces: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed surfaces with same material as used for shop painting. Comply with SSPC PA 1.

END OF SECTION

SECTION 129300

SITE FURNISHINGS

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 DESCRIPTION OF WORK

A. Provide all materials and equipment, and do all work necessary to furnish and install the site furnishings, as indicated on the Drawings and as specified.

1.3 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 03 3001, CAST-IN-PLACE CONCRETE - SITEWORK; Poured in place concrete foundation.

1.4 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American Society for Testing and Materials (ASTM):
   A 153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware

1.5 SUBMITTALS

A. Complete shop drawings of each item specified shall be submitted.

B. Where appropriate, and when approved by the Architect, manufacturer's catalogue cuts may be substituted for shop drawings.

C. Certificate of wood treatment shall be submitted upon delivery of treated wood items.

D. Submit assembly instruction drawings showing layout(s), connections, bolting and anchoring details as per manufacturer’s standards.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials shall be the standard products of a manufacturer regularly engaged in the manufacture of such products. The materials provided shall be of a type with proven satisfactory usage for at least 2 years.

2.2 FASTENERS AND HARDWARE

A. Provide manufacturer's standard materials and accessories as required for assembly of units and as indicated on the assembly drawings. Provide unexposed aluminum, stainless steel or steel plates, angles and supports as required for complete assembly. Separate dissimilar materials to prevent electrolytic action.

1. Fasteners and metal components shall be cadmium-plated steel or steel hot-dipped galvanized in accordance with ASTM A 153.

2.3 WOOD BENCH

A. Bench shall be Avondale bench by Sitescapes, to match benches in park. Bench to be 6' long and 8' long, backed, cast iron ends, 1"x4" Ipe wood slats, with powdercoat finish to match benches in park. Manufactured by Sitescapes, www.sitescapesonline.com, phone 888.331.9464. Substitutions will only be accepted for benches that match the existing park benches in materials and design.

B. Bench shall be installed using Embedded Mount attachment for bench provided by Sitescapes, product # CV1-1000-EM.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall verify that finished grades and other operations affecting mounting surfaces have been completed prior to the installation of site furnishings. Site furnishings shall be installed plumb and true, at locations indicated, in accordance with the approved manufacturer's instructions.

3.2 ASSEMBLY AND ERECTION OF COMPONENTS

A. Items shall be shipped knocked-down (KD) ready for site assembly. Packaged components shall be complete including all accessories and hardware. New parts shall be acquired from the manufacturer; substitute parts will not be accepted unless approved by the manufacturer. When the inspection of parts has been completed, the site furnishings shall be assembled and anchored according to manufacturer's instructions or as indicated. When site furnishings are assembled at the site, assembly shall not interfere with other operations or pedestrian and vehicular circulation.

3.3 ANCHORAGE, FASTENINGS AND CONNECTIONS

A. Furnish metal work, mounting bolts or hardware in ample time for securing into concrete or masonry as the work progresses. Provide anchorage where necessary for fastening granite benches securely in place. Provide, for anchorage not otherwise specified or indicated, slotted

inserts, expansion shields, and power-driven fasteners, when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; through bolts, lag bolts, and screws for wood. Provide non-ferrous attachments for non-ferrous metal. Make exposed fastenings of compatible materials, generally matching in color and finish the fastenings to which they are applied. Conceal fastenings where practicable.

3.4 TESTING

A. Each site furnishing shall be tested to determine a secure and correct installation. A correct installation shall be according to the manufacturer's recommendations and by the following procedure: The Contractor shall measure the physical dimensions and clearance of each installed site furnishing for compliance with manufacturer's recommendations and as indicated. Site furnishings which do not comply shall be reinstalled. Fasteners and anchors determined to be non-compliant shall be replaced. A written report describing the results of the testing shall be provided.

3.5 BENCHES

A. Examination

1. Do not begin installation until substrates are properly prepared.
2. Verify that substrates are stable and capable of supporting the weight of the product.

B. Installation

1. Install tables and benches in accordance with manufacturer’s installation instructions.
2. Bolt and anchor tables and benches securely in place.

C. Adjusting

1. Any loose or missing hardware should be tightened or replaced immediately.
2. If any part is found to be cracked or broken it is recommended that the product be taken out of service until the appropriate repairs can be made.

D. Cleaning Metal Components

1. Should dirt from the environment build-up on this surface a wipe with a soft cloth and mild detergent will do the trick.
2. Abrasive cleaners, brushes and steel wool should be avoided.
3. If the finish is marred by a sharp object and the steel is exposed take a fine abrasive material to the area to improve the adhesion of the primer and touch-up paint. A quality grade exterior metal primer and top coat of matching color enamel should then be applied over the prepared surface.

E. Protection

1. Protect installed tables and benches until completion of project.

END OF SECTION

SECTION 26 52 00

EXTERIOR LIGHTING

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 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following: exterior lighting fixtures, lamps, ballasts, poles standards, and accessories. The existing electrical box and service to the site is to remain. Contractor to provide new electrical lines, conduit, and pull boxes as required.

1.3 DEFINITIONS

A. Fixture: A complete lighting unit. Fixtures include a lamp or lamps and parts required to distribute the light, position and protect lamps, and connect lamps to the power supply.

B. Lighting Unit: A fixture, or an assembly of fixtures with a common support, including a pole or bracket plus mounting and support accessories.

C. Luminaire: A fixture.

1.4 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data describing fixtures, lamps, ballasts, poles, and accessories. Arrange product data for fixtures in order of fixture designation. Include data on features, poles, accessories, and the following:

1. Outline drawings of fixtures and poles indicating dimensions and principal features.

2. Electrical ratings and photometric data with certified results of independent laboratory tests.

C. Product certifications signed by manufacturers of lighting units certifying that their products comply with specified requirements.

D. Shop drawings from manufacturers detailing nonstandard fixtures and poles and indicating dimensions, weights, methods at field assembly, components, and accessories.

E. Maintenance data for products for inclusion in Operating and Maintenance Manual specified in Division 1.

1.5 QUALITY ASSURANCE

A. Comply with NFPA 70 "National Electrical Code" for components and installation.

B. Comply with ANSI C2, "National Electrical Safety Code."

C. Listing and Labeling: Provide fixtures and accessories that are listed and labeled for their indicated use and location on the Project.

1. Special Listing and Labeling: Provide lighting units for use under water that are specifically listed and labeled for such use.

2. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article 100.

3. Listing and Labeling Agency Qualification: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

D. Manufacturers' Qualifications: Firms experienced in manufacturing lighting units that are similar to those indicated for this Project and that have a record of successful in-service performance.

E. Light fixtures shall conform to all Dark Sky Requirements as defined in The "IES" (Illuminating Engineering Society of North America) Lighting Handbook, most recent edition.

1.6 STORAGE AND HANDLING OF POLES

A. General: Store poles on decay-resistant treated skids at least 1 ft. above grade and vegetation. Support pole to prevent distortion and arrange to provide free air circulation.

B. Metal Poles: Retain factory-applied pole wrappings until just before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.7 WARRANTY

A. Special Project Warranty: Submit a warranty, mutually executed by manufacturer and the Installer, agreeing to replace external parts of lighting fixtures exhibiting a failure of finish as specified below. This warranty is in addition to, and not a limitation of, other rights and remedies the Owner may have under the Contract Documents.

1. Protection of Metal from Corrosion: Warranty against perforation or erosion of the finish due to weathering.

2. Color Retention: Warranty against fading, staining, and chalking due to the effects of weather and solar radiation.

3. Special Project Warranty Period: 5 years, beginning on the date of Substantial Completion.

PART 2- PRODUCTS

2.1 FIXTURE COMPONENTS, GENERAL

A. Metal Parts: Free from burrs and sharp edges and corners.

B. Sheet Metal Components: Corrosion-resistant aluminum, except as indicated. Form and support to prevent warping and sagging.

C. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/ breather for enclosed fixtures.

D. Doors, Frames, and Other Internal Access Provisions: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in the operating position. Provide for door removal for cleaning or replacing lens. Arrange for door opening to disconnect ballast.

E. Exposed Hardware Material: Stainless steel.

F. Reflecting Surfaces: Minimum reflectances as follows, except as otherwise indicated:

1. White Surfaces: 85 percent.

2. Specular Surfaces: 83 percent.

3. Diffusing Specular Surfaces: 75 percent.

G. Plastic Parts: Resistant to yellowing and other changes due to aging and exposure to heat and UV radiation.

H. Lenses and Refractors: Materials as indicated. Use heat- and aging-resistant, resilient gaskets to seal and cushion lens and refractor mounting in fixture doors.

2.2 POST LIGHT

A. Providence Medium Light Fixture (PROV/T3-32LED/3K/450/BLK/PCAT/STND) by Architectural Area Lighting, mounted on post PR4/4R10-125/BLK/BC5SEE, Manufacturer’s Typical Mounting Detail.

2.3 INSTALLATION

A. Set units plumb, square, level, and secure according to manufacturer’s written instructions and shop drawings.

2.4 CONCRETE FOUNDATIONS

A. Construct concrete foundations with 3000-pound, 28-day concrete conforming to Division 3 Section "Cast-In-Place Concrete." Comply with details and manufacturer's recommendations for reinforcing, anchor bolts, nuts, and washers.

A. Pole Installation: Use fabric web slings (not chain or cable) to raise and set poles.

A. Fixture Attachment: Fasten to indicated structural supports.

A. Lamp fixtures with indicated lamps according to manufacturer's instructions. Replace malfunctioning lamps.

2. GROUNDING

A. Ground fixtures and metal poles according to Division 16 Section "Grounding."

1. Poles: 1/0 ground wire attached to grounding electrode system as indicated on the Drawings.

3. FIELD QUALITY CONTROL

A. Inspect installed units for damage.

B. Provide advance notice of dates and times for field tests.

C. Provide instruments to make and record test results.

D. Tests: Verify normal operation of lighting units after installing fixtures and energizing circuits with normal power source. Include the following:

1. Check for excessively noisy ballasts.

2. Check for uniformity of illuminations.

3. Written report of tests indicating actual illumination results.

4. ADJUSTING AND CLEANING

A. Clean components on completion of installation. Use methods and materials recommended by manufacturer.

END OF SECTION

SECTION 312300

SITE EXCAVATING, BACKFILLING AND COMPACTING

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 WORK INCLUDED

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following: site excavating, backfilling, and compacting, as indicated on the Drawings and as specified.

B. The work of this section shall include, but is not necessarily limited to the following:

1. Site excavation, filling, and grading.
2. Excavation and backfill for site structures and utilities.
3. Preparation of subgrade for slabs and pavements.
4. Grading for landscape and pavement areas.
5. Sheeting, bracing, and support of excavations as necessary.
6. Drainage and dewatering as necessary to perform work in the dry.
7. Placement and compaction of fills.
8. Placement and compaction of aggregate base other than beneath pavements.

1.3 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 024113, SELECTIVE SITE DEMOLITION AND REMOVALS; Clearing and grubbing and stripping of topsoil.
2. Section 329119, LANDSCAPE GRADING.
3. Aggregate base courses beneath paving is included under the applicable paving specification section.

1.4 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American Society for Testing and Materials (ASTM):
   - C 33 Concrete Aggregates
   - C 136 Sieve Analysis of Fine and Coarse Aggregates
   - D 422 Particle - Size Analysis of Soils
   - D 698 Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft. (6000kN-m/m.))
   - D 1556 Density of Soil In-Place by the Sand Cone Method

D 1557 Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10-lb. (4.54-kg) Rammer and 18-in. (457-mm) Drop
D 2487 Classification of Soils for Engineering Purposes (Unified Soil Classification System)
D 3017 Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D 3740 Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
D 4318 Liquid Limit, Plastic Limit, and Plasticity Index of Soils
E 329 Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
E 548 General Criteria Used for Evaluating Laboratory Competence

2. Associated General Contractors of America, Inc.(AGC):
Manual of Accident Prevention in Construction

1.5 EXISTING CONDITIONS

A. The Contractor shall become thoroughly familiar with the site, consult records and drawings of adjacent structures and of existing utilities and their connections, and note all conditions which may influence the work of this Section.

B. By submitting a bid, the Contractor affirms that he has carefully examined the site and all conditions affecting work under this Section including work which has been let for construction under previous bid packages. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions.

C. The Contractor may, at his own expense, conduct additional subsurface testing as required for his own information.

1. No excavation or testing shall be performed outside the Limit of Work as shown on the Drawings.

1.6 INFORMATION NOT GUARANTEED

A. Information on the Drawings and in the Specifications relating to subsurface conditions, natural phenomena, and existing utilities and structures is from the best sources presently available. Such information is furnished only for the information and convenience of the Contractor, and the accuracy or completeness of this information is not guaranteed.

B. Plans, surveys, measurements, and dimensions under which the work is to be performed are believed to be correct, but the Contractor shall have examined them for himself during the bidding period, as no additional compensation will be made for errors and inaccuracies that may be found therein.

1.7 QUALITY CONTROL

A. The Owner reserves the right to retain a Testing Laboratory, to perform on-site observation and testing in accordance with Section 014000, QUALITY REQUIREMENTS during the following phases of the construction operations. The services of the Testing Laboratory may include, but not be limited to the following:

1. Observation during excavation and replacement of existing fill beyond the pavilion area.
2. Observation during placement and compaction of fills.

3. Laboratory testing and analysis of fill and bedding materials specified, as required.
4. Observe construction and perform water content, gradation, and compaction tests at a frequency and at locations determined by the Testing Laboratory. The results of these tests will be submitted to the Architect, copy to the Contractor, on a timely basis so that the Contractor can take such action as is required to remedy indicated deficiencies. During the course of construction, the Testing Laboratory will advise the Architect in writing with copy to Contractor if, at any time, in his opinion, the work is not in substantial conformity with the Contract Documents.
5. Observation of fills following interruptions by rains or other inclement weather.

B. Perform field density tests in accordance with ASTM D 1556 or D 3017.

1. Make at least one field density test of the subgrade for every 2000 sq. ft. of paved area, but in no case less than three tests.
2. In each compacted fill layer, make one field density test for every 2000 sq. ft. of overlaying paved areas, but in no case less than three tests.

C. The Testing Laboratory 's presence does not include supervision or direction of the actual work by the Contractor, his employees, or agents. Neither the presence of the Testing Laboratory, nor any observations and testing performed by him shall excuse the Contractor from defects discovered in his work.

D. The Owner reserves the right to modify or waive Testing Laboratory services.

E. Testing of soils shall be in accordance with the following:

Property	ASTM Test Method
Particle-Size Analysis	D 422
Liquid Limit	D 4318
Plasticity Index	D 4318

1.8 SUBMITTALS

A. A 10 lb. sample of each off-site material proposed for use, and of any on-site material when so requested by the Architect or Testing Laboratory, shall be submitted for approval.

1. Samples shall be delivered to office of the Architect or Testing Laboratory, as directed.
2. Samples required in connection with compaction tests will be taken and transported by the Testing Laboratory.

1.9 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

A. The work shall be executed in such manner as to prevent any damage to adjacent property and any other property and existing improvements such as, but not limited to: streets, curbs, paving, utility lines and structures, monuments, bench marks and other public and private property. Protect existing structures and foundations from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. In case of any damage or injury caused in the performance of the work, the Contractor shall, at his own expense, make good such damage or injury to the satisfaction of, and without cost to the Owner. Existing roads, sidewalks, and curbs damaged during the project work shall be repaired or replaced to their original condition at the completion of operations. The Contractor

shall replace, at his own cost, existing bench marks, monuments, and other reference points which are disturbed or destroyed.

C. Buried structures, utility lines, etc., including those which project less than 18 in. above grade, which are subject to damage from construction equipment shall be clearly marked to indicate the hazard. Markers shall indicate limits of danger areas, by means which will be clearly visible to operators of trucks and other construction equipment, and shall be maintained at all times until completion of Project.

1.10 DRAINAGE AND DEWATERING

A. The Contractor shall provide, at his own expense, adequate pumping and drainage facilities to keep excavated areas sufficiently dry from groundwater and/or surface runoff so as not to adversely affect construction procedures or cause excessive disturbance of underlying natural ground or excavation bottom.

B. The Contractor shall grade and ditch the site as necessary to direct surface runoff away from open excavations and subgrade surfaces. Positive drainage (minimum 2.0% slope) shall be maintained at all times.

C. Water handled as part of the Contractor's dewatering operations shall be discharged on-site to the ground surface in a location to be coordinated with the Architect and Geotechnical Consultant.

D. Water from trenches and excavations shall be disposed of in such a manner as will not cause injury to public health nor to public or private property, nor to existing work, nor to the work completed or in progress, nor to the surface of roads, walks, and streets, nor cause any interference with the use of the same by the public. Methods of disposal of pumped effluent shall not cause erosion or siltation.

E. Under no circumstances place fills, pour concrete, or install piping and appurtenances in excavations containing free water.

F. There shall be sufficient pumping equipment, in good working order, available at all times to remove water.

G. Where, in the opinion of the Testing Laboratory pumping of excavations is not effective in maintaining a dry firm subgrade, other dewatering methods acceptable to the Testing Laboratory, shall be employed. This may include the use of well points or deep well dewatering.

1.11 FROST PROTECTION

A. Do not excavate to full indicated depth when freezing temperatures may be expected, unless footings or slabs can be poured immediately after the excavation has been completed. Protect the excavation from frost if placing of concrete is delayed.

B. Completed footings which have not been backfilled shall be protected from freezing by temporary additional earth cover, insulating blankets, heaters, or other methods acceptable to the Architect.

C. Frozen material shall not be placed as fill or backfill.

1.12 SHORING AND SHEETING

A. Provide shoring, sheeting and/or bracing at excavations, as required, to prevent collapse of earth at side of excavations.

B. Comply with federal, state, and local regulations, or in the absence of such regulations, comply with the requirements contained in the AGC Manual.

C. Remove sheeting and shoring and the like, as backfilling operations progress, taking all necessary precautions to prevent collapse of excavation sides.

1.13 ROCK

A. Rock shall be defined as sound and solid mass, layer, or ledge of mineral matter in place of such hardness and texture that it:

1. Mechanical Definition of Rock: Cannot be effectively loosened or broken down by ripping in a single pass with a late model tractor-mounted hydraulic ripper equipped with one digging point of standard manufacturer's design adequately sized for use with and propelled by a crawler type tractor rated between 210-and 240-net flywheel horsepower, operating in low gear, or
2. Manual Definition of Rock: In areas where the use of the ripper described above is impracticable, rock defined as sound material of such hardness and texture that it cannot be loosened or broken by a 6-lb. drifting pick. The drifting pick shall have a handle not less than 34 in. in length.

1.14 COORDINATION

A. Prior to start of earthwork the Contractor shall arrange an on-site meeting with the Architect for the purpose of establishing Contractor's schedule of operations and scheduling inspection procedures and requirements.

B. As construction proceeds, the Contractor shall be responsible for notifying the Architect prior to start of earthwork operations requiring inspection and/or testing.

C. The Contractor shall be responsible for obtaining test samples of soil materials proposed to be used and transporting them to the site sufficiently in advance of time planned for use of these materials for testing of materials to be completed. Use of these proposed materials by the Contractor prior to testing and approval or rejection, shall be at the Contractor's risk.

D. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.
3. Contact utility-locator service for area where Project is located before excavating.

1.15 PROTECTION OF EXISTING LANDSCAPE

A. The Contractor shall exercise care to preserve the natural landscape and shall conduct his construction operations so as to prevent any unnecessary destruction, scarring, or defacing of the natural surroundings in the vicinity of the Work.

1. Except where clearing is required for permanent works, for approved construction roads, and for excavation operations, all trees, native shrubbery, and vegetation shall be preserved and shall be protected from damage which may be caused by the Contractor's construction operations and equipment. Existing trees to remain shall be suitably protected from damage with fencing or other means acceptable to the Architect.
2. Movement of crews and equipment within the right-of-way and over routes provided for access to the work shall be performed in a manner to prevent damage to property. Where unnecessary destruction, scarring, damage, or defacing may occur as a result of the Contractor's operations the same shall be repaired, replanted, reseeded, or otherwise corrected at the Contractor's expense.

B. Where indicated on the Drawings and as directed by the Architect, disturbed areas shall be temporary seeded.

1.16 PROTECTION OF EXISTING WATER SYSTEMS

A. The Contractor shall comply with applicable Federal and State laws, orders, and regulations concerning the control and abatement of water pollution.

B. The Contractor's construction activities shall be performed by methods that will prevent entrance, or accidental spillage, of solid matter, contaminants, debris, and other objectionable pollutants and wastes into streams, water courses, lakes, and underground water sources.

PART 2 - PRODUCTS

2.1 SOURCE OF MATERIALS

A. Material shall be obtained from required on-site excavation, to the extent that suitable material is available, and from off-site sources, to the extent that suitable material is not available from on-site excavation. The Contractor shall maximize the reuse of excavated materials on-site to ensure there is no surplus soil material requiring off-site disposal.

B. Reuse of excavated materials shall be conducted as directed by the Geotechnical Consultant.

C. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

D. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.

1. Unsuitable material is defined as surficial organics, surficial and buried topsoil and subsoil, old foundations and pavement, and compressible and deleterious materials.
2. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

2.2 EMBANKMENT MATERIALS

A. Embankment material shall be a granular material conforming to the following:

1. Liquid Limit shall not exceed 35%
2. Plasticity Index shall be in the range of 2 to 10.

3. Gradation shall conform to the following:

Sieve Size %	Passing by Weight
2 in.	100
3/4 in.	80-100
No. 4	60-85
No. 40	35-60
No. 100	15-40
No. 200	0-12

2.3 BACKFILL MATERIALS

A. On-site material for use in compacted backfill shall be natural, inorganic, granular soil, taken from areas of excavation after stripping of topsoil and removal of unsuitable material.

B. Material containing organic matter, topsoil, organic silt, peat, or soft or frost-susceptible soil is unsuitable for any of the following uses:

Backfill beneath site structures and pavilion

Backfill beneath pavement and within 5 ft. of subgrade

Bearing strata material

Bedding

C. Backfill materials shall be free from rocks greater than 8 in. in diameter or length, having largest dimension greater than 3/4 lift thickness, or greater than 1/2 ft.3 in volume, and foreign matter, such as construction debris, trash, wood, roots, leaves, sod, organic matter, or soft clay and silt. Backfill shall be clean, non-organic material, of non-swelling character, capable of being readily compacted to form a solid, stable embankment. Materials containing ice or frozen lumps shall not be employed.

D. Backfill material shall be compacted clean washed sand with less than 10% passing the No. 200 sieve. Maximum diameter shall be 1-1/2 in. Testing laboratory shall examine and approve material before backfilling.

E. Structural Fill: Backfill below and around foundations and other structural elements and above the select fill in trenches should consist of clean, well-graded sand and gravel free of organic material, trash, ice, frozen soil, and other deleterious materials. The recommended gradation for structural fill should satisfy the following limits.

U.S. Sieve Size and Number	Percent Finer by Weight Minimum	Maximum
4 inch	100	---
2 inch	65	10
No. 4	30	80
No. 20	10	65
No. 40	5	40
No. 100	0	20

No. 200	0	8

1. The moisture content of the structural fill material should be adjusted before placement so that it is within 2 percent of the optimum moisture content.

F. Select Fill: should be used as backfill around and above underground piping. Select fill shall consist of hard, durable sand and gravel, free from trash, organic matter, surface coatings and other deleterious materials. The recommended gradation for select fill should satisfy the following limits.

Percent Finer by Weight U.S. Sieve Size and Number	Minimum	Maximum
4 inch	100	---
No. 10	30	100
No. 40	0	70
No. 200	0	15

1. The moisture content of the select fill material should be adjusted before placement so that it is within 2 percent of the optimum moisture content.

G. Common Fill (in landscaped areas) shall be bankrun sand, gravel, or mixture thereof, graded within the following limits:

Sieve Size %	Passing by Weight
6 in.	100
No. 4	30-95
No. 200	0-15

H. Aggregate Base shall be Dense-graded Crushed Stone, conforming to MHD Specifications Section M2.01.7.

I. Planting Soils: Refer to Section 329200, LAWNS AND GRASSES and Section 329300, TREES, PLANTS AND GROUND COVERS.

PART 3 - EXECUTION

3.1 PROTECTIVE EQUIPMENT

A. Provide all employees and subcontractor(s) with personal protective equipment and protective clothing consistent with the levels of protection for this work as indicated in the Contractor's Health and Safety Plan.

3.2 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. When excavations have reached required subgrade, Contractor shall have subgrades surveyed to determine if subgrade elevations will allow for the indicated depth of proposed materials to be placed on them.

1. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material to achieve required subgrade elevation, as directed.
2. If survey indicates that subgrade elevations are too high, continue excavation and reconstruct subgrades to required elevation as directed, without additional compensation.
3. If survey indicates that subgrade elevations are too low, add compacted backfill or fill material to achieve required subgrade elevation as directed, without additional compensation.

C. Proof-roll subgrade below the building slabs and 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 (5 km/h).
2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
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.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.3 EXCAVATION

A. Sheeting, shoring, bracing, pumping, bailing, and other incidental work necessary to make and maintain excavations and keep them free from water at all times during placing of concrete, utility lines, and fill and backfill materials, shall be performed or supplied as required. Fill and backfill shall be placed in dry or dewatered areas only.

B. Sheeting shall be installed where required to maintain safe and workable conditions in excavations. Sheeting, including necessary swales and struts, shall be selected and designed by the Contractor. Use of sheeting shall equal or exceed minimum required for safety and/or conformance to law.

C. Structures, pipes, pavement, earth, and other property liable to damage from excavation operations shall be braced, underpinned, and supported as required to prevent damage and movement.

D. As excavation approaches underground utilities and structures, excavation shall be done by hand tools. Such manual excavation is incidental to normal excavation and no special payment will be made.

E. Excavation shall include satisfactory disposal of excavated material not employed as backfill or fill materials.

1. Excavation material, other than topsoil, which is not required for or is unsuitable for backfill or fill materials, shall be legally disposed of off-site.

F. Excavation for pipe and other items shall be carried far enough below underside of item to accommodate bedding material.

G. Excavations which extend below indicated or specified levels ("over-excavation"), shall be filled to those levels with compacted Granular Fill Material.

H. If bearing surface of subgrade which is to receive fill, structure, concrete, or other construction becomes softened, disturbed, or unstable, unsuitable material shall be removed down to a firm bearing surface and replaced with suitable material. Subgrade shall then be protected from further disturbance until construction item is placed.

I. Excavations shall not be wider than required to set, brace, and remove forms for concrete, install structures, piping, or perform other necessary work. Width of trench at 12 in. above top of pipe or conduit shall not be greater than the sum of outside diameter of the pipe or the conduit plus 2 ft. (pipe O.D. + 2 ft.). Sides of trench above this level shall be sloping, at an angle 30 degrees or less from vertical, from this level to grade. In materials where sloping walls are not stable, trench walls shall be sheeted.

J. Explosives: Do not use explosives.

K. Below-ground Demolition

1. Underground items, not indicated on the Drawings, which impede construction of new work indicated, shall be abandoned, demolished, and/or removed only with the approval of the Architect.

L. Proof roll areas to support foundations, pavements with a 35 ton rubber tired roller in four passes in two perpendicular directions. Undercut to level of stable soils in unstable areas. Perform work in presence of Testing Laboratory.

M. The excavation and handling of lead-impacted soil shall be conducted implementing Best Management Practices (BMPs) as recommended by the Geotechnical Consultant to help reduce potential exposure to elevated lead.

3.4 FILLING

A. Filling shall be done in any area only after the Testing Laboratory has reviewed subgrade.

B. Benching: Fills placed on existing slopes which exceed 6 ft. horizontal to 1 ft. vertical shall be keyed or benched into the existing slope not less than 5 ft. to prevent the formation of slippage planes.

C. Compaction at End of Day: Areas undergoing filling shall be smooth-rolled before the end of the work day to seal and protect these areas from rainfall infiltration during the night.

3.5 FILL, BACKFILL, AND COMPACTION

A. Excavation below finished grades shall be backfilled. Temporary planking, timbering, forms, debris, and refuse shall be removed before backfill is placed.

B. Backfilling shall be done in any area only after the Architect or Testing Laboratory has inspected and approved subgrade, or other work in excavations. Notice that the work is ready for inspection shall be given promptly, and sufficient time shall be allowed for making necessary examinations.

C. General Site Fill: General Site Fill for use in areas beyond the building limits and beyond structures shall be placed in lifts not exceeding 12 in. in loose thickness and compacted to 90% of maximum density, determined by ASTM D 1557.

D. Where pumping of excavations is not effective and where permitted by the Architect or Testing Laboratory, Stone Fill may be placed below water without compaction in lieu of General Site Fill or Structural Backfill. There will be no adjustment in Contract price.

E. In order to prevent lateral movement, care shall be exercised in placing backfill adjacent to foundation wall, footing, utility line and other structures. Backfill on opposite sides of such items shall be kept at approximately the same elevation as backfilling progresses to prevent unbalanced earth pressure. During backfilling the difference in elevation of backfill on opposite sides of the structure shall not exceed 12 in.

F. Except as otherwise noted, tolerance of top surface of completed backfill shall be +2 in. from true grade indicated, and variations from indicated tolerance shall approximately compensate within each 100 ft.2 area.

G. Subgrade and backfill of indicated areas or structures shall be compacted in accordance with requirements of ASTM D 1557, and as specified in the following table:

COMPACTION TABLE

Area or Structure	Subgrade Compaction Minimum %	Max. Compacted Thickness Per. Lift – in.	Compaction of Each Each Lift Minimum %
Above pipe cover to subgrade	85	12	90
Area or structure not otherwise noted	85	12	90
Concrete equipment pad	90	8	95
Footing, foundation, manhole, or similar structure, and within 2 ft. horizontally	90	8	95
Pavillion Footing and within 2 ft. horizontally	95	8	45
Pavement, including 1 ft. beyond edge	90	8	95
Pipe cover	--	6	95
Granular Fill	95	6	95

H. Compaction requirements shall apply to material directly below the indicated supported item (base course, footing, or structure), and to all material above the undisturbed earth beneath fill, and enclosed by the following planes:

1. Horizontal plane at the elevation of the bottom of the supported item (base course, footing, or structure), within a perimeter line located 2 ft. beyond the exterior face or edge of item.
2. Flat planes extending from the perimeter line downward and outward at 45o angle with the horizontal, to where the planes intersect undisturbed earth. Where zones of higher and lower percentages of compaction overlap, that of the higher percentage shall apply.

I. Compaction of backfill in excavation shall be to a density not less than that required of the surrounding area fill.

J. Equipment and methods employed to achieve specified compaction shall be subject to the approval of the Architect and Testing Laboratory and equipment shall be replaced and methods revised as directed until specified compaction is obtained.

K. Compaction of each lift shall be completed before compaction of the next lift is started.

L. Backfill adjacent to wall, conduit, pipe, and similar item, and in other areas where wheeled equipment cannot safely be employed, shall be placed in 4 in. thick layers, to the specified compaction, using mechanical tampers.

M. Contractor shall coordinate the reuse of excavated materials on-site with the recommendations of the Geotechnical Consultant.

3.6 MOISTURE CONTROL

A. Variation of moisture content in fill and backfill materials shall be limited to Optimum Moisture (-1% to +2%). Moisture content shall be as uniformly distributed as practicable within each lift, and shall be adjusted as necessary to obtain the specified compaction.

B. Material which does not contain sufficient moisture to be compacted to the specified densities shall be moisture conditioned by sprinkling, disking, windrowing, or other method approved by the Testing Laboratory.

1. Material conditioned by sprinkling shall have water added before compaction. Uniformly apply water to surface of subgrade or layer of soil material to obtain sufficient moisture content. The Contractor shall maintain sufficient hoses and/or water distributing equipment at the site for this purpose.

C. Material containing excess moisture shall be dried to required Optimum Moisture Content before it is placed and compacted. Excessively moist soils shall be removed and replaced or shall be scarified by use of plows, discs, or other approved methods, and air-dried to meet the above requirements.

D. Materials which are within the moisture requirements specified above, but which display pronounced elasticity or deformation under the action of earthmoving and compaction equipment, shall be reduced to Optimum Moisture Content, or below, to secure stability.

E. In the event of sudden downpours or other inclement weather, exposed subgrades and fills which, in the opinion of the Testing Laboratory, become inundated or excessively moistened shall have excess water removed and soil dried as specified above.

3.7 DUST CONTROL

A. Contractor shall be responsible for dust control during all construction operations**.** During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities including sweeping and sprinkling of streets as necessary, so as to minimize the creation and dispersion of dust. If the Architect decides that it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread calcium chloride as directed. Methods and materials for dust control shall be as approved by the Architect.

3.8 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.9 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Surplus satisfactory soil imported from off-site sources shall be transported off-site by the Contractor or relocated to designated storage areas on Owner's property and stockpiled or spread as directed by Architect.

B. The transportation and off-site disposal of excavated materials generated during the course of the work under this Contract is prohibited without prior approval by the Architect. Contractor shall coordinate the reuse of excavated materials on-site with the recommendations of the Geotechnical Consultant.

C. Remove waste material, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION

SECTION 312500

EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.00 GENERAL PROVISIONS

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 SUMMARY

A. This Section specifies equipment and materials for an erosion and sediment control program for minimizing erosion and siltation during the construction phase of the project. The erosion and sediment control provisions detailed on the Drawings and specified herein are the minimum requirements for an erosion control program. The Contractor shall provide additional control materials and methods as required to effect the erosion and siltation control principles specified herein.

1.02 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other specification Sections that directly relate to work of this Section include, but are no for sitework,

1. Section 011000, GENERAL REQUIREMENTS; Fencing, except silt fence.

2. Section 024113, SELECTIVE SITE DEMOLITION AND REMOVALS ; Clearing and grubbing.

3. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING; Excavation and backfill.

4. Section 329200, LAWNS AND GRASSES; Permanent sodding for lawns.

1.03 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. Commonwealth of Massachusetts Highway Department (MHD):

Specifications	Standard Specifications for Highways and Bridge

1.04 SUBMITTALS

A. Proposed methods, materials to be employed, and schedule for effecting erosion and siltation control and preventing erosion damage shall be submitted for approval. Submittals shall include:

1. Proposed methods for effecting erosion and siltation control including 1" = 40' scale plans indicating location of erosion control devices and siltation basins.

2. List of proposed materials including manufacturer's product data.

3. Schedule of erosion control program indicating specific dates from implementing programs in each major area of work.

B. The following samples shall be submitted:

Sample	Size
Filter Fabric	12 x 12 in.

1.06 EROSION CONTROL PRINCIPLES

A. The following erosion control principles shall apply to the land grading and construction phases:

1. Stripping of vegetation, grading, or other soil disturbance shall be done in a manner which will minimize soil erosion.

2. Whenever feasible, natural vegetation shall be retained and protected.

3. Extent of area which is exposed and free of vegetation and duration of its exposure shall be kept within practical limits.

4. Temporary seeding, mulching, or other suitable stabilization measures shall be used to protect exposed critical areas during prolonged construction or other land disturbance.

5. Drainage provisions shall accommodate increased runoff resulting from modifications of soil and surface conditions during and after development or disturbance. Such provisions shall be in addition to existing requirements.

6. Sediment shall be retained on-site.

7. Erosion control devices shall be installed as early as possible in the construction sequence prior to start of clearing and grubbing operations and excavation work.

B. Cut and fill slopes and stockpiled materials shall be protected to prevent erosion. Slopes shall be protected with permanent erosion protection when erosion exposure period is expected to be greater than or equal to six months, and temporary erosion protection when erosion exposure period is expected to be less than six months.

1. Permanent erosion protection shall be accomplished by seeding with grass and covering with an erosion protection material, as appropriate for prevailing conditions.

2. Temporary erosion protection shall be accomplished by covering an erosion protection materials, as appropriate for prevailing conditions.

3. Except where specified slope is indicated on Drawings, fill slopes shall be limited to a grade of 2:1 (horizontal: vertical) cut slopes shall be limited to a grade of 1.5:1.

1.07 QUALITY ASSURANCE

A. Erosion control measures shall be established at the beginning of construction and maintained during the entire period of construction. On-site areas which are subject to severe erosion, and off-site areas which are especially vulnerable to damage from erosion and/or sedimentation, are to be identified and receive special attention.

B. All land-disturbing activities are to be planned and conducted to minimize the size of the area to be exposed at any one time, and the length of time of exposure.

C. Surface water runoff originating upgrade of exposed areas should be controlled to reduce erosion and sediment loss during the period of exposure.

D. When the increase in the peak rates and velocity of storm water runoff resulting from a land-disturbing activity is sufficient to cause accelerated erosion of the receiving stream bed, provide measures to control both the velocity and rate of release so as to minimize accelerated erosion and increased sedimentation of the stream.

E. All land-disturbing activities are to be planned and conducted so as to minimize off-site sedimentation damage.

F. The Contractor is responsible for cleaning out and disposing of all sediment once the storage capacity of the sediment facility is reduced by one-half.

G. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

H. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

PART 2 PRODUCTS

2.01 SILT FENCE

A. Silt fence shall be a wire-bound woodroll snow fence covered with filter fabric. Fence shall be 4 ft. high minimum, and shall have 3/8 in. by 1-1/2 in. wide pickets, approximately 2 in. apart, bound together with at least 13 gage minimum, galvanized steel wire.

1. Filter fabric shall be one of the following, or approved equal:

Product	Manufacturer
Trevira Spunbond	Hoechst Fibers Industries
Fabric Type 1120	Spartanburg, SC 29304
Supac N 5NP(UV)	Phillips Fibers Corporation
	Greenville, SC 29602
Envirofence Mirafi, Inc.,	Charlotte, NC 2822

2. Silt fence shall be supported by steel posts, driven a minimum of 3 ft. into the ground. Posts shall be spaced 10 ft. o.c. maximum.

PART 3 EXECUTION

3.01 SILT FENCE

A. Silt fence shall be constructed and installed as indicated on the Drawings, prior to start of clearing and grubbing operations.

3.02 MAINTENANCE AND REMOVAL OF EROSION CONTROL DEVICES

A. Drainage structures shall be kept clean and clear of obstructions during construction period.

B. Erosion Control Devices

1. Sediment behind the erosion control device shall be checked twice each month and after each heavy rain. Silt shall be removed if greater than 6 in. deep.

2. Condition of erosion control device shall be checked twice each month or more frequently as required. Damaged and/or deteriorated items shall be replaced. Erosion control devices shall be maintained in place and in effective condition.

3 Sediment deposits shall be disposed of off-site, in a location and manner which will not cause sediment nuisance elsewhere.

C. Removal of Erosion Control Devices

1. Erosion control devices shall be maintained until all disturbed earth has been paved or vegetated, at which time they shall be removed. After removal, areas disturbed by these devices shall be regraded and seeded.

2. Erosion protection material shall be kept securely anchored until acceptance of completed slope or entire Project, whichever is later.

END OF SECTION

SECTION 321416

BRICK UNIT PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Wire cut brick unit paving set in sand setting beds to tolerances to comply with ADA codes.

1.03 ACTION SUBMITTALS

A. Product Data: Manufacturer's product data shall be submitted for the following items:
1. Brick paver
2. Edging system

B. Samples:
1. (5) Five individual brick pavers, showing extreme variations in color, texture and finish.
2. Joint materials involving color selection.
3. Exposed edge restraints involving color selection.

1.04 INFORMATIONAL SUBMITTALS

A. Material Certificates: For unit pavers. Include statements of material properties indicating compliance with requirements, including compliance with standards. Provide for each type and size of unit.

B. Test report of brick pavers shall be submitted. Test report shall indicate the compressive strength of the paver is psi.

1.05 SAMPLE PANEL

A. Construct a sample panel of brick pavers on each specified base and setting bed before start of any brick paving. Sample panel shall exhibit proposed color range, texture, bond, jointing, pattern, finish, paver size, and workmanship. Size of panel shall be 10 x 4 ft., minimum.

1. Notify Architect seven days in advance of dates and times when mockups will be constructed.
2. Obtain Architect's approval of mockups before starting brick paver installation. If the sample is not acceptable, construct additional panels at no cost to the Owner until an acceptable panel is constructed. Accepted panel shall become the standard for the entire job, and shall remain undisturbed until completion of all work.
3. Demolish and remove mockups when directed.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Brick pavers shall be carefully packed by the supplier for shipment.

B. Brick shall be stored off the ground and protected against staining and other damage.

C. Pavers damaged in any manner will be rejected and replaced with new materials at no additional cost to the Owner.

1.07 FIELD CONDITIONS

A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

1.08 PROTECTION OF FINISHED SURFACES

A. Finished surfaces adjacent to the brick paving work shall be adequately protected from soiling, staining, and other damage during construction.

PART 2 - PRODUCTS

2.01 BRICK PAVERS

A. Brick pavers shall meet or exceed the requirements of ASTM C 902, Class SX, Abrasion Type II for pedestrian pavements, Application PX for sand filled joint applications.

B. Brick shall conform to the following requirements:
1. Average absorption, 24 hr. cold-water absorption test = 4% or less.
2. Average compressive strength of not less than 10,500 psi for any five bricks tested.
3. Capable of withstanding at least the equivalent of 100 cycles of freeze-thaw conditions.
4. Permissible paver tolerances shall conform to ANSI/ASTM C 902.
5. Paver shall not vary from nominal dimensions by more than 1/8 in.

C. Color and texture shall be as approved by the Landscape Architect from samples submitted by the Contractor prior to delivery. Brick shall be wire cut with regular size, appearance, and dimensions, and have square regular edges, no lugs.

D. Brick pavers shall be "Regimental Full Range Paver", 2-1/4 x 4 x 8 in. nominal size, no lugs, square edges, manufactured by The Belden Brick Company, Canton, OH, tel. (330) 456-0031.

2.02 AGGREGATE BASE MATERIALS

A. Material for aggregate base course shall be a graded, granular, non-frost susceptible, free-draining material, consisting of either durable stone and coarse sand or of blast furnace slag, practically free from loam and clay, and which can be readily compacted to form a stable foundation.
   1. Material shall conform to MHD Specifications Section M1.03.0, with less than 8% by weight passing the No. 200 sieve.

2.03 SAND SETTING BED MATERIALS

A. Sand shall be a clean, sharp, natural sand conforming to ASTM C 33, except that the fineness modulus shall be 2.25 $\pm$ 0.10.
   1. Gradation for setting bed sand shall be as follows:

Sieve Size	% Passing by Weight
3/8 in.	100
No. 4	95 - 100
No. 8	80 - 100
No. 16	50 - 85
No. 50	10 - 30
No. 100	5 - 15
No. 200	0 - 10

2.04 SAND JOINT FILLER

A. Joint filler between paver joints shall be sand.
   1. Polymeric Joint Sand: Joint filler shall be polymeric joint sand, “TechniSeal Polymeric Joint Sand for Pavement Joints - HP”, manufactured by TechniSeal, Inc., Boucherville, Canada J4B 7K2; Tel. 1-800-363-7560; “Alliance DP SuperSand Bond” Polymeric Sand, manufactured by Alliance Designer Products, Inc., Laval, Canada, H7L 6A1; Tel. 1-866-212-1611, or approved equal. Sand shall be from a single source. Source of supply shall not be changed during course of job without written permission of the Landscape Architect.
   2. Color of sand shall be uniform matching the paver in color, and shall be approved by the Landscape Architect.

2.05 EDGE RESTRAINTS

A. Steel edging shall be Ryerson Steel Landscaping Edging, manufactured by Ryerson Tull, Cleveland, OH 44114, or approved equal. Steel edging shall be shop fabricated, 3/16 in. thick x 4 in. deep, steel, primed and painted green. Edging shall be furnished in 20 ft. lengths.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Pavers with chips, cracks, or other structural or aesthetic defects shall not be used.

B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures to match approved mock-up panel.

C. Where required, pavers shall be accurately cut with a masonry or concrete saw. Cut edges shall be plumb and straight. Scoring and breaking will not be acceptable. No brick less than half the size of a standard brick will be used without review of Landscape Architect.

D. Joint Pattern: As indicated.

E. Tolerances: Do not exceed 1/32-inch (0.8-mm) unit-to-unit offset from flush (lippage) nor 1/8 inch in 10 feet (3 mm in 3 m) from level, or indicated slope, for finished surface of paving. Finished installation shall comply with all ADA codes.

F. Expansion and Control Joints: Provide joint filler at locations and of widths indicated. Install joint filler before setting pavers. Make top of joint filler flush with top of pavers.

G. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

3.02 AGGREGATE SETTING-BED APPLICATIONS

A. Compact soil subgrade uniformly to at least 95 percent of ASTM D 1557 laboratory density.

B. Aggregate material for base beneath concrete pavers shall be to the depth indicated on the Drawings. Base shall be compacted to 95% of maximum dry density at optimum moisture content, as determined by ASTM D 1557.

C. Place aggregate base in thickness indicated. Compact by tamping with plate vibrator and screed to depth required to allow setting of pavers.

D. Place aggregate base over compacted subgrade. Provide compacted thickness indicated. Compact base to 100 percent of ASTM D 1557 maximum laboratory density and screed to depth required to allow setting of pavers.

E. Provide edge restraints as indicated. Install edge restraints before placing brick pavers.

1. Install edge restraints to comply with manufacturer's written instructions. Install splicing units and stakes at intervals required to hold edge restraints in place during and after unit paver installation.

F. Sand shall be spread over aggregate base course as a setting bed for pavers. Sand shall be spread and leveled to required slope and grade. Minimum thickness of sand shall be 1-1/2 in. after leveling. Bed shall not be compacted until pavers are installed.

G. Surface tolerance shall be within 1/4 in. of required grade as measured with a 10 ft. straightedge in both the transverse and longitudinal directions.

H. Setting bed shall be protected from damage prior to setting pavers.

I. Setting shall be done by competent workmen under adequate supervision, and in accordance with manufacturer's recommendations. Pavers shall be placed on the setting bed, to true line and plane and in required position.

J. Pavers with chips, cracks, or other structural or aesthetic defects shall not be used.

K. Set pavers with a minimum joint width of 1/16 inch (1.6 mm) and a maximum of 1/8 inch (3 mm), being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch (10 mm) with pieces cut to fit from full-size unit pavers.
   1. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.

L. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf (16- to 22-kN) compaction force at 80 to 90 Hz. Perform at least three passes across paving with vibrator. Vibrate under the following conditions:
   1. After edge pavers are installed and there is a completed surface or before surface is exposed to rain.
   2. Before ending each day's work, fully compact installed concrete pavers to within 36 inches (900 mm) of the laying face. Cover open layers with nonstaining plastic sheets overlapped 48 inches (1200 mm) on each side of the laying face to protect it from rain.

M. On a dry day, after pavers have been installed, joints of pavers shall be filled. Contractor to follow manufacturers instructions on installation techniques for Polymetric Sand. Water final application as instructed.

END OF SECTION 321416

SECTION 323225

STONE WALLS

PART 1 GENERAL

1.1 GENERAL REFERENCE

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.2 WORK INCLUDED

A. Provide all materials and equipment, and do all work required to construct stacked and mortared, fieldstone wall constructed to give the appearance of dry laid wall, as indicated on the Drawings and as specified.

1.3 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 3123000, SITE EXCAVATING, BACKFILLING AND COMPACTING; Establishment of subgrade elevation.

1.4 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American Society for Testing and Materials (ASTM):

C 5	Quicklime for Structural Purposes
C 144	Aggregate for Masonry Mortar
C 150	Portland Cement
C 270	Mortar for Unit Masonry
D 1557	Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb. (4.54-kg) Rammer and 18 in. (457-mm) Drop

2. Massachusetts Highway Department (MHD):

Specifications	Standard Specifications for Roads, Bridges and Incidental Construction

1.5 QUALITY ASSURANCE

A. Installer shall be a firm which has successfully installed stonework for comparable project for a period of not less than five (5) years.

B. Supplier must be able to adequately demonstrate to the Landscape Architect that it can supply the quantities and types of stone which are required for the project.

1. The right is reserved, at the source or job site, to reject materials deemed by the Landscape Architect to be unsuitable. Such material shall be removed from the job site at the Contractor's expense.
2. Stone from specified source shall display consistent color range and texture throughout the work.

1.6 SUBMITTALS

A. Samples: Submit one pallet of stone samples, per wall type, to Landscape Architect for review as soon as possible after award of contract. Include full range of color, finish, and texture to be expected in completed work.

1. Obtain Landscape Architect's acceptance of visual qualities of stone before start of stonework. Retain samples during construction as a standard for judging completed stonework.
2. Mortar Samples: Submit a set of colored pointing mortar samples.

B. The following mock-up shall be constructed as prototype for the wall work:

1. Fieldstone Retaining Wall: Construct wall mockup, 8 ft. long x full width x full height before start of any fieldstone wall work. Sample shall exhibit proposed color range, texture, coursing, jointing, weepholes, cap treatment, workmanship and relationship to abutting work.

C. Mockup will be inspected by the Landscape Architect. If the mockup is not acceptable, construct additional at no cost to the Owner until an acceptable mockup is constructed. Accepted mockup shall become the standard for the entire job, and shall remain undisturbed until completion of all work. Acceptable mock-up may be incorporated into the finished work.

1.7 QUALITY CONTROL

A. Wall contractor shall assume single source responsibility for entire wall construction including necessary excavation and compaction, gravel base or concrete footing (as indicated on the Drawings), providing stone wall materials, erecting stone wall, required drain stone and backfill, weepholes and subdrainage as indicated on the Drawings.

PART 2 PRODUCTS

2.1 FIELDSTONE RETAINING

A. Fieldstone Wall Stone: shall be whole and/or roughly dressed flat fieldstone, free from seams, cracks, and other structural defects.

B. Stone shall meet the requirements of this section and shall be approved by the Landscape Architect.

D. Stretcher stones (1 ft. - 0 in. x 3 ft. - 0 in. minimum size) shall have a depth in the wall of at least 1-1/2 times the rise of the stone and a length on the face of at least 1/3 the

rise. Headers (0 ft. - 8 in. x 1 ft. - 4 in. x 1 ft. - 8 in. deep minimum size) shall have a length on the face at least twice the rise. Headers shall hold in the heart of the wall the same size as shown on the face and shall extend into the wall at least 12 in. more than the stretchers. At least 75% of stretcher stones shall have vertical face dimensions in the range of 8 to 16 in

2.2 MORTAR

A. Mortar shall be ASTM C 270, Type M.

B. Portland cement shall be any American brand conforming to ASTM C 150, Type I or II.

C. Sand shall conform to ASTM C 144.

D. Water shall be potable.

E. Lime shall be fresh-burned, pulverized, unslaked when received, conforming to ASTM C 5, or an approved brand of Type S mason's hydrated lime conforming to ASTM C 207.

F. Waterproofing admixture for mortar shall be one of the following:

Admixture	Manufacturer
Hydratite Plus	W.R. Grace & Company
Medusa Waterproofing	Medusa Portland Cement Company
Omnicron Mortarproofing	Master Builders Company
Mortaron	The Aquabar Company
Hydracide Paste	Sonneborn Building Products, Inc.

2.3 AGGREGATE BASE COURSE

A. Material for aggregate base course shall be a graded, granular, non-frost susceptible, free-draining material, consisting of either durable stone and coarse sand or of blast furnace slag, practically free from loam and clay, and which can be readily compacted to form a stable foundation.

1. Material shall be dense graded crushed stone conforming to MHD Specifications Section M2.01.7.

2.5 WEEPHOLES

A. Weepholes shall be constructed of 1 in. square stainless steel pipe, at 8’ intervals, or as indicated on the drawings.

2.6 FILTER FABRIC

A. Filter fabric shall be a non-woven polypropylene fabric made specifically for use in subsurface drainage structures equal to Mirafi 140N, manufactured by Tencate, 365 South Holland Drive, Pendergrass, GA 30567; Tel 800 685 9990; Tel 706 693 2226; Fax 706 693 4400; www.mirafi.com, or approved equal.

PART 3 EXECUTION

3.1 ESTABLISHING WALL LINE

A. Establish location and line of all stone walls prior to construction by staking in the field with stake spacing not exceeding 15 ft. o.c., showing length and height of wall. Location and line shall be inspected and approved by the Landscape Architect before construction.

3.2 PREPARATION OF SUBGRADE

A. Subgrade to receive stone wall shall be smoothed and compacted prior to placing aggregate base. Excavation and backfill shall meet requirements of Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING.

3.3 AGGREGATE BASE

A. Compaction of aggregate base course shall be to 95% of maximum density as determined by ASTM D 1557, Method D. Stone greater than 2 in. shall be excluded from course.

B. Width of base course shall be greater than or equal to the width of wall surface, if continuous lateral support is provided during rolling, and shall extend at least 2 x base thickness beyond edge of the course above, if not so supported.

C. Aggregate material shall be applied in lifts less than or equal to 6 in. thick, compacted measure. Each lift shall be separately compacted to specified density.

D. Subgrade and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with aggregate base. Materials spilled outside pavement lines shall be removed and area repaired.

E. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise damaged, shall be cleaned, replaced, and otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

3.4 MORTAR BEDDING AND JOINTS

A. Mortar shall be stiff mix, using smallest amount of water possible.

1. Lime shall be kept dry until used.
2. Quicklime shall be thoroughly water-slaked at the site for at least 72 hours.
3. Lime putty shall be kept moist until used.

B. Add mortar waterproofing to mortar in accordance with waterproofing manufacturer's directions.

C. Plasticity of mortar shall be maintained by retempering as required up to 2-1/2 hours after original mixing of mortar. Mortar requiring retempering to maintain proper workability after this period shall be discarded.

D. Mortar grout shall contain a coloring additive. Color shall be approved by the Landscape Architect.

1. Coloring additive shall be equal to SGS Colors, manufactured by Solomon Grind Service, Springfield, IL 62705.
2. Mortar coloring additive shall have mineral oxide pigment and shall be certified by the supplier to be resistant to alkali, light, and weather, and shall be of a chemical composition

unaffected by cement and free of water and soluble salts.
3. Color pigment in grout mixture shall not exceed 10% of the Portland cement content.
4. Color will be selected by Architect.

3.5 STONE WALL CONSTRUCTION

A. Wall pattern shall follow images and descriptions shown on drawings, no stones set vertically, with a minimum 6 in. below finish grade. Vertical joints shall be offset by at least 3 in. at each course, and no vertical joint shall be located directly above or below a header.

B. Each stone shall be cleaned and thoroughly wetted before being set. Selected stone, roughly shaped to provide suitable exposed faces, shall be used at wall angles.

C. A minimum of 65% of Cap stones at top of wall shall extend across full width of wall; the remaining cap shall be made up of no more than 2 stones across the width.

D. No Chinking in joints.

E. Mortar Beds

1. Fieldstone Wall: Stones shall be laid on full mortar bed. Mortar joints shall be full, and the stones settled in place before the mortar has set. Mortar joints and beds shall be raked back and forcibly tamped before mortar has set to produce sound, dense faces lying 6 in. inside the visible face of the wall, to give the appearance of a dry laid wall. Joints in top of wall shall be raked back approximately 1 in., pointed full with a dense, stiff mortar. Top joints shall be forcibly tooled to finish 1/4 in. (at center of wall) to 1/2 in. (at face of wall) below top of stones, and shall be uniformly sloped between high and low point. No mortar shall be visible at joints.

F. Wall shall be constructed with weepholes between stone joints at base above finished grade. Maximum spacing of weepholes shall be as indicated on the Drawings.

G. Masonry shall be covered at night and during bad weather with non-staining waterproof coverings for a minimum of seven days following completion of the wall.

H. Mortar and mortar stains shall not be permitted on visible faces of stone. Mortar stains and excess mortar shall be removed and the wall shall be left in a neat and workmanlike condition.

3.6 BACKFILL

A. Where back of wall is below grade, back of wall shall be backfilled with stone aggregate material. Aggregate shall be not less than 6 in. thick from back of wall, and shall extend for full depth of wall, except for the top 6 in.

END OF SECTION

SECTION 328000

IRRIGATION SYSTEM

PART 1 GENERAL

1.00 GENERAL PROVISIONS

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 DESCRIPTION OF WORK

A. This is a Design/Build Specification: The Contractor is responsible for the design and engineering of the entire irrigation system including sizing all piping, calculating system hydraulics, testing, and all other work required for a complete operable system and for providing the specified guarantees. Design and install irrigation system in compliance with ASIC Standards.

1. The irrigation system installed during the summer of 2020 will be retained and modified to add zones related to the new planting areas associated with this phase of the work.

B. On-Site Conditions

1. Inspection of the Site: The Contractor shall acquaint himself with all on-site conditions. Should utilities not shown on the Drawings be found during excavations, the Contractor shall promptly notify the Owner for instruction as to further action. Failure to do so will make the Contractor liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities not shown on the Drawings.
2. Protection of Property: The Contractor shall be responsible for the preservation and protection of all site conditions to remain from damage due to this work. In the event damage does occur, all damage shall be completely repaired to its original condition at no additional cost to the Owner.
3. Trenching: All trenching or other work under the leaf canopy of any and all trees shall be done by hand or by other methods so that no branches, and minimal root systems are damaged in any way.

    a. Trenching around existing plant material shall be done by hand so as to minimize root disturbance.
    b. Buildings, walks, walls, and other property shall be protected from damage. Open ditches left exposed shall be flagged and barricaded by the Contractor by approved means. The Contractor shall restore disturbed areas to their original condition.

4. Protection and Repair of Underground Utilities: The Contractor shall be responsible for requesting the proper utility company to stake the exact location of any underground lines including but not limited to electric, gas, telephone service, water, and cable.

    a. Call “DIGSAFE,” at 811 at least 3 business days before you dig. Contractor shall verify the location of existing utilities in the field prior to commencing construction. No adjustments will be made after construction has commenced.
    b. The Contractor shall take whatever precautions are necessary to protect these underground lines from damage. In the event damage does occur, all damage shall be completely repaired to its original condition, at no additional cost to the

Owner.

1.03 RELATED WORK

A. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. Other specification sections which directly relate to the work of this section include, but are not limited to the following:

1. Section 329200, LAWNS AND GRASSES; Lawns and grasses.
2. Section 329300, TREES, PLANTS AND GROUND COVERS; New plantings.

1.04 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American National Standards Institute (ANSI):

B16.26 Tubes	Cast Copper Alloy Fittings for Flared Copper

2. American Society of Irrigation Consultants (ASIC):

Standards	Minimum Standards for Landscape Irrigation

3. American Society for Testing and Materials (ASTM):

B 88	Seamless Copper Water Tube
D 1785	Poly (Vinyl Chloride)(PVC) Plastic Pipe, Schedules 40, 80, and 120
D 2239	Polyethylene (PE) Plastic Pipe (SLPR - PR) Based On Controlled Diameter.
D 2241	Poly(Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR)
D 2464	Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
D 2466	Poly (Vinyl Chloride)(PVC) Plastic Pipe Fittings, Schedule 40
F 690	Underground Installation of Thermoplastic Pressure Piping Irrigation Systems

1.05 SUBMITTALS

A. Submit a complete materials list indicating name of manufacturer, with model numbers of proposed irrigation system equipment and accessories.

B. After completion of installation, furnish complete As-built drawings showing locations

of all sprinkler heads, valves, drains, and piping to scale, with dimensions where required or necessary.

1. On or before the date of final field observation, deliver completed AutoCAD computer plots of “As-built record drawings on vellum and AutoCAD electronic files on disk to Owner as part of contract closeout. Delivery of plots will not relieve Contractor of the responsibility of furnishing required information that may have been omitted from the prints.

1.06 LAWS, CODES, AND ORDINANCES

A. Irrigation system shall be installed in accordance with the latest laws, ordinances, rules, and regulations of all local, state, and federal authorities having jurisdiction.

1.07 GUARANTEE

A. In addition to the manufacturer’s guarantees, the Contractor shall warrant the entire irrigation system, both parts and labor for a period of two (2) years from the date of acceptance by the Owner.

1. The Contractor will be held strictly responsible for all parts of his work. If failure in the irrigation system or appurtenances develop within two (2) years from the date of final approval and acceptance of the work, the Contractor will be required to replace all faulty materials at his full expense.
2. Labor and materials to fulfill the requirements of this warranty shall be furnished by the Contractor at no additional cost to the Owner. All labor shall include premium time to correct any faulty material or workmanship.
3. As part of the one-year warranty the Contractor shall perform the first year-end winterization and spring start-up for the irrigation system.

1.08 QUALITY ASSURANCE

A. All applicable ANSI, AWWA, and ASTM Standards and Specifications, and all applicable building codes and other public agencies having jurisdiction upon the work.

B. Protection of Existing Plants and Site Conditions: The Contractor shall take necessary precautions to protect site conditions to remain. Should damages be incurred, this Contractor shall repair the damage to its original condition at his own expense. Any disruption, destruction, or disturbance of any existing plant, tree, shrub, or turf, or any structure shall by completely restored to the satisfaction of the Owner, solely at the Contractor's expense.

C. Permits and Fees: Obtain all permits and pay required fees to any governmental agency having jurisdiction over the work. Inspection required by local ordinances during the course of construction shall be arranged as required. On completion of the work, satisfactory evidence shall be furnished to Architect to show that all work has been installed in accordance with the ordinances and code requirements.

D. The Contractor shall provide full coverage in all irrigated areas and shall be responsible for additional heads and components as required, installed at his own cost.

E. On-Site Observation: At any time during the installation of the irrigation system by the Contractor, the Owner or Architect may visit the site to observe work underway. Upon

request, the Contractor shall be required to uncover specified work as directed by the Owner or Architect without compensation. Should the material, workmanship or method of installation not meet the standards specified herein, the Contractor shall replace the work at his own expense.

F. Workmanship: All work shall be installed by skilled personnel, proficient in the trades required, in a neat, orderly, and responsible manner with recognized standards of workmanship. The Contractor shall have had considerable experience and demonstrated ability in the installation of sprinkler irrigation systems of this type.

1.09 MAINTENANCE AND OPERATING INSTRUCTIONS

A. Contractor shall include in their Bid an allowance for four (4) hours of instruction of Owner and/or Owner's personnel upon completion of check/test/start-up/adjust operations by a competent operator (The Architect's office shall be notified at least one (1) week in advance of check/test/start-up/adjust operations).

B. Upon completion of work and prior to application for acceptance and final payment, a minimum of three (3) three ring, hard cover binders titled MAINTENANCE AND OPERATING INSTRUCTIONS FOR THE SPLAINE PARK IRRIGATION SYSTEM, shall be submitted to the Architect's office. After review and approval, the copies will be forwarded to the Owner. Included in the Maintenance and Operating binders shall be:

1. Table of Contents
2. Written description of Irrigation System.
3. System drawings:
   a. One (1) copy of the original irrigation plan;
   b. One (1) copy of the Record Drawing;
   c. One (1) reproducible of the Record Drawing;
   d. One (1) copy of the controller valve system wiring diagram
4. Listing of Manufacturers.
5. Manufacturers’ data where multiple model, type and size listings are included; clearly and conspicuously indicating those that are pertinent to this installation.
   a. "APPROVED" submittals of all irrigation equipment;
   b. Operation:
   c. Maintenance: including complete troubleshooting charts.
   d. Parts list.
   e. Names, addresses and telephone numbers of recommended repair and service companies. A copy of the suggested "System Operating Schedule" which shall call out the controller program required (zone run time in minutes per day and days per week) in order to provide the desired amount of water to each area under "no-rain" conditions.

6. Winterization and spring start-up procedures.
7. Guarantee data.

PART 2 PRODUCTS

2.01 PIPE AND FITTINGS

A. Polyvinyl chloride (PVC) plastic pipe shall be continuously and permanently marked with the following information: Manufacturer's name, pipe size, type of pipe and material, SDR number, ASTM number, and the NSF (National Sanitation Foundation) seal.

B. Main Lines (irrigation line on the supply side of the system up to the zone control valves).

1. Pipe 4 in. diameter and less shall be Schedule 40 polyvinyl chloride (PVC) plastic pipe 1120 or 1220, NSF approved, conforming to ASTM D 1785.
2. Pipe larger than 4 in. diameter shall be polyvinyl chloride (PVC) plastic pipe, SDR 21, 1120 or 1220, conforming to ASTM D 2241, with a minimum pressure rating of 200 psi.
3. Plastic pipe fittings shall be polyvinyl chloride (PVC) molded fittings manufactured of the same material as the pipe and shall be suitable for solvent weld or slip joint ringtite seal (Schedule 40) conforming to ASTM D 2466, or threaded connections (Schedule 80) conforming to ASTM D 2464.
4. Slipfitting socket taper shall be sized so that a dry unsoftened pipe end conforming to these specifications can be inserted no more than halfway into the socket. Plastic saddle and flange fittings shall not be used. Only Schedule 80 pipe may be threaded.

C. Lateral Lines (irrigation lines on the sprinkler head side of the system from the control valves to the sprinkler heads).

1. Pipe 2 in. diameter and less shall be polyethylene (PE) pipe, SIDR 9, Class 160, Type III, Grade 3, Class C conforming to ASTM D 2239, with a minimum pressure rating (PR) of 160 psi.
2. Pipe larger than 2 in. diameter shall be polyvinyl chloride (PVC) plastic pipe, SDR 26 conforming to ASTM D 2241, with a minimum pressure rating (PR) of 160 psi.
3. Polyethylene pipe fittings shall be insert PVC or nylon type fitting recommended by pipe manufacturer. Fittings shall conform to NSF Standards, and be attached with two (2) dog-eared stainless steel clamps supplied by Harvard, Liverpool, NY, or approved equal. Fittings shall be per ASTM D2609, manufactured by Dura, Lasco or approved equal
4. Supply only pipes and fittings that are marked by the manufacturer with the appropriate ASTM designations and pressure ratings and are free from cracks, wrinkles, blisters, dents or other damage.

D. Copper tubing: Hard, straight lengths of domestic manufacture only Type "K" conforming to ASTM B 88. No copper tube of foreign extrusion or thin wall copper tubing shall be used.

1. Where necessary, joints shall be made with cast brass three-part compression coupling or flared tube fittings conforming to ANSI B16.26.

E. Sleeves

1. For Control Wires: Schedule 40 PVC pipe or Schedule 40 galvanized steel pipe.
2. For Water Lines: Schedule 40 PVC or Schedule 40 galvanized steel pipe.
3. Sleeve size shall be at least twice the diameter of the pipe line.

F. Adapters

1. All adapters shall be provided as required by the manufacturer, and are required to construct the proposed system.

2.02 WARNING AND DETECTOR TAPE

A. Detector tape for identification of irrigation main locations shall be manufactured by Reef Industries, Inc., Houston, TX 77275-0218, or approved equal. Detector tape shall consist of a solid aluminum foil core running the full length and width of the tape and encased in a protective, high visibility, color coded inert plastic jacket.

1. Color of tape shall be "Safety Precaution Blue."
2. Tape shall be imprinted with the following legend: "Caution Buried Irrigation Line Below".

2.03 SPRINKLERS AND RISER ASSEMBLY

A. Sprinklers: Manufacturer's standard sprinklers designed for uniform coverage over entire spray area indicated, at available water pressure.

1. Flush, Surface Sprinklers: Fixed pattern, with screw-type flow adjustment.
2. Bubblers: Fixed pattern, with screw-type flow adjustment.
3. Pop-up, Spray Sprinklers: Fixed pattern, with screw-type flow adjustment and stainless-steel retraction spring.
4. Pop-up, Rotary, Spray Sprinklers: Gear drive, full-circle and adjustable part-circle types.
5. Pop-up, Rotary, Impact Sprinklers: Impact drive, full-circle and part-circle types.

2.04 DRIP SYSTEM COMPONENTS

A. Dripperline and Integral Dripperline Components: The dripperline shall be Techline CV or Techline pressure compensating dripperline or 8mm Techlite non-pressure compensated dripperline, manufactured by Netafim Irrigation, Inc., or approved equal Dripper flow rate and spacing shall be as recommended by drip system component manufacturer based on specific plant material to be irrigated.

1. Techline CV/Techline/8mm Techlite Fittings: All Techline CV/Techline/8mm Techlite connections shall be made with approved Techline CV/Techline/8mm Techlite insert fittings.
2. Soil Staples: All on-surface/under mulch Techline CV/Techline/8mm Techlite installations shall be held in place with Techline Soil Staples spaced evenly every 3’ - 5’ on center, and with two staples on each change of location.
3. Line Flushing Valves: All Techline/Techlite systems shall be installed with Netafim Automatic Line Flushing Valves. Techline CV zones do not require an automatic line flushing valve but must have a manual flushing port(s) in the position that an automatic flush valve would be positioned.
4. Air/Vacuum Relief Valves: Each independent Techline subsurface irrigation zone shall be installed with an Air/Vacuum Relief Valve at the zone’s highest point(s). Techline CV zones do not require an Air/Vacuum Relief Valve.
5. Pressure Regulator: A pressure regulator shall be installed at each zone valve or on the main line to ensure operating pressures do not exceed system requirements. The pressure regulator shall be a Netafim Pressure Regulator.

6. Disc Filter: A disc filter shall be installed at each zone valve or on the main line to ensure proper filtration. The filter shall be a Netafim Disc Filter.
7. Reduced Pressure or other Backflow Prevention Units: Reduced pressure backflow prevention units or any unit as required by local codes shall be provided as indicated on drawings and shall comply with local codes.

2.05 SOIL MOISTURE SENSOR

A. Soil moisture sensor shall sense soil moisture status by measuring the conductivity of a soil volume between two stainless steel probes. Moisture sensor device shall interrupt programmed irrigation cycles until the soil moisture matrix potential has reached a predetermined state. Soil moisture sensor shall be "Baseline Watertec S100" Soil Moisture Sensor, manufactured by Baseline LLC, 2700 E Lanark St. Ste. 100, Meridian, ID 83642 USA; Tel. Day Time Voice (208) 323-1634; Fax (208) 323-1834; Toll Free (866) 294-5847, or approved equal.

1. Soil moisture sensor shall be electrically isolated from other electrical potentials, and be wired from the sensor controller to the probes with water tight materials and connections.

2.06 AUTOMATIC REMOTE CONTROL VALVE AND BOX

A. Automatic remote control valves shall be pressure regulating electric remote control valves. Valve size shall not be less than the size of the lateral served.

B. Each remote control valve shall have a valve box.

1. Valve box shall be impact resistant cycolac plastic with locking cover, similar to those manufactured by Ametek, Sheboygan, WI 53081. Cover color shall be green.

C. Remote control valve tags shall be yellow with thermofused numbers.

2.07 GATE VALVE AND BOX

A. Gate valves 2 in. and smaller shall be cast iron body, bronze mounted with non-rising stem and working pressure rating of 200 psi.

B. Gate valves larger than 2 in. shall be mechanical joint or flanged cast iron with non-rising stem and working pressure rating of 200 psi.

C. Gate valves for above grade or pit use shall be supplied with wheel handles.

D. Gate valve for underground use shall be supplied with 2 in. square operating nut.

E. Each gate valve shall have a valve box.

1. Valve box shall be impact resistant cycolac plastic with locking cover, similar to those manufactured by Ametek, Sheboygan, WI 53081. Cover color shall be green.

2.08 DRAIN VALVE AND BOX

A. Drain valves shall be all bronze construction manual angle valves installed at low points in system.

B. Each drain valve shall have a valve box.

1. Valve box shall be impact resistant cycolac plastic with locking cover, similar to those manufactured by Ametek, Sheboygan, WI 53081. Cover color shall be green.

2.09 CONTROL AND GROUND WIRE

A. Control and ground wiring shall be minimum Type "UF", #12 wire, 600 volt, solid copper, single conductor wire with PVC insulation and shall bear UL approval for direct underground burial feeder cable.

B. A minimum of one extra wire for each direction of run to last valve shall be supplied. Extra wire shall be a fugitive color, loop at each valve.

C. Wire types, connectors, splices, and installation procedures shall conform to applicable local codes.

D. Multi conductor cable will not be acceptable.

E. Wire splices shall be made with "scotch lock connectors" or "snip snap caps" (per title connectors) or other approved method.

2.10 QUICK COUPLING VALVES

A. Quick coupling valves shall be 1 in. heavy duty brass construction one-piece body design, with locking rubber cover. Furnish to the Owner the following additional items: three hollow coupler keys and three swivel hose ell adapters.

1. For use on systems using non-potable water, locking rubber cover shall have molded-in warnings of "DO NOT DRINK" in English and Spanish

2.11 BACKFLOW PREVENTER

A. Existing backflow preventer to remain.

2.12 AUTOMATIC CONTROLLER

A. Existing automatic controller to remain.

PART 3 EXECUTION

3.01 GENERAL

A. Coordinate all installation/repair work with landscape planting work, especially fine grading, and soil preparation for lawn areas per Section 329200, LAWNS AND GRASSES.

B. Excavation required for the installation of the irrigation system shall conform to ASTM F 690.

3.02 PIPE, CONTROL VALVE, AND CONTROL WIRE INSTALLATION

A. Plastic pipe shall be delivered to the site in manufacturer's packaging, stacked in such a manner as to provide adequate protection from compression and deformation of the pipe ends. Pipe shall be protected from exposure to direct sunlight.

B. Pipe interior shall be thoroughly cleaned of all dirt or foreign matter before lowering pipe into trenches. Pipe interiors shall be kept clean during pipe installation by plugs or other approved methods. Piping shall not be installed in water or mud. Ends of pipe shall be securely closed when work is not in progress to prevent water and foreign matter from entering the lines.

C. PVC pipe shall be cut with a hand saw or hack saw with the assistance of a square in sawing vise, or other manner to ensure a square cut. Burrs at cut ends shall be removed prior to installation so that a smooth unobstructed flow will be obtained.

D. Installation of plastic pipe shall conform strictly to manufacturer's recommendations and to ASTM F 690.

1. Metallic fittings shall not be supported by PVC pipe. Metallic fittings shall be supported by a concrete block or cradle.
2. When damaged, plastic pipe shall be replaced by cutting out entire damaged area and replacing with same Schedule, Class, and type of pipe, or heavier, at no additional cost. Plastic pipe shall be thoroughly dry when this replacement is made.

E. Snake pipe in trench from side to side to allow for expansion and contraction.

F. Threaded Joints for Plastic Pipes:

1. Use Teflon tape on the threaded PVC fittings except where Marlex fittings are used.
2. Use strap-type friction wrench only: Do not use metal-jawed wrench.
3. When connection is plastic to metal, male adapters shall be used. Male adapter shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be Teflon tape or equal upon approval.

G. Threaded Joints for Galvanized Steel Pipes:

1. Factory-made nipples shall be used wherever possible. Field-cut threads in pipes will be permitted only where absolutely necessary and approved by Architect; when field threading, cut threads accurately on axis with sharp dies.
2. Use pipe joint compound or Teflon tape to male threads only.

H. Joints for Polyethylene Pipes:

1. Double-clamp all connections 1-1/4 in. diameter and greater.
2. Make all connections between polyethylene pipes and metal valves or pipes with threaded fittings using male adapters.

I. Connections between plastic pipe and metal valves or steel pipe shall be made with threaded fittings using plastic toe nipples or shall be made with adapters and a non-hardening pipe compound applied to male threads.

J. Solvent weld joints shall be made according to manufacturer's instructions. Joints shall be tight and inseparable. Joints shall be allowed to cure 24 hours at temperatures over 40oF. before testing.

1. Solvent shall be compatible with plastic material of heads, pipe, and fittings.

K. Remote control valve shall be installed in a valve box with a locking lid.

1. Clearance between the highest part of the valve and the bottom of the valve box lid shall

be 2 in., minimum, and 4 in., maximum. The lid shall not rest on any part of the valve.
2. Clearance between the top of the piping and the bottom of the valve box or the valve box knock-outs shall be 2 in., minimum. Valve box shall not rest on piping.
3. Clearance between the valve body and the sides of the valve box shall be 3 in., minimum.

L. Control wire splices shall be made at electric valve locations. Make no splices between the controller and the remote control valve. Lay to the side of pipeline. Provide looped slack at valves and snake wires in trench to allow for contraction. Tie wires in bundles at 10 ft. intervals. Control wires crossing under pavements shall be installed in conduit.

1. Install a minimum of one extra control wire to the control valve located the greatest distance from the controller in each direction and label each end.
2. Install tag to valve wire before making final connection.
3. Separate color coding of control wires by satellite if required.

3.03 INSTALLATION OF SPRINKLER HEADS

A. After irrigation piping and risers are in place and connected, and prior to installation of sprinkler heads, the control valves shall be opened and a full head of water used to flush out the system. Sprinkler heads shall be installed only after flushing of the system has been completed.

B. Sprinklers shall be set plumb and perpendicular to finish grade.

C. Sprinklers and valve box covers adjacent to walls, curbs, and other paved areas, shall be set to finish grade unless otherwise noted on Drawings.

3.04 INSTALLATION OF DRIP SYSTEM

A. Dripperline Installation:

1. Install all dripperline as indicated on Drawings. Dripperlne shall be installed in areas designated, by hand under the mulch, and shall have an average depth of 4 inches unless otherwise indicated on the Drawings. Tubing should not be visible through the mulch. All in-line emitter tubing shall be installed on the high side of the plant material being watered to help insure dispersion of the water. Use only Teflon tape on all threaded connections.
    a. In-line emitter tubing is to be installed 4 inches from all planter edges, curbs and walls. Spacing of in-line emitter tube is to be 18 inches center-to-center in all irrigated areas.
    b. All in-line tubing shall have a minimum incoming pressure of not less than 5-PSI of the pressure regulator, 45-PSI, to assure a maximum linear length of 280 feet at zero elevation lift.
2. Clamp Techline/Techlite fittings with Oetiker clamps when operating pressure exceeds specific dripperline fitting requirements.
3. When installing Techline CV, Techline, or 8mm Techlite dripperlines on-surface, install soil staples as listed below:
    a. Sandy Soil - One staple every three (3') feet and two (2) staples on each change of direction (tee, elbow, or cross).
    b. Loam Soil - One staple every four (4') feet and two (2) staples on each change of direction (tee, elbow, or cross).
    c. Clay Soil - One staple every five (5') feet and two (2) staples on each change of direction (tee, elbow, or cross).

4. Cap or plug all openings as soon as lines have been installed to prevent the intrusion of materials that would obstruct the pipe. Leave in place until removal is necessary for completion of installation.
5. Thoroughly flush all water lines before installing valves.

B. Pressure regulator shall assure a 45-PSI downstream pressure entering drip supply header. Pressure shall be verified by contractor to assure proper operating pressure for the in-line emitter tubing at maximum linear run of 280 feet. Contractor may need to manifold pressure regulators to reach the mid-range flow of the regulator.

C. n-line drip tubing shall be secured with stakes. Stakes shall be spaced to ensure that tubing does not shift location in presence of foot traffic, operations, gravity on slope installations, or environmental effects. Stake in-line drip tubing at minimum 5-foot intervals to prevent movement.

D. Air relief valves shall be installed in the emitter tubing, at high elevation points as indicated on the drawing.

3.05 GATE VALVES

A. Install isolation and branch gate valves directly on main as required.

B. Where gate valves isolate branch mains of a smaller size, size valve to largest main and add reducing fittings downstream of valves.

C. Install valve and valve box to finish grade as indicated on the Drawings.

3.06 TESTING AND COMPLETION

A. Flushing:

1. After all piping, valves, sprinkler bodies, pipe lines and risers are in place and connected, but prior to installation of sprinkler internals, open the control valves and flush out the system under a full head of water.
2. Sprinkler internals, flush caps and riser nozzles shall be installed only after flushing of the system has been accomplished to the full satisfaction of the Owner’s Representative.
3. Contractor shall be responsible for flushing the entire system after installation is complete and will be responsible for any clogged nozzles for thirty (30) days after substantial completion of this portion of the landscape irrigation system.

B. Irrigation system shall be tested for leakage prior to backfilling of piping. Leakage test shall be at 100 psi pressure at furthest point of system being tested for a minimum period of one hour. System is acceptable if no leakage or loss of pressure occurs.

C. When the irrigation system is completed, perform a coverage test in the presence of the Architect to determine if the coverage of water for all areas is completely adequate. All valves, and the alignment and coverage of all sprinkler heads shall be adjusted, prior to final inspection, for required coverage. Correct inadequacies of coverage as directed by Architect.

D. All testing shall be at the expense of the Contractor.

E. Instruct Owner's designated personnel in proper operation of irrigation system, including programming controller; valves; adjustment of sprinkler heads.

3.07 BACKFILL AND COMPACTING

A. After system is operating and required tests and inspections have been made, backfill excavations and trenches with clean soil, free of debris.

B. Backfill for all trenches, regardless of the type of pipe covered, shall be compacted to minimum 95% density under pavements, 85% under planted areas.

C. Dress off all areas to finish grades.

3.08 PRESSURE SETTING

A. Prior to final inspection Contractor shall adjust each remote control valve to an agreed operating pressure by installing temporary pressure gauge on schrader valve and making necessary adjustments while valve is operating.

3.09 CLEAN UP

A. Upon completion of all installation work, Contractor shall remove all leftover materials and equipment from the site in a safe and legal manner.

B. Contractor shall remove all debris resulting from work of this section.

C. Contractor shall regrade, lightly compact, and replant around sprinkler heads where necessary to maintain proper vertical positioning in relation to established grade.

D. Contractor shall fill all depressions and eroded channels with sufficient soil mix to adjust grade to ensure proper drainage. Compact lightly, and replant filled areas in accord with Drawings requirements.

3.10 WINTERIZATION

A. Winterization: The irrigation system is designed to be completely drained to protect pipe from bursting prior to freezing temperatures. To adequately drain the system the following procedure must be followed:

1. Air blow-out
    a. Set automatic controller stations to 3 minutes timing.
    b. Attach hose from portable air compressor to 1-inch air inlet installed on main line at back flow prevention device in basement.
    c. Operate compressor at 100 cubic feet per second at 60-80 psi.
2. Manual drain valves: Open manual drain valves located at low points on the main line to drain main completely after air blow-out has been completed.

END OF SECTION

SECTION 329119

LANDSCAPE GRADING

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 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the site grading work of this Section, in accordance with the Drawings and Specifications.

1.3 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING; Excavation, backfill, compaction and establishment of subgrade elevations.
2. Section 329200, LAWNS AND GRASSES.
3. Section 329300, TREES, PLANTS AND GROUND COVERS.

1.4 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American Society for Testing and Materials (ASTM):
   - D 1556 Density of Soil in Place by the Sand-Cone Method
   - D 2167 Density and Unit Weight of Soil In Place by the Rubber-Balloon Method.

1.5 EXISTING CONDITIONS

A. By submitting a bid, the Contractor affirms that he has carefully examined the site and all conditions affecting work under this Section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions.

1.6 QUALITY CONTROL

A. The Architect reserves the right to perform on-site observation during the grading operations. The observations may include, but not be limited to the following:

1. Observation of subgrade preparation for slab-on-grade and paved areas.
2. Observation of rough and finish grading operations.

B. Contractor shall set grade string lines for Architect’s review and approval. All grade breaks shall be staked with grade stakes at each end, any change of direction, and at 20’ centers along the length for Architect’s review during grading operations.

C. Perform field density tests in accordance with ASTM D 1556 or ASTM D 2167.

1. Make at least one field density test of the subgrade for every 2000 sq. ft. of paved area, but in no case less than three tests.
2. In each compacted fill layer, make one field density test for every 2000 sq. ft. of overlaying paved area, but in no case less than three tests.
3. Make at least one field density test of the planting soil for every 2000 sq. ft. of plant bed area, but in no case less than three tests.
4. Make at least one field density test of the planting soil for every 2000 sq. ft. of lawn area, but in no case less than three tests.

D. If, in the opinion of the Architect, based on reports of the testing service and inspection, the subgrade or fills which have been placed are below the specified density, additional compaction and testing will be required until satisfactory results are obtained.

1. The results of density tests of soil-in-place will be considered satisfactory if the average of any four consecutive density tests which may be selected are in each instance equal to or greater than the specified density, and if not more than one density test out of five has a value more than 2% below the required density.

E. The Architect's presence does not include supervision or direction of the actual work by the Contractor, his employees, or agents. Neither the presence of the Architect, nor any observations and testing performed by him shall excuse the Contractor from defects discovered in his work.

1.7 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

A. The work shall be executed in such manner as to prevent any damage to adjacent property and any other property and existing improvements such as, but not limited to: streets, curbs, paving, utility lines and structures, monuments, bench marks and other public and private property.

B. In case of any damage or injury caused in the performance of the grading work, the Contractor shall, at his own expense, make good such damage or injury to the satisfaction of, and without cost to the Owner. Existing roads, sidewalks, and curbs damaged during the grading work shall be repaired or replaced to their original condition at the completion of operations. The Contractor shall replace, at his own cost, existing bench marks, monuments, and other reference points which are disturbed or destroyed.

1.8 COORDINATION

A. Prior to start of grading operations, the Contractor shall arrange an on-site meeting with the Architect for the purpose of establishing Contractor's schedule of operations and scheduling inspection procedures and requirements.

B. As construction proceeds, the Contractor shall be responsible for notifying the Architect prior to start of grading operations requiring inspection and/or testing.

C. The Contractor shall be responsible for obtaining test samples of soil materials proposed to be used and transporting them to the site sufficiently in advance of time planned for use of these materials for testing of materials to be completed. Use of these proposed materials by the Contractor prior to testing and approval or rejection, shall be at the Contractor's risk.

PART 2 - PRODUCTS

2.1 SOURCE OF MATERIALS

A. Material shall be obtained from required on-site excavation, to the extent that suitable material is available, and from off-site sources, to the extent that suitable material is not available from on-site excavation. Refer to Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING for fill materials, and Section 329200, LAWNS AND GRASSES and Section 329300, TREES, PLANTS AND GROUND COVERS for Planting Soil.

PART 3 - EXECUTION

3.1 COMPACTION

A. Refer to Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING for required levels of subgrade compaction at paved areas.

1. Unless otherwise indicated, scarified subgrade in landscape areas shall be compacted to 86% - 88% compaction ASTM D698 Standard Proctor.
2. Planting Soil – Planting Pits and Beds: shall be spread in lifts not greater than twelve inches and compacted to a density between 82 and 86 percent Standard Proctor Maximum Dry Density.
3. Planting Soil - Lawn Areas: shall be spread over the area and shall be compressed to a density of 86 to 88% Standard Proctor maximum dry density. No vibratory compaction of the subgrade or the planting medium shall take place. No rubber-tired equipment or heavy equipment except for a small bulldozer shall pass over soils after they have been loosened or planting medium spread.

3.2 GRADING – GENERAL

A. Uniformly grade areas within the limits of site grading under this section, including adjacent transition areas. Smooth finished surfaces within specified tolerances, and between points where elevations are shown, or between such points and existing grades.

B. The degree of finish required will be that ordinarily obtainable from either blade-grader or scraper operations.

1. Ditches: Finish ditches to ensure proper flow and drainage. Conduct final rolling operations to produce a hard, uniform, and smooth cross-section.
2. Grade Breaks located on the plans indicate crisp transitions, not blended or rounded edges. These should be clean, sharp, and uniform in line and curve as indicated on the plans.

3.3 ROUGH GRADING

A. General: Rough grading shall include the shaping, trimming, rolling and refinishing of all surfaces of the subbase, shoulders, earth embankments and the preparation of grades as shown on the Drawings. The grade of shoulders and sloped areas may be done by machine methods.

B. Do all cutting, filling and grading to lines and grades indicated on the Drawings. Grade evenly to within the dimensions required for grades shown on the Drawings and specified herein. No stones larger than 4 in. shall be placed in uper 6 in. of fill. Fill shall be left in compacted state at the end of work day and sloped to drain.

1. Architect may make such adjustments in gardes and alignments as are found necessary to avoid special conditions encountered.
2. Provide a smooth transition between adjacent existing grades and new grades.
3. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

C. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).
2. Walks and Pavements: Plus or minus 1/2 inch (13 mm).
3. Up to 2 in. in 10 ft. – 0 in. tolerance shall be permitted on slopes provided the slopes are uniform in appearance and without any abrupt changes.
4. Traffic of men and equipment across soil subgrade areas shall be prohibited following excavation to the required lines and grades.

3.4 FINE GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Finish Grading:

1. Lawn or Unpaved Areas: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
2. Walks: Shape the surface of areas under walks to line, grade and cross-section, with the finish surface not more than 0.00 ft. above or 0.10 ft. below the required subgrade elevation, compacted as specified, and graded to prevent ponding of water after rains.
3. Pavements: Shape the surface of the areas under pavement to line, grade and cross-section, with the finish surface not more than 1/2 in. above or below the required subgrade elevation, compacted as specified, and graded to prevent ponding of water after rains. Include such operations as plowing, discing, and any moisture or aerating required to provide the optimum moisture content for compaction. Fill low areas resulting from removal of unsatisfactory soil materials, obstructions, and other deleterious materials, using satisfactory soil material. Shape to line, grade, and cross-section as shown on the Drawings.

3.5 MAINTENANCE

A. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and re-establish grades in settled, eroded, and rutted areas to the specified tolerances.

C. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, re-shape, and compact to the required density prior to further construction.

3.6 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Remove waste materials, including excavated material classified as unsatisfactory soil material, trash and debris, and dispose of it legally off the Owner's property.

END OF SECTION

SECTION 329200

LAWNS AND GRASSES

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 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following: the seeding and sodding of lawns, including furnishing and placing planting soil, as indicated on the Drawings and as specified.

1.3 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING; Establishment of subgrade elevation.
2. Section 329119, LANDSCAPE GRADING.
3. Section 329300, TREES, PLANTS AND GROUND COVERS.

1.4 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American Society for Testing and Materials (ASTM):
   - C 136 Sieve Analysis of Fine and Coarse Aggregates
   - D 422 Particle-Size Analysis of Soils
   - E 11 Wire-Cloth Sieves for Testing Purposes

1.5 SUBMITTALS

A. Samples: The following samples shall be submitted:

Material	Quantity (lb.)
Fertilizer	1
Lime	1
Compost	1
Seed, each mix	1
Loam borrow	1

B. Manufacturer's Product Data: Manufacturer's product data shall be submitted for the following materials: Fertilizer

C. Certificates: Labels from the manufacturer's container certifying that the product meets the specified requirements shall be submitted for the following materials:
   Commercial fertilizer

Grass seed
Ground limestone

1.6 OWNER'S INSPECTION AND TESTING

A. Work will be subject to inspection at all times by the Architect. The Owner reserves the right to engage an independent testing laboratory in accordance with requirements of Section 014320, QUALITY CONTROL AND TESTING SERVICES to analyze and test materials used in the construction of the work. Where directed by the Architect, the testing laboratory will make material analyses and will report to the Architect whether materials conform to the requirements of this specification.

1. Cost of tests and material analyses made by the testing laboratory will be borne by the Owner when they indicate compliance with the specification, and by the Contractor when they indicate non-compliance.
2. Testing equipment will be provided by and tests performed by the testing laboratory. Upon request by the Architect, shall provide such auxiliary personnel and services needed to accomplish the testing work.
3. Gradation of granular materials shall be determined in accordance with ASTM C 136. Sieves for determining material gradation shall be as described in ASTM E 11.

1.7 CONTRACTOR'S INSPECTION AND TESTING

A. The Contractor shall engage an independent testing agency, experienced in the testing of agricultural soils and acceptable to the Architect, to perform the topsoil/planting soil tests and analyses specified herein. All costs associated with testing shall be the Contractor's responsibility.

1. Particle size analysis shall include the following gradient of mineral content:

USDA Designation	Size in mm
Gravel	+ 2 mm
Very coarse sand	1-2 mm
Coarse sand	0.5-1 mm
Medium sand	0.25-0.5 mm
Fine sand	0.1-0.25 mm
Very fine sand	0.05-0.1 mm
Silt	0.002-0.05 mm
Clay	< 0.002 mm

2. Chemical analysis shall include the following:

a. pH and buffer pH.
b. percentage of organic content by oven-dried weight. Nutrient levels by parts per million, including phosphorus, potassium, magnesium, manganese, iron, zinc, and calcium.
c. Nutrient test shall include testing laboratory recommendations for supplemental additions to the soil, if necessary, based on the requirements for ornamental horticultural plants. Recommendations shall include rates at which additives are to be applied.
d. Soluble salt by electrical conductivity of a 1:2 soil/water sample. .

1.8 DELIVERY, STORAGE, AND HANDLING

A. Digging Sod:

1. Sod shall not be dug at the nursery or approved source until ready to transport sod to the site of the work or acceptable storage location.
2. Before stripping, sod shall be mowed at a uniform height of 2 in.
3. Cut sod to specified thickness and to standard width and length desired.

B. Transportation of Sod:

1. Sod transported to the Project in open vehicles shall be covered with tarpaulins or other suitable covers securely fastened to the body of the vehicle to prevent injury. Closed vehicles shall be adequately ventilated to prevent overheating of the sod.
2. Evidence of inadequate protection following the digging, carelessness while in transit, or improper handling shall be cause for rejection.
3. Sod shall be kept moist, fresh, and protected at all times. Such protection shall encompass the entire period during which the sod is in transit, being handled, or are in temporary storage.
4. Upon arrival at the temporary storage location or the site of the work, sod material shall be inspected for proper shipping procedures. Should the sod be dried out, the Architect will reject the sod. When sod has been rejected, the Contractor shall at once remove it from the area of the work and replace it with acceptable material.
5. Unless otherwise authorized by the Architect, the Contractor shall notify the Architect at least two working days in advance of the anticipated delivery date of sod material. Certificate of Inspection when required shall accompany each shipment.

C. Handling and Storage of Sod:

1. Sod material shall be handled with extreme care to avoid breaking or tearing strips.
2. Sod shall not be stored for longer than 30 hours prior to installation. Sod shall be stored in a compact group and shall be kept moist. Sod shall be prevented from freezing.
3. Sod that has been damaged by poor handling or improper storage will be rejected by the Architect.

D. Deliver seed in original sealed containers, labeled with analysis of seed mixture, percentage of pure seed, year of production, net weight, date of packaging, location of packaging, and name of seed grower. Damaged packages will not be accepted .

E. Seed shall be stored under cool and dry conditions so that the endophytic seed in the mixture is capable of maintaining a high level of endophytes.

F. Deliver fertilizer in sealed waterproof bags, printed with manufacturer's name, weight, and guaranteed analysis.

1.9 PLANTING SEASON

A. Planting season shall be as follows:

Seeding and sodding	
Spring:	3/15 to 5/15
Fall:	8/15 to 10/15

B. Planting shall only be performed when weather and soil conditions are suitable for planting the material specified in accordance with locally accepted practice.

C. Planting season may be extended with the written permission of the Architect.

1.10 ACCEPTANCE

A. Acceptance:

1. The Architect will inspect all work for Substantial Completion upon written request of the Contractor. The request shall be received at least ten calendar days before the anticipated date of inspection.
2. Acceptance of material by the Architect will be for general conformance to specified requirements, and shall not relieve the Contractor of responsibility for full conformance to the Contract Documents.
3. Upon completion and reinspection of all repairs or renewals necessary in the judgement of the Architect, the Architect will recommend to the Owner that the work of this Section be accepted.

B. Sod and seed areas will be accepted when in compliance with all the following conditions:

1. Roots are thoroughly knit to the soil
2. Absence of visible joints (sodded areas)
3. All areas show a uniform stand of specified grass in healthy condition
4. At least 60 days have elapsed since the completion of work under this Section

PART 2 - PRODUCTS

2.1 GENERAL

A. Materials shall be extracted or recovered and manufactured from within 500 miles of project site.

2.2 SEED

A. Seed mixture: Standard grade seed of the most recent season's crop. Seed shall be dry and free of mold. Seed shall be inoculated with endophytes. Seed mixture shall be as follows: SEED MIX

Name of Seed	% by Weight in Mixture	Minimum % Purity	Minimum % Germination
Chewings Fescue	30	98	85
Shademaster Creeping Red Fescue	30	98	85
Commander Perennial Ryegrass	30	98	85
Kentucky Bluegrass	10	98	90

B. Certified Fescue Turfgrass Sod: Superior sod grown from certified, high quality seed of known origin or from plantings of certified grass seedlings or stolons. It shall be inspected by the certification agency of the state in which it is grown to assure satisfactory genetic identity and purity, overall high quality and freedom from noxious weeds as well as excessive quantities of other crop and weedy plants at time of harvest. All seed or original plant material in mixture must be certified. Turfgrass sod shall meet the published state standards for certification.

1. Sod shall be a Fescue sod grown from a blend of fescues free of bluegrass.

C. Sod shall be nursery grown on cultivated mineral agricultural soils. Sod shall have been mowed regularly and carefully, and otherwise maintained from planting to harvest.

D. Thickness of Cut: Sod shall be machine cut at a uniform soil thickness of 5/8 in., plus or minus 1/4 in., at the time of cutting. Measurement for thickness shall exclude top growth and thatch.

E. Strip Size: Individual pieces of sod shall be cut to the supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be plus or minus 1/2 in. on width, and plus or minus 5% on length. Broken strips and torn and uneven ends will not be acceptable.

F. Strength of Sod Strips: Standard size sections of sod shall be strong enough to support their own weight and retain their size and shape if suspended vertically when grasped in the upper 10% of the section.

G. Moisture Content: Sod shall not be harvested or transplanted when moisture content (excessively dry or wet) may adversely affect its survival.

H. Time Limitations: Sod shall be harvested, delivered, and transplanted within a 36 hour period unless a suitable preservation method is approved prior to delivery. Sod not transplanted within this period shall be inspected and approved by the Architect prior to its installation.

I. Thatch: Sod shall be relatively free of thatch. A maximum of 1/2 in. (uncompressed) thatch will be permitted.

J. Diseases, Nematodes, and Insects: Sod shall be free of diseases, nematodes, and soil-borne insects. State Nursery and Plant Materials Laws require that all sod be inspected and approved for sale. The inspection and approval must be made by the State Agricultural Department, Office of the State Entomologist.

K. Weeds: Sod shall be free of objectionable grassy and broad leaf weeds. Turfgrass sod shall be considered free of such weeds if less than five such plants are found per 100 sq. ft. of area.

1. Turfgrass sod shall not be acceptable if it contains any of the following weeds: common bermudagrass (wiregrass), quackgrass, johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel and bromegrass.

2.3 SOD FARM GROWING MEDIUM

A. Soil in which sod was grown shall be classified as loam or sandy loam (silt loam is not acceptable) and shall conform to the following grain size distribution for material passing the #10 sieve:

U.S. Sieve No.	% Passing by Weight	
	Minimum	Maximum
10	100	---
20	75	100
40	30	85
100	12	45
270	5	25
0.002 mm	1	4

1. The maximum retained on the #10 sieve shall be 15% by weight of the total sample.
2. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422.
3. The organic content shall be between 3.0 and 8.0 percent.

2.4 PLANTING SOIL

A. Existing Topsoil

1. Existing topsoil from on-site source(s) may be used for planting soil, to the extent available, if it meets the requirements of this Section for planting soil, or if approved by the Architect.

B. Planting Soil

1. Planting soil shall be composed of a natural, fertile, friable soil typical of cultivated topsoils of the locality, suitable for the germination of seeds and support of vegetative growth, with additives, if required, to achieve particle distribution and organic content specifications . Topsoil shall be taken from a well-drained, arable site, free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots, other objectionable, extraneous matter or debris nor contain toxic substances. Planting soil shall have a pH value between 5.5 and 6.5 and organic matter content of 5 to 10% of total dry weight.
2. Planting soil shall have the following mechanical analysis (see paragraph 1.6 for particle sizes):

Approximate Particle Distribution	
Gravel	Less than 10%
Coarse to medium sand	55 – 65%
Fine to very fine sand	15 – 25%
Silt	10– 20%
Clay	15 – 20%

3. Minimum planting soil nutrient levels shall be: Nitrogen @ 5% average of organic matter, Phosphorus @ .02 to .05% average of total soil content, Potassium @ 1.2% average of total soil content.
4. The Contractor shall provide the Architect with planting soil test results, as specified in Paragraph 1.6, before the start of planting operations. If planting soil does not fall within the required particle distribution, organic content, or pH range, it shall be adjusted to meet the specifications through the addition of sand, compost, limestone, or aluminum sulfate to bring it within the specified limits.

2.5 COMPOST

A. Compost shall be derived from organic wastes such as food and agricultural residues, animal manures, mixed solid waste and biosolids (treated sewage sludge) that meet all State Environmental Agency requirements. The product shall be well composted, free of viable weed seeds and contain material of a generally humus nature capable of sustaining growth of vegetation, with no materials toxic to plant growth.

1. Compost shall have the following properties:

Parameters	Range
pH	5.5 – 8.0
Moisture Content	35% - 55%
Soluble Salts	less than or equal to 4.0 mmhos (dS)
C:N ratio	15 – 30:1
Particle Size	< 1”
Organic Matter Content	> 50%
Bulk Density	< 1000 lbs./cubic yard
Foreign Matter	< 1% (dry weight)

2. Compost generator shall also provide minimum available nitrogen and other macro and micro nutrients to determine fertilizer requirements.

3. Compost shall be “AllGro”, distributed by AllGro, 4 Liberty Lane West, Hampton, NH 03842; “Agresoil”, distributed by Agresource, 100 Main Street, Amesbury, MA 01913; or approved equal.
4. Guidelines for quantity of compost required to achieve suitable soil organic content in soil mixes for ornamental horticultural planting shall be as recommended by the compost manufacturer

2.6 LIMESTONE

A. Ground limestone shall be an agricultural limestone containing a minimum of 85% total carbonates, by weight. Ground limestone shall be graded within the following limits:

Sieve Size	% Passing by Weight
No. 10	100
No. 20	90
No. 100	60

2.7 WATER

A. Water shall be suitable for irrigation and free from ingredients harmful to seeded or sodded areas.

2.8 COMMERCIAL FERTILIZER

A. Starter fertilizer shall be HD Scotts Starter Fertilizer or approved equal.

B. Fertilizer shall conform to the following:

1. When applied as a topsoil amendment, fertilizer shall have an analysis that will deliver appropriate amounts of nitrogen, phosphorus, and potassium as required to remedy deficiencies revealed by testing the topsoil.

a. 50% of nitrogen shall be derived from natural organic source of ureaform .
b. Available phosphorus shall be derived from superphosphate, bone meal, or tankage.
c. Potassium shall be derived from muriate of potash containing 60% potash.

C. Fertilizer shall be delivered in manufacturer's standard container printed with manufacturer's name, material weight, and guaranteed analysis.

2.9 SUPERPHOSPHATE

A. Superphosphate shall be composed of finely ground phosphate rock as commonly used for agricultural purposes, and containing not less than 20% available phosphoric acid. The superphosphate shall be delivered to the site in the original unopened containers, each bearing the manufacturer's guaranteed analysis. Any superphosphate which becomes caked or otherwise damaged making it unsuitable for use, will be rejected.

2.10 CELLULOSE FIBER MULCH

A. Cellulose fiber mulch shall be composed of virgin wood, contain a green color additive, be weed free, and non-polluting, containing no germination or growth - inhibiting factors, similar to Hydro Mulch, manufactured by Conwed Corporation, St. Paul, Minnesota 55113.

2.11 WEED CONTROL

A. Weed control for stockpiled topsoil shall be a non-selective weed killer for control of grassy and broadleaf weeds; weed control shall have short residual, allowing seeding and sodding operations to occur within 7 days of application.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBGRADE

A. Subgrade shall be examined to ensure that rough grading and all other subsurface work in lawn areas and other areas to be seeded or sodded is done prior to start of seeding or sodding.

B. Existing subgrade shall be loosened or scarified to a minimum depth of 3 in. prior to spreading topsoil. Subgrade shall be brought to true and uniform grade, and shall be cleared of stones greater than 3 in., sticks, and other extraneous material.

3.2 SPREADING OF PLANTING SOIL

A. Planting soil shall not be spread until it is possible to follow immediately or within 24 hours with seeding or sodding operations. If topsoil is spread prior to this time it shall be cultivated to loosen soil prior to seeding or sodding.

B. Planting soil shall not be placed when subgrade or topsoil material are frozen, excessively wet, or excessively dry.

C. Planting soil shall be spread in a uniform layer, to a thickness which will compact to the depth required to bring final lawn and grass surfaces to required elevation. Unless otherwise indicated minimum depth of topsoil for seeded and sodddd areas shall be 6 in.

1. Place approximately 1/2 the thickness of planting soil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil mixture.

D. Grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger than 1-1/2 inches (38 mm) in any dimension, and other objects that may interfere with planting or maintenance operations.

E. Moisten prepared lawn areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

F. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.

3.3 APPLICATION OF FERTILIZER AND CONDITIONERS

A. Fertilizer and conditioners shall be applied at the following rates:

1. Compost - as required by test results of topsoil.
2. Limestone - as required by test results of topsoil.
3. Fertilizer - as required by test results of topsoil.

B. Mixing with planting soil:

1. Fertilizer and conditioners shall be spread over the entire lawn areas at the application rates indicated above.
2. Materials shall be uniformly and thoroughly mixed into the top 4 in. of planting soil by discing, rototilling, or other approved method.

3.4 FINISH GRADING

A. Refer to Section 329119, LANDSCAPE GRADING.

B. Contractor shall set grade lines for Architect's review and approval.

1. Final surface of topsoil immediately before seeding and sodding shall be within + 1/2 in. of required elevation, with no ruts, mounds, ridges, or other faults, and no pockets or low spots in which water can collect. Stones, roots, and other debris greater than 1 in. in any dimension, which are visible at the surface, shall be removed and the resulting holes filled with topsoil, leaving a uniform planar surface.

C. Finish grade surface with a drag or rake. Round out all breaks in grade, smooth down all lumps and ridges, fill in all holes and crevices. Rolling with a light roller is acceptable, if the surface is scarified afterward.

1. Lawn: Compaction of topsoil for finish grade shall be 85% to 88%.

D. In the event of settlement, the Contractor shall readjust the work to required finished grade.

3.5 SEED APPLICATION

A. Seed shall be applied in two applications; by mechanical spreader.

B. First Application: Seed shall be broadcast by means of an approved mechanical spreader, to give a uniform application at the following rates:

Seed Application	Rate lb./1,000 s.f.
Seed Mixture	4.0 (unless otherwise recommended by seed supplier)

1. Seed shall be applied in two equal applications for uniform coverage; direction of travel of spreader for second pass shall be perpendicular to that of the first pass. Seeding shall not be done when it is raining or snowing, or when wind velocity exceeds 5 mph.
2. Following seeding the area shall be lightly raked to mingle seed with top 1/8 to 1/4 in. of soil. Area shall then be fine graded. Stones and other debris greater than 1 in. in any dimension which are visible on surface shall be removed.

C. Following seeding and raking, entire area shall be rolled with a hand roller having a weight of 60 to 90 lb./ft. of width, and a minimum diameter of 2 ft. Entire area shall then be watered by use of lawn sprinklers, or other approved means. Initial watering shall continue until the equivalent of a 2 in. depth of water has been applied to entire seeded surface, at a rate which will not dislodge the seed. Watering shall be repeated thereafter as frequently as required to prevent drying of the surface, until the grass attains an average height of 1/4 in. Watering methods and apparatus which may cause erosion of the surface shall not be permitted.

D. Rope off entire seeded area to prevent vehicles and pedestrians from entering area.

3.6 SODDING

A. Edges of the sodded areas shall be smooth, and all sodded areas shall conform to the design cross sections and grade. At edges adjacent to curbs, paved areas, etc., top surface of earth in sod shall be 1/2 in. below adjacent hard surface.

B. Sod shall be placed and all sodding operations completed within 72 hours following stripping from sod source bed.

C. On slopes steeper than 2 to 1, sod shall be fastened in place with suitable wood pins or other approved methods, spaced at not less than 1 pin per square foot.

D. Surface of completed sodded area shall be smooth. Sod shall be laid edge-to-edge, with tight-butted, staggered joints. Sod shall be carefully placed to insure that it is neither stretched or overlapped. Immediately after laying sod shall be pressed firmly into contact with sod bed by tamping or rolling, to eliminate air pockets. Following compaction, topsoil shall be used to fill all cracks, and excess soil shall be worked into grass with rakes or other suitable equipment. Sod shall not be smothered with excess fill soil.

E. Immediately after sodding operations have been completed, entire surface shall be compacted with a cultipacker roller or other approved equipment weighing 100 to 160 lb./ft. of roller.

F. Completed sod shall immediately be watered sufficiently to uniformly wet the soil to at least 1 in. below the bottom of sod bed.

3.7 CONTRACTOR MAINTENANCE

A. Except as otherwise specified below, maintenance shall include all operations required to produce an established lawn, including but not limited to:
   Fertilizing
   Mowing
   Replanting
   Watering
   Weeding

B. Maintenance of seeded areas shall begin upon completion of seeding and shall continue until acceptance of the building, or until mowing as specified below is completed, or until average height of grass is 1-1/2 in., whichever occurs later.

   1. Watering

      a. Week No. 1: Provide all watering necessary to keep seed bed moist at all times. Perform watering daily or as necessary to maintain moist soil to a depth of 4 in.
      b. Week No. 2 and until acceptance of the building, or until mowing as specified below is completed, or until average height of grass is 1-1/2 in., whichever occurs later: Water as necessary to maintain adequate moisture in the upper 4 in. of soil to promote seed germination.

   2. Mowing

      a. Not more than 40% of the grass leaf shall be removed during the first or subsequent mowings.
      b. Cool season grasses shall be maintained between 1-1/2 in. and 2-1/2 in.
      c. All clippings shall be removed.

C. Maintenance of sodded areas shall begin upon completion of sodding and shall continue for 45 days thereafter, unless sodding is not completed until after September 15, in which case maintenance shall continue until the June 15 following.

1. Watering

a. Week No. 1: Provide all watering necessary for rooting of sod. Soil on sod pads shall be kept moist at all times. Perform watering daily or as necessary to maintain moist soil to a depth of 4 in. Watering shall be done during the heat of the day to prevent wilting
b. Week No. 2 and Subsequent Weeks: Water as necessary to maintain adequate moisture in the upper 4 in. of soil to promote deep root growth.

2. Mowing

a. Mowing shall not be attempted until the sod is firmly rooted and securely in place. Not more than 40% of the grass leaf shall be removed during the first or subsequent mowings.
b. Cool season grasses shall be maintained between 1-1/2 in. and 2-1/2 in.
c. All clippings shall be removed.
d. After 2 mowings, the Contractor shall top dress the sod with an application of fertilizer at the rate of 1 pound of actual nitrogen per 1000 square feet.

D. After grass has sprouted, seeded areas which fail to show a uniform stand of grass shall be replanted as often as necessary to establish an acceptable stand of grass.

1. Scattered bare spots, shall not exceed 15 sq. in. Each.

E. Weeds and growth other than varieties of grass named in grass seed formula shall be removed. Removal may be accomplished by use of suitable herbicides or by physical removal, in which case top growth and roots shall both be removed, and bare spots exceeding specified limits shall be reseeded.

F. If lawn or grass is established in the fall and maintenance is required to continue into spring months, lawn and grass shall receive an application of lime and fertilizer in the spring. Lime and fertilizer shall be spread in a uniform layer over the entire lawn surface, at the following rates.

Material	Application Rate
Lime	100 lb./1000 sq. ft.
Fertilizer	20 lb./1000 sq. ft.

G. Remove rope barricades only after second cutting of lawns.

END OF SECTION

SECTION 329300

TREES, PLANTS, AND GROUND COVERS

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 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Planting.
2. Planting Soil.

B. Alternatives: Not Applicable

1.3 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 329119 – LANDSCAPE GRADING
2. Section 329200 – LAWNS AND GRASSES

1.4 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American National Standards Institute, Inc. (ANSI): Z60.1 American Standard for Nursery Stock (Sponsor: American Association of Nurserymen, Inc.)
2. American Society for Testing and Materials (ASTM):

   C 136 Sieve Analysis of Fine and Coarse Aggregates

   D 422 Particle-Size Analysis of Soils

   E 11 Wire-Cloth Sieves for Testing Purposes

   F 405 Corrugated Polyethylene (Pe) Tubing and Fittings
3. "Hortus Third", A Concise Dictionary of Plants Cultivated in the United States and Canada, Cornell University, L.H. Bailey Hortorium, MacMillian Publishing Co., New York, NY.

1.5 SUBMITTALS

A. Samples: The following samples shall be submitted:

Material	Sample Size or Quantity
Mulch	1 ft.3
Compost	1 ft.3
Planting soil	1 ft.3
Loam borrow	1 ft.3
Tree stake	36 in. length

B. Manufacturer's Product Data: Manufacturer's product data shall be submitted for the following materials:

Aluminum sulfate

Antidessicant

Fertilizer

Fungicide

Herbicide

Insecticide

Compost

Gator Bags

C. Certificates: Labels from the manufacturer's container certifying that the product meets the specified requirements shall be submitted for the following materials:

Commercial fertilizer

Limestone Certificates: Labels

D. Test Reports: Test reports from an approved testing agency indicating compliance with the specifications shall be submitted for topsoil, peat moss, planting soil mixture, and any other materials designated by the Architect.

1.6 OWNER'S INSPECTION AND TESTING

A. Work will be subject to inspection at all times by the Architect. The Owner reserves the right to engage an independent testing laboratory in accordance with requirements of Division 01, GENERAL REQUIREMENTS to analyze and test materials used in the construction of the work. Where directed by the Architect, the testing laboratory will make material analyses and will report to the Architect whether materials conform to the requirements of this specification.

1. Cost of tests and material analyses made by the testing laboratory will be borne by the Owner when they indicate compliance with the specification, and by the Contractor when they indicate non-compliance.
2. Testing equipment will be provided by and tests performed by the testing laboratory. Upon request by the Architect, shall provide such auxiliary personnel and services needed to accomplish the testing work.
3. Gradation of granular materials shall be determined in accordance with ASTM C 136. Sieves for determining material gradation shall be as described in ASTM E 11.

1.7 CONTRACTOR'S INSPECTION AND TESTING

A. The Contractor shall engage an independent testing agency, experienced in the testing of agricultural soils and acceptable to the Architect, to perform the topsoil/planting soil tests and analyses specified herein. All costs associated with testing shall be the Contractor's responsibility.

1. Particle size analyis shall include the following gradient of mineral content.

USDA Designation	Size in mm
Gravel	+ 2 mm
Very coarse sand	1-2 mm
Coarse sand	0.5-1 mm
Medium sand	0.25-0.5 mm
Fine sand	0.1-0.25 mm
Very fine sand	0.05-0.1 mm
Silt	0.002-0.05 mm
Clay	< 0.002 mm

2. Chemical analysis shall include the following:
   a. pH and buffer pH
   b. percentage of organic content by oven-dried weight
   c. Nutrient levels by parts per million, including phosphorus, potassium, magnesium, manganese, iron, zinc, and calcium. Nutrient test shall include testing laboratory recommendations for supplemental additions to the soil, if necessary, based on the requirements for ornamental horticultural plants. Recommendations shall include rates at which additives are to be applied.
   d. Soluble salt by electrical conductivity of a 1:2 soil/water sample

1.8 SOURCE QUALITY CONTROL

A. Identification of plant materials shall be as named in "Hortus Third".

B. Selection of Plant Materials: Submit to the Architect the names and locations of nurseries proposed as sources of acceptable plant material. Inspect all nursery materials to determine that the materials meet the requirements of this section. Proposed materials shall be flagged at the nurseries by the Contractor prior to viewing by the Architect.

1. Schedule with the Architect a time for viewing plant material at the nursery. Trips to nurseries shall be efficiently arranged to allow Architect to maximize viewing time. A

minimum of six weeks shall be allowed for this viewing prior to time that plants are to be dug.

2. Architect may choose to attach seal to each plant, or representative samples.

3. Where requested by the Architect, photographs of plant material or representative samples of plants shall be submitted.

4. Viewing and/or sealing of plant materials by the Architect at the nursery does not preclude the Architect's right to reject material at the site of planting

1.9 AVAILABILITY OF PLANT MATERIAL

A. Before changes or substitutions can be made due to unavailability of plant material, submit satisfactory evidence that the Contractor has advertised for a one month period in a trade journal such as the "American Nurseryman", with no response, or has undertaken other methods of locating plant material acceptable to the Architect.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Digging Plant Material: Plants shall not be dug at the nursery or approved source until the Contractor is ready to transport them from their original locations to the site of the work or acceptable storage location.

B. Transportation of Plant Material: Plants transported to the project in open vehicles shall be covered with tarpaulins or other suitable covers securely fastened to the body of the vehicle to prevent injury to the plants. Closed vehicles shall be adequately ventilated to prevent overheating of the plants. Plants shall not remain in darkened enclosed trailer for more than 48 hours cumulative.

1. Plants shall be kept moist, fresh, and protected at all times. Such protection shall encompass the entire period during which the plants are in transit, being handled, or are in temporary storage.

2. Unless otherwise authorized by the Architect, notify the Architect at least three working days in advance of the anticipated delivery date of any plant material. A legible copy of the bill of lading, showing the quantities, kinds, and sizes of materials included for each shipment shall be furnished to the Architect.

C. Storage: Unless specific authorization is obtained from the Architect, plants shall not remain on the site of work longer than three days prior to being planted.

1. Plants that are not planted immediately shall be protected as follows:
   a. Earth balls shall be kept appropriately moist and their solidity carefully preserved.
   b. Plants shall not be allowed to dry out or freeze.

2. Both the duration and method of storage of plant materials shall be subject to the approval of the Architect

D. Handling of Plant Materials: Exercise care in handling plant materials to avoid damage or stress.

1.11 REJECTION OF MATERIALS

A. Evidence of inadequate protection following digging, carelessness while in transit, or improper handling or storage, shall be cause for rejection.

B. Upon arrival at the temporary storage location or the site of the work, plants shall be inspected for proper shipping procedures. Should the roots be dried out, large branches be broken, balls of earth broken or loosened, or areas of bark be torn, the Architect will reject the injured plant.

C. When a plant has been rejected, remove it from the area of the work within 3 days and replace it with one of the required size and quality.

1.12 PLANTING SEASON

A. Planting: Planting may commence as soon as the ground has thawed at the nursery and at the site of planting, and weather conditions make it practicable to work both at the nursery and at the site.

1. Spring planting shall not occur any later than the following:
   a. Deciduous Trees and Shrubs: July 15
   b. Evergreen Trees and Shrubs: June 30

2. Fall Planting: Fall planting will be permitted with the exception of oak trees. Oak trees shall not be planted in the fall.

B. Regardless of the dates specified above, planting shall only be performed when weather and soil conditions are suitable for planting the material specified in accordance with locally accepted practice.

C. Planting season may be extended only with the written permission of the Architect. Plant material guarantee shall be honored regardless of extended planting season.

1.13 ACCEPTANCE

A. The Architect will inspect all work for Substantial Completion upon written notice of completion. The request shall be received at least ten calendar days before the anticipated date of inspection

B. Acceptance of plant material by the Architect will be for general conformance to specified size, character, and quality, and shall not diminish responsibility for full conformance to the Contract Documents.

C. Upon completion and reinspection of all repairs or renewals necessary in the judgement of the Architect, the Architect will recommend to the Owner that acceptance of the work of this Section be given.

D. Acceptance in Part

1. The work may be accepted in parts when it is deemed to be in the Owner's best interest to do so, and when permission is given to the Contractor in writing to complete the work in parts.

2. Acceptance and use of such areas by the Owner shall not waive any other provisions of this Contract.

1.14 MAINTENANCE

A. Contractor shall maintain plant material until the completion of 12-month guarantee period and Final Acceptance of work, as described in Part 3 of this Section.

1.15 GUARANTEE

A. Plants shall be guaranteed for a period of 12-months after the date of Acceptance by the Owner. When the work is accepted in parts, the guarantee periods shall extend from each of the partial acceptances to the terminal date of the last guarantee period. Thus, all guarantee periods terminate at one time.

B. Plants shall be healthy, free of pests and disease, and in flourishing condition at the end of the guarantee period. Plants shall be free of dead and dying branches and branch tips, and shall bear foliage of normal density, size, and color.

C. Replace dead plants and all plants not in a vigorous, thriving condition, as determined by the Architect during and at the end of the guarantee period, without cost to the Owner, as soon as weather conditions permit and within the specified planting period.

1. Replacements shall closely match adjacent specimens of the same species. Replacements shall be subject to all requirements stated in this Specification.

2. Make all necessary repairs due to plant replacements. Such repairs shall be done at no extra cost to the Owner.

3. The guarantee of all replacement plants shall extend for an additional 12-month period from the date of their acceptance after replacement. In the event that a replacement plant is not acceptable during or at the end of the said extended guarantee period, the Owner may elect one more replacement or credit for each item.

D. At the end of the guarantee period, and no less than five days prior to final inspection, staking and guying materials, and tree wrap and ties shall be removed from the site.

1.16 FINAL INSPECTION AND FINAL ACCEPTANCE

A. At the end of the 12-month guarantee period, the Architect will, upon written notice of end of guarantee period inspect the work for Final Acceptance. Request shall be received at least ten calendar days before the anticipated date for Final Inspection.

B. Upon completion and reinspection of full repairs or replacements necessary in the judgment of the Architect at that time, the Architect will recommend to the Owner that Final Acceptance of the Work of this Section be given.

PART 2 - PRODUCTS

2.1 PLANTS

A. Except as otherwise specified, size and grade of plant materials shall conform to ANSI Z60.1. In no case shall ball size be less than 11 in. in diameter for each inch of caliper.

B. Plants shall have outstanding form; symmetrical, heavily branched with an even branch distribution, densely foliated and/or budded, and a strong, straight, distinct leader where this is characteristic of species. Plants shall possess a normal balance between height and spread. The Architect will be the final arbiter of acceptability of plant form.

C. Plants shall be healthy and vigorous, free of disease, insect pests and their eggs, and larvae.

D. Plants shall have a well-developed fibrous root system.

E. Plants shall be free of physical damage such as scrapes, broken or split branches, scars, bark abrasions, sunscalds, fresh limb cuts, disfiguring knots, or other defects. These defects shall not interrupt more than 25% of the circumference of the plant cambium.

F. Plants shall meet the sizes indicated on the Plant List. Plants larger or smaller than specified may be used only if accepted by the Architect.

G. Where a size or caliper range is stated, at least 50% of the material shall be closer in size to the top of the range stated.

H. Plants shall not be pruned before delivery.

I. All trees and shrubs shall be labeled. Labels shall be durable and legible, stating the correct plant name and size in weather-resistant ink or embossed process. Labels shall be securely attached to all plants prior to delivery to the site, being careful not to restrict growth.

J. Plants indicated as "B&B" shall be balled and burlapped.

K. Container grown plants shall be well rooted and established in the container in which they are growing.

L. Perennials: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery and that are in bud but not yet in bloom.

2.2 PLANTING SOIL

A. Existing Topsoil

1. Existing topsoil from on-site source(s) may be used for planting soil, to the extent available, if it meets the requirements of this Section for planting soil, or if approved by the Architect.

B. Planting Soil

1. Planting soil shall be composed of a natural, fertile, friable soil typical of cultivated topsoils of the locality, suitable for the germination of seeds and support of vegetative

growth, with additives, if required, to achieve particle distribution and organic content specifications . Topsoil shall be taken from a well-drained, arable site, free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots, other objectionable, extraneous matter or debris nor contain toxic substances. Planting soil shall have a pH value between 5.5 and 6.5 and organic matter content of 5 to 10% of total dry weight

2. Planting soil shall have the following mechanical analysis (see paragraph 1.06 for particle sizes):

Approximate Particle Distribution	
Gravel	Less than 10%
Coarse to medium sand	55 – 65%
Fine to very fine sand	15 – 25%
Silt	10 – 20%
Clay	15 – 20%

3. Minimum planting soil nutrient levels shall be: Nitrogen @ 5% average of organic matter, Phosphorus @ .02 to .05% average of total soil content, Potassium @ 1.2% average of total soil content.

4. The Contractor shall provide the Architect with planting soil test results, as specified in Paragraph 1.06, before the start of planting operations. If planting soil does not fall within the required particle distribution, organic content, or pH range, it shall be adjusted to meet the specifications through the addition of sand, compost, limestone, or aluminum sulfate to bring it within the specified limits.

5. Planting soil for ericaceous shrubs shall have a pH value range of 4.5 to 5.0

2.3 COMPOST

A. Compost shall be derived from organic wastes such as food and agricultural residues, animal manures, mixed solid waste and biosolids (treated sewage sludge) that meet all State Environmental Agency requirements. The product shall be well composted, free of viable weed seeds and contain material of a generally humus nature capable of sustaining growth of vegetation, with no materials toxic to plant growth.

1. Compost shall have the following properties:

Parameters	Range
pH	5.5 – 8.0
Moisture Content	35% - 55%
Soluble Salts	<4.0 mmhos (dS)
C:N ratio	15 – 30:1
Particle Size	< 1”
Organic Matter Content	> 50%
Bulk Density	< 1000 lbs./cubic yard
Foreign Matter	< 1% (dry weight)

2. Compost generator shall also provide minimum available nitrogen and other macro and micro nutrients to determine fertilizer requirements.

3. Compost shall be “AllGro”, distributed by AllGro, 4 Liberty Lane West, Hampton, NH 03842; “Agresoil”, distributed by Agresource, 100 Main Street, Amesbury, MA 01913; or approved equal.
4. Guidelines for quantity of compost required to achieve suitable soil organic content in soil mixes for ornamental horticultural planting shall be as recommended by the compost manufacturer.

2.4 WATER

A. Water shall be suitable for irrigation and shall be free from ingredients harmful to plant life.

2.5 FERTILIZER

A. Commercial grade complete fertilizer of neutral character, consisting of fast and slow release nitrogen, 50% of nitrogen shall be derived from natural organic source of ureaform phosphorus and potassium in the following composition.

B. Controlled-release fertilizer shall be granular consisting of 50% water and insoluble nitrogen, phosphorus and potassium.

2.6 MULCH

A. Mulch shall be a 100% fine-shredded pine bark, of uniform size.

2.7 STAKING AND GUYING MATERIALS

A. As indicated on Drawings.

2.8 ANTIDESICCANT

A. Antidessicant shall be an emulsion specifically manufactured for plant protection which provides a protective film over plant surfaces which is permeable enough to permit transpiration. Antidessicant shall be delivered in manufacturer's sealed containers and shall contain manufacturer's printed instructions for use.

PART 3 - EXECUTION

3.1 EXAMINATION OF SUBGRADE

A. Examine subgrade and rough grading before planting. Alert Architect to unacceptable rough grading or subgrade.

3.2 DRAINAGE OF SOILS

A. Test drainage of five plant beds and pits chosen by the Architect shall be done by filling with water twice in succession. The time at which water is put into the pit or bed for a second filling

shall be noted. Architect shall then be notified of the time it takes for pit or bed to drain completely. Planting operations shall not proceed until Architect has reviewed test drainage results.

B. Notify the Architect in writing of all soil or drainage conditions that he considers detrimental to growth of plant material. Submit proposal and cost estimate for correction of the conditions for Architect's approval before starting work.

3.3 LAYOUT OF PLANTING AREAS

A. Individual trees shall be located in the field as indicated on the Drawings for Architect’s approval prior to planting. Contractor shall provide one foreman, one loader with operator and two laborers to work with Architect in the field to determine the final location and orientation of each tree prior to planting. It is anticipated that this process may take several days to complete. Contractor shall plan to have this layout crew available to work with Architect at a slow and deliberate pace in order to achieve the desired results.

B. Individual shrub locations and outlines of shrub and ground cover areas to be planted shall be staked by the Contractor in ample time to allow inspection by the Architect.

C. Individual vines and groundcovers to be planted shall be laid out in plant beds by the Contractor in ample time to allow inspection by the Architect.

D. Digging shall not begin until locations are approved by the Architect.

E. Location of trees shall be staked using color coded stakes. A different stake color shall be used for each tree species.

3.4 PREPARATION OF SUBGRADE

A. Subgrade of planting areas shall be loosened or scarified to a minimum depth of 3 in. prior to spreading planting soil. Subgrade shall be brought to true and uniform grade and shall be cleared of stones greater than 2 in., sticks, and other extraneous material.

3.5 PLANT PIT EXCAVATION

A. Planting pits for trees and shrubs shall be excavated to the depth and dimension indicated on the Drawings.

B. Excavation shall not begin until locations are approved by the Architect.

3.6 SPREADING OF PLANTING SOIL

A. Planting soil shall be spread and placed to required depths.

B. Surfaces shall be graded and smoothed, eliminating all sharp breaks by rounding, scraping off bumps and ridges, and filling in holes and cuts.

3.7 PLANTING

A. Walls of plant pits shall be dug so that they are sloped and scarified.

B. Plants shall be set as indicated on Drawings. Plants shall have same relationship to finished grade as in the nursery.

C. Plants shall be turned to the desired orientation when required by Architect.

D. Containerized plants shall be removed from container taking care not to damage roots. The side of the root ball shall be scarified to prevent root-bound condition and plant positioned in planting pit.

E. Planting shall be positioned in center of planting pit, set plumb, and rigidly braced in position until all planting soil has been tamped solidly around the ball.

F. Pits shall be backfilled with planting soil. Soil shall be worked carefully into voids and pockets, tamping lightly every 6 in.

1. When pit is two-thirds full, plants shall be watered thoroughly, and water left to soak in before proceeding.
2. At this time, ropes or strings on top of ball shall be cut and shall be pulled back. Burlap or cloth wrapping shall be left intact around ball except that portions of wrap that are exposed at top of ball shall be turned under and buried. Non-biodegradable ball wrapping and support wire shall be totally removed from ball and planting pit.
3. Wire baskets shall be completely cut away from sides of root ball, and removed from pit. Bottom of basket may remain.
4. Remove nursery plant identification tags.

G. Backfilling and tamping shall then be finished and a saucer formed around plant pits as indicated on the Drawings.

H. Saucer shall be filled with water and water left to soak in. Saucer shall then be filled with water again.

3.8 APPLICATION OF FERTILIZER

A. Fertilizer shall be applied when planting pits are backfilled two-thirds full. Fertilizer application shall be of the type, rate, and timing recommended by fertilizer manufacturer.

3.9 STAKING AND GUYING

A. Each tree shall be staked or guyed immediately following planting. Plants shall stand plumb after staking or guying. Staking or guying shall not be used as a means to straighten trees.

3.10 MULCHING

A. Mulch shall be applied as follows (entire area listed shall be mulched):

Plant Type	Mulch Area	Mulch Depth, in.
Tree	Saucer	2
Shrub	Saucer or Bed	2
Perennial	Bed	2
Ground Cover	Bed	2

3.11 PRUNING

A. Each tree and shrub shall be pruned to preserve the natural character of the plant. Pruning shall be done after delivery of plants and after plants have been inspected and approved by the Architect. Pruning procedures shall be reviewed with Architect before proceeding.

3.12 MAINTENANCE OF PLANTING

A. Maintenance shall begin immediately after each plant is planted and shall continue through 12-month guarantee period until Final Acceptance.

1. The maintenance of all replacement plants shall continue for an additional 12-month period from the date of their acceptance after replacement.
2. Maintenance includes all plants and turf installed within the scope of the project, regardless of property lines, including but not limited to street tree planting within grates, planting within the MWRA property, and within the DCR site.

B. Maintenance shall consist of pruning, watering, cultivating, weeding, mulching, removal of dead material, repairing and replacing of tree stakes, tightening and repairing of guys, repairing and replacing of damaged tree wrap material, resetting plants to proper grades and upright position, and furnishing and applying such sprays as are necessary to keep plantings free of insects and disease, and in a healthy growing condition.

1. Watering for establishment- contractor to be responsible for watering for all plants including monitoring and filling of gator bags on trees, hand watering trees and turf in areas not covered by the irrigation system as needed, and monitoring and adjusting the irrigation system as needed.

C. Planting areas shall be kept free of weeds, grass, and other undesired vegetative growth.

END OF SECTION